PORSCHE

Technical Manual

911 Carrera (996)

Technical Information

Repair

Contents:

Group 0
Entire vehicle – General

WKD 483 721

Foreword

The workshop documentation for the 911 Carrera (996) model has the designation
"911 Carrera (996)" Technical Manual
and contains **Technical Information** as well as instructions on **Repairs**.

The integration of the technical information published in the "911 Carrera (996)" Technical Manual with the instructions on repairs provides the user with a complex reference work that combines into one book associated or cross-referenced material of relevance to workshops and originating from various information media.

The "911 Carrera (996)" Technical Manual consists of 15 folders, subdivided into the following Groups

0	Entire vehicle – General
0	Diagnosis, part 1 (up to Repair Group 45) *1
0	Diagnosis, part 2 (as of Repair Group 61) *2
1	Engine, part 1 (up to Repair Group 13) *3
1	Engine, part 2 (as of Repair Group 15) *4
2	Fuel, exhaust, engine electronics
3	Transmission, manual transmission
3	Transmission, automatic transmission
4	Running gear
5	Body
6	Body equipment, exterior
7	Body equipment, interior
8 / 9	Air conditioning / Electrics
9	Circuit diagrams, part 1 (up to and including the '99 model) *5
9	Circuit diagrams, part 2 (as of the '00 model) *6

*1 The two folders with Group 0 are to be regarded as one folder; i.e. file the "Technical Information" notices only in front of the repair descriptions in the folder "Group 0 – Diagnosis, part 1" **(up to Repair Group 45)**.

*2 The **second folder** "Group 0 – Diagnosis, part 2" **(as of Repair Group 61)** includes the further Repair Groups belonging to Group 0.

*3 The two folders with Group 1 are to be regarded as one folder; i.e. file the "Technical Information" notices only in front of the repair descriptions in the folder "Group 1 – Engine, part 1" **(up to Repair Group 13)**.

*4 The **second folder** "Group 1 – Engine, part 2" **(as of Repair Group 15)** includes the further Repair Groups belonging to Group 1.

*5 The two folders with Group 9 are to be regarded as one folder; i.e. file the "Technical Information" notices only in front of the repair descriptions in the folder "Group 9 – Circuit diagrams, part 1" **(up to and including the '99 model)**.

*6 The **second folder** "Group 9 – Circuit diagrams, part 2" **(as of the '00 model)** includes the further circuit diagrams belonging to Group 9.

The "911 Carrera (996)" Technical Manual has the same structure in each folder, with the following breakdown for all Groups:

Title page: "911 Carrera (996)" Technical Manual
> Foreword

Title page: "Technical Information"
> Table of Contents, Technical information
> Technical information

Title page: "Repair"
> Repair Groups: overview
> Table of Contents, repairs
> General / technical data
> Instructions on repairs

As can be seen from the breakdown, the published Technical Information is in the front part of each folder – numbered according to the Groups. The Table of Contents assigned to each Group will be periodically updated.

Following the Technical Information, separated by a title page, the instructions on repairs – assigned according to the Groups or broken down into Repair Groups – are included in the folders.

The instructions on repairs will be extended and updated by means of supplements.

Note

Sheets that already exist in the "911 Carrera (996)" Technical Manual and are updated or revised and thereby exchanged by a supplement are designated "replacement sheet". Revisions or technical modifications on pages of these replacement sheets are identified for the user with a vertical bar at the margin.

Record sheet for supplements to

Technical Manual "911 Carrera (996)"

We ask that you file the supplement under the appropriate Repair Groups and enter them in the table below to provide an overview.

Supplement No.	Date filed	Signature
1	already filed	— — —
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

Record sheet for supplements to

"911 Carrera (996)" Technical Manual

We ask that you file the supplements under the appropriate Repair Groups and enter them in the table below to provide an overview.

Supplement No.	Date filed	Signature
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		
31		
32		
33		
34		
35		
36		
37		
38		
39		
40		

911 Carrera (996) Technical Manual – Repair

General

The Technical Manual – Repair – describes all essential work operations requiring special instructions to ensure that repairs are performed properly. It should be in the hands of the workshop foremen and the workshop personnel, as careful compliance with the stated instructions is a precondition for maintaining the traffic and operating safety of the vehicle. In addition, of course, the generally customary basic safety rules for the repair of motor vehicles are unrestrictedly applicable.

Structure

Overview of repair groups

Contents

Technical data / general

Description of repairs

Breakdown of Repair Groups

Tools, special tools and materials required for repair

Exploded drawing and illustration of sequence

Legend for exploded drawing and description of sequence

Instructions for assembly and adjustment

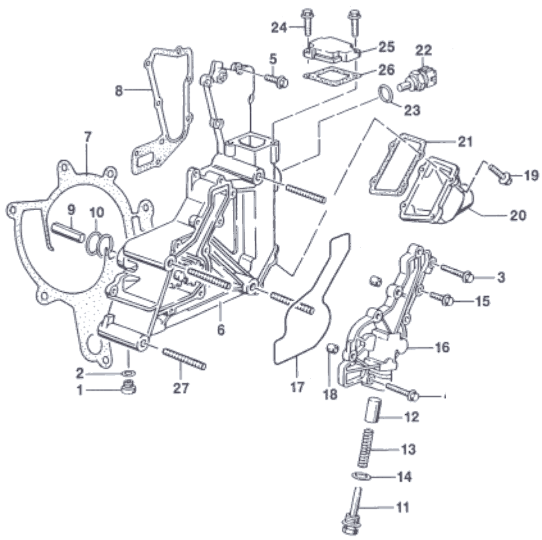
The Technical Manual is regularly expanded by supplements, which must be incorporated immediately to preserve the usefulness of the Manual. As verification of completeness, the record sheet should be completed.

Printed in Germany, 1997

Structure of exploded view

A 17 B Engine - Lubrication C 911 Carrera (996)

H Removing and installing oil pump with coolant guide housing



D F 17 20 19 Removing and installing oil pump with coolant guide housing E 996171 G Printed in Germany, 1997

C 911 Carrera (996) B Engine - Lubrication A 17

H Removing and installing oil pump with coolant guide housing

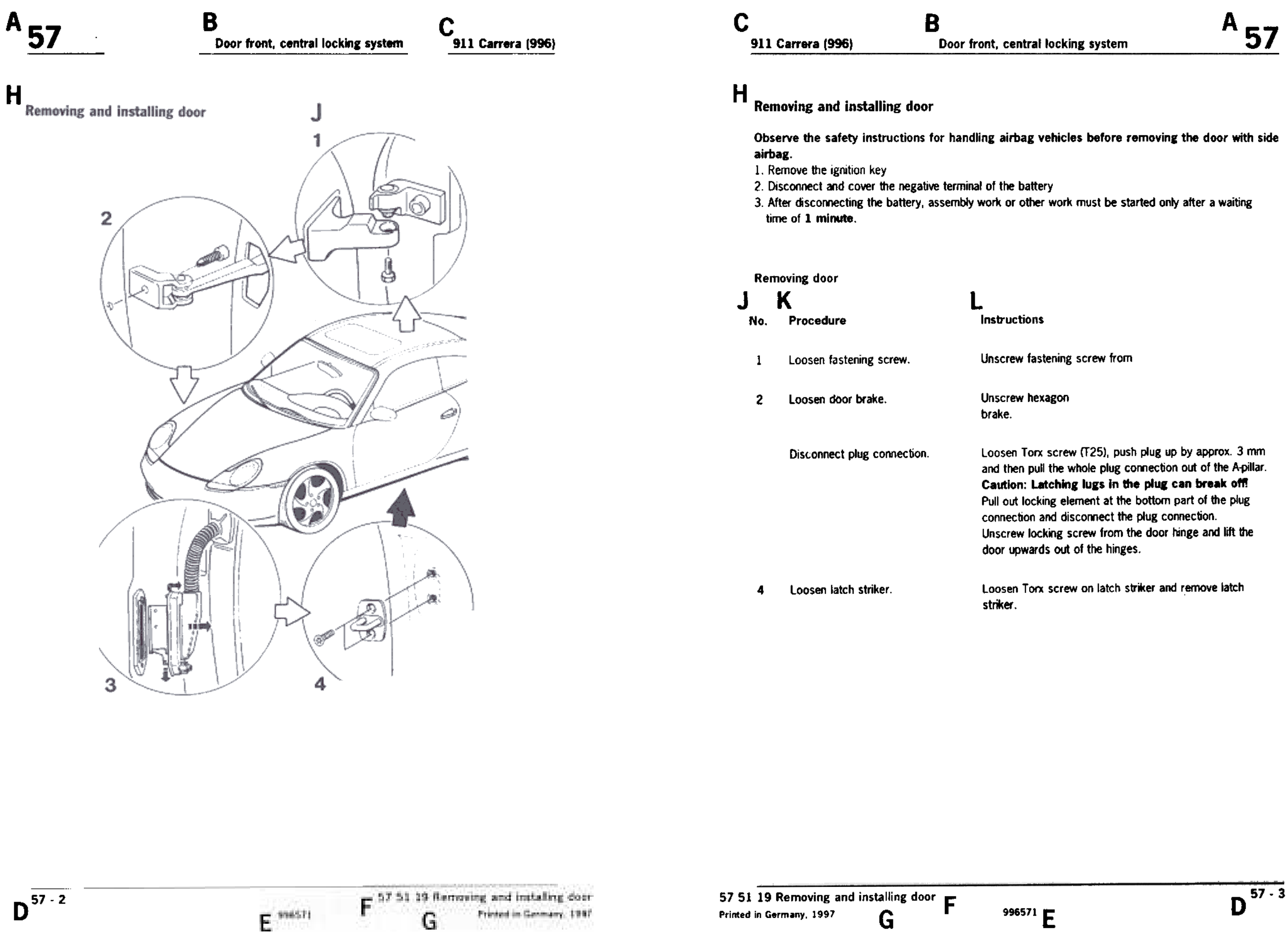
J K Note:

No.	Designation	Qty.	Removal	Installation
	Coolant drain plug M10 x 1			
2	Sealing ring A18 x 13.5			
3	Hexagon-head bolt M6 x 70			
4	Hexagon-head bolt M6 x 70			
5	Hexagon-head bolt M6 x 20			Tightening torque 10 Nm (7.5 ftlb.)
6	Oil pump with coolant gu housing			
7	Gasket			Always replace; insert or fit only if coolant guide housing has been put onto the crankcase
8	Gasket			Always replace; insert or fit only if coolant guide housing has been put onto the crankcase
9	Driver			
10	O-ring			Always replace
11	Plug with guide pin			Tightening torque 25 (19 ftlb.)
12	Piston			Oil
13	Spring			
14	Sealing ring			Replace

17 20 19 Removing and installing oil pump with coolant guide housing F D 17 - 7
Printed in Germany, 1997 G E 996171

- **A** = Repair Group, numbers
- **B** = Repair Group, text
- **C** = Vehicle type
- **D** = Page number
- **E** = Internal Porsche number
- **F** = Work operation, consisting of **"After-sales service number"** and **"Title"**
- **G** = Imprint, supplement number, year of printing
- **H** = Title of exploded view
- **J** = Item number of exploded view, in disassembly sequence
- **K** = Special instructions to be followed during installation or removal

Structure of sequence description


A 57 B Door front, central locking system C 911 Carrera (996)

H Removing and installing door

J 1 2 3 4

C 911 Carrera (996) B Door front, central locking system A 57

H **Removing and installing door**

Observe the safety instructions for handling airbag vehicles before removing the door with side airbag.
1. Remove the ignition key
2. Disconnect and cover the negative terminal of the battery
3. After disconnecting the battery, assembly work or other work must be started only after a waiting time of **1 minute.**

Removing door

J No.	K Procedure	L Instructions
1	Loosen fastening screw.	Unscrew fastening screw from
2	Loosen door brake.	Unscrew hexagon brake.
	Disconnect plug connection.	Loosen Torx screw (T25), push plug up by approx. 3 mm and then pull the whole plug connection out of the A-pillar. **Caution: Latching lugs in the plug can break off!** Pull out locking element at the bottom part of the plug connection and disconnect the plug connection. Unscrew locking screw from the door hinge and lift the door upwards out of the hinges.
4	Loosen latch striker.	Loosen Torx screw on latch striker and remove latch striker.

D 57 - 2 E 996571 F 57 51 19 Removing and installing door G Printed in Germany, 1997

57 51 19 Removing and installing door F Printed in Germany, 1997 G 996571 E D 57 - 3

A	=	Repair Group, numbers
B	=	Repair Group, text
C	=	Vehicle type
D	=	Page number
E	=	Internal Porsche number
F	=	Work operation, consisting of **"After-sales service number"** and **"Title"**
G	=	Imprint, supplement number, year of printing
H	=	Title of sequence description
J	=	Sequence number in order of sequence
K	=	Procedure in the sequence
L	=	Description or explanation of the procedure

0 Entire vehicle – General

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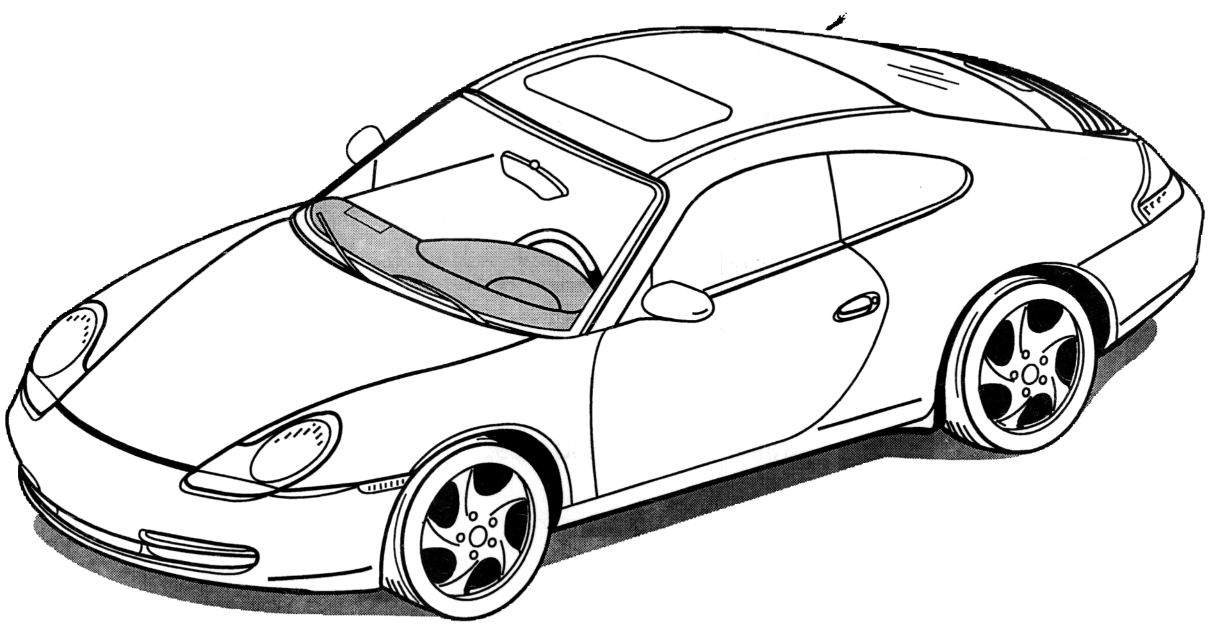

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0 Technical data

Engine

Engine type:		M 96/01
Number of cylinders		6
Bore	mm (in.)	96 (3.78)
Stroke	mm (in.)	78 (3.07)
Displacement	cm^3 (cu. in.)	3387 (206.67)
Compression ratio		11.3 : 1
Max. engine power as per 80/1269/EWG	kW (HP)	220 (300)
at engine speed	rpm	6800
Max. torque as per 80/1269/EWG	Nm (ftlb.)	350 (259)
at engine speed	rpm	4750
Max. litre output	kW/l (HP/l)	63.8 (86.8)
Rpm limitation by fuel supply interruption at	rpm	7300
Idle speed	rpm	700
Automatic transmission	rpm	700
Engine weight as per DIN 70020 A kg (lbs)	Manual trans. 190* (418.86)	Automatic transmission 179 (394.60)

* including ZMS (dual-mass flywheel)

Engine design

Type	6-cylinder aluminium opposed-cylinder engine, water cooled
Radiators	Two in the front end (+ 3rd radiator in Tiptronic vehicle)
Crankcase	Vertically split light alloy cylinder housing with separate crankshaft bearing housing
Crankshaft	Forged, supported by 7 bearings
Crankshaft bearings	Plain bearings
Connecting rods	Forged
Con-rod bearings	Plain bearings
Pistons	Light alloy, pressed
Cylinders	Lokasil cylinder lining
Cylinder head	3-part light alloy head
Valve guide	Pressed in
Valve arrangement	2 inlet valves suspended in parallel V arrangement 2 exhaust valves suspended in parallel V arrangement
Valve control	Via flat-based tappets
Camshaft	From the crankshaft via a double chain to the intermediate shaft, and from there to the exhaust camshafts via one double chain each. Inlet camshaft coupled with exhaust camshaft via a single chain.

Camshaft adjustment	Porsche VarioCam with 25° adjustment	
Valve clearance	Hydraulic valve clearance compensation	
Valve timing with 1 mm valve travel and zero clearance	Inlet opens	15° after TDC
	Inlet closes	59° after BDC
	Outlet opens	39° before BDC
	Outlet closes	7° before TDC
Intake system	2-stage tuned-intake system (plastic)	

Engine cooling

Water cooling; two radiators ahead of the front wheels.
(Additional radiator for Tiptronic vehicles)
Two electric fans, controlled in two stages

Engine lubrication

Type	Integrated dry sump
Oil cooling	Via oil-water heat exchanger
Oil filter	On pressure side behind oil pump
Oil pressure at n = 5000 rpm	Approx. 0.5 bar at 90 °C
Oil pressure indication	Oil pressure indicator light
Oil consumption	Approx. 1.0 l/1000 km

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Exhaust system		2-pipe system with one 3-way catalytic converter per pipe, 2 rear mufflers
Emission control		Oxygen sensor closed-loop control and 3-way catalytic converter (metallic substrate) USA - additional electrical secondary-air pump
Heating		Via water heat exchanger, closed loop-controlled on air side
Fuel system		
Fuel injection		DME (Digitale - Motor - Elektronik – engine control module ECM) Injection valves controlled sequentially
Fuel supply		1 electrical internal gear pump
Fuel quality (RON)		98 unleaded
Electrical system		
Radio interference suppression		ECE - R 10 and 72/245/EWG
Rated voltage	V	12
Battery capacity	Ah/A	70/340
Rated generator output	W	1680 (alternator)

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Ignition	DME (ECM), individual ignition coils, knock control
Firing order	1 - 6 - 2 - 4 - 3 - 5
Ignition timing control	Via DME (ECM)
Spark plugs	Bosch FR 6 LDC Beru 14 FR 6 LDU
Electrode gap mm (in)	0.8 + 0.1 (0.031 + 0.004)

Power transmission

Engine and transmission bolted together to form a power unit. Power is transferred to the rear wheels via double-jointed drive shafts.

Clutch

Manual transmission	Single-plate dry clutch Hydraulic actuation Double-mass flywheel
Contact plate	GGG 60 (nodular cast iron)
Clutch plate ø	240
Automatic transmission:	
Torque converter ø mm (in)	260 (11.03) Screw center point diameter 282 (11.11) Largest outer diameter, screwed axially

Moving-off ratio		1.92
Stall speed	rpm	2450
Transmission	Manual transm. Carrera 2 G 96.00	Tiptronic Carrera 2 A 96.00
Number of gears, forward/reverse	6/1	5/1
Internal designation Transmission ratios (i)		
1st gear	3.82	3.66
2nd gear	2.20	2.0
3rd gear	1.52	1.41
4th gear	1.22	1.0
5th gear	1.02	0.74
6th gear	0.84	—
Reverse gear	3.55	4.10
Final drive:	Bevel gear wheel	
Final drive ratio (i)	3.444	3.676
Transmission weight (dry) kg (lbs)	60.5 (133.4)	106.82 (235.48) with torque converter 94.72 (208.8) without torque converter
Transmission weight (wet and ready for installation) kg (lbs)	62.9 (138.6)	115.62 (254.88) with torque converter 103.52 (228.21) without torque converter

Body designs

Lightweight, galvanized all-steel integral body-frame
Full-size airbag for driver and passenger
Coupé: Number of seats = 2 + 2

Running gear

Front axle		Spring strut axle: Wheels individually suspended by control arms with trailing arms and spring struts (McPherson type, Porsche optimized) Springs: One truncated cone spring per wheel, with vibration damper inside spring
Vibration dampers		Double-acting hydraulic twin-tube gas-filled vibration dampers
Steering		
Steering wheel ø	mm (in)	380 (14.97)
Steering ratio		16.9 : 1 Left-hand drive vehicle 16.9 : 1 Right-hand drive vehicle
Turning circle ø	m (ft)	10.6 (34.8)
Track circle ø	m (ft)	10.2 (33.5)
Steering wheel revolutions from lock to lock		2.98 Left-hand drive vehicle 2.98 Right-hand drive vehicle
Power steering pump		Driven via poly V-belt Ratio i = 1 : 1.18
Rear axle		Multi-link axle
Wheel suspension		Wheels individually guided by 5 control arms
Springs		Cylindrical coil spring per wheel, with coaxial vibration vibration damper inside spring
Vibration dampers		Double-acting hydraulic single-tube gas-filled vibration dampers

Brakes

Operating brake		Foot operated, hydraulic-mechanical boost Dual-circuit brake system, 4-piston Al monobloc brake calipers at FA and RA, distributed per axle, internally ventilated brake discs at front and rear axles, ABS standard, Traction Control (TC) optional with switch-over possibility to automatic brake differential (ABD).
Vacuum brake booster (boost factor)		3.85
Brake master cylinder ø	mm (in)	23.81/23.81 (0.94/0.94)
Brake master cylinder stroke	mm (in)	18/18 (0.71/0.71)
Pressure reducer - switching-on pressure		55 bar
- reducing factor		0.46
Brake disc ø	mm (in)	Front 318 (12.53) Rear 299 (11.78)
Effective brake disc ø	mm (in)	Front 261.8 (10.31) Rear 247.6 (9.75)
Brake disc thickness	mm (in)	Front 28 (1.10) Rear 24 (0.95)
Effective total brake area per wheel	cm^2 (sq.in)	Front 127 (19.69) Rear 98 (15.195)
Piston ø in brake caliper	mm (in)	Front 36 (1.42) and 40 (1.576) Rear 28 (1.10) and 30 (1.182)
Parking brake		Drum-type parking brake

Brake drum ø	mm (in)	180 (7.092)
Brake shoe width	mm (in)	25 (0.985)
Lining area per wheel	cm^2 (sq.in)	85 (13.08)

Wheels and tyres

Summer tyres		Rim offset (mm)
Tyre size, front – on wheel	205/50 ZR 17 - 7 J x 17	55 *
Tyre size, rear – on wheel	255/40 ZR 17 - 9 J x 17	55 *
Tyre size, front – on wheel	225/40 ZR 18 - 7.5 J x 18	50 *
Tyre size, rear – on wheel	265/35 ZR 18 - 10 J x 18	65 *
Winter tyres **		Rim offset (mm)
Tyre size, front – on wheel	205/50 R 17 89T M + S - 7 J x 17	55
Tyre size, rear – on wheel	225/45 R 17 90T M + S - 8.5 J x 17	50 ***

Only if specified make is fitted.
M + S tyres with higher load rating and/or higher speed symbols can also be mounted optionally (max. "H" = max. 210 km/h).
Snow chains approved if special chains are used.

Spare wheel

High-pressure tyre		105/95 * - R 17 * bound to make	
Wheel		3.5 J x 17 rim offset 19	
Tyre pressure		17"	18"
front	bar	2.5	2.5
rear	bar	2.5	3.0
Spare wheel	bar	4.2	4.2

Dimensions

Length	mm (in)	4430 (174.54)	
Width	mm (in)	1765 (69.5)	
Height	mm (in)	1305 (51.42) at DIN empty weight	
Wheel base	mm (in)	2350 (92.59)	
Track widths		17"	18"
Front	mm (in)	1455 (57.33)	1465 (57.72)
Rear	mm (in)	1500 (59.10)	1480 (58.31)
Ground clearance	mm (in)	100 (3.94) 65 (2.56) at max. gross weight	

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	Vehicle in design position *	
Ramp angle	Degrees	13.0
Overhang angle, front	Degrees	12.0
Overhang angle, rear	Degrees	14.5

* Design position according to Porsche definition:

DIN empty	+ driver	=	68 kg
	+ passenger	=	34 kg
	+ luggage	=	10 kg

Weights according to DIN 700 20

	Manual transmission	Tiptronic
Empty weights according to equipment kg (lbs.)		
Front	500 - 540	505 - 545
Rear	820 - 840	860 - 880
Total, Coupé	1320 - 1380 * (2909.9 - 3042.2)	1365 - 1425 * (3009.1 - 3141.4)

* For EU homologation plus 75 kg driver's share (35 kg at front axle, 40 kg at rear axle)

Permissible axle load

Coupé, front	775 (1708.49)	775 (1708.49)
rear	1100 (2425.06)	1100 (2425.06)
Max. gross weight	1720 (3791.74)	1765 (3791.74)
Max. trailer load		
Braked	none	none
Unbraked	none	none
Permissible towed weight	none	none
Permissible drawbar load	none	none

Permissible roof load, kg (lbs.)

With original Porsche Roof Transport System	75 (165)	75 (165)

Filling capacities:

Measurement of the engine oil level by instrument or oil dipstick.
The Driver's Manual is definitive.

Engine specification		Approved:
	Europe -	According to ACEA Specification A4 - 96 and special Porsche requirements (refer to Techn. Info bulletin about engine oils)
	USA, RoW -	According to API SG and SHn Specifications and special Porsche requirements (refer to Techn. Info bulletin about engine oils)

Engine oil quantity	(imp. gal.)	Approx. 10.25 (2.22) Change quantity 8.25 (1.79)	
Manual transmission with differential	l (imp. gal.)	2.7 (0.59)	
Automatic transmission with torque converter	(imp. gal.)	Approx. 9.5 (2.06)	
Differential	(imp. gal.)	0.8 (0.17)	
Transmission oil specification		Manual transmission	Tiptronic
		SAE 90 GL5	
Specification for differential transmission oil (Tiptronic)			GL5 SAE 75 W 90 or GL5 SAE 90
Fuel tank	(imp. gal.)	Approx. 65 (14.1) actual volume 10 (2.2) reserve Approx. 64.0 (13.87) refill volume	
Coolant:	l (imp. gal.)	22.5 (4.88)	
Brake fluid reservoir	(imp. gal.)	Approx. 0.45 (0.097)	
Tank for windscreen washer and headlight cleaning system	(imp. gal.)	Approx. 2.5/6.5 (0.54/1.41)	
Power-assisted steering	(imp. gal.)	1.27 (0.28) Pentosin CHF 11 S	

Performance data

Top speed		Manual transmission	Tiptronic
	km/h	280	275
	mph	173.9	170.8
Acceleration	0 - 100 km/h	5.2 s	6.0 s
Acceleration	0 - 160 km/h	11.5 s	13.0 s
Acceleration	0 - 200 km/h	18.3 s	20.4 s
Kilometre from standing start		24.2 s	25.3 s
1/4 mile from standing start		13.5 s	
Elasticity			
80 - 120 km/h	5th gear	7.1 s	6.9 s
	6th gear	8.9 s	9.7 s
100 - 200 km/h	5th gear	17.3 s	18.3 s
	6th gear	23.4 s	28.5 s

Climbing performance	1st gear	
	2nd gear	
	3rd gear	
	4th gear	
	5th gear	
	6th gear	

Specific power	kg/kW	6.0 6.3	6.2 ... 6.5
	kg/HP	4.4 4.6	4.6 ... 4.8

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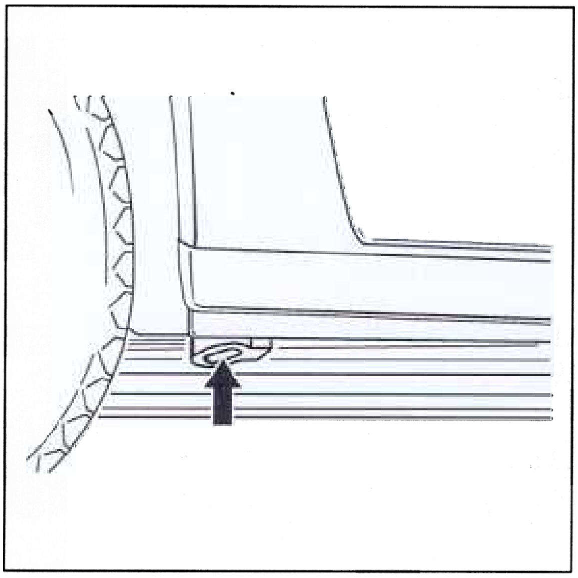
0 Lifting the vehicle

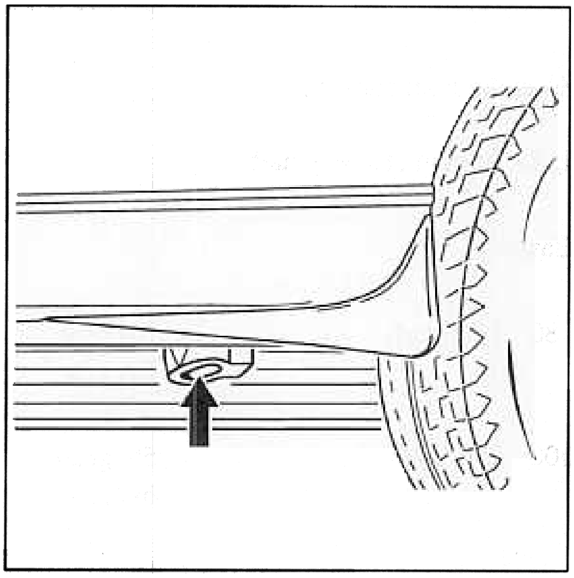
Lift the vehicle only at the take-up points shown in the figure. When driving onto a platform lift, make sure that there is sufficient distance between the platform lift and the vehicle.

Front



97-047

Rear



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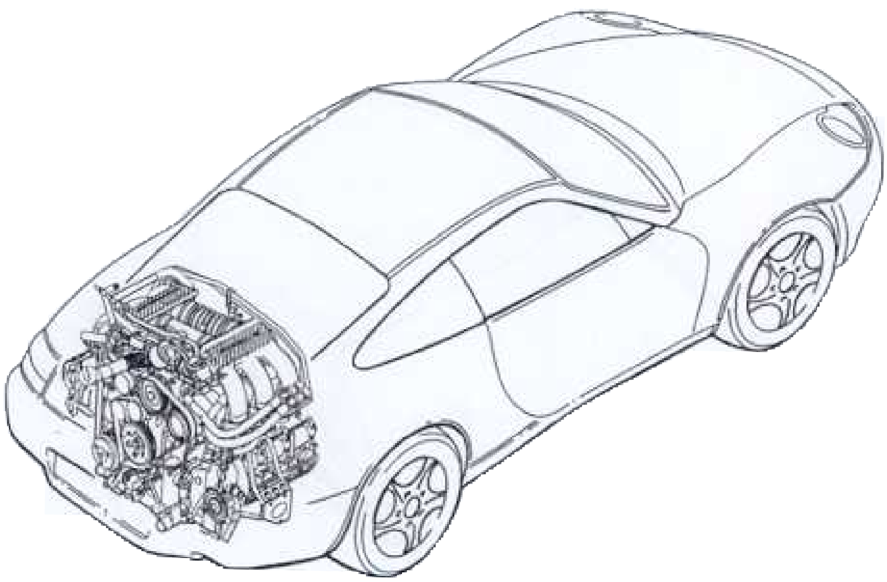
0 Power unit - general

Engine M 96/01



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Type	6-cylinder aluminium opposed-cylinder engine, water cooled	
Bore / stroke	mm	96 / 78
Displacement (actual)	cm^3	3387
Compression ratio		11.3 : 1
Max. engine power	kW/HP	221 / 300
at engine speed	rpm	6800
Max. torque	Nm (ftlb.)	350 (259)
at engine speed	rpm	4600

Engine control	Bosch M5.2.2 with static high-voltage distribution, sequential fuel injection, cylinder-specific knock control, stereo oxygen-sensor control and diagnostic system.
Cylinder head	2 overhead camshafts with hydraulic valve clearance compensation
Camshaft drive	Porsche VarioCam
Type of fuel	98 RON premium unleaded

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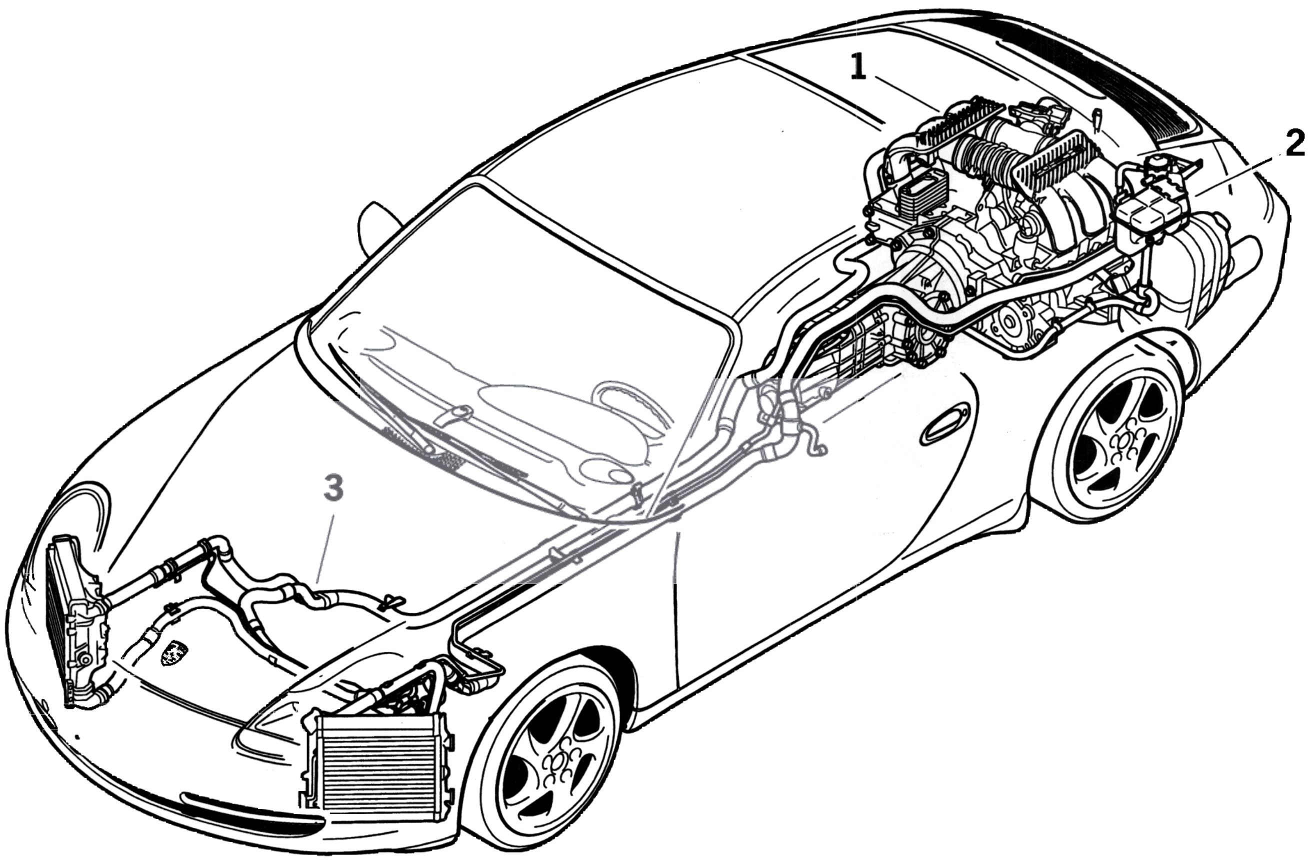
Engine-cooling diagram



392 - 97

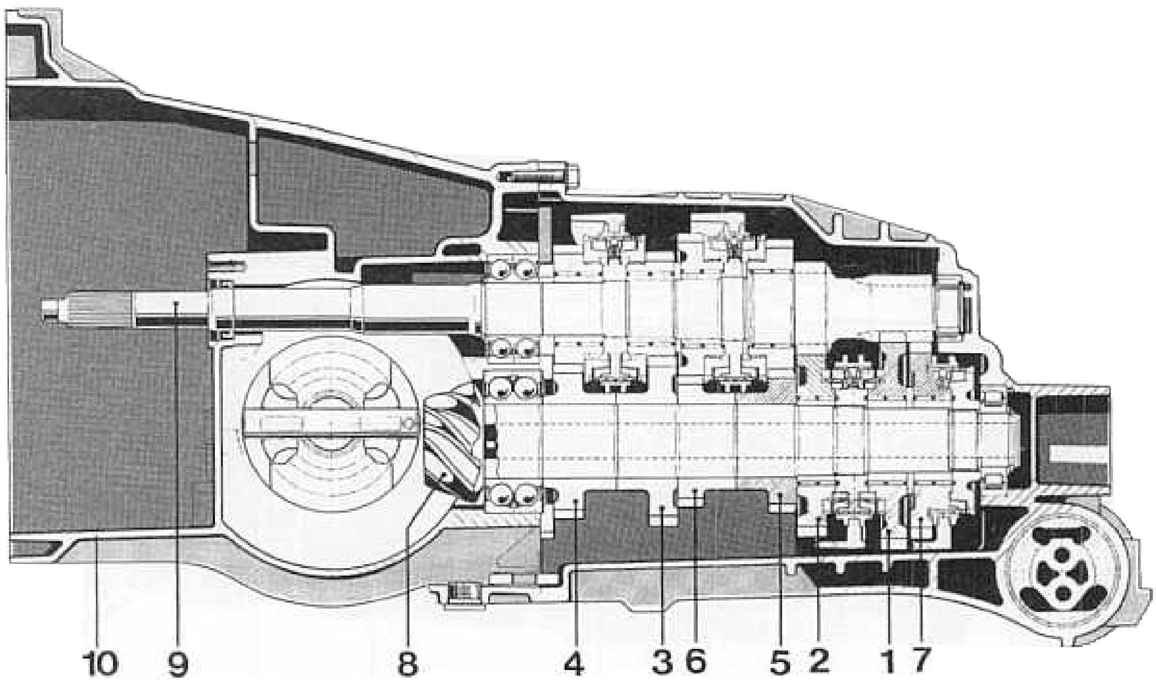
1 Opposed-cylinder engine, water cooled

2 - Expansion tank

3 - Water circuit

0 Transmission – general

Manual transmission (G96)



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1st gear
2 - 2nd gear
3 - 3rd gear
4 - 4th gear
5 - 5th gear
6 - 6th gear
7 - Reverse gear
8 - Output shaft
9 - Input shaft
10 - Transmission housing

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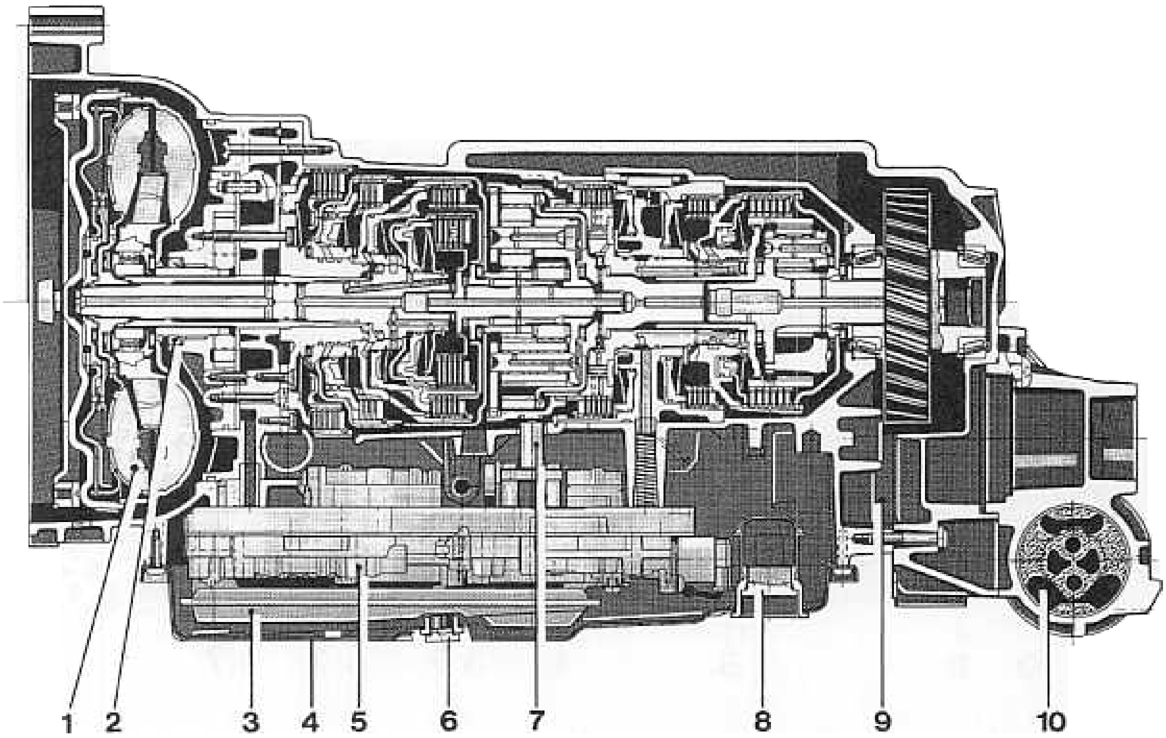
Tiptronic transmission (A96)



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1 – Torque converter
2 – Sealing ring for torque converter
3 – ATF filter
4 – ATF pan
5 – Hydraulic control unit
6 – ATF drain plug
7 – Transmission input speed sensor
8 – ATF filler screw
9 – Gasket for spur gear
10 – Transmission bearing

0 Running gear – general

Running gear – overview

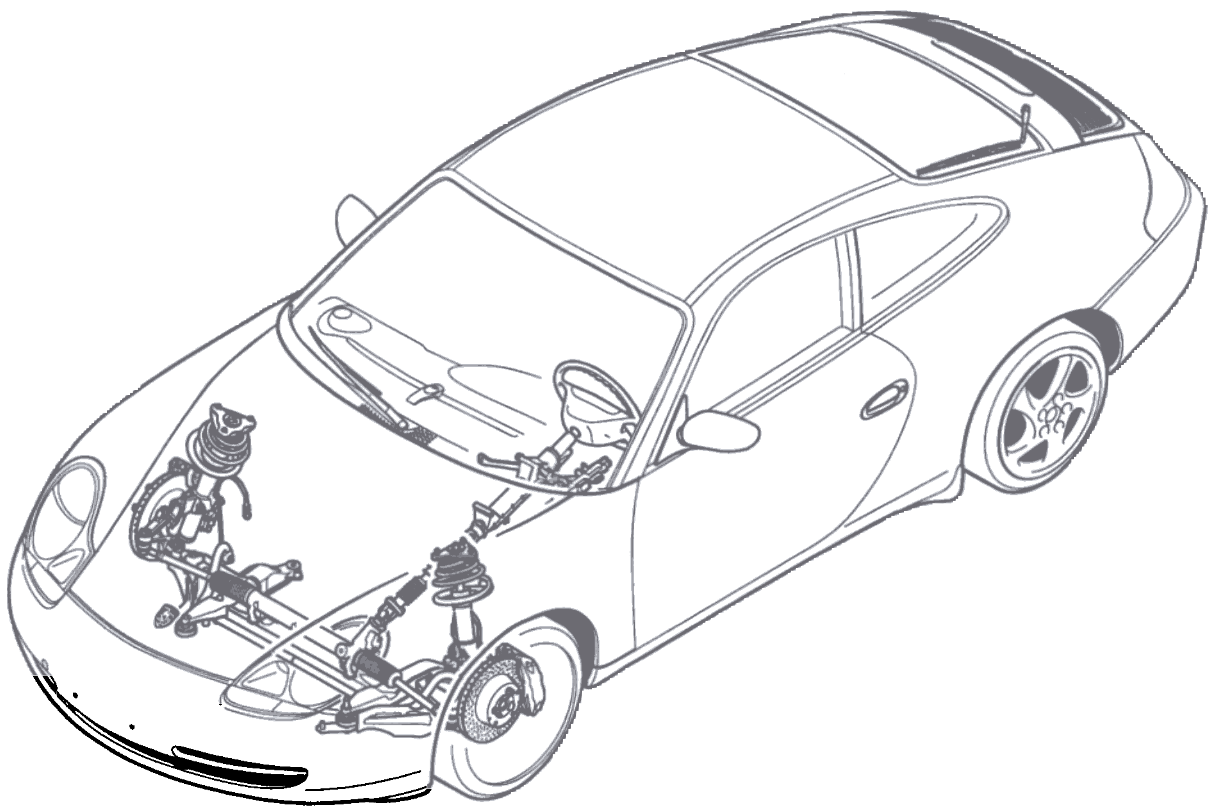
Front axle / steering

McPherson wheel suspension with offset spring. Twin-tube gas-filled shock absorbers in standard or sports version.

In order to obtain greater stiffness with reduced intrinsic weight as compared with steel, the following components have been made from aluminium:
Control arm, diagonal brace, track rod, wheel carrier and cross member / side member.

Rack-and-pinion gear (i = 16.9 : 1) with hydraulic assistance.
Steering wheel longitudinally adjustable (40 mm).

Further improvement of steering precision and reduction in the turning circle (10.6 m) as compared with the previous 911 Carrera (993).



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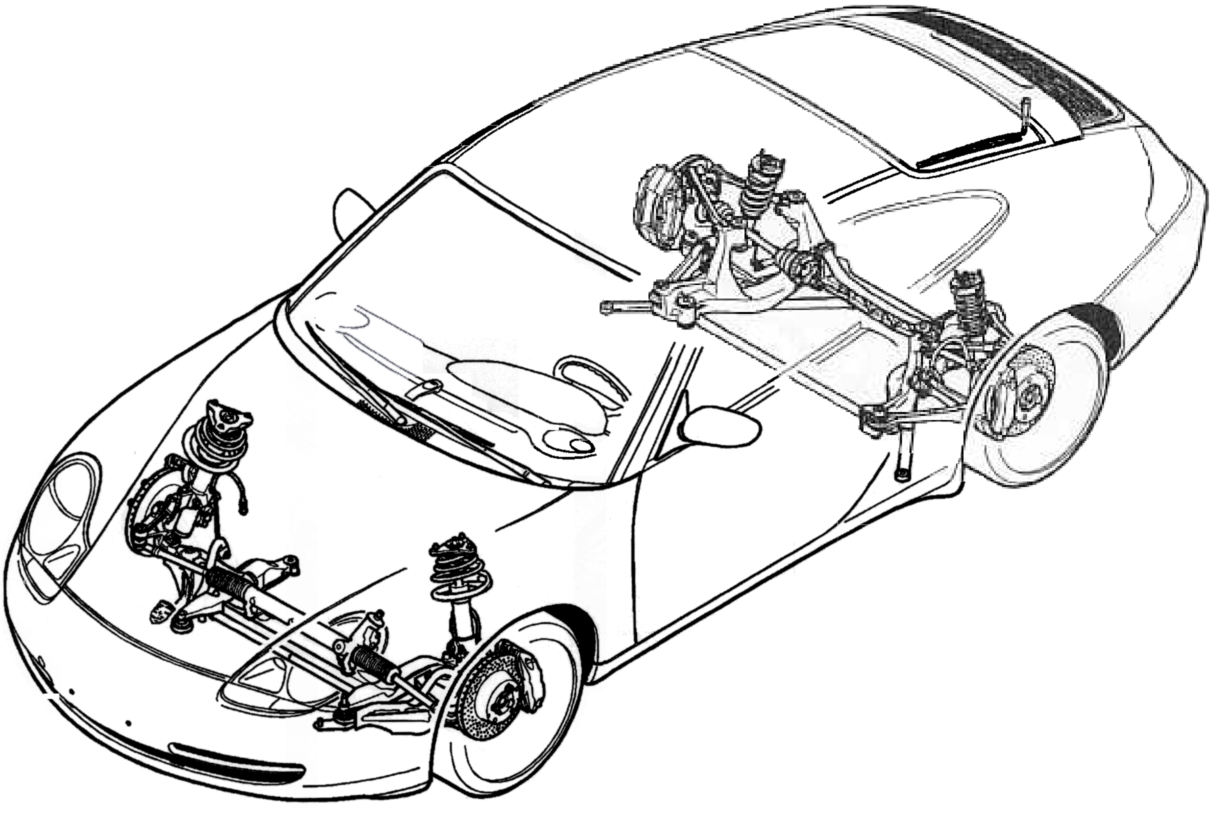
Rear axle

The multi-link rear axle used in the 911 Carrera (993) served as the basis for the further development in the new 911 Carrera (996). Important considerations here were to achieve further weight reduction while preserving the familiar good vehicle dynamic properties.
The longer wheel base offered additional potential for improvements in driving comfort and handling.

The wheel suspension consists of **five aluminium control arms**, of which the **two upper control arms** are aluminium forgings.

Gas-filled shock absorbers in standard or sports version.



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Wheels and tyres

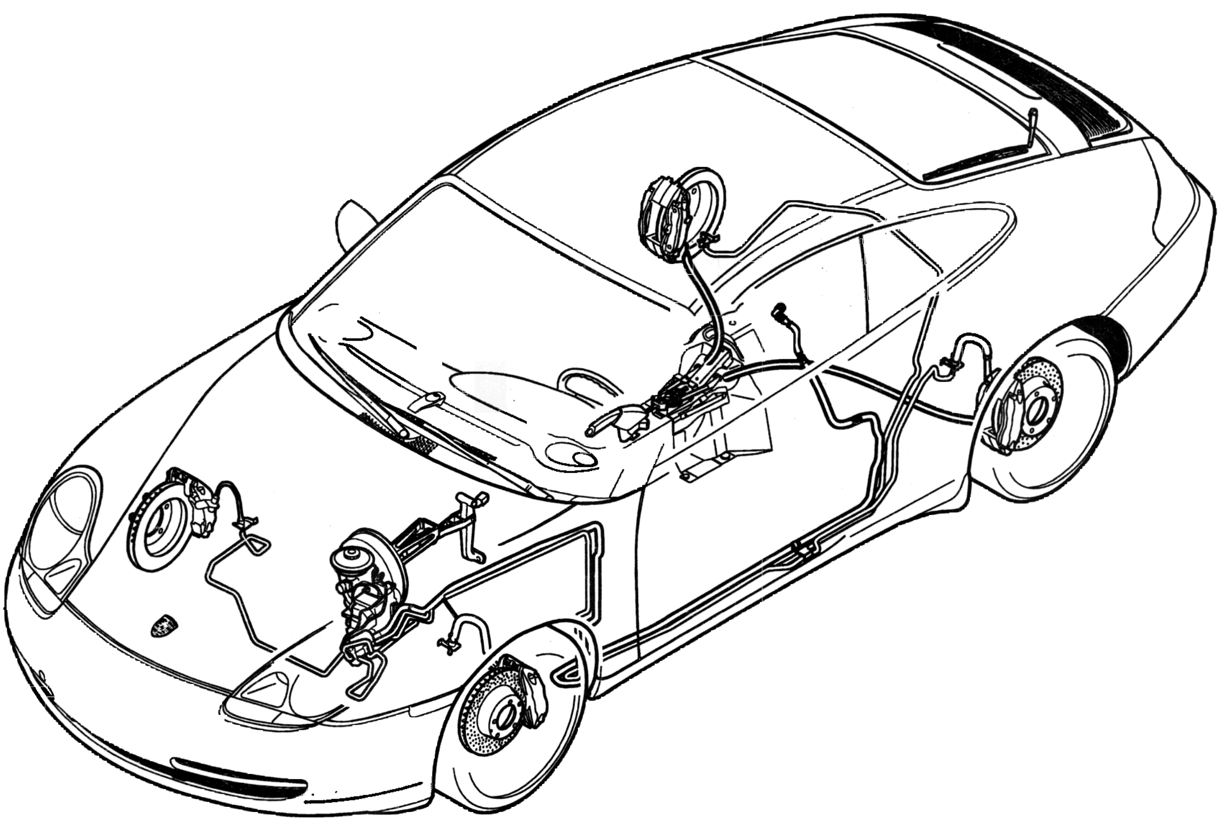
	Front	Rear
Standard		
Wheels:	7J X 17	9J X 17
Tyres:	205/50 R 17	255/40 R 17
Option		
Wheels:	7.5J X 18	10J X 18
Tyres:	225/40 R 18	265/35 R 18

Brakes

Hydraulic dual-circuit brake system with front-axle / rear-axle brake-circuit distribution. Vacuum brake booster, internally ventilated and perforated brake discs with four-piston fixed calipers at front and rear axles.

ABS 5.3 (3-channel system) standard.
ABS/TC 5.3 (4-channel system) on request.
TC = Traction Control, consisting of ASR (anti-slip control) and ABD (Automatic Brake differential).

Parking brake (handbrake):
Drum brake acting mechanically on both rear wheels.



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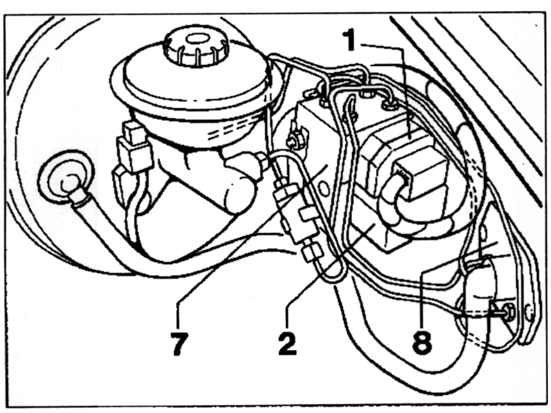
Information on ABS 5.3 and ABS/TC 5.3

General

The Porsche 911 Carrera (996) is equipped **as standard** with an anti-lock brake system (ABS 5.3).
"**Traction Control (TC)**" is available 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 on 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 **form a unit** that is located next to the brake master cylinder.



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Diagnosis and system tests 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
(diagram: see Page 0 - 27).

ABS/TC 5.3 = **4**-channel system
(diagram: see Page 0 - 29).

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

Number of brake lines at intermediate piece (No. 8 / Figure 181 - 96):

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) warning light and
TC (ASR/ABD) function light
(information light) in vehicles **with ABS/TC.** These lights light up when the ignition is switched on (lamp check).
In vehicles **with ABS 5.3** (Solo ABS) these lights are **not fitted** in the instrument cluster.
A figure showing the warning lights and the function light is shown on Page 0-30.

ABS 5.3 (3-channel system) system description

ABS operation

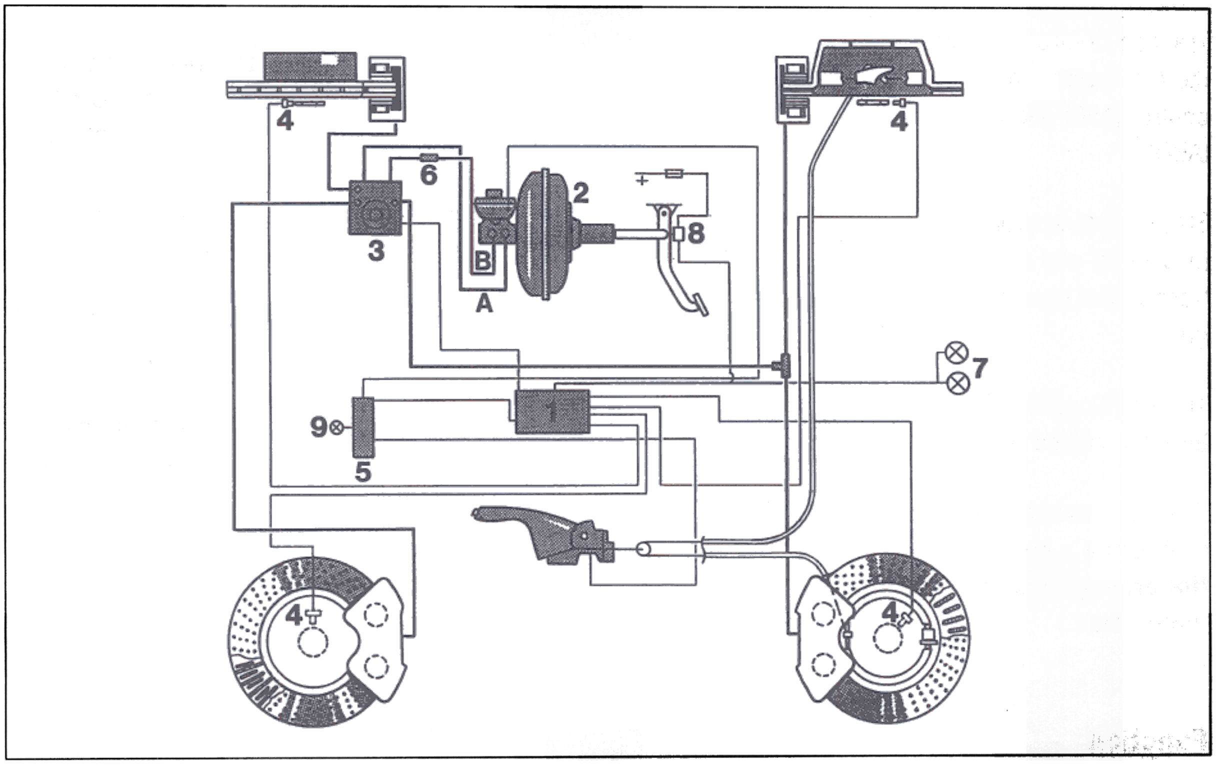
The ABS control module receives a signal from the brake-light switch and the AC voltage signals from the four speed sensors. These signals are converted into digital wheel-speed signals independently of each other by two microprocessors. The wheel slip (approximately proportional to the computed vehicle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

If vehicle deceleration and excess slip at a wheel are detected, the pressure-holding phase is initiated, 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 lock up, the pressure in the wheel 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 and the input signals are continuously monitored. If a fault is detected, the control unit switches the ABS function off, switches on the ABS warning light and stores the fault in a non-volatile memory in the control unit.

In addition, whenever a journey is begun and a speed of 6 km/h is exceeded, a test programme 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 warning light is switched on and the fault is stored.

Diagram: ABS 5.3 (3-channel system)



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1 – ABS control module *

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

3 – ABS hydraulic unit * (**3** hydraulic outputs)

4 – ABS speed sensors

5 – Instrument cluster

6 – Brake proportioning valve **(1x)**

7 – Brake light

8 – Brake-light switch

9 – ABS warning light (yellow)

A = Front-axle braking circuit

B = Rear-axle braking circuit

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

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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 whenever the engine is started.

The TC information light in the instrument panel is lit during a control process **and warns that the driving style must be matched 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 spin 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 spin at the same rpm (slip).

With driving stability control switched off, the TC warning light 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.

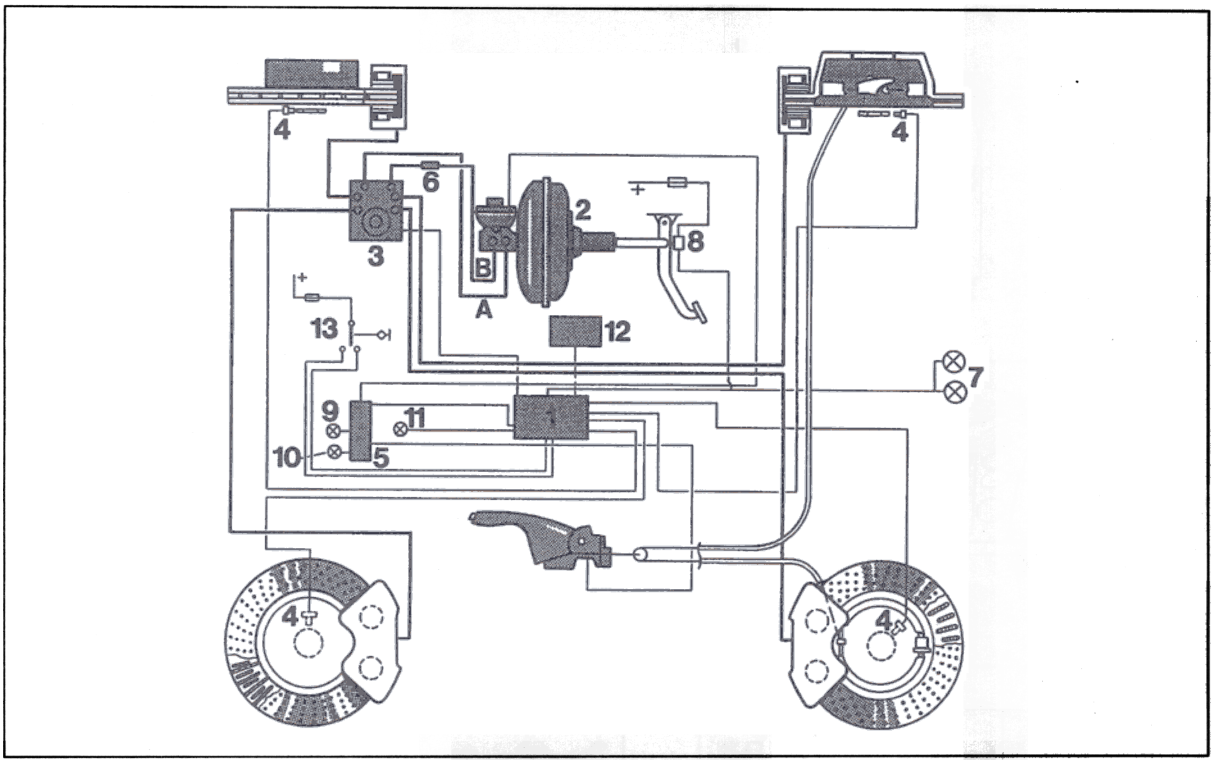
Switching driving stability control back on*

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 second 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)



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1 – **ABS/TC** control module *

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

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

4 – ABS speed sensors

5 – Instrument cluster

6 – Brake proportioning valve **(1x)**

7 – Brake light

8 – Brake-light switch

9 – **ABS warning light** (yellow)

10 – **TC warning light** (TC/yellow)

11 – **TC function light** (green)

12 – **DME control module**

13 – TC rocker switch

A = Front-axle braking circuit

B = Rear-axle braking circuit

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

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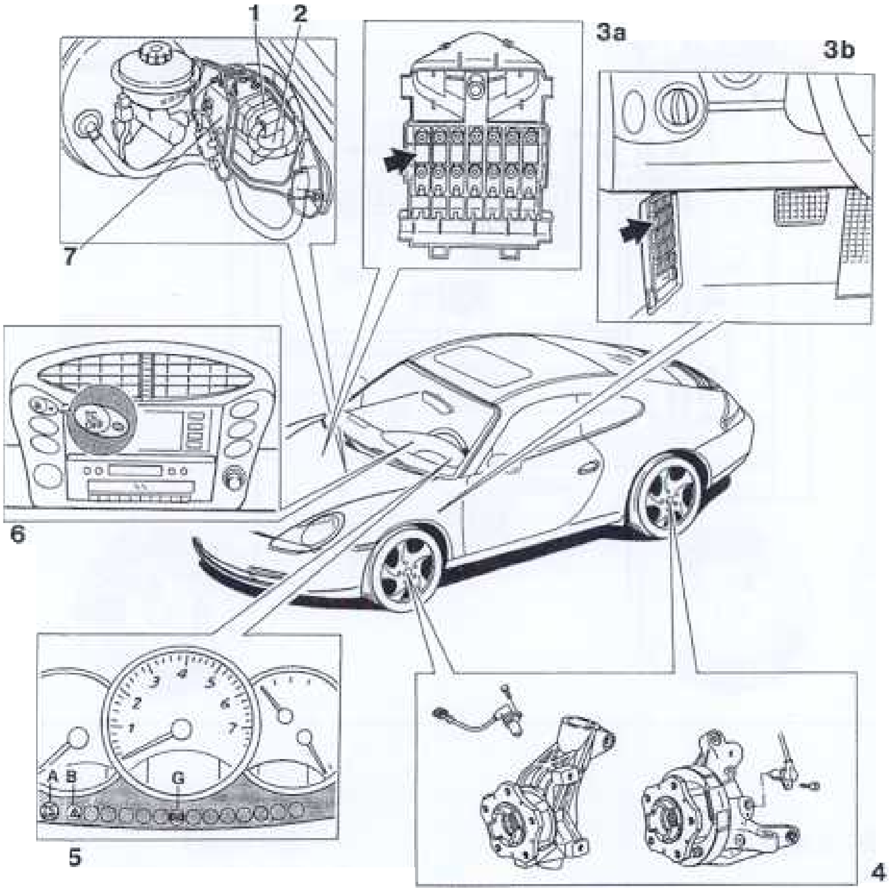
6 - TC (OFF) rocker switch with light



3 - Fuses
 3a = 50-A fuse in current distributor
 3b = 15-A fuse **B 9**
 (fuse holder B, fuse No. 9)
 3b = 15-A fuse **B 1**
 (fuse holder B, fuse No. 1)

4 - Speed sensors

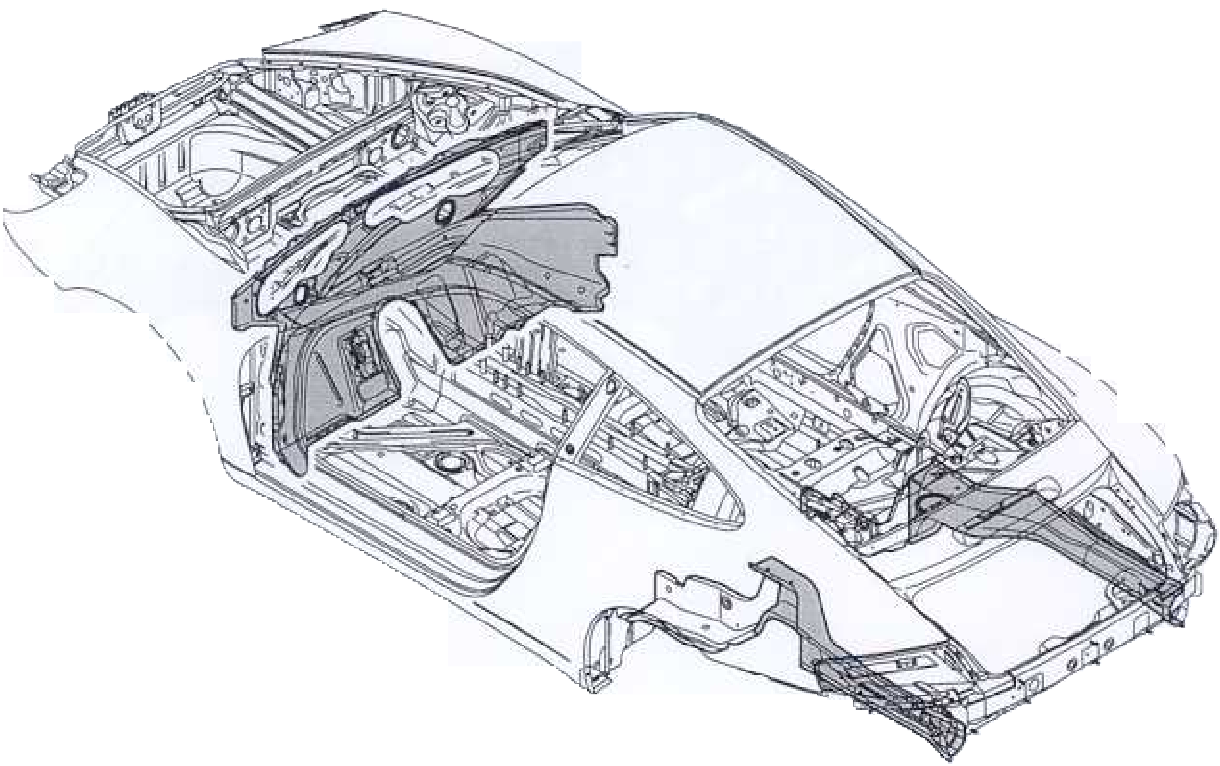
5 - Warning and information lights
 B = TC information light
 A = TC warning light
 G = ABS warning light

7 - Hydraulic unit

0 Body - general

Body of high-strength steel

The indicated body parts are made by welding together plates of differing thicknesses and characteristics and then deep-drawing these parts. In their crash behaviour, these body parts are distinguished by their high energy absorption.



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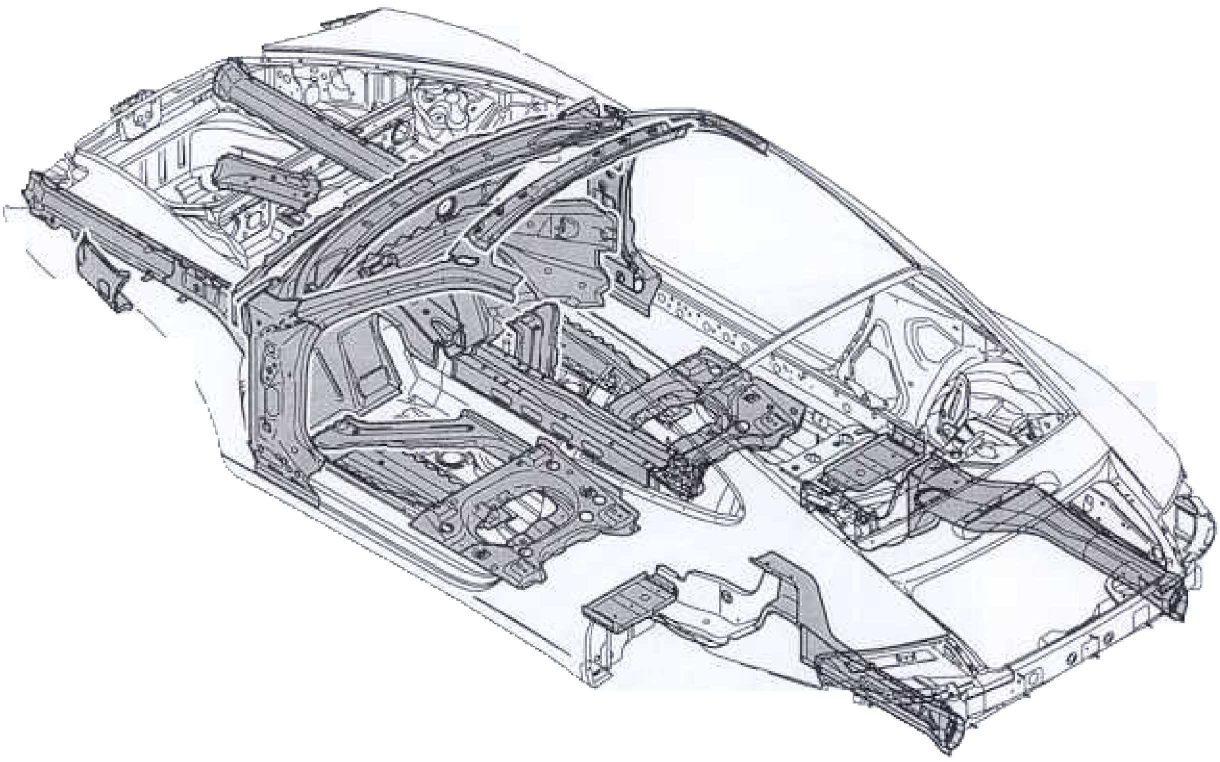
Body parts of high-strength steel

The indicated body parts attain their final strength **only** under the temperature effects of the production stage of cathodic immersion painting and drying.



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Body repairs by means of reshaping are not possible if these body parts are correspondingly deformed. Here, the repair must be carried out using new parts or by means of sectional repairs.

The use of high-strength steels for the body has an effect on body repairs. For this reason, only

"Original Porsche parts"

must be used for repair work.

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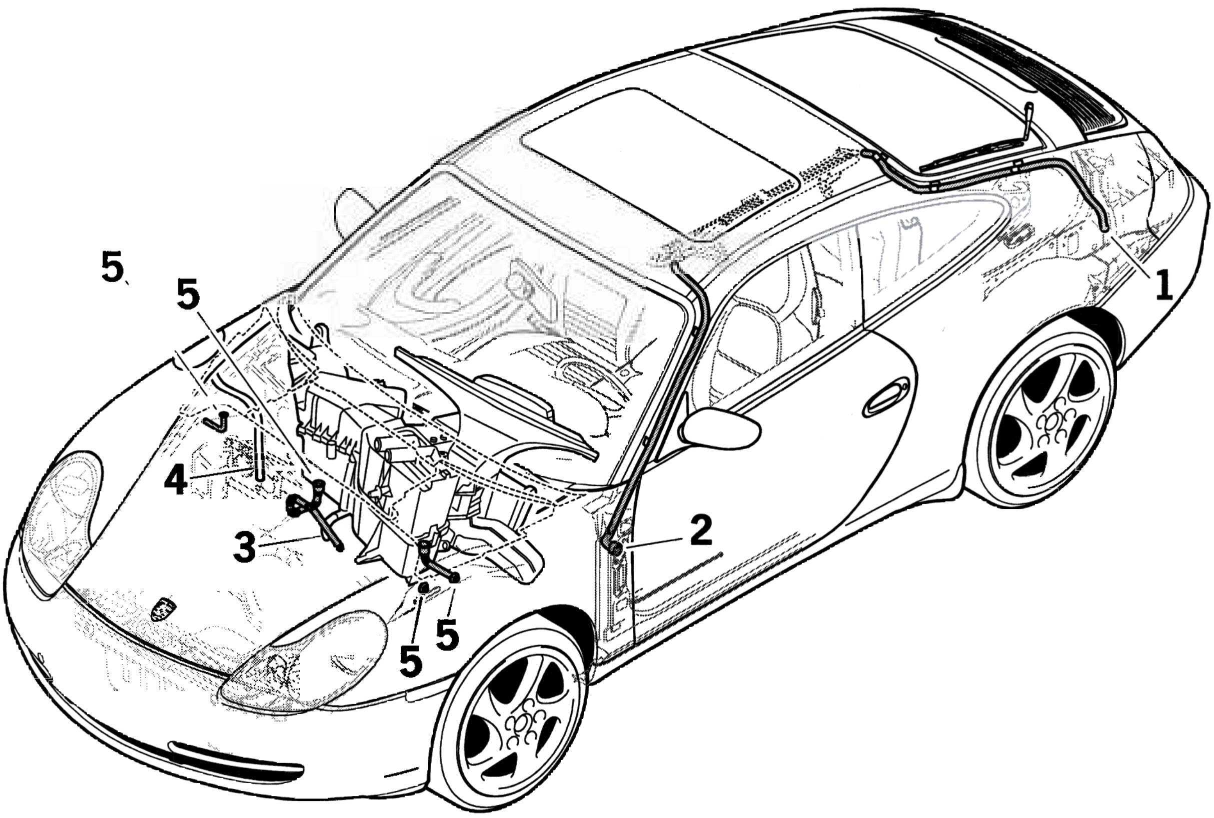
Water drainage plan – Coupe



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	Water drainage: sliding roof, rear	2	Water drainage: sliding roof, front
3	Water drainage: tank tray	4	Water drainage: evaporator of heating and air-conditioning system
	Water drainage: radiator tank		

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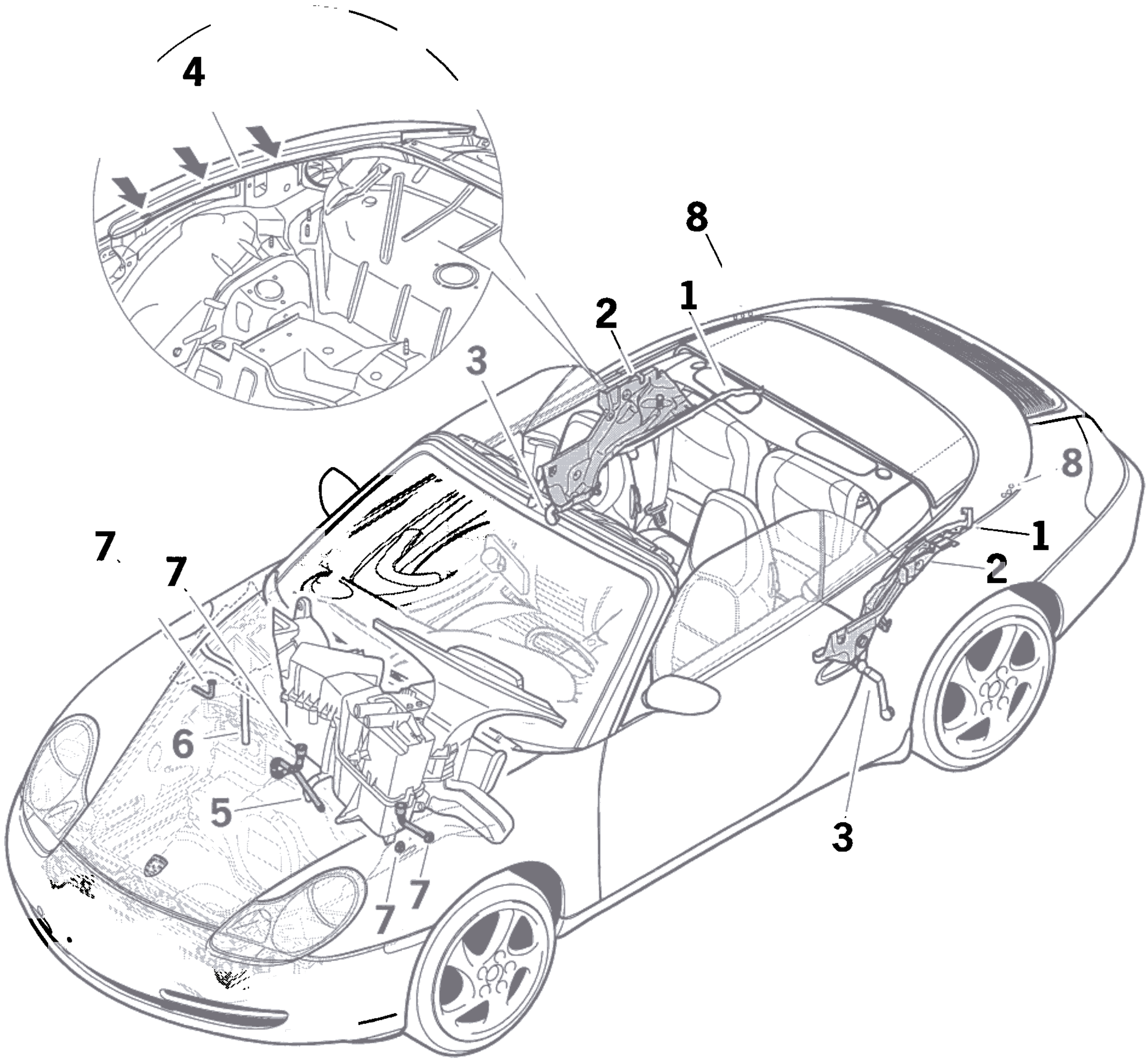
Water drainage plan – Cabriolet



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1 Water drainage: water channel

2 Water drainage: water collection tray

3 Water drainage: water drain tube

4 Water drainage: water channel, side section

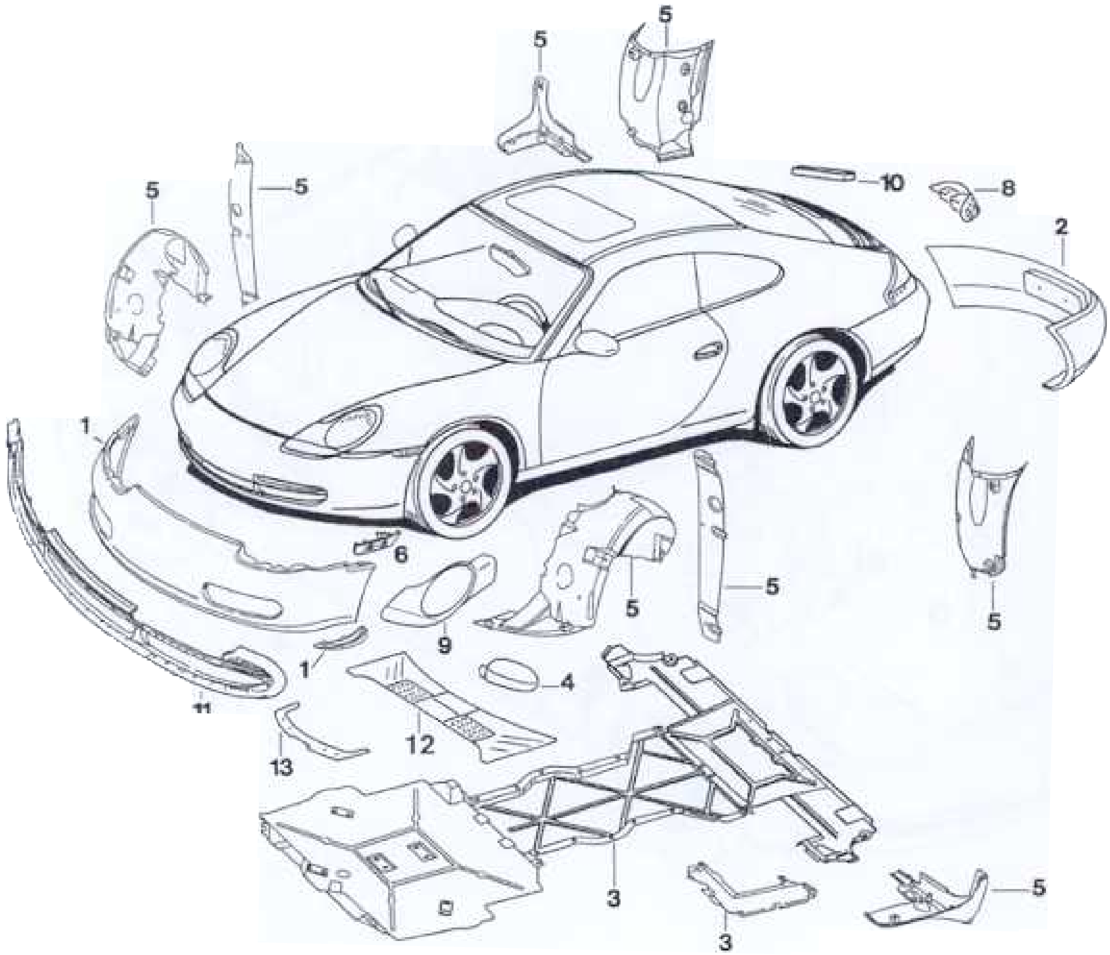
5 Water drainage: evaporator of heating and air-conditioning system

6 Water drainage: tank tray

7 Water drainage: radiator tank

8 Water drainage: inner panel of convertible top compartment lid

Overview – plastic body components



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Plastic body components

No.	Component	Plastic
1	Front end	PP+EPDM
2	Rear end	PP+EPDM
3	Underside panel	PP
4	Housing for rear-view mirror	PC+ABS
5	Wheel housing liners	PP
6	Front direction indicator light	
	Direction indicator light housing	ABS
	Direction indicator light lens	PMMA
7	Rear spoiler	PA
8	Rear direction indicator light	
	Direction indicator light housing	ABS
	Direction indicator light lens	PMMA
9	Headlight	
	Headlight housing	PP
	Headlight lens	PC
10	Third brake light	PMMA
11	Front air inlet grille	PP+EPDM
12	Front radiator tank cover	PP
13	Front luggage compartment cover	PP

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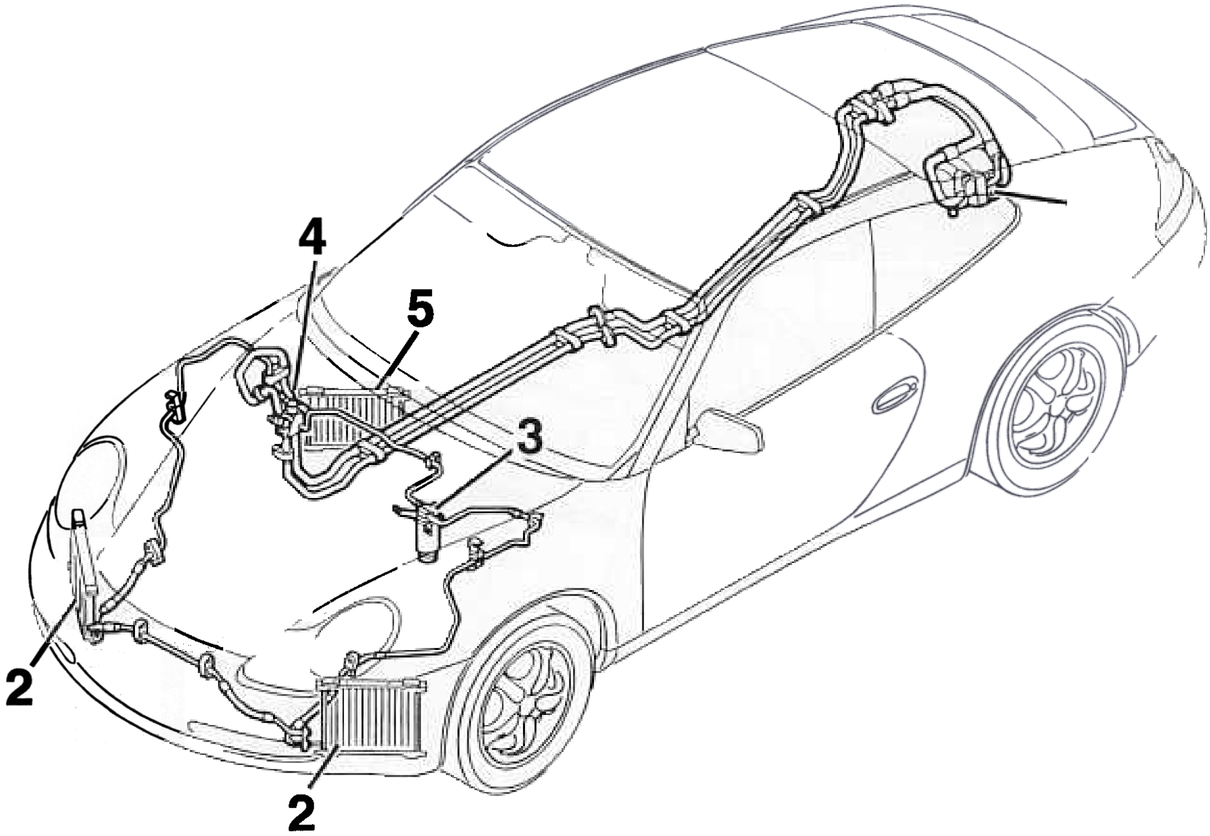
Refrigerant circuit



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1 - Compressor

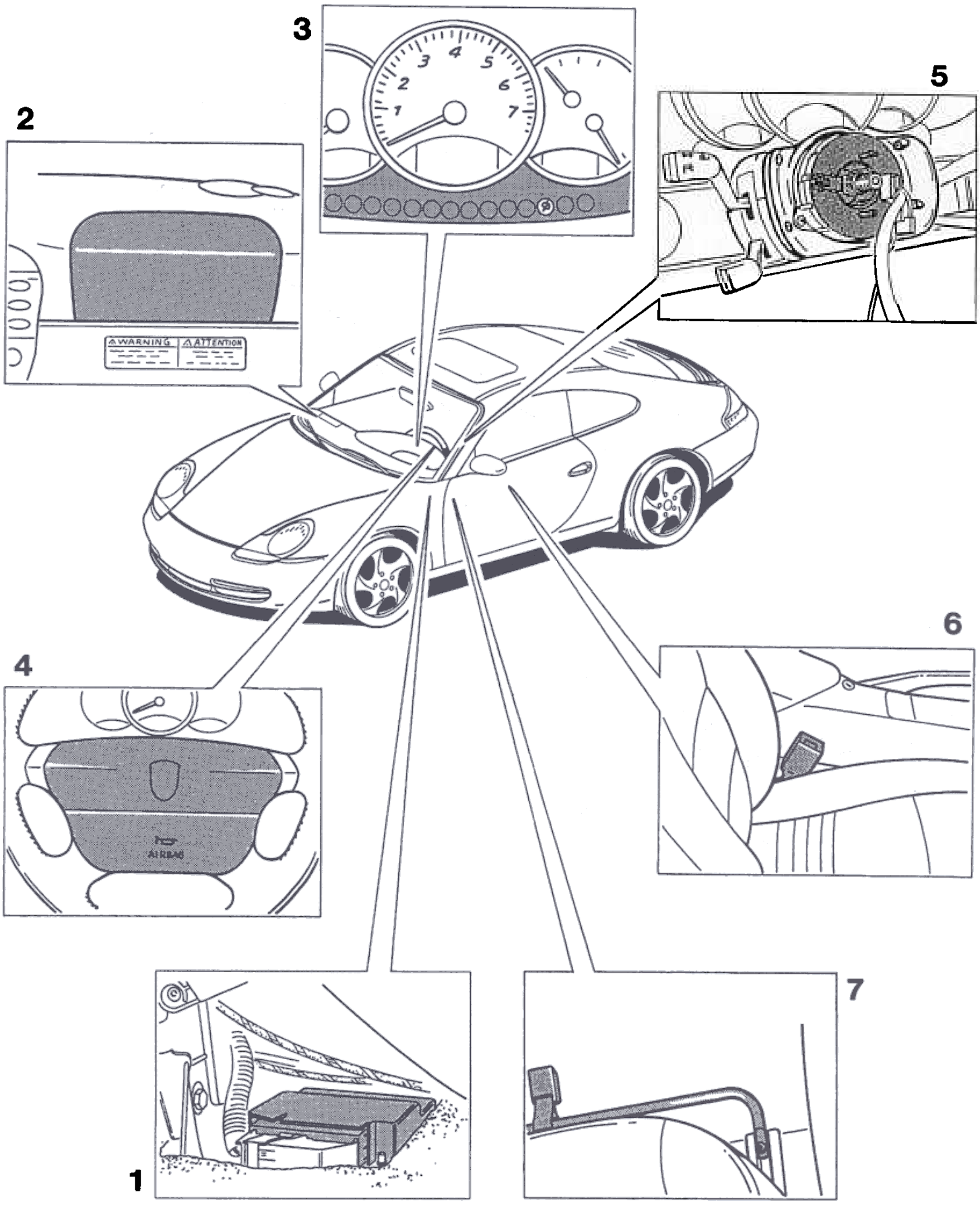
2 - Condenser

3 - Fluid reservoir

4 - Expansion valve

5 - Evaporator

Component arrangement – airbag



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Component arrangement – airbag

System B 04

1 Triggering unit

2 Passenger airbag unit

3 Warning light

4 Driver airbag unit

5 Contact unit

6 Belt buckle, driver/passenger

7 Plug connection, child restraint system

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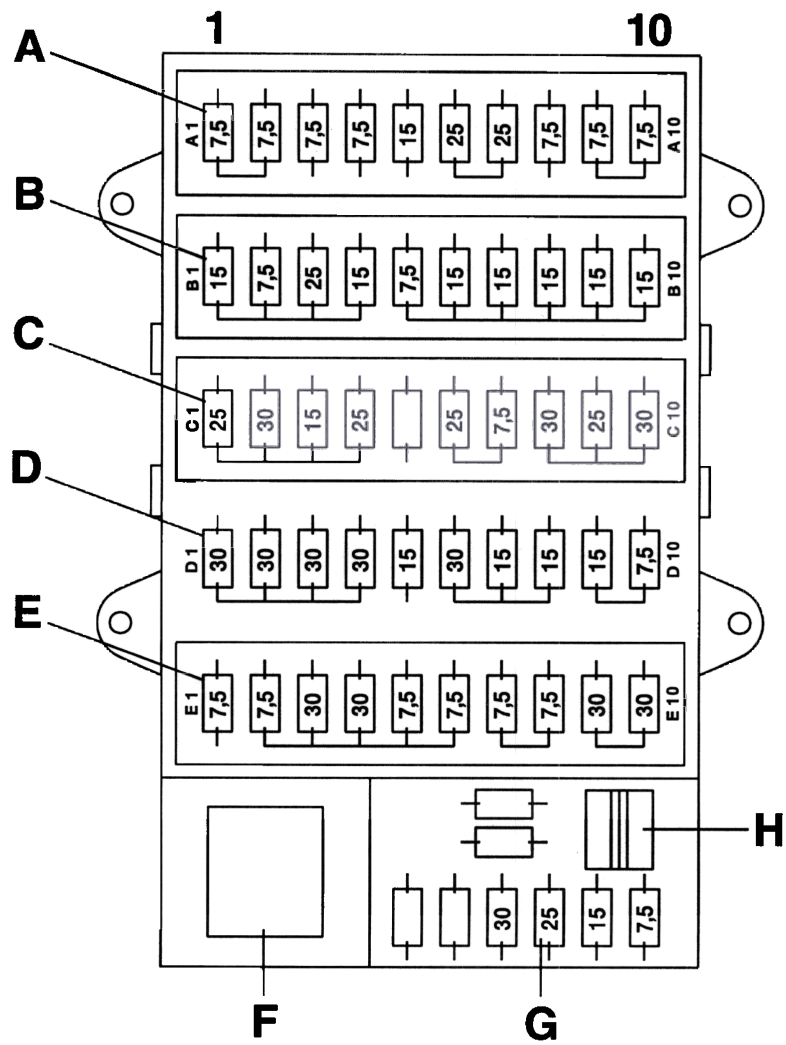
0 Electrical system – general

Fuse assignments



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A to E: Fuses (rows A...E or 1...10)

F: Switch for retractable spoiler

G: Replacement fuses

H: Gripper

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Fuse assignments

No.	Load	Amperage rating
Row A		
	High beam headlight, right	7.5
2	High beam headlight, left	7.5
3	Side lights, right	7.5
4	Side lights, left	7.5
5	Number plate light, instrument lighting	15
6	Seat heating	25
7	Fog lights, rear fog light	25
8	Number plate light, Canada	7.5
9	Dipped beam headlight, right	7.5
10	Dipped beam headlight, left	7.5
Row B		
	Instrument cluster, Tiptronic, ASR button, diagnosis, convertible-top drive	15
2	Radio, information system	7.5
3	Horn	25
4	Engine-compartment fan	15
5	Reversing lights, control module for convertible-top drive, mirror and mirror memory	7.5
6	Switch for hazard warning lights, power window touch-control enable	15
7	Brake lights, cruise control	15
8	Control modules for central locking system, alarm system, DME, Tiptronic	15
9	Control module for ABS, traction control	15
10	Instrument cluster, diagnosis	15

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No.	Load	Amperage rating
Row C		
	DME relay	25
2	Ignition relay, oxygen sensors	30
3	Control module for central locking system, alarm system, power windows	15
4	Fuel pump relay	25
5	Not used	
6	Windscreen wipers	25
7	Terminal X, control wiring	7.5
8	Radiator fan 2	30
9	Headlight washer	25
10	Radiator fan 1	30
Row D		
	Power windows	30
2	Door mirrors, heated rear window	30
3	Convertible-top drive, sliding roof	30
4	Rear power windows, cabriolet	30
5	Cigarette lighter	15
6	Heater relay	30
7	Switch for hazard warning lights	15
8	Retractable spoiler	15
9	Sound package	15
10	Slot for additional equipment Caution! Max. 5 A	7.5

Note

If the power windows should fail, check fuse C3 (15 A) in addition to fuse D1 (30 A).

No.	Load	Amperage rating
Row E		
1	Terminal 86 S, instrument cluster, radio, daytime driving light, control modules for central locking, alarm system, information system, roll-over sensor	7.5
2	Control module for seat memory	7.5
3	Memory control module for seat adjustment, left	30
4	Memory control module for seat adjustment, right	30
5	Information system	7.5
6	Terminal 30, telephone, navigation control module	7.5
7	Air-conditioning system	7.5
8	Terminal 15 - telephone, information system	7.5
9	Not used	30
10	Not used	30

0 Electrical power supply – general

Work instructions after disconnecting the battery

Effect of disconnection or total discharge of the battery on electrical systems in the vehicle, subsequent measures:

1. Never disconnect battery with engine running.
2. Never start engine without securely connected battery.
3. Do not use a boost charger to start the engine.
4. Whenever possible, use jump leads with overvoltage protection.
5. Always disconnect the battery terminals before carrying out welding work on the vehicle.
6. Wiring harness plugs of control modules or other electronic components must be connected or disconnected with the ignition off. Exception: vehicles with the additional equipment M 536 (alarm siren with tilt sensor).

Note concerning M 536:

In order to avoid triggering the alarm siren (installed on right next to the battery) of vehicles with M 536, the battery must be disconnected with the ignition on (all loads must be switched off beforehand).

Control module memories:

Values and faults stored in the control modules can be deleted if the battery is disconnected or completely discharged.

Remedy:

If possible, all fault memories should be checked and, if necessary, printed out before the battery is disconnected.

Supply voltage fault entry:

The entry "supply voltage" could be stored in various control modules if the battery has been completely discharged.

Remedy:

Delete the "supply voltage" entry from the control modules in question.

Test drive after connecting the battery:

The fault memories of all vehicle control modules should be read out again after the test drive.

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24 70 DME control module:

After disconnection of the power supply, the idle speed might change or fluctuate briefly until the idle speed positioner (M 5.2) or the throttle adjusting unit (ME 7.2) is readapted. The mixture adaptation is also lost.

Remedy:

After the battery is connected:

With the DME ME 7.2, it is necessary to carry out a learning and adaptation routine as described below:

Switch the ignition on for 1 minute without starting the engine. Do not actuate accelerator pedal.

Switch off ignition for at least 10 seconds.

This completes the adaptation of the throttle adjusting unit.

With all DME systems, the engine must run for several minutes before the engine control module can relearn the idle speed and mixture adaptation values.

37 30 Tiptronic:

The stored pressure adaptation values are lost if the power supply to terminal 30 is interrupted. This can result in poor shifting quality (rough shift operations) during the adaptation phase.

Remedy:

Perform a test drive. During the test drive, drive the vehicle with varying load conditions and speeds so that all shift functions (manual and automatic programs) are executed at least once. This readapts the shifting pressures of the system and thereby re-establishes smooth shifting.

64 Power windows:

The limit positions of the power windows are deleted from the control module when the battery is disconnected and connected.

Remedy:

Manually close each power window as far as it will go, then press the rocker switch for closing the window again. The limit position of the respective power window is now stored in the control module again.

90 25 Instrument cluster:

The trip counter is set to 0 when the power supply is disconnected.

90 20 Clock:

Depending on the software version, the clock is set to 12:00 a.m. or 1:00 a.m. when the power supply is disconnected.

Remedy:

Enter the current time again.

Note:

On vehicles with PCM, 91 10 PCM position 3.

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90 80 On-board computer:

Disconnection of the vehicle battery deletes the memories for average speed and average consumption. As a result, the displayed range on remaining fuel can be markedly different or even 0.
The outside temperature indicator loses its memory effect. In other words, the indicated outside temperature can be too high due to the heat radiated when the vehicle is hot.

90 23 Fuel level display:

Only 911 Carrera 4 (996) and GT3 are affected:

If the power supply is interrupted by a discharged or disconnected battery with the tank containing less than 19 l, the calculated value for the range on remaining fuel in the instrument cluster will be incorrect or deleted.

If the tank contains less than 10 l, it is possible that the fuel level warning light is no longer activated.

If the power supply is restored with the fuel level at less than 19 l, it is possible that the fuel level display may subsequently display too much in some 996 Carrera 4 and GT3 vehicles.

This may lead to the vehicle breaking down.

Remedy in these vehicles:

Refill at least 19 l of fuel; then the fuel level sensor is in operating range and its display precision is guaranteed.
Note: 911 Carrera (996) Technical Manual, Group 2, TI. No. 9/99.

91 20 Radio:

The radio reverts to the *Code* function when the battery is disconnected and is thus no longer ready for operation.

Remedy:

Input the radio code. If the code card is unavailable, the radio code can be read from the DME control module (under "Vehicle data"). The code is also available from the Porsche IPAS.

91 10 PCM:

1. The PCM reverts to the Code function when the battery is disconnected and is thus no longer ready for operation.

2. When the power supply is disconnected, the built-in GPS receiver loses the so-called *"almanac"* containing the satellite orbital paths.

3. The date and time are deleted when the battery is disconnected.

4. Radio stations stored by the customer are no longer displayed.

5. If the telephone card was inserted and the telephone was ready for operation, the telephone is subsequently disabled.

Remedy:

1. Input the PCM code. If the code card is unavailable, the PCM code can also be read from the DME control module (under "Vehicle data"). This code is also available from the Porsche IPAS.

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2. Switch on the PCM with a free panoramic view for approx. 20 minutes (to load GPS almanac).
3. The date and time are also adopted once the GPS almanac has been loaded (see step 2); it may be necessary to change over to summer time (daylight-saving time). This time is transferred to the instrument cluster. If the time is then manually changed by means of the instrument cluster, this time is adopted by the PCM and synchronised with GPS time.
4. The stored stations are displayed again when station buttons 1 to 6 are pressed.
5. The telephone is enabled again when the telephone PIN code is entered with the SIM telephone card inserted.

01 Sales check

Deactivating the transport lock in the roll-over protection system, 911 Carrera Cabriolet

General

The transport lock in the roll-over protection system is activated on delivery to protect the vehicle during transport. The red warning light in the instrument cluster lights up.

Before starting the vehicle for the first time, the transport lock must be deactivated in order to ensure that the system functions.

CAUTION:

Risk of system failure if the following steps are not performed correctly.

In serious cases, the system will not be actuated.

> The red warning light in the instrument cluster must go off when the transport lock has been deactivated.

> After the transport lock has been deactivated, check the control module for stored faults using the Porsche System Tester 2.

Procedure

1. Switch on the Porsche System Tester 2 with the ignition off, then switch the ignition on.
2. Wait until the start-up screen of the Porsche System Tester 2 appears
3. Press the double arrow key [>>] to go to the next level
4. Select the vehicle type 911 (996) in the left-hand window using the arrow key [v]
5. Press the → key to activate the right-hand window
6. Using the arrow key [v] , select the *Roll-over protection* control module
7. Press the double arrow key [>>] to go to the next level
8. Select *Transport lock* using the arrow key [v]
9. Press the double arrow key [>>] to go to the next level
10. Select *not active* using the arrow key [v
11. Press key F8 (coding)
12. Press the [Esc] key 2x

When the red warning light goes out, deactivation of the transport lock is complete.

Printed in Germany - 11, 1998 99601_1

01 Sales check

Activating the parking aid

General

The automatic lowering of the door mirror aids the driver during parking manoeuvres. The door mirror is lowered by the set value as soon as reverse gear is engaged. If reverse gear is disengaged again or the mirror adjustment switch touched with reverse gear still engaged, the door mirror returns to its stored position.

Note

This function is only available in vehicles with seat memory.

The following settings can be selected from the menu and encoded using the Porsche System Tester 2.

Parking aid (active or not active)

Parking aid with door mirror (right or left)

Lowering

The system function can be activated or deactivated under the menu item *Parking aid.*

Either the right-hand or left-hand door mirror is selected and activated under the menu item *Parking aid with door mirror.*

The degree to which the door mirror is lowered is set under the menu item *Lowering.*

Activating the parking aid

1. Connect the PST2 with the ignition off, then switch the ignition on
2. Switch on the PST2 and wait for the start-up screen
3. Press the [>>] key to go to the next level
4. Select the vehicle type *911 (996)* in the left-hand window using the [v] key
5. Press the [→] key to activate the right-hand window
6. With the [v] key, select the *Seat memory* control module and press the [>>] key to go to the next level
7. With the [v] key, select the *Coding* control module and press the [>>] key to go to the next level
8. The *Parking aid* menu item is already highlighted on your screen. Press the [>>] key to alter the coding
9. Select the menu item *active* using the [v] key
10. Press key F8 (coding)

The parking aid is now activated

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11. Press the [<<] key to switch between the right-hand or left-hand door mirror

12. With the [v] key, select *Parking aid with door mirror* and press the [>>] key to alter the coding

13. Select the desired side *right* or *left* using key [v] or [^]

14. Press key F8 (coding)

The selected door mirror is now activated

15. Press the [<<] key to set the lowering degree of the door mirror

16. With the [v] key, select *Lowering* and press the [>>] key to alter the coding

17. Select the desired degree of lowering using key [v] or [^]

18. Press key F8 (coding)

The selected degree of lowering has now been stored.

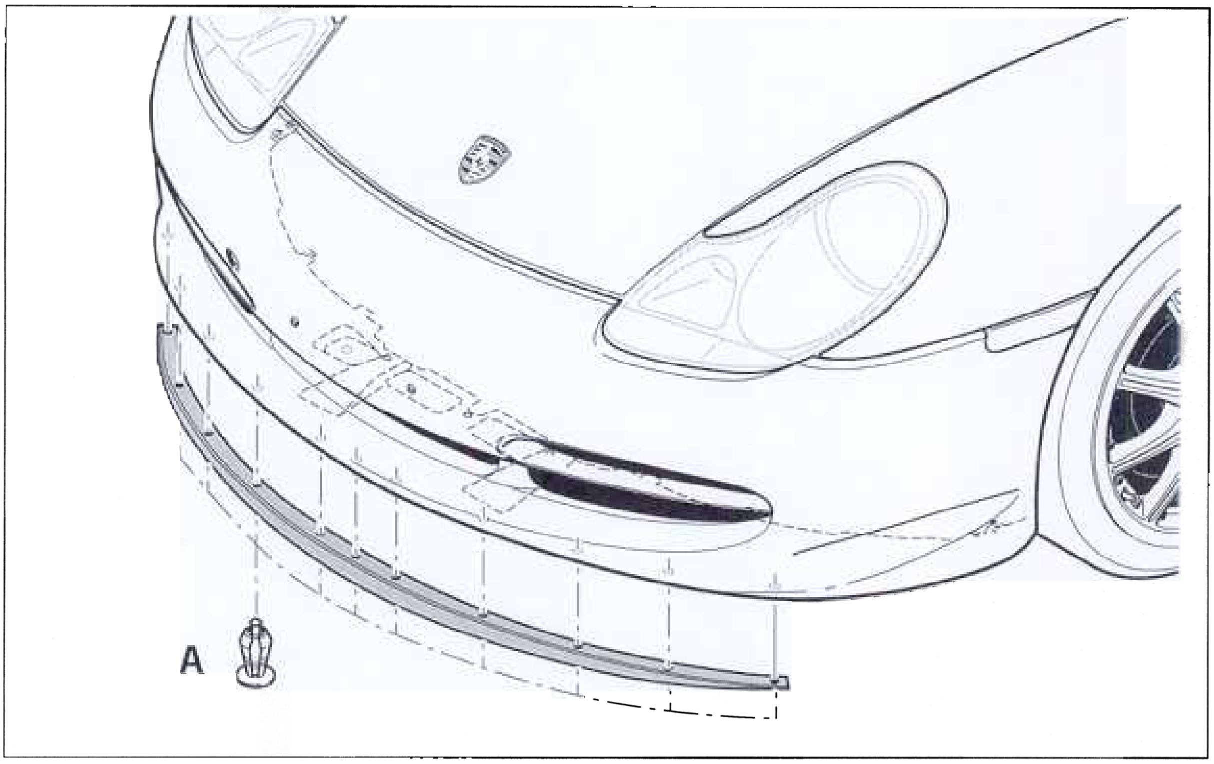
19. Press the [Esc] key 2x to quit this level

Setting of the system is now complete.

99601_3 Printed in Germany - 11, 1998

01 Sales check

Fitting front lip – GT3



63_99

General

The 911 GT3 is lowered by approx. 30 mm as standard to lower the centre of gravity of the vehicle.
The front lip is not fitted on the vehicle for protection when loading or unloading the vehicle.
The front lip and body-bound rivets included with the vehicle must be fitted.

Note:

Lift the vehicle on a lifting platform to fit the front lip.

- Position the front lip onto the holes provided on the front end and fix in position with the body-bound rivets **A**. Press in the retaining pin of the body-bound rivet.

Printed in Germany - 25, 1999 99601_5

01 Sales check

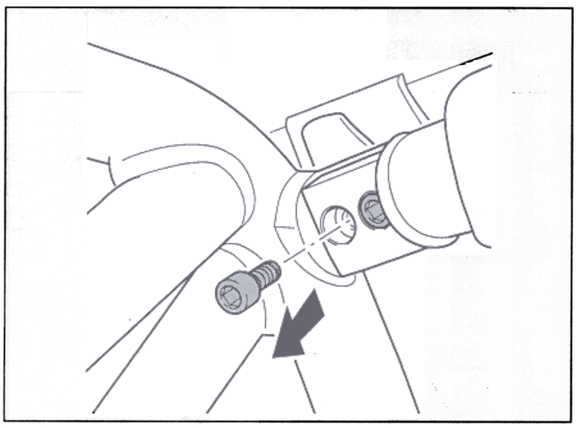
Fitting roll cage – GT3

General

The screwed roll cage is not fully fitted on vehicle delivery if the vehicle is supplied with Club Sport equipment.
The front sections (A-pillar support) of the roll cage which are delivered separately from the vehicle must be fitted on to the base cage.

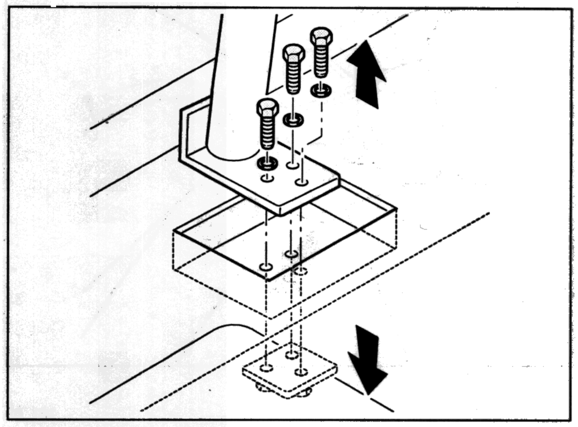
Note:
Do not tighten any of the screwed points until the screws have been screwed in.
Use correct tightening torques!

Fitting left section



160_99

1. Insert the left section of the roll cage (A-pillar support) from the left door and position at the rear on the screwed points of the base cage. Fasten with the M 8 x 12 hexagon socket head bolts.
   Tightening torque: 23 Nm (17 ftlb.)



162_99

2. Position the section (A-pillar support) on the screwed points at the front. Position the counterplate on the outside of the vehicle underbody and fasten with the M8 x 25 hexagon-head bolts, 8.4 washers and the M8 fastening nuts.
   Tightening torque: 23 Nm (17 ftlb.)

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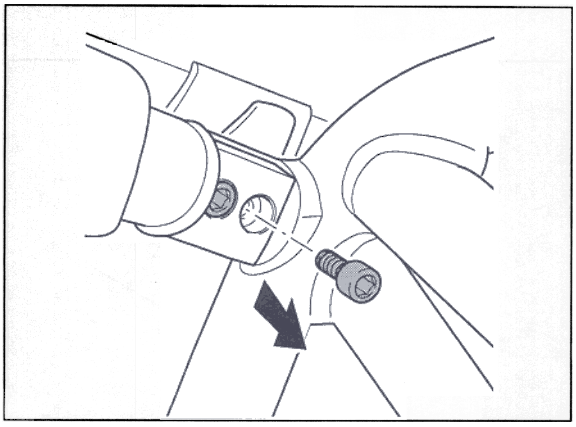
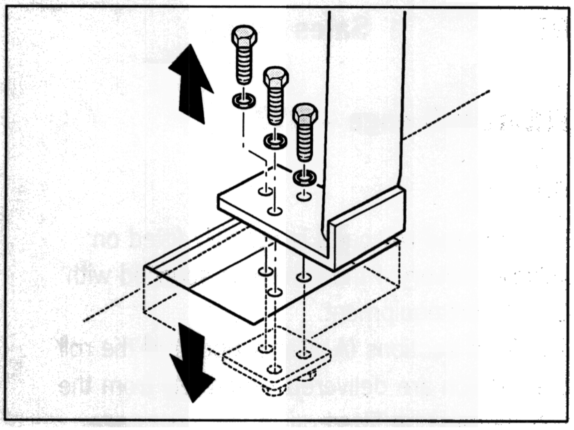
Fitting right section



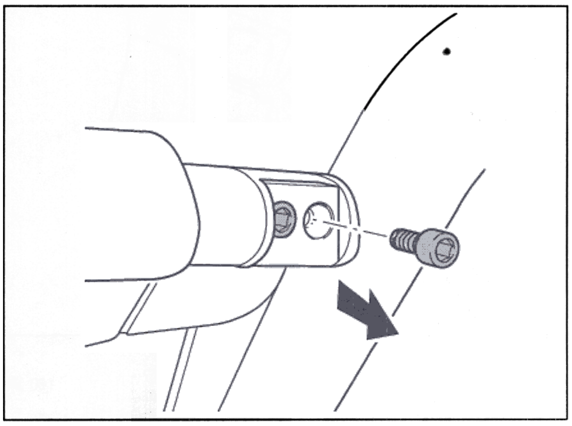
161_99

3. Insert the right section of the roll cage (A-pillar support) from the right door and position at the rear on the screwed points of the base cage. Fasten with the M 8 x 25 hexagon-head bolts.
   Tightening torque: 23 Nm (17 ftlb.)



163_99

4. Position the section (A-pillar support) on the screwed points at the front. Position the counterplate on the vehicle underbody on the outside and fasten with the M8 x 25 hexagon-head bolts, 8.4 washers and the M8 fastening nuts.
   Tightening torque: 23 Nm (17 ftlb.)



164_99

5. Fasten the transverse connection between both sections with the M 8 x 12 hexagon socket head bolts.
   Tightening torque: 23 Nm (17 ftlb.)

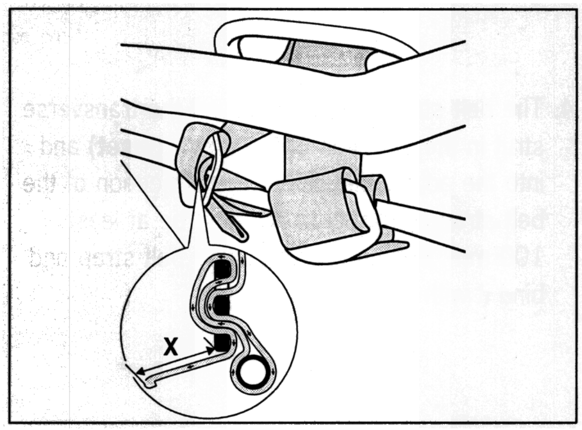
01 Sales check

Fitting six-point seat belt – GT3

General

The six-point seat belt is not fitted on vehicle delivery for the Club Sport equipment.
The six-point seat belts which are delivered separately from the vehicle can be fitted as required (customer request).

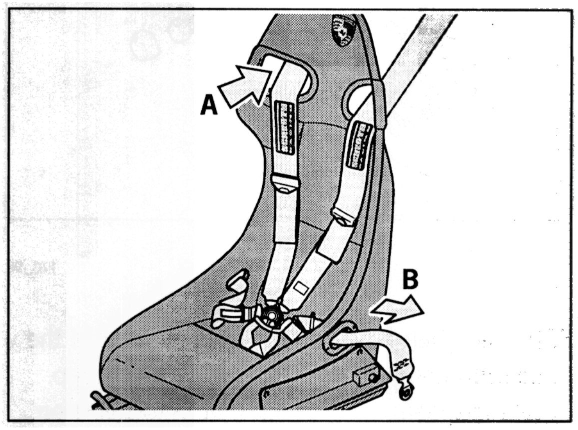
Loop technique for fastening to the bucket seat cross member



168_99

1. The belt strap is looped around the transverse strut in the direction of the arrow **(inset)** and into the adjustable slider. The projection of the belt strap **(dimension X)** must be at least 100 mm.

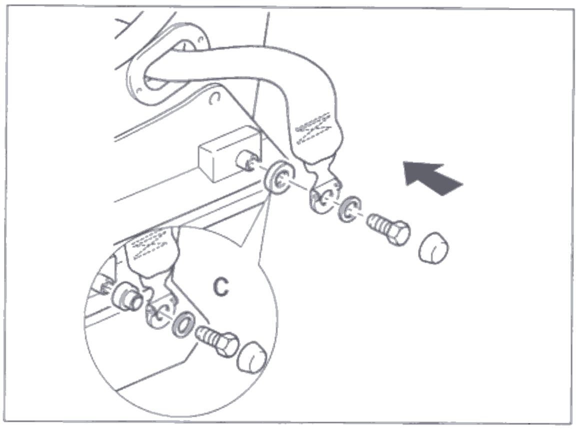
Pulling six-point seat belt through the openings



169_99

2. Pull six-point seat belt through the upper opening in the backrest from behind **(arrow A)** and through the opening in the seat frame from the side **(arrow B)**.

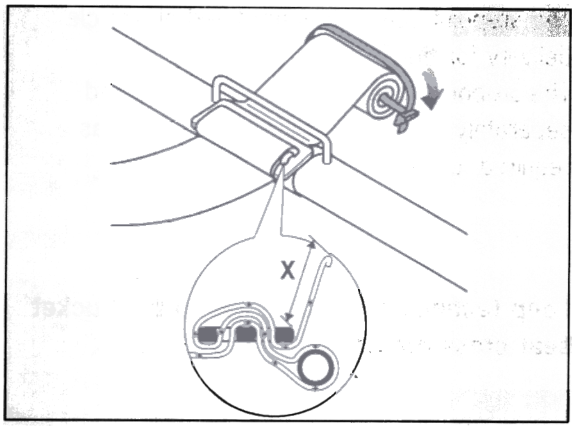
Fitting belt fitting



170_99

3. Position belt fitting on the left and right of the seat frame and fasten. Attach covering cap. Use the foam part for the Club Sport version. Use the bushing **insert C** for the Cup racing version.
   Tightening torque: 50 Nm (37 ftlb.)

Loop technique for fastening to the roll cage cross member



171_99

4. The belt strap is looped around the transverse strut in the direction of the arrow **(inset)** and into the adjustable slider. The projection of the belt strap **(dimension X)** must be at least 100 mm. Roll up the projecting belt strap and bind it with a tie wrap.

01 Sales check

Removing transport lock (spring strut locking devices) – Carrera and GT3

General

Spring strut locking devices are installed **on the front axle** of the **following** new vehicles in order to protect the vehicle during transport (e.g. driving on and off during lorry transport):

RoW new vehicles with the option **"Sports package"** P70 (manual transmission) or P71 (Tiptronic transmission)

911 GT3

This increases the ground clearance of the vehicle.

Tests have demonstrated that spring strut locking devices are not necessary at the **rear axle**.

The spring strut locking devices must be removed before a test drive and before the vehicle is handed over to the customer!

If the spring strut locking devices are not removed, this will seriously impair the handling behaviour and thus the driving safety.

Send the removed spring strut locking devices to the Porsche Warranty Test Office in Ludwigsburg.
Include the spring strut locking devices with the normal warranty goods consignment.

Removing spring strut locking devices

1. Lift the vehicle (wheels at the front axle must be free).
   The wheels need **not** be removed.

2. Remove spring strut locking devices from all spring struts. To do this, pull spring strut locking devices off the springs.

03 Maintenance schedule

Minor maintenance after 20,000, 60,000, 100,000, 140,000 km etc. / 12,000, 36,000, 60,000, 84,000 mls etc.	911 Page	
Diagnosis system: Read out fault memory	1	27
Change engine oil	1	
Replace spark plugs (only on vehicles without catalytic converter)	2	
Vehicle underside and engine compartment: Visual inspection for leaks (oils and fluids) and chafing damage (lines and hoses)	2	
Power-assisted steering: Check fluid level	3	30
Coolant hoses: Check condition; radiator: Visual inspection for external contamination Coolant: Check level and antifreeze protection	4	
Particle filter: Replace filter element	4	32
Brake hoses and lines: Visual inspection for damage, routing and corrosion, check brake fluid level	5	
Drive shafts: Visual inspection of boots for leaks and damage	5	33
Tyres and spare wheel: Check condition and tyre pressure	5	
Check the door, lid locks and safety hooks of the front lid to ensure that they are secure and functioning	6	
Vehicle lighting: Check function; all headlights: Check adjustment Horn: Check function	6	35
Windscreen washer, headlight washer: Check the fluid level and nozzle settings, pay attention to antifreeze protection in the winter	9	36
All other electrical equipment as well as warning and indicator lights: Check function	10	37
Test drive: Foot and parking brakes (also actuation travel), engine, clutch, transmission, automatic speed control, steering, heating, air-conditioning system and instruments: Check function	10	
Oils, fluids: Visual inspection for leaks	10	37

Major maintenance after
40,000, 80,000, 120,000, 160,000 km etc. /
24,000, 48,000, 72,000, 96,000 mls etc.

Diagnosis system: Read out fault memory	1	27
Polyrib belt: Check condition	10	
Change engine oil and oil filter	12	
Replace spark plugs	2	
Vehicle underside and engine compartment: Visual inspection for leaks (oils and fluids) and chafing damage (lines and hoses)	2	
Coolant hoses: Check condition; radiator: Visual inspection for external contamination Coolant: Check level and antifreeze protection	4	31
Air filter: Replace filter element	23	48
Particle filter: Replace filter element	4	

	911 Page	
Fuel system: Visual inspection for damage, routing and secure fit of line connections		
Power-assisted steering: Check fluid level	3	30
Parking brake: Check free play of parking brake lever	13	
Brake system: Visual inspection of brake pads and brake discs for wear	15	
Brake hoses and lines: Visual inspection for damage, routing and corrosion, check brake fluid level	5	
Clutch: Check play and pedal end position	16	44
Throttle actuation: Check smooth operation	16	
Steering gear: Visual inspection of bellows for damage Tie rod ends: Check play and dust bellows	17	
Axle joints: Check play, visual inspection of dust bellows for damage, check screw connections of running gear adjustment facility, front and rear, for secure fit	17	45
Drive shafts: Visual inspection of the boots for leaks and damage		
Exhaust system: Visual inspection for leaks and damage, check suspension		
Tyres and spare wheel: Check condition and tyre pressure	4	33
Check the door, lid locks and safety hooks of front lid for secure seating and function		
Seat belts: Check function and condition	18	46
Vehicle lighting: Check function; all headlights: Check adjustment Horn: Check function	6	
Windscreen washer, headlight washer: Check the fluid level and nozzle settings, pay attention to antifreeze protection in the winter	9	35
All other electrical equipment as well as warning and indicator lights: Check function	10	37
Test drive: Foot and parking brakes (also actuation travel), engine, clutch, transmission, automatic speed control, steering, heating, air-conditioning system and instruments: Check function	10	
Oils, fluids: Visual inspection for leaks	10	37

Additional maintenance every 80,000 km / 48,000 mls

Replace fuel filter	23	48
Replace Polyrib belt	10	37

Additional maintenance every 160,000 km / 96,000 mls

Manual transmission: Change oil	19	47
Automatic transmission: Change ATF and ATF filter	20	
Automatic transmission: Change oil in final drive	20	
Final drive front: Change oil		

Yearly maintenance

File Status Report for Long-life guarantee, for the first time after 2 years within the framework of regular servicing		

Maintenance every 2 years	911 Page	GT3 Page
Change brake fluid (use only original Porsche brake fluid)	18	46
Check roll-over protection system		

Maintenance after 4, 8, 10 then every 2 years

Inspect airbag system	51	**51**
Ancillary unit mounts and running gear: Visual inspection of all rubber mounts for damage		

Annual maintenance

Diagnosis system: Read out fault memory	1	27
Vehicle underside and engine compartment: Visual inspection for leaks (oils and fluids) and chafing damage (lines and hoses)	2	
Power-assisted steering: Check fluid level Engine: Check oil level	3	30
Brake hoses and lines: Visual inspection for damage, routing and corrosion, check brake fluid level	5	33
Steering gear: Visual inspection of bellows for damage Tie rod ends: Check play and dust bellows	17	45
Axle joints: Check play, visual inspection of the dust bellows for damage	17	45
Drive shafts: Visual inspection of the boots for leaks and damage		
Tyres and spare wheel: Check condition and tyre pressure	5	33
Vehicle lighting: Check function; all headlights: Check adjustment Horn: Check function	6	
All other electrical equipment as well as warning and indicator lights: Check function	10	37
Test drive: Foot and parking brakes (also actuation travel), engine, clutch, transmission, automatic speed control, steering, heating, air-conditioning system and instruments: Check function	10	
Oils, fluids: Visual inspection for leaks	10	37

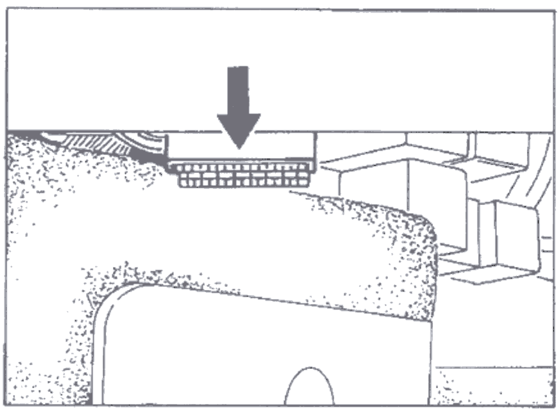
03 20 00 Maintenance

Diagnosis system

Reading out the fault memory

The method of reading out the fault memory is described in the operating instructions for the Porsche System Tester 2. The operating instructions are supplied with each Tester.

The Porsche System Tester 2 is connected to the vehicle via a 16-pole diagnosis socket. The diagnosis socket is located inside the vehicle near to the driver (left-hand drive vehicles) or the passenger (right-hand drive vehicles) below the instrument panel.



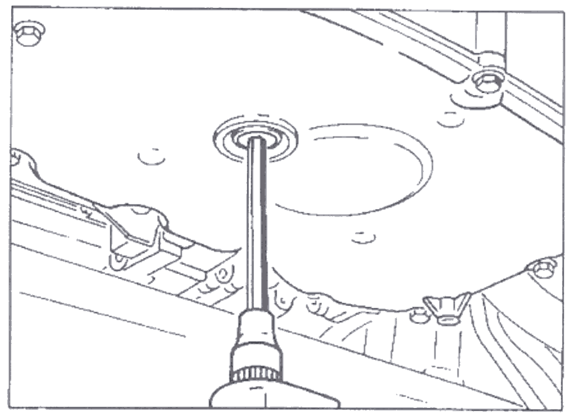
12_96

Changing the engine oil (without oil filter)

Warning:
Danger of burns from draining oil!

> wear protective equipment specified.

1. Undo the oil drain plug on the oil pan and drain off the engine oil.



271_96

2. Clean the oil drain plug. Always replace the sealing ring.
   Tightening torque 50 Nm (37 ftlb.)

3. Fill in engine oil.

The oil change quantity (without oil filter change) is approx. 8.5 litres after a dripping time of 20 minutes.

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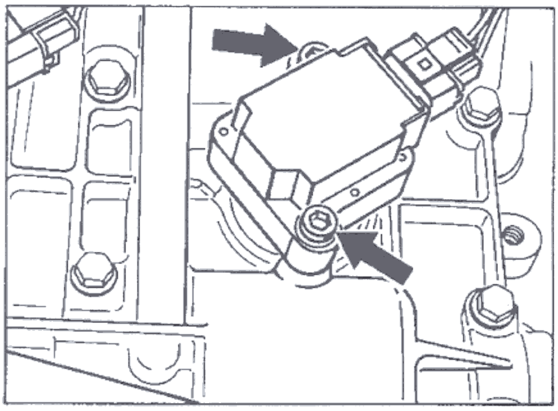
Replacing the spark plugs

1. Lift the vehicle.

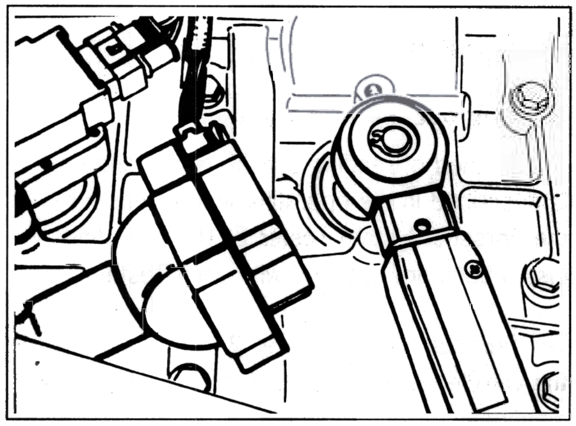
2. Undo the hexagon-head bolts on the plug coils.



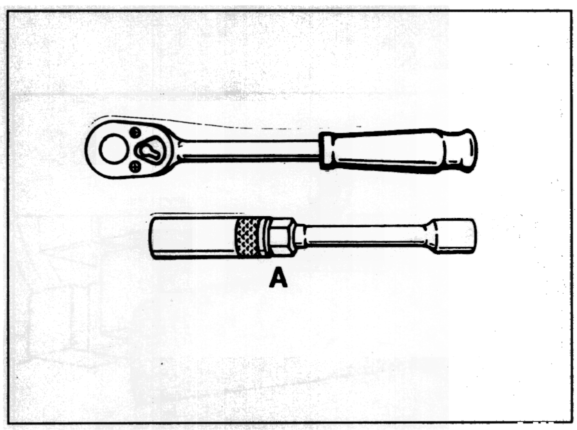
272_96

3. Pull off the plug coils and detach them to the side with connected cable.

4. Unscrew or tighten the spark plugs with the standard socket key insert from the Snap - On company, Order No. S 9706, and the Snap - On extension, Order No. FXW 4.



399_97



A – Snap - On tools 637_96

Note

Only this spark plug wrench from the Snap - On company was tested and approved.
Tightening torque: 30 + 3 Nm (22 + 2.0 ftlb.)

Underside of vehicle and engine compartment

Visual inspection for leaks (oils and fluids) and abrasion (lines and hoses)

Power-assisted steering

Checking the fluid level

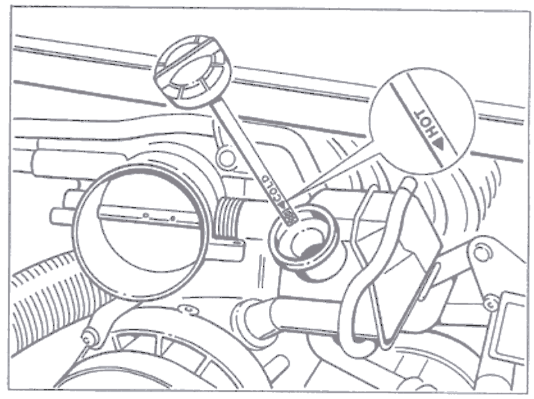
General

Damage to the power-assisted steering is caused by a shortage of oil in the hydraulic system. Even small leaks can cause the fluid to escape and damage the servo pump as a result of the high oil pressure occurring in the hydraulic circuit.
Grunt-like noises when the steering is locked or foam formation in the reservoir indicates a shortage of oil and/or that air has also been sucked in. However, before topping up the reservoir, remedy any leaks on the suction side and replace the faulty part on the pressure side.

Checking the fluid level for the power-assisted steering

The reservoir is located in the engine compartment. There are two markings on the dipstick located on the reservoir cap. Here, the marking "Cold" for the cold engine (approx. 20 °C) is on one surface and the marking for the hot engine "Hot" (approx. 80 °C) is on the other surface.

Check the fluid level (Pentosin CHF 11 S) **when the engine is not running and when it is cold** (approx. 20 °C).



84_97

Note

Multiple steering operations (maneouvering) with the engine switched off change the fluid level in the reservoir – fluid level rises.
In this case, the engine must be run for at least 5 seconds immediately prior to the fluid level check.

1. Open the engine cover. Open the cap of the supply tank.

2. Wipe off the dipstick.
   Close and then reopen the cap. The fluid level should be in the shaded area **below** the "Cold" marking (marking = max. level at 20 °C).
   Top up with Pentosin if necessary.*
   The top marking "Hot" is intended for a fluid temperature of 80 °C.

When filling in and topping up with Pentosin, make sure that Pentosin does not come into contact with the coolant hoses. In order to avoid overfilling and the resulting overflowing, observe the specifications on this page. Coolant hoses that come into contact with Pentosin must be thoroughly cleaned with water IMMEDIATELY!
Replace visibly swollen coolant hoses!

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Coolant hoses

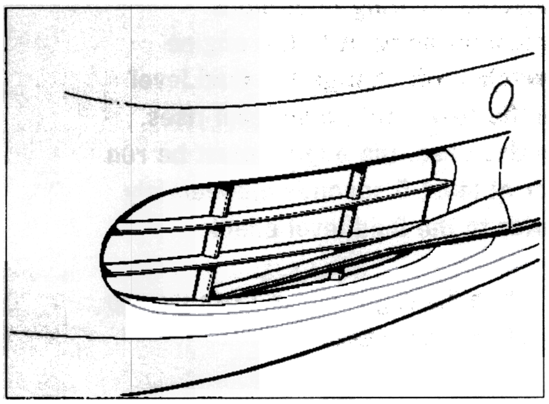
Check their condition

Radiators

Visual inspection for external contamination

Note

If necessary, the cooling air inlet channels upstream of the radiators can be cleaned with a vacuum cleaner nozzle (crevice nozzle) from the Kärcher company, part number 6.900 - 922.0 (length 56 cm).



311-96

Coolant

Check the level and antifreeze protection

Note

The engine cooling system was filled with a lifetime coolant filling at the factory. This coolant must not be mixed with or replaced by other coolants. Only **Original Porsche coolant** must be used when changing or topping up the coolant.

Particle filter

**Replace filter element
(with and without activated carbon)**

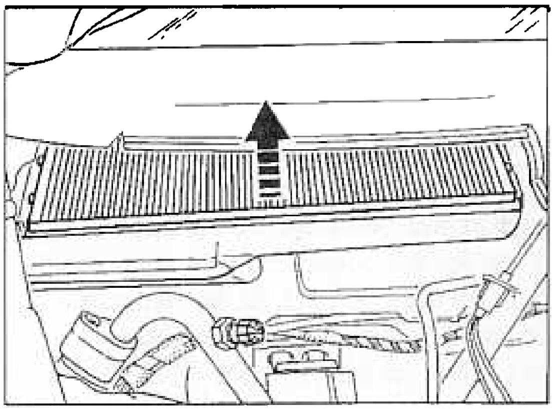
Note

The particle filter is installed on the right in front of the heating/air-conditioning system.

Removal

1. Remove the cover for the heating and air-conditioning system.

2. Remove the particle filter upwards out of the housing guide.



7-96

Installation

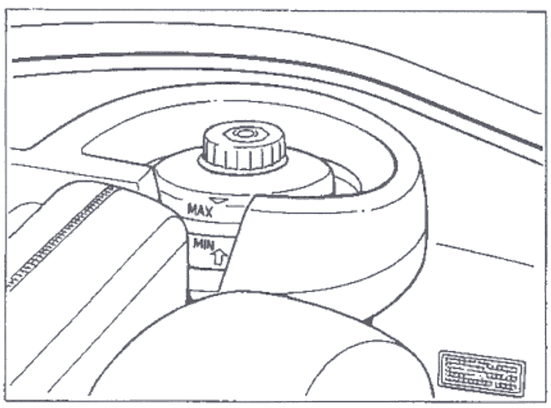
1. Insert a new particle filter into the housing guide. Check that the filter is correctly fitted and in the correct installation position.

Brake hoses and lines

Visual inspection for damage and routing (corrosion)

Check the brake fluid level

Adjust the brake fluid level if necessary (markings are on the brake fluid reservoir).
Never top up above the max. marking. Use only Super DOT 4 brake fluid.



189 - 96

Drive shafts

Perform a visual inspection of the boots for leaks and damage

Tires

Check the condition and the tire pressure

Tire condition

Tires are a safety element which fulfil the demands placed on them only if they have the correct air pressure and a sufficient tread depth.

The stated air pressures are minimum pressures and must never be fallen below, since in addition to the unfavorable driving performance, this would bring about a risk of serious tire damage.

Valve caps protect the valve from dust and dirt and therefore from leaks. Always screw on the caps tightly and replace missing valve caps.

For safety reasons, in addition to checking the air pressure you should perform a visual inspection for sufficient tread depth, foreign bodies, pricks, cuts, cracks and bulges in the sidewall (ply breakage).

Tire pressure of cold tires (approx. 20° C)

17-inch wheels
(summer and winter tires)

front	2.5 bar overpressure
rear	2.5 bar overpressure

18-inch wheels

front	2.5 bar overpressure
rear	3.0 bar overpressure

Spare wheel

front/rear	4.2 bar overpressure

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Oil the door hinges

Check the door locks, lid locks and safety hooks of the front lid to ensure that they are secure and functioning properly

Secure fit inspection

The fastening screws for the door lock, front lid lock and rear lid lock, as well as the retaining nuts for the upper parts of the locks of the front and rear lids must be tightened with 10 Nm (7.5 ftlb.).

Functional inspection

Door lock

The door lock must engage in two stages through the locking wedge when the doors are closed and must disengage again when the door handle is operated (inside and outside).

Lid lock, front and rear

The lid locks must engage by insertion of the lock upper parts when the lids (front and rear) are closed and must disengage again when the lid releases are pulled.

Safety hook, front lid

The front lid must be held down by the safety hook after the lid lock is opened. At the same time, the safety hook must engage in the retaining plate at its lowest point.
When the lid is open, the return spring must pull back the safety hook until it makes contact with the base plate of the lock upper part.

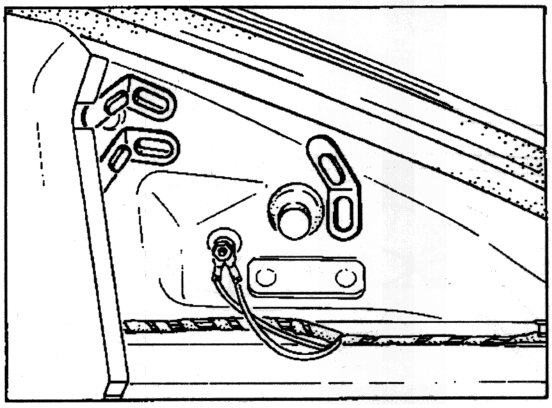
Checking the function of the vehicle's lights

Adjusting the main headlights

1. Open the luggage compartment lid.

2. Remove the luggage compartment mat on the wheel housing wall.

3. Open the cover for the headlight adjustment screws.



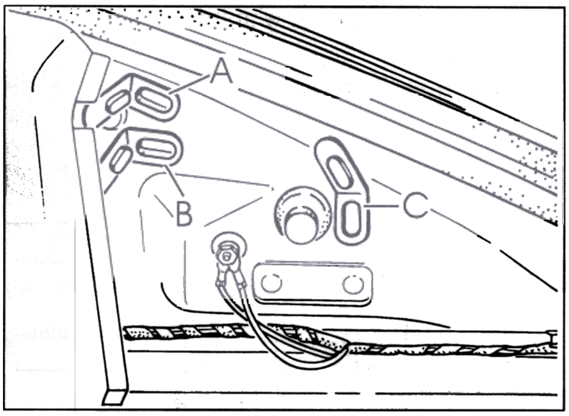
8 - 96

4. Clean the cover disk and switch on the dipped beam headlights.

5. The vehicle must be on a horizontal surface. Make the adjustment with the vehicle ready for driving (fuel tank full, driver's seat occupied by a person or 75 kg, the tire pressure must correspond to the stipulated values) using a headlight adjustment unit.

Note

Make the adjustment with the regulator switch set to 0. (Headlight beam adjustment.)



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A – Lateral adjustment
B – Height and side adjustment
C – Fog light adjustment

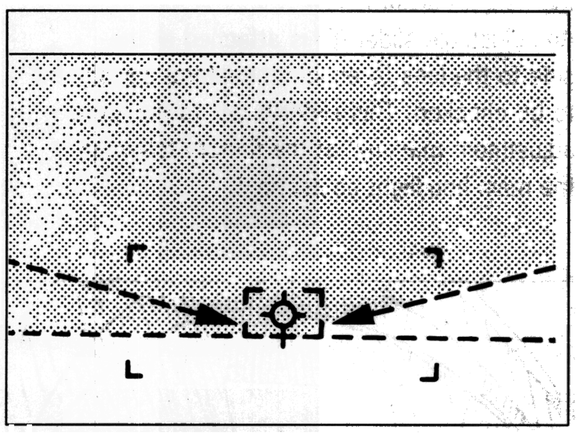
Use a standard 5 mm ball-head screwdriver to make the headlight adjustment. Only the lower screw may be turned for height adjustment; for lateral adjustment the upper and lower screws must be turned in the same direction and for the same number of rotations.

Adjustment

Note

Set the headlight adjustment unit to 10 cm/10 m (1%).

1. First, make the vertical adjustment of the dipped beam headlights. To do this, line up the light/dark borderline running upwards at an angle on the right hand side with the dotted 15° line of the adjustment unit.
2. Next, perform the horizontal adjustment of the dipped beam headlights. To do this, line up the left, horizontal part of the light/dark limit (in the case of driving on the right) with the dotted horizontal line of the adjustment unit. With this alignment, preference must be given to the central zone around the salient point of the light/dark limit.


290_96

Note

The distance between the headlights and the adjustment unit should be as small as possible. It should not exceed 30 cm, because if the distance is greater, it is no longer possible to clearly define the formation of the light/dark limit in the adjustment unit.
Secure the plugs after making the adjustment.
For **Litronic headlights** the ignition must be switched off and on after adjustment with the lights switched on. After this, the adjustment must be checked again.

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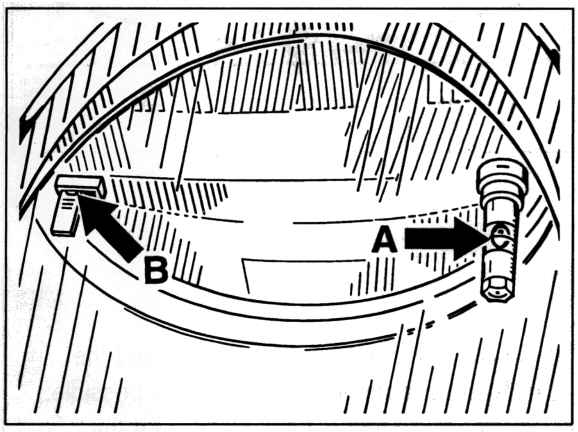
Adjusting the main headlights, USA version

Note

In accordance with the specifications, the headlights have a spirit level (A) secured to the lens in the side area in a location clearly visible from the outside.
This is used for adjusting and checking the height adjustment.
An adjustable slider (B) is attached at the side to the lens to enable the lateral adjustment to be checked. This slider is set to the "zero adjustment marking" at the factory following the main headlight adjustment.



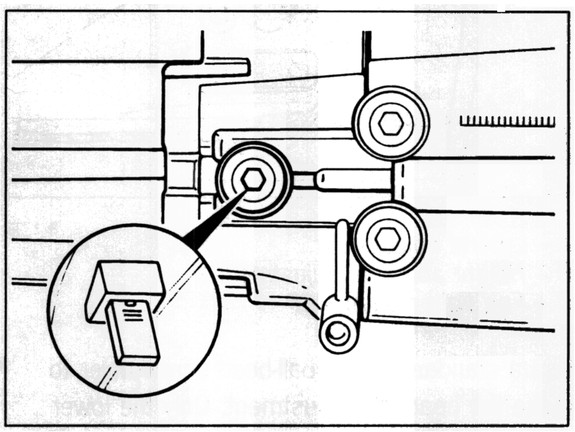
023_96

Following a correct main headlight adjustment, the spirit level must be between the marking. The lateral adjustment of the main headlights is marked by the adjustable slider. This zero adjustment marking is set at the factory and must not be readjusted.
A new adjustment may only be made in the case of **accident repairs or replacement of the main headlights.**

Setting the zero adjustment marking

1. After the main headlight adjustment, turn the adjustment screw of the slider (checking the lateral adjustment) with a 5 mm ball head screwdriver until the "zero adjustment marking" corresponds with the reflector.

   The illustration shows the main headlight removed.



024_96

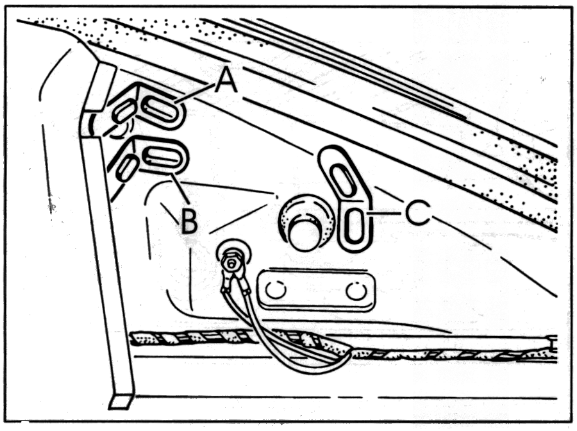
2. Adjustment screw through the luggage compartment, see Figure 11 - 96 C.

Note

Spirit level A (Fig. 023_96) has been omitted for the beginning of the '98 model of the main headlights, USA version. As a result, subsequent adjustment of the slider (Fig. 024_96) for zero adjustment marking is also omitted.
Vertical and horizontal adjustment must be carried out with a headlight adjustment unit.

Adjusting the fog lights

The vehicle must be on a horizontal surface. Make the adjustment with the vehicle ready for driving (fuel tank full, driver's seat occupied by a person or 75 kg, the tyre pressure must correspond to the stipulated values) using a headlight adjustment unit.

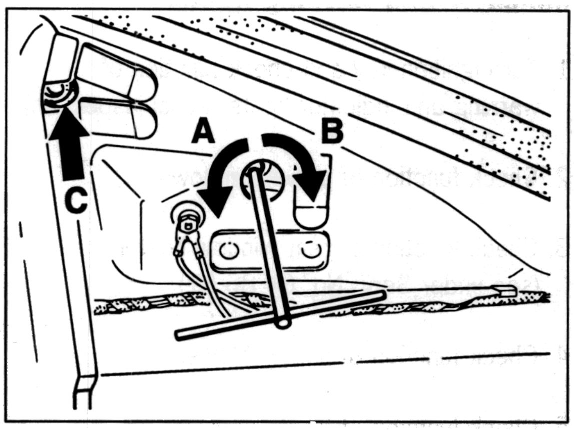


C – Adjusting the fog lights 8_1_96

Note

Switched-on headlights must not be covered by a front apron or film.

Removing and installing the main headlights



A – Open
B – Close
C – Slider adjustment (USA) 11_96

Secure the plugs after installation.

Windscreen washer system, headlight washer system

Check the function, fluid levels and nozzle settings

Note

The headlight washer nozzles are preset.
It is not necessary to adjust them.

Use only soapy water to clean the exterior lights and the plastic headlight lenses. Never use chemical cleaning agents. To avoid scratches, do not rub with dry or only damp cloths, paper towels or insect-removal sponges.

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Check the function of all other electrical equipment, as well as the indicator and warning lights:

1. Turn ignition key and check function of warning and indicator lights (visual inspection)

2. Check function of power windows

3. Check function of rear window heater (see under Serv. No. 64 86 01)

4. Check function of heater blower

5. Check function of front seats

6. Check function of radio

7. Check function of door mirror

Test drive

Check the function of the foot and hand brakes, clutch, automatic speed control, steering, heating, air-conditioning system and instruments.

Oils and fluids

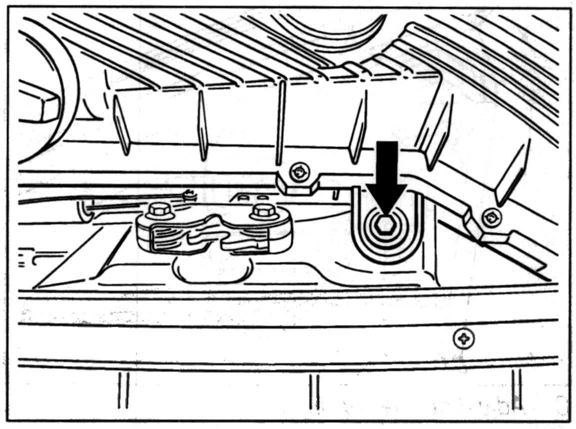
Visual inspection for leaks

Drive belt

Check condition and replace if necessary

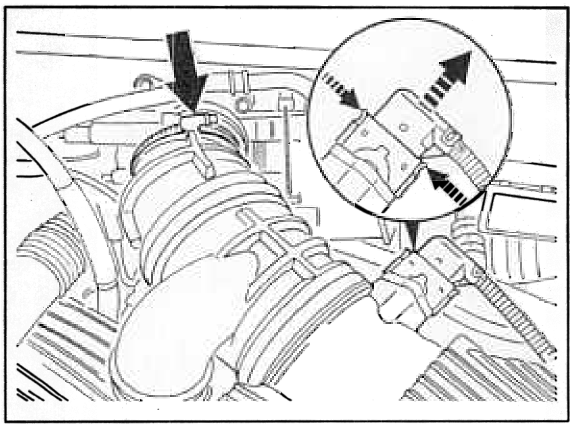
Removal

1. Completely remove air cleaner assembly.
a. Undo hexagon-head screw M8 x 15.



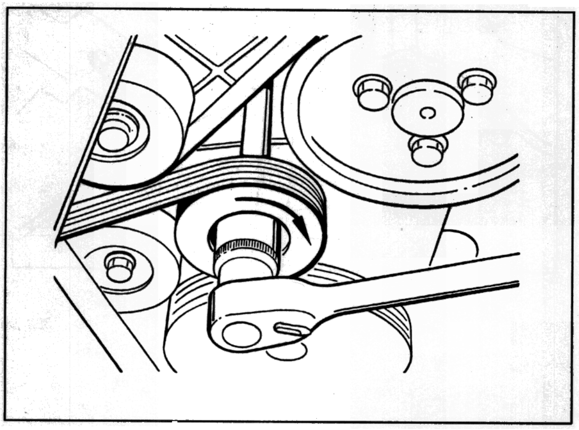
261_97

b. Undo the hose clamp on the throttle body. Remove connector from mass air flow meter. Unclip wire on air cleaner housing and remove air cleaner assembly.



249_97

2. Mark the running direction of the belt with a coloured pen. Relieve the belt tension. To do this, turn the tensioning roller (wrench size 24 mm) clockwise and simultaneously remove the belt from the drive pulleys.



229_97

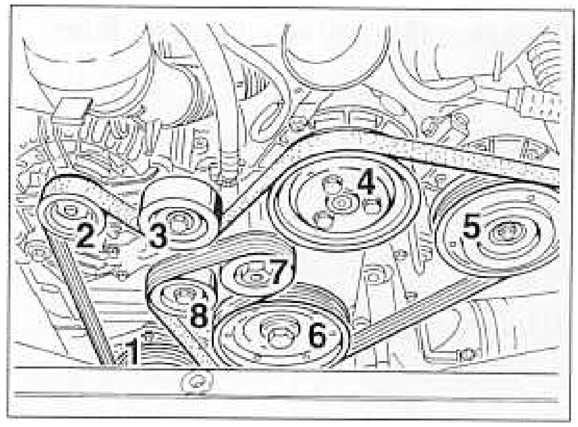
3. Visually inspect the condition of the belt and replace it if necessary.

Installation

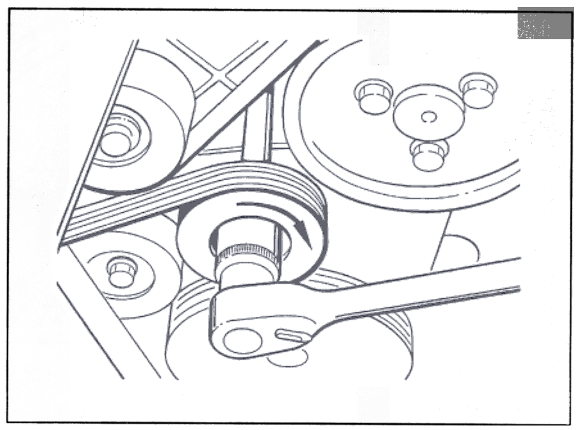
1. Tensioning the toothed belt slightly by hand, fit it in the order described below:

   1. Coolant pump drive pulley (1)
   2. Alternator drive pulley (2)
   3. Deflection roller 1 (3)
   4. Power steering pump drive pulley (4)
   5. Air-conditioning compressor drive pulley (5)
   6. Crankshaft pulley (6)
   7. Tensioning roller (7)

Then turn the tensioning roller (7) in clockwise direction and simultaneously fit the drive belt on the deflection roller 2 (8).



338_97



229_97

2. Slowly relieve the tensioning roller.

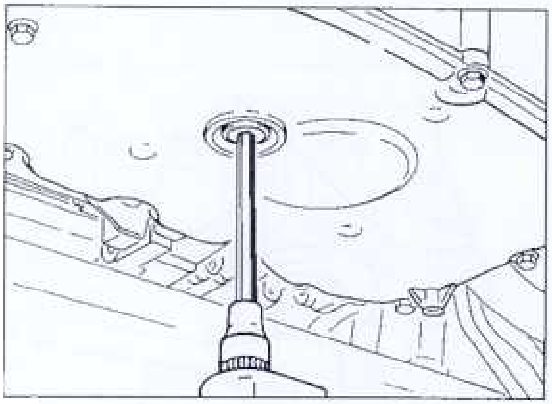
3. Visually check whether the belt is correctly positioned on all drive pulleys.

Changing the engine oil and oil filter

Warning:
Danger of burns from draining oil!

> wear protective equipment specified.

1. Undo the oil drain plug on the oil pan and drain off the engine oil.



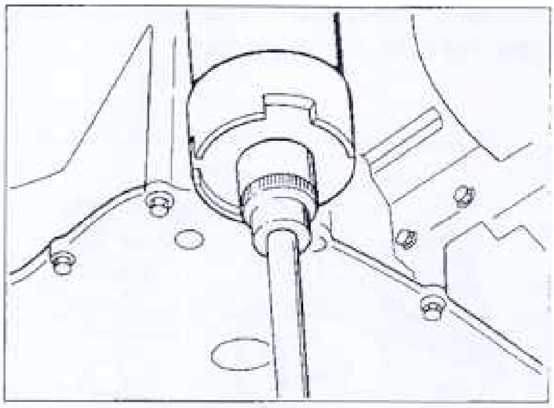
271_96

2. Clean the oil drain plug. Always replace the sealing ring.
   Tightening torque: 50 Nm (37 ftlb.)

3. Fill in engine oil.

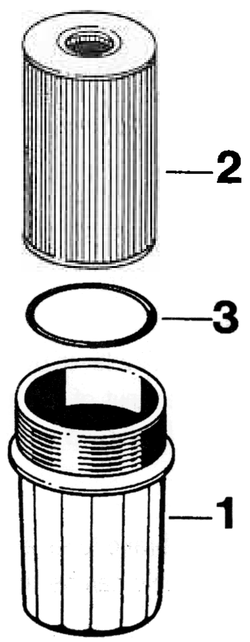
The oil change quantity (with oil filter change) is approx. 8.75 litres after a dripping time of 20 minutes.

4. Undo the oil filter with the special tool 9204.



322_96

4. Remove the oil filter element.



1 – Oil filter housing
2 – Filter insert
3 – Sealing ring

699_96

Tightening torques:

Oil drain plug on
oil pan 50 Nm (37 ftlb.)

Oil filter on
crankcase 25 ± 1 Nm (19 ± 1 ftlb.

The oil change quantity (with filter change) is approx. 8.75 litre.

Handbrake

Check the free play of the handbrake lever

The handbrake has asbestos-free brake linings. The handbrake with asbestos-free brake linings must **never be adjusted in such a way** that the lining must "grind down" during operation.

The handbrake must be adjusted if the handbrake lever can be pulled up by more than 4 teeth with medium force application without a braking effect being apparent.

Adjusting the handbrake:

1. Remove the rear wheels.

2. Undo the handbrake lever and push back the disc brake pads of the rear axle until the brake disc can rotate freely.

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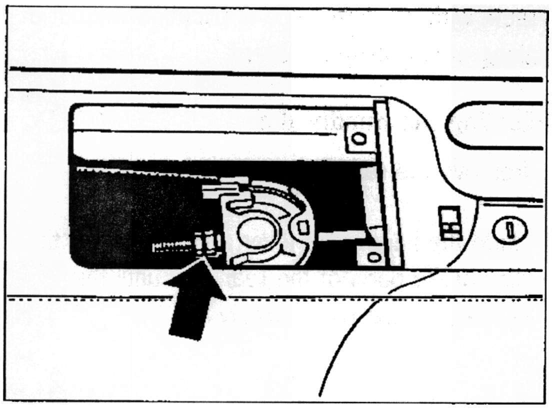
3. Undo the adjustment nuts on the turnbuckle (arrow) until the cables are without pretension.

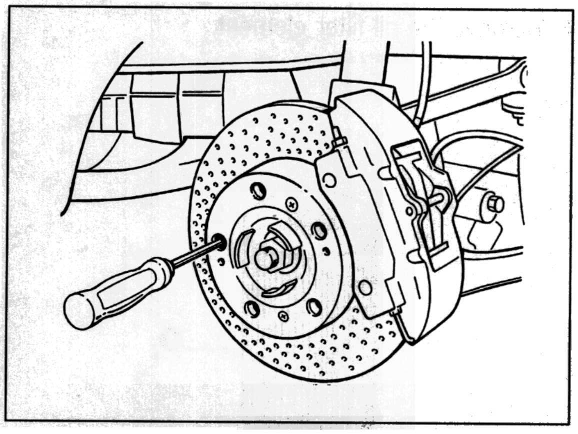
Note

To make the turnbuckle accessible, open the cover of the tray behind the handbrake lever and remove the rubber inlay and also the insert.



18_96

4. With a screwdriver, adjust the adjustment fixture through a threaded wheel bolt hole until the wheel can no longer be turned. Next, turn back the adjustment fixture through 5 notches again (release approx. 3 notches until the wheel can be turned freely, then release another 2 notches).



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5. Pull up the handbrake lever by 2 teeth and turn the adjustment nut of the turnbuckle until both wheels can be turned manually with difficulty.

6. Release the handbrake lever and check whether both wheels can be turned freely.

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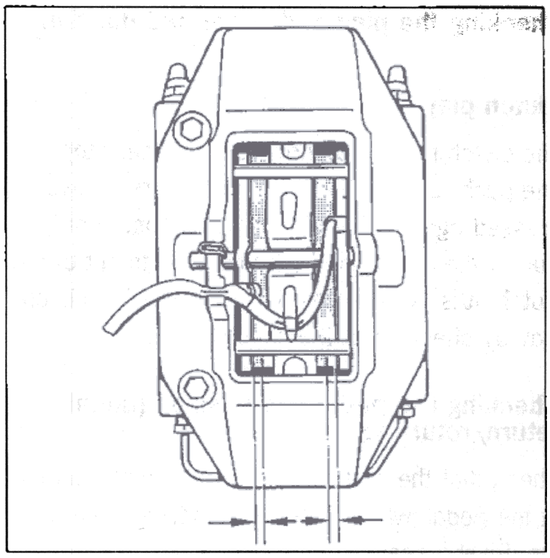
Brake system

Visual inspection of the brake pads and brake discs for wear



22_96

Note

The brake pads must be replaced when the brake pad warning indicator lights up, but no later than when there is a residual pad thickness of 2 mm (per axle). If brake pad wear is indicated by the warning light, the warning contact (sender including wire and plug connection) must also be replaced. Replacing the warning contact or warning contacts can be avoided by replacing the brake pads no later than when the pad thickness is still 2.5 mm. Warning contacts must be replaced if the core of the wire is worn. However, if only the plastic part of the warning contact is worn, there is no need to replace it.

To check the brake pads, remove the wheels.

2. Visually inspect the brake pads for wear.

The wear limit is reached when the pad has a residual thickness of 2 mm.

Clutch

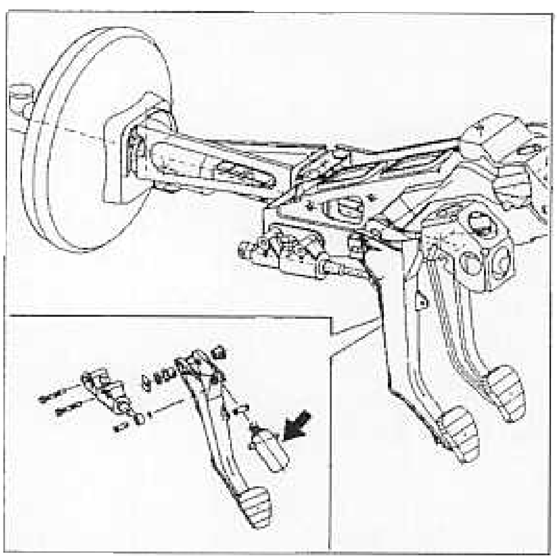
Checking the play and pedal end position

Clutch play

The clutch master cylinder has an inner stop. The push rod and the clutch pedal are always pressed against this stop by the boost spring. Due to the automatic hydraulic adjustment of the clutch, it is not possible to determine the clutch play by checking at the clutch pedal.

Checking the pedal end position (pedal return/return force)

Check that the pedal is in end position by pulling at the pedal (without the use of force) towards the driver's seat.
The pedal must not give way during the process. If it gives way, the fault is in the boost spring (arrow) or in the pedals (observe the following instructions).



267_96

Note

The clutch push rod and the boost spring are not adjustable. The boost spring has 2 functions, namely to provide pedal force assistance and to return the pedal.
The following are some of the points which are requirements for perfect clutch operation:

Correct bleeding of the clutch hydraulics

No leaks in the hydraulic system

Pedal return to the starting position

Installation position of the pedals in accordance with the series condition.

Throttle valve operation

Check smooth operation, check the full throttle position with the Tester.

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Steering gear

Visually inspect the bellows for damage

Track rod joints

Check the play and dust bellows

Check the function of the dust bellows, bellows and joints and ensure that they are free of leaks.

The rubber dust bellows and bellows on the steering gear and on the tie rods can be damaged by external influences, e.g. stone impact, or during assembly work. If a rubber dust bellows leaks, the joint or the tie rod must be replaced, because dirt or moisture entering will destroy the joint.

Axle joints

Check the play and visually inspect the dust bellows for damage.

Inspect the dust bellows of the axle joints (ball joints) on the suspension (front and rear) as follows:

Put the vehicle onto a lifting platform with the steering lock disengaged.

Perform a visual inspection after cleaning. When doing so, the rubber dust bellows should be pressed down with the fingers in order to reveal hidden cracks.

The procedure for the front axle is as follows: Turn the front wheels as far as they will go. Perform a visual inspection of the visible surfaces on the left and on the right.

After turning the front wheels to the other steering stop, check the other half of each rubber dust bellows.

Note

In the vicinity of the brake cover panels, no visual inspection is possible in a small area. Check this area by touch.
If a rubber dust bellow leaks, the corresponding joint or control arm must be replaced, because dirt or moisture entering will destroy the joint.

Running gear adjustment (wheel alignment values)

Check that the screw connections of the suspension adjustment system (wheel alignment values) at the front and rear are secure.

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Seat belts

Check function and condition

Functional inspection:

It must be possible to smoothly unroll the belt strap from the belt retractor via the deflector fitting by pulling evenly, and the tongue of the seat belt must engage audibly in the buckle. An abrupt pull on the belt strap must lock the belt retractor.

Condition inspection:

The belt strap must undergo a visual inspection for damage. If it displays evidence of damage in the form of cuts, fraying, seam tears etc., the seat belt must be replaced.

Changing the brake fluid (vacuum brake booster)

Important notes

Use only new DOT 4 brake fluid. **Observe the change interval and the brake fluid quality.** Total brake fluid change quantity **approx. 1 litre.**

The brake-fluid change interval is 2 years in conjunction with the Super DOT 4 brake fluid.

Procedure for changing brake fluid

– Fill up the brake fluid reservoir with new brake fluid up to its top edge. **Connect a bleeding device to the brake fluid reservoir.** Switch on the bleeding device. Bleeding pressure approximately 1.5 bar.

  Continue with the brake fluid change at the brake calipers (no particular tyre sequence). Open every bleeder valve until clear, bubble-free brake fluid emerges and until the corresponding change quantity per brake caliper is reached (approximately 250 cm^3). It must be noted that bleeding takes place at both bleeder valves on each caliper.

  Use a collecting bottle to accurately check the escaping brake fluid for cleanliness, lack of air bubbles and to determine the brake fluid used.

  Some brake fluid is also drained off at the bleeder valve of the clutch slave cylinder (approx. 50 cm^3).

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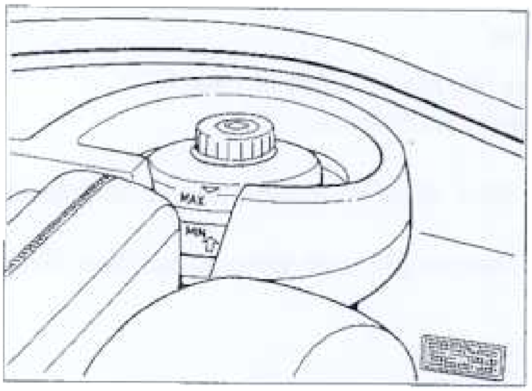
Switch off and disconnect the bleeding device. Correct the brake fluid level if necessary.



189-96

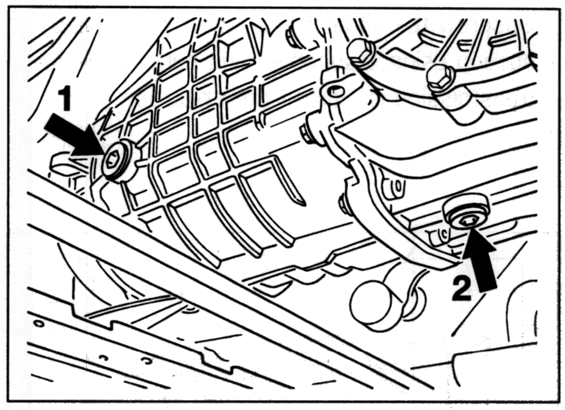
Changing transmission oil (manual transmission G96)

Filling capacity: 2.7

Note

Use only oils approved by Porsche.
See Parts Catalogue.

1. Unscrew the oil filler screw and drain plug and drain the oil with the vehicle horizontal.



97-088

1 – Filler screw
2 – Drain screw

2. Clean the drain plug and filler screw.

3. Fill with oil up to the bottom edge of the oil filler opening.

4. Tighten the drain plug and filler screw with **30 Nm (22 ftlb.)**.

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Changing transmission oil in the final drive (Tiptronic transmission A96)

Filling capacity: 0.9

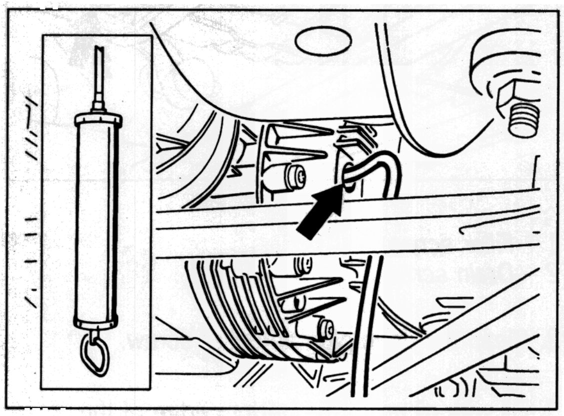
Note

Use only oils approved by Porsche.
See Parts Catalogue.

Note

There is no oil drain plug on the final drive.

1. Unscrew the oil filler plug and remove oil by suction using a suitable hand pump while the transmission is warm from operation.



97-307

2. Fill with **0.9** l transmission oil using special tool **V.A.G 1924**.

Note

Filling must be carried out **very** slowly because there is a baffle plate in the cover of the final drive.

3. Replace sealing ring for oil filler plug and tighten to **30 Nm (22 ftlb.)**.

Changing ATF and ATF filter

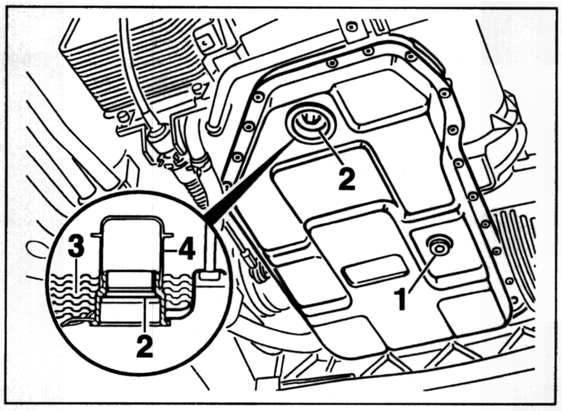
Filling capacity: approx. 9.5 l
Change quantity: approx. 4.0

Note

Use only ATF approved by Porsche.
See Parts Catalogue.

1. Place oil collection pan under the transmission.

2. Unscrew ATF drain screw (1) and drain ATF.



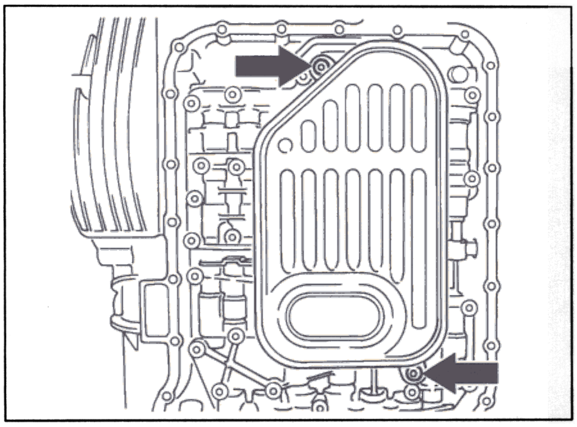
97-187

Note

Without ATF, the engine must not be started and the vehicle must not be towed.

3. Remove ATF pan (loosen screws crosswise).

4. Remove ATF filter.



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5. Thinly coat gasket on the suction collar of the ATF filter with Vaseline and install filter.

6. Tighten fastening screws for the ATF filter to **6 Nm (4.5 ftlb.)**.

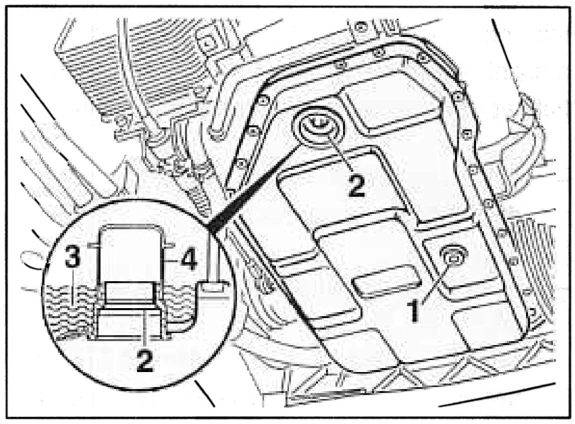
7. Clean ATF pan.

8. Clean all four magnets and place them in the seams of the ATF pan (they must lie flat over their entire surface).

9. Fit ATF pan with new seal. Tighten the screws crosswise in several stages.
   Tightening torque: **10 Nm (7.5 ftlb)**

10. Replace sealing ring for ATF drain plug and tighten plug to **40 Nm (29 ftlb.)**.

11. Unscrew ATF filler screw (2).



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12. Suspend filled ATF container (special tool V.A.G. 1924) as high as possible on the vehicle and fill in ATF until it overflows.

Note

The filler hook must be carefully inserted into one of the openings of the ATF guard cap (4) on the filler hole. When doing so, do not move the filler hook upwards, since the oil guard cap (4) can spring off upwards.

13. Move selector lever to position "P" and allow engine to idle.

14. With engine running, top up ATF again until excess ATF emerges from the bore of the ATF filler screw (2).

15. With the brake pedal pressed, change through all selector lever positions, remaining in each position for approx. 10 s.

16. Check ATF level. The following test conditions must be observed:

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Note

The stipulated fluid level (3) is extremely important to perfect functioning of the automatic transmission. It is correct if there is still a slight amount of ATF escaping at the filler screw (2) hole at temperatures between 30 °C and 40 °C.

The transmission must not be in the "reduced driving program".

The ATF temperature **must** be between 30 °C and 45 °C.
An ATC inspection at an insufficient ATF temperature causes over-filling and an inspection at an excessive ATF temperature causes insufficient filling

Selector lever in position "P" and engine idling.

The air-conditioning system and the heater must be switched off.

The vehicle must be standing horizontally.

17. Connect the Porsche System Tester 2 and call up the ATF temperature.

Note

The ATF temperature must not be higher than 40 °C at the start of the test.

18. Put on protective goggles and top up the ATF using the special tool V.A.G 1924 until surplus ATF runs out at the bore (2).

Note

If ATF escapes from the filler screw (2) hole and if the ATF temperature is 30 °C ... 40 °C, the ATF level is OK.

19. Screw in the ATF filler screw with a new sealing ring and tighten it with **80 Nm (59 ftlb.)**.

Note

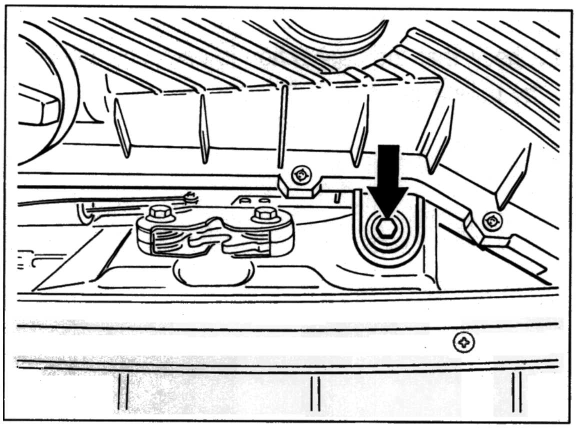
The filler screw must be closed no later than when an ATF temperature of 45 °C is reached.

Air cleaner

Replacing the filter element

1. Remove the complete air cleaner assembly.

a. Undo hexagon-head bolt M6 x 34.



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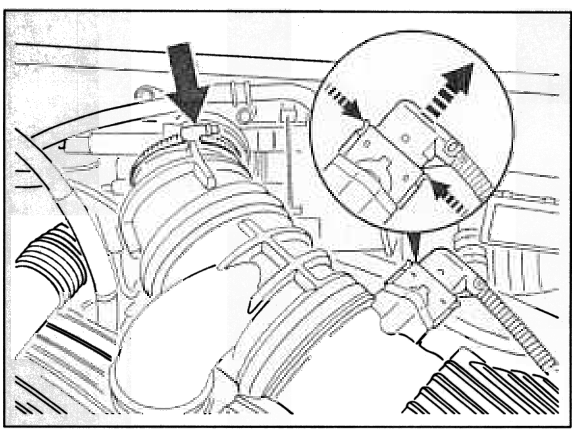
b. Undo the hose clamp on the throttle body. Remove connector from mass air flow meter. Unclip wire on air cleaner housing and remove air cleaner assembly.



249_97

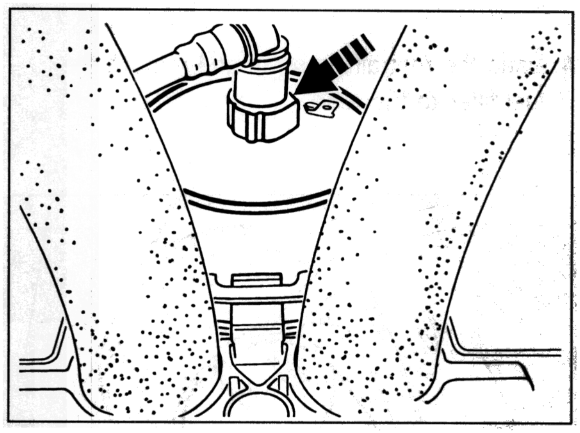
2. Undo captive fastening screws (7 ea.), remove top of air cleaner and take out air filter insert.

3. Clean top and bottom parts of air cleaner.

Replacing the fuel filter

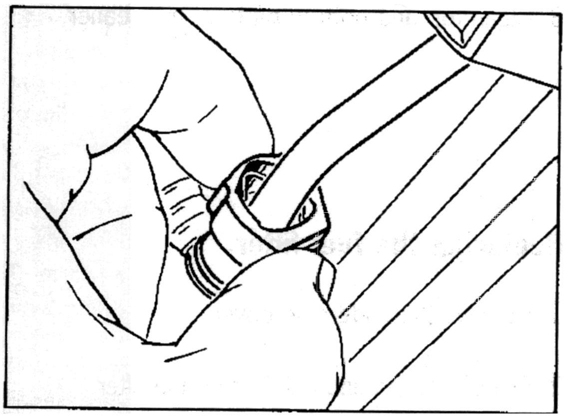
1. Remove the underside cover.

2. Pull off the ground cable from the filter.



350_97

3. Disconnect the plug connection and collect the residual fuel.



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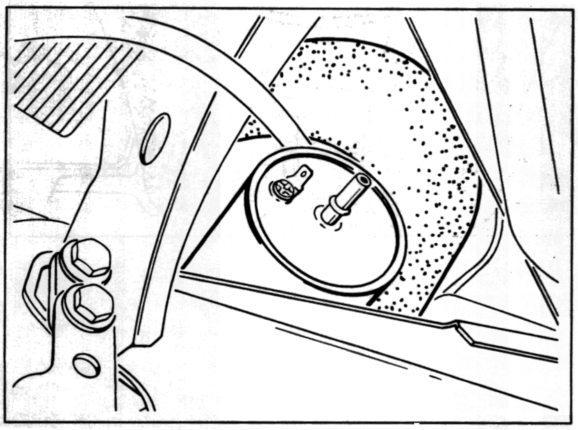
4. Undo the restraining strap and remove the fuel filter to the rear.



351_97

Note

a. Connect and disconnect the plug connection only in a straight line.

b. Never use excessive force.

c. Always take great care to protect the plug and socket piece from dirt and scratches.

d. Check that the connection is correctly locked by pulling gently.

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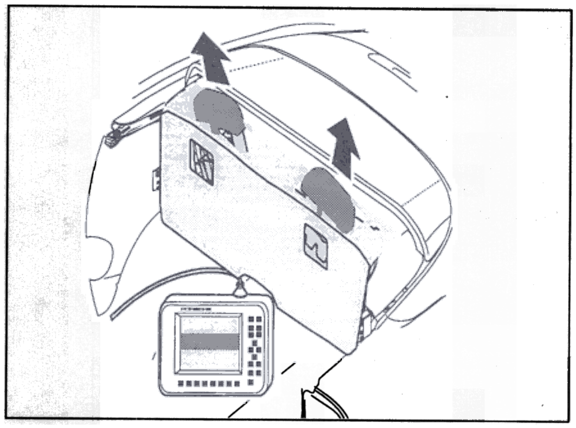
Checking roll-over protection system

Warning:
Danger of injury during work on the roll-over protection system

> The movement range of the roll-over protection system must be kept clear.
Work on the roll-over protection system must be performed only with the ignition key withdrawn.
Important: Do not begin assembly work until after a **waiting time of 1 minute** has elapsed.
Tools or other objects must not be placed in the extension area of the roll-over protection system.

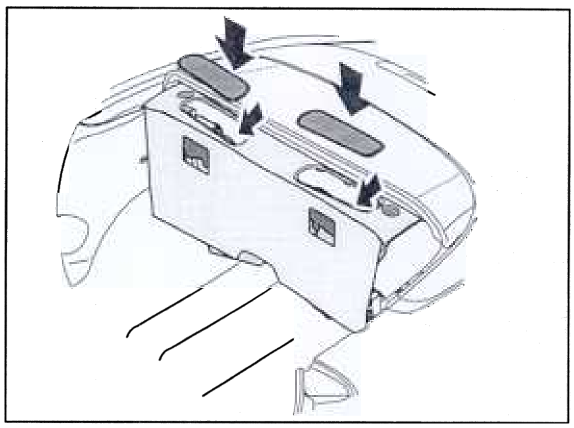
Perform the function test on the roll-over protection system only if:
the hardtop is removed
the convertible top is open
the caps are removed.

After assembly work on the roll-over protection system – but at least every **2 years** – the function of the roll-over protection system must be tested by triggering it via the diagnostic interface.



33_99

Connect the Porsche System Tester 2 to the diagnostic socket.
Switch ignition on.
Select menu item "Roll-over protection".
Select menu item "Drive links" in the command line which then appears. Press the key combination described in the Tester; the roll-over protection system is triggered.



32_99

Push the locking lever outward and hold. Slowly push down the protection bar until it can be felt to engage. Fit cover flaps on the left and right.

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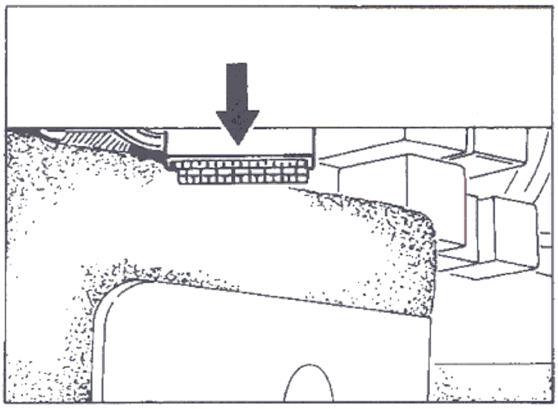
03 20 00 Maintenance – GT3

Diagnosis system – GT3

Reading out the fault memory

The method of reading out the fault memory is described in the operating instructions for the Porsche System Tester 2. The operating instructions are supplied with each Tester.

The Porsche System Tester 2 is connected to the vehicle via a 16-pole diagnosis socket. The diagnosis socket is located inside the vehicle below the instrument panel near to the driver (left-hand drive vehicles) or the passenger (right-hand drive vehicles).



12_96

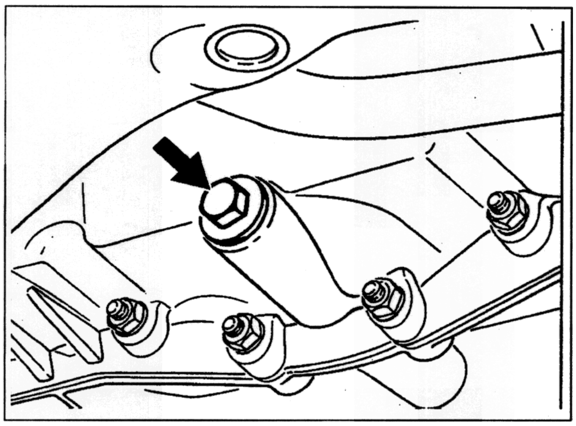
Changing the engine oil – GT3

Changing the engine oil (without oil filter)

Warning!
Danger of scalding from draining oil!

> wear protective equipment specified.

1. Undo the oil drain plug on the crankcase and drain off the engine oil.

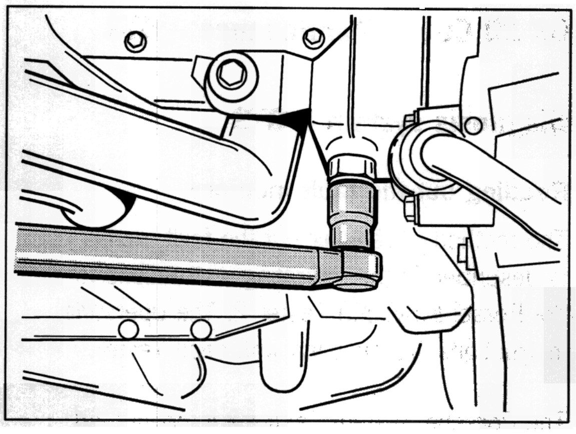


136_99

2. Undo the oil drain plug on the oil container and drain off the oil.

Warning!
Damage to the oil container

> It is absolutely necessary to counter with a wrench when undoing or tightening the oil drain plug in order to prevent damage to the oil container.



128_99

3. Clean the oil drain plugs. Always replace the sealing rings.
   Tightening torques:

   Drain plug on the crankcase: 60 Nm (44 ftlb.)
   Drain plug on the oil container: 60 Nm (44 ftlb.)

   Make sure to counter with a wrench when tightening the drain plug on the oil container.

3. Fill in engine oil.

   The oil change quantity (without oil filter change) is approx. 8.3 litres.

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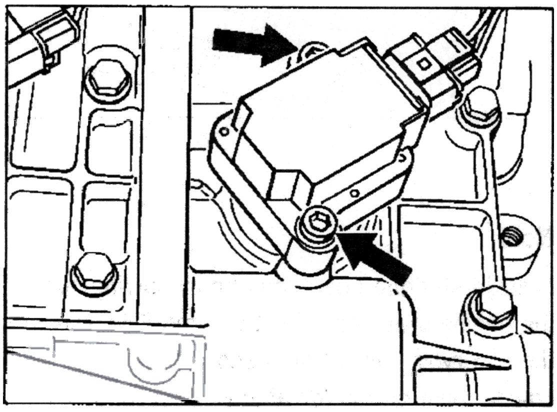
Replacing the spark plugs – GT3

1. Lift the vehicle.

2. Remove shield.

3. Undo the hexagon-head bolts on the plug coils.



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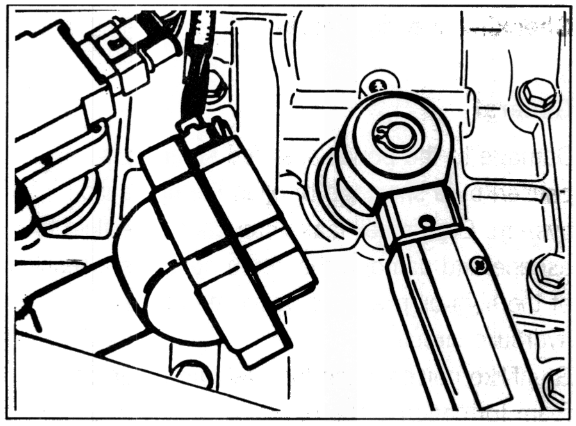
4. Pull off the plug coils and detach them to the side with connected cable.

5. Unscrew or tighten the spark plugs with the commercially available tool, Chapter 2.4 Order No. S9706, and extension, Order No. FXW 4.



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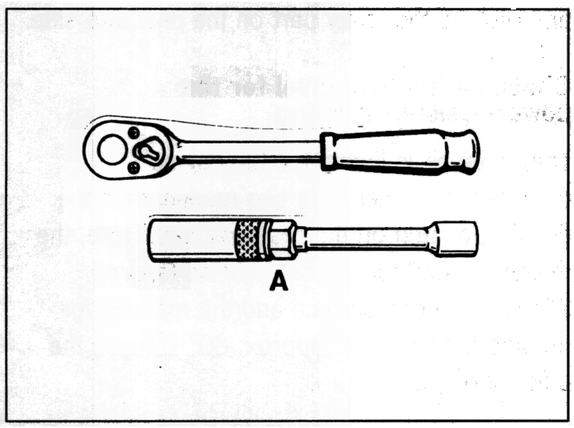

A – Commercially available tool, S9706 637_96

Note

Only this spark plug wrench was tested and approved.

Tightening torque	30 Nm (22 ftlb.)
Re-fitting	25 Nm (19 ftlb.)

Vehicle underside and engine compartment – GT3

Visual inspection for leaks (oils and fluids) and abrasion (lines and hoses)

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Power steering – GT3

Checking the fluid level

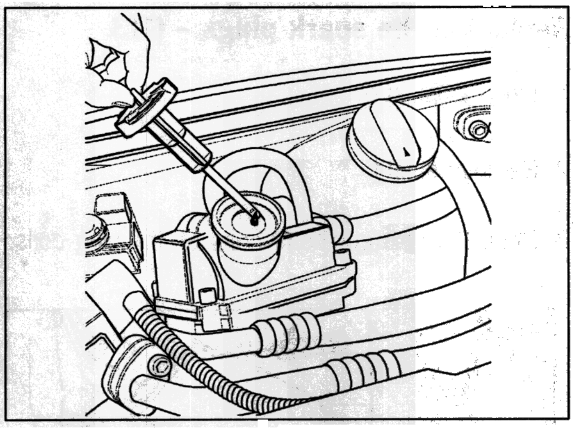
General

Damage to the power-assisted steering is caused by a shortage of oil in the hydraulic system. Even small leaks can cause the fluid to escape and damage the servo pump as a result of the high oil pressure occurring in the hydraulic circuit.
Grunt-like noises when the steering is turned or foam formation in the reservoir indicates a shortage of oil and/or that air has also been sucked in. However, before topping up the reservoir, remedy any leaks on the suction side and replace the faulty part on the pressure side.

Checking the fluid level for the power-assisted steering

The reservoir is located in the engine compartment. There are two markings on the dipstick located on the reservoir cap. Here, the marking "Cold" for the cold engine (approx. 20° C) is on one surface and the marking for the hot engine "Hot" (approx. 80° C) is on the other surface.

Check the fluid level (Pentosin CHF 11 S) **when the engine is not running and when it is cold** (approx. 20° C).*



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Note

Multiple steering operations (manoeuvring) with the engine switched off change the fluid level in the reservoir – fluid level rises. In this case, the engine must be run for at least 5 seconds immediately prior to the fluid level check.*

1. Open the engine lid. Open the cap of the supply tank.*

2. Wipe off the dipstick.
   Close and then reopen the cap. The fluid level should be in the shaded area **below** the "Cold" marking (marking = max. level at 20° C).
   Top up with Pentosin if necessary.*
   The upper "Hot" mark is intended for a fluid temperature of 80° C.

* **When filling in and topping up with Pentosin, make sure that Pentosin does not come into contact with the coolant hoses. In order to avoid overfilling and the resulting overflowing, observe the specifications on this page. If coolant hoses come into contact with Pentosin, thoroughly clean them with water IMMEDIATELY!**
Replace visibly swollen coolant hoses!

Coolant hoses – GT3

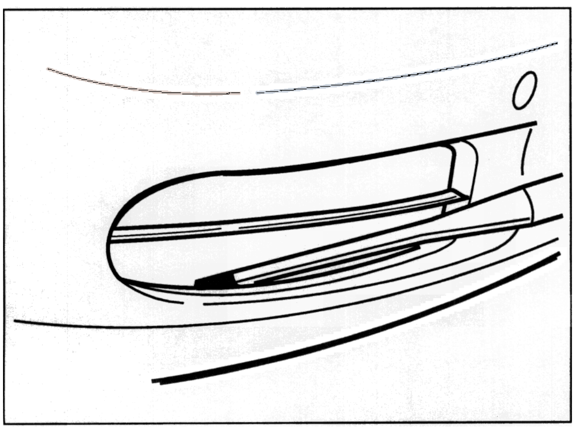
Check their condition

Radiators GT3

Visual inspection for external contamination

Note

If necessary, the cooling air inlet channels upstream of the radiators can be cleaned with a vacuum cleaner nozzle (commercially available tool, Chapter 2.4 Order no. 160). It is absolutely necessary to ensure that the radiators are not blocked. Soiled radiators hinder optimum cooler action and can lead to thermal problems especially in very warm regions. If the radiators are soiled, they must be cleaned.



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Coolant – GT3

Check level in the coolant expansion tank and antifreeze protection

Note

The engine cooling system was filled with a lifetime coolant filling at the factory. This coolant must not be mixed with or replaced by other coolants. Only **Original Porsche coolant** must be used when changing or topping up the coolant. The antifreeze protection is filled to a value of: **- 35° C** at the factory. If the measured values shows that too little antifreeze is available, this must be corrected accordingly.

If coolant which is not approved by Porsche was used for topping up, the cooling system **must** be rinsed.

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Particle filter – GT3

Replace filter element
(with and without carbon)

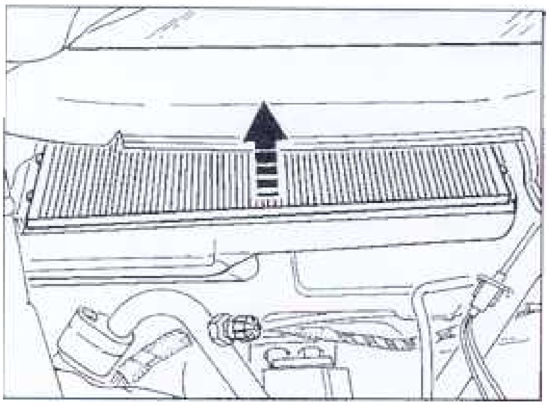
Note

The particle filter is installed on the right in front of the heating/air-conditioning system.

Removal

1. Remove the cover for the heating and air-conditioning system.

2. Remove the particle filter upwards out of the housing guide.



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Installation

1. Insert a new particle filter into the housing guide. Check that the filter is correctly fitted and in the correct installation position.

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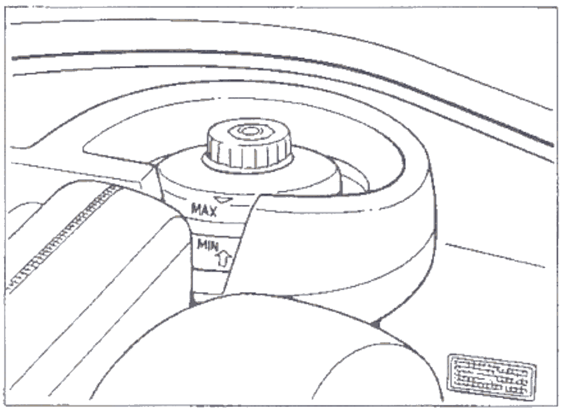
Brake hoses and lines – GT3

Visual inspection for damage and routing (corrosion)

Checking the brake fluid level – GT3

Adjust the brake fluid level if necessary (markings are on the brake fluid reservoir). Never top up above the max. marking. Use only Super DOT 4 brake fluid.



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Drive shafts – GT3

Perform a visual inspection of the boots for leaks and damage

Tyres – GT3

Check the condition and the tyre pressure

Tyre condition

Tyres are a safety element which fulfil the demands placed on them only if they have the correct air pressure and a sufficient tread depth.

The stated air pressures are minimum values and must never be fallen below, since in addition to the unfavourable driving performance, this would bring about a risk of serious tyre damage.

Valve caps protect the valve from dust and dirt and therefore from leaks. Always screw on the caps tightly and replace missing valve caps.

For safety reasons, in addition to checking the air pressure you should perform a visual inspection for sufficient tread depth, foreign bodies, pricks, cuts, cracks and bulges in the sidewall (ply breakage).

Tyre pressure of cold tyres (approx. 20° C)

18-inch wheels

(summer and winter tyres)

front	2.2 bar (32 psi) overpressure
rear	2.7 bar (37 psi) overpressure

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Oiling the door hinges GT3

Check the door locks, lid locks and safety hooks of the front lid to ensure that they are secure and functioning properly

Secure fit inspection

The fastening screws for the door lock, front lid lock and rear lid lock, as well as the retaining nuts for the upper parts of the locks of the front and rear lids must be tightened with 10 Nm (7.5 ftlb.).

Functional inspection

Door lock

The door lock must engage in two stages through the locking wedge when the doors are closed and must disengage again when the door handle is operated (inside and outside).

Lid lock, front and rear

The lid locks must engage by insertion of the lock upper parts when the lids (front and rear) are closed and must disengage again when the lid releases are pulled.

Safety hook, front lid

The front lid must be held down by the safety hook after the lid lock is opened. At the same time, the safety hook must engage in the retaining plate at its lowest point.
When the lid is open, the return spring must pull back the safety hook until it makes contact with the base plate of the lock upper part.

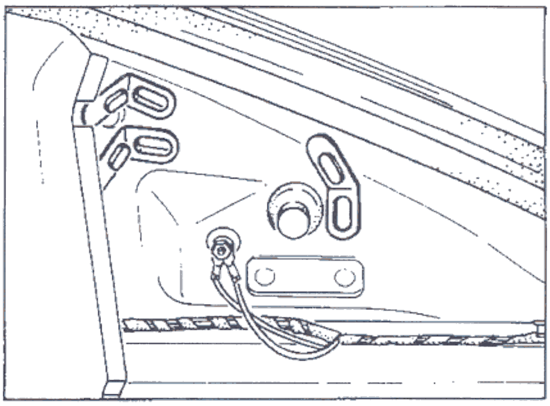
Checking the function of the vehicle's lights – GT3

Adjusting the main headlights

1. Open the luggage compartment lid.

2. Remove the luggage compartment mat on the wheel housing wall.

3. Open the cover for the headlight adjustment screws.



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4. Clean the cover disk and switch on the dipped beam headlights.

5. The vehicle must be on a horizontal surface. Make the adjustment with the vehicle ready for driving (fuel tank full, driver's seat occupied by a person or 75 kg, the tyre pressure must correspond to the stipulated values) using a headlight adjustment unit.

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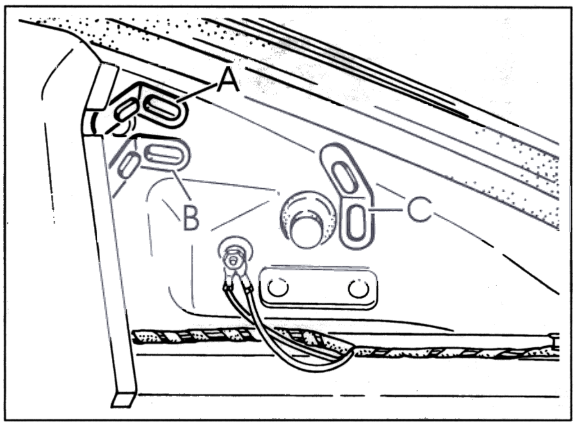
Note

Make the adjustment with the regulator switch set to 0. (Headlight beam adjustment).



A – Lateral adjustment 8_1_96
B – Height and side adjustment
C – Fog light adjustment

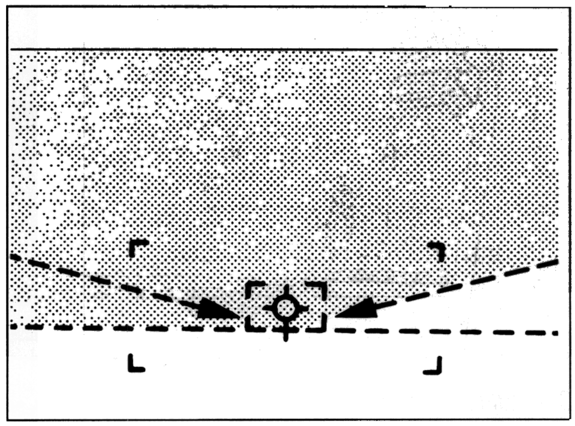
Use a standard 5 mm ball-head screwdriver to make the headlight adjustment. Only the lower screw may be turned for height adjustment; for lateral adjustment the upper and lower screws must be turned in the same direction and for the same number of rotations.

Adjustment

Note

Set the headlight adjustment unit to 10 cm/10 m (1%).

1. First, make the vertical adjustment of the dipped beam headlights. To do this, line up the light/dark borderline running upwards at an angle on the right hand side with the dotted 15° line of the adjustment unit.
2. Next, perform the horizontal adjustment of the dipped beam headlights. To do this, line up the left, horizontal part of the light/dark limit (in the case of driving on the right) with the dotted horizontal line of the adjustment unit.
   With this alignment, preference must be given to the central zone around the salient point of the light/dark limit.



290_96

Note

The distance between the headlights and the adjustment unit should be as small as possible. It should not exceed 30 cm, because if the distance is greater, it is no longer possible to clearly define the formation of the light/dark limit in the adjustment unit.
Secure the plugs after making the adjustment.
For **Litronic headlights** the ignition must be switched off and on after adjustment with the lights switched on. After this, the adjustment must be checked again.

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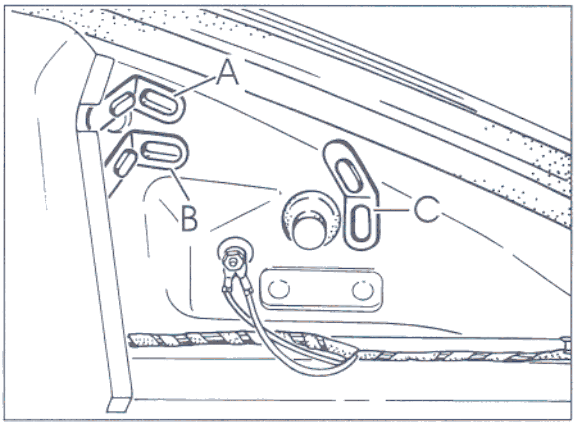
Adjusting the fog lights

The vehicle must be on a horizontal surface. Make the adjustment with the vehicle ready for driving (fuel tank full, driver's seat occupied by a person or 75 kg, the tyre pressure must correspond to the stipulated values) using a headlight adjustment unit.

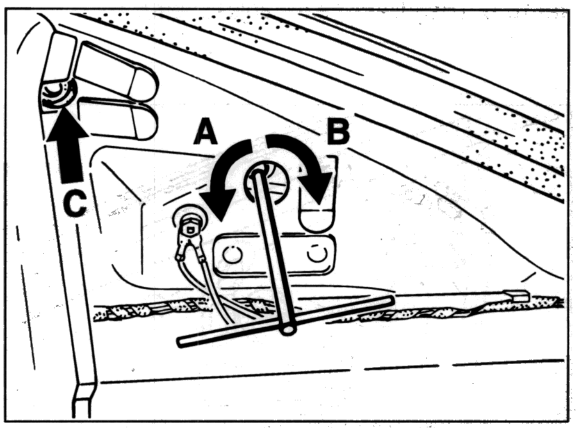


C – Adjusting the fog lights 8_1_96

Note

Switched-on headlights must not be covered by a front apron or film.

Removing and installing the main headlights



A – Open
B – Close
C – Slider adjustment (USA) 11_96

Secure the plugs after installation.

Windscreen washer system, headlight washer system – GT3

Check the function, fluid levels and nozzle settings

Note

The headlight washer nozzles are preset.
It is not necessary to adjust them.

Use only soapy water to clean the exterior lights and the plastic headlight lenses. Never use chemical cleaning agents. To avoid scratches, do not rub with dry or only damp cloths, paper towels or insect-removal sponges.

Checking the function of all other electrical equipment, as well as the indicator and warning lights – GT3

Test drive

Check the function of the foot and hand brakes, clutch, automatic speed control, steering, heating, air-conditioning system and instruments.

Oils and fluids – GT3

Visual inspection for leaks

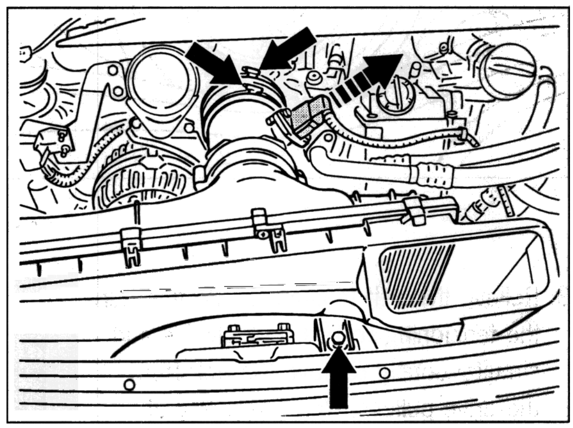
Check all hydraulic system and cooling circuits for leaks. Check the fluid levels and correct if necessary.

Drive belt – GT3

Check condition and replace if necessary

Removal

1. Remove the complete air cleaner assembly. Undo hexagon-head bolt M6 x 34. Undo the hose clamp on the throttle body. Pull off plug from hot film mass air flow sensor and remove air cleaner assembly.



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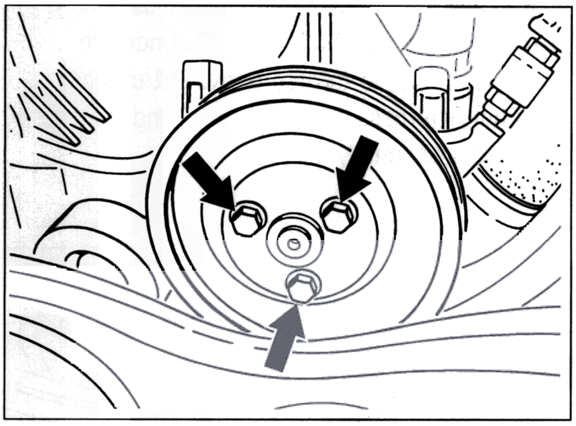
2. Mark belt travel direction with a coloured pen. Undo the three hexagon-head bolts on the pulley of the servo pump by approx. one half turn.



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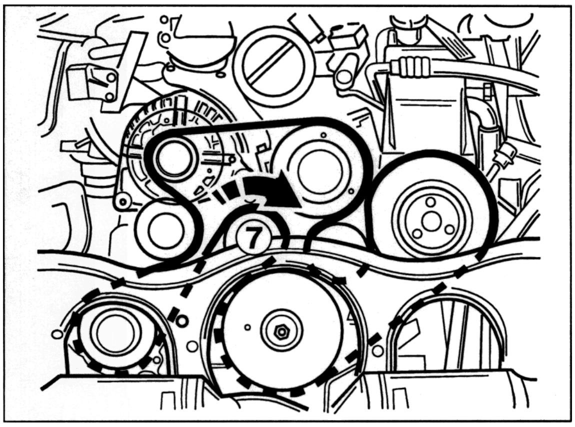
3. Relieve the belt tension. To do this, turn the tensioning roller (7) clockwise and simultaneously remove the belt from the drive pulleys. Remove pulley of the servo pump and take out drive belt.



165_99

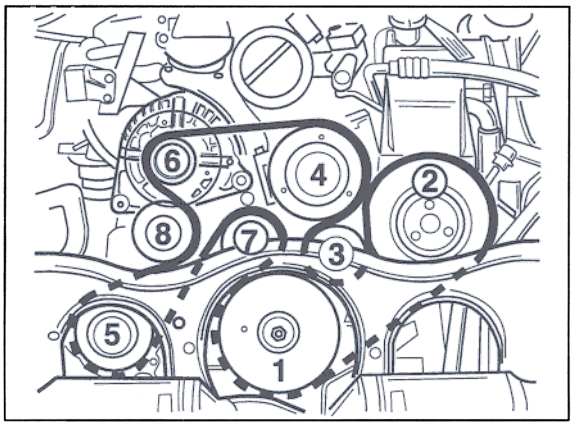
4. Visually inspect the condition of the belt and replace it if necessary.

Installation

1. Fit the pulley of the servo pump with the drive belt and tighten the three hexagon-head bolts. Tighten the drive belt in the following order:

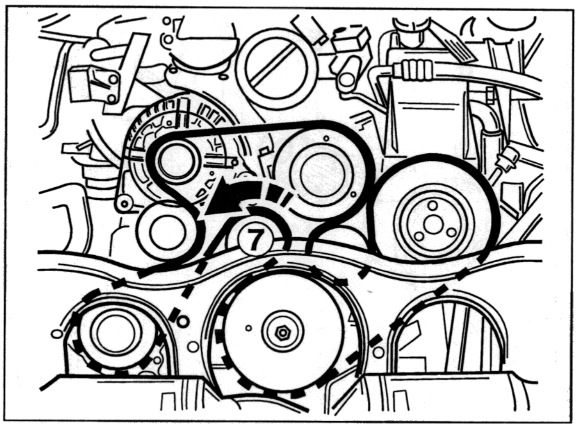
   1. Crankshaft pulley (1)
   2. Power steering pump drive pulley (2)
   3. Deflection roller 1 (3)
   4. Air-conditioning compressor drive pulley (4)
   5. Coolant pump drive pulley (5)
   6. Alternator drive pulley (6)
   7. Tensioning roller (7)
   8. Deflection roller (8)

Then turn the tensioning roller (7) in clockwise direction and simultaneously fit the drive belt on the deflection roller 2 (8).



120_99

5. Slowly relieve the tensioning roller. To do this, turn the tensioning roller slowly anti-clockwise.



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6. Visually check whether the belt is correctly positioned on all drive pulleys.

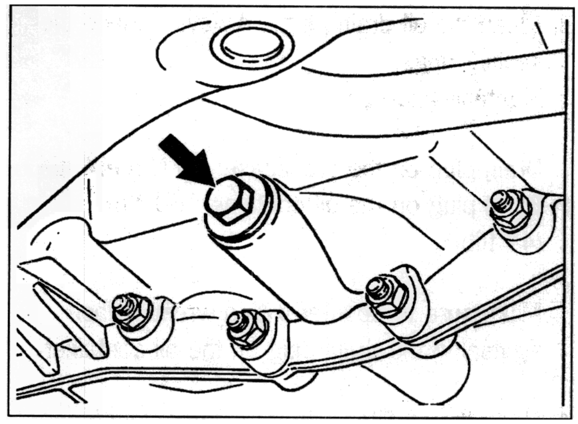
7. Tighten the three hexagon-head bolts on the pulley of the servo pump to 23 Nm (17 ftlb.).

Change engine oil and oil filter – GT3

Warning!
Danger of scalding from draining oil!

> wear protective equipment specified.

1. Undo the oil drain plug on the crankcase and drain off the engine oil.



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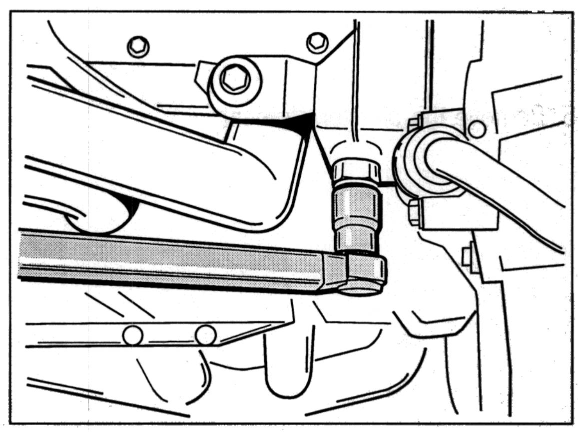
2. Undo the oil drain plug on the oil container and drain off the oil.

Caution!
Damage to the oil container

> It is absolutely necessary to counter with a wrench when undoing or tightening the oil drain plug in order to prevent damage to the oil container.



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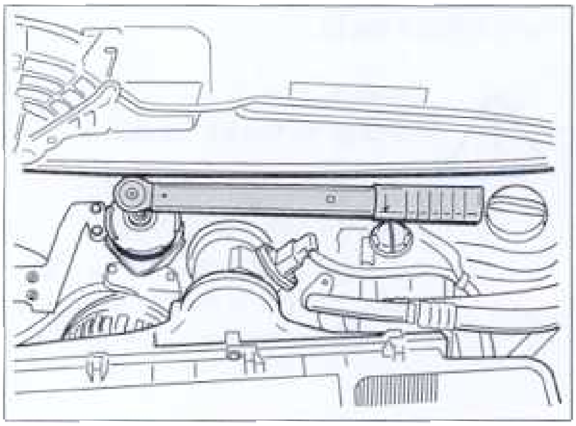
3. Clean the oil drain plugs. Always replace the sealing rings.
   Tightening torques:

   Drain plug on the crankcase: 60 Nm (44 ftlb.)
   Drain plug on the oil container: 60 Nm (44 ftlb.)

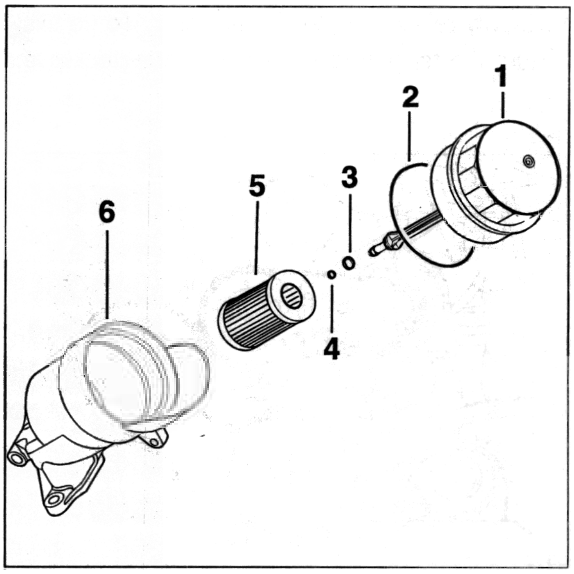
   Make sure to counter with a wrench when tightening the drain plug on the oil container.

4. Undo the oil filter with the oil filter key (special tool 9204).



123_99

5. Remove the oil filter element.



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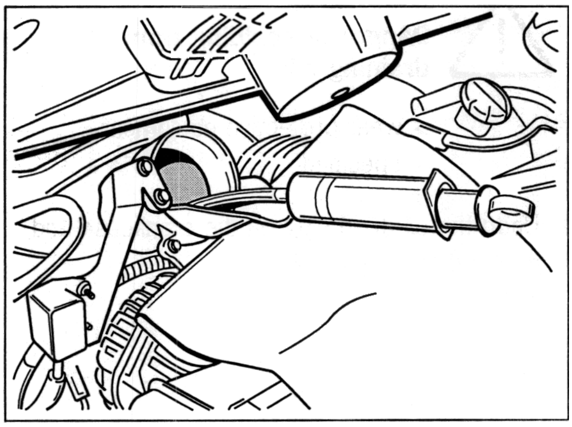
1 – Oil filter cover
2 – O-Ring 71.5 x 3.5
3 – O-Ring 10 x 2
4 – O-Ring 6 x 2
5 – Filter insert
6 – Oil filter housing

6. Remove the remaining quantity of oil from the oil filter housing by suction.



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7. Insert the new oil filter and tighten oil filter cover to 25 Nm (17 ftlb.).

8. Fill in engine oil.

The oil change quantity (with oil filter change) is approx. 8.5 litres.

Tightening torques:

Oil drain plug on	
the crankcase	60 Nm (44 ftlb.)
the oil container	60 Nm (44 ftlb.)

Make sure to counter with a wrench when tightening the drain plug on the oil container. Insert oil drain plug with a 3 mm thick sealing ring.

Handbrake – GT3

Check the free play of the handbrake lever

The handbrake has asbestos-free brake linings. The handbrake with asbestos-free brake linings must **never be adjusted** in such a way that the lining must "grind down" during operation.

The handbrake must be adjusted if the hand-brake lever can be pulled up by more than 4 teeth with medium force application without a braking effect being apparent.

Adjusting the handbrake:

1. Remove the rear wheels.

2. Undo the handbrake lever and push back the disc brake pads of the rear axle until the brake disc can rotate freely.

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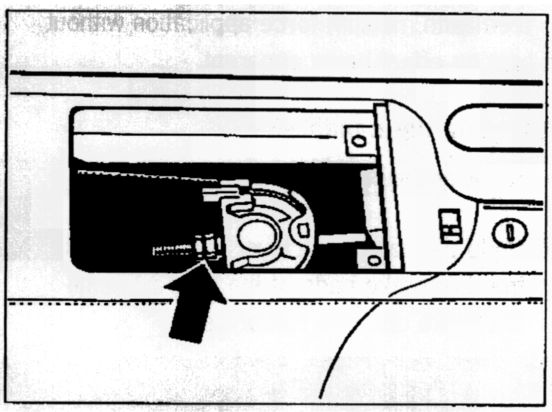
3. Undo the adjustment nuts on the turnbuckle (arrow) until the cables are without pretension.

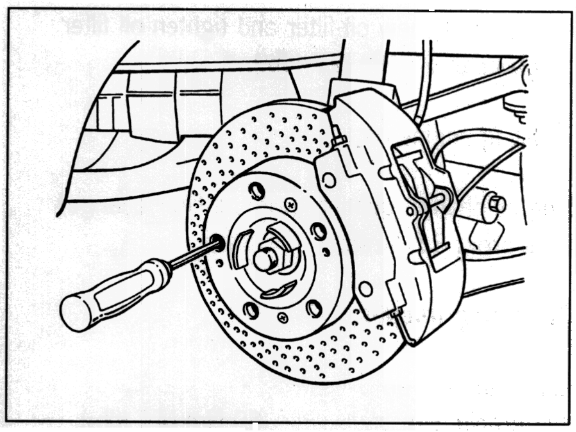
Note

To make the turnbuckle accessible, open the cover of the tray behind the handbrake lever and remove the rubber inlay and also the insert.



18_96

4. With a screwdriver, adjust the adjustment fixture through a threaded wheel bolt hole until the wheel can no longer be turned. Next, turn back the adjustment fixture through 5 notches again (release approx. 3 notches until the wheel can be turned freely, then release another 2 notches).



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5. Pull up the handbrake lever by 2 teeth and turn the adjustment nut of the turnbuckle until both wheels can be turned manually with difficulty.

6. Release the handbrake lever and check whether both wheels can be turned freely.

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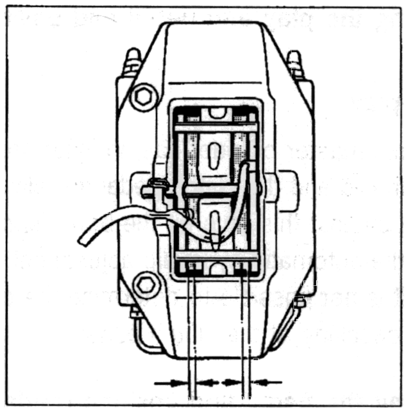
Brake system – GT3

Visual inspection of the brake pads and brake discs for wear



22_96

Note

The brake pads must be replaced when the brake pad warning indicator lights up, but no later than when there is a residual pad thickness of 2 mm (per axle). If brake pad wear is indicated by the warning light, the warning contact (sender including wire and plug connection) must also be replaced. Replacing the warning contact or warning contacts can be avoided by replacing the brake pads no later than when the pad thickness is still 2.5 mm. Warning contacts must be replaced if the core of the wire is worn. However, if only the plastic part of the warning contact is worn, there is no need to replace it.

1. To check the brake pads, remove the wheels

2. Visually inspect the brake pads for wear.

The wear limit is reached when the pad has a residual thickness of 2 mm.

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Clutch – GT3

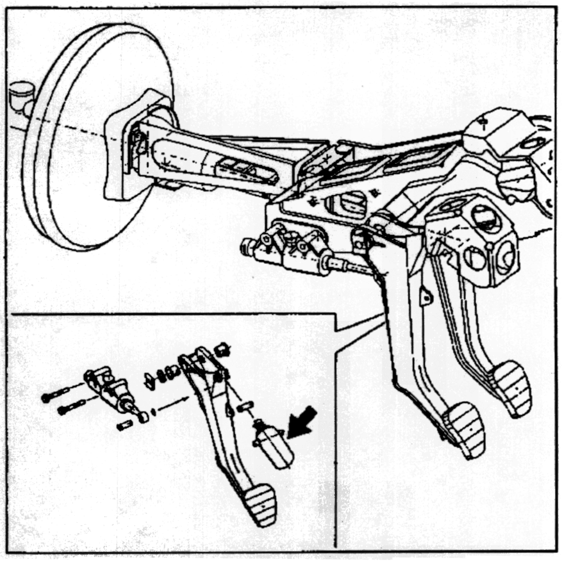
Checking the play and pedal end position

Clutch play

The clutch master cylinder has an inner stop. The push rod and the clutch pedal are always pressed against this stop by the boost spring. Due to the automatic hydraulic adjustment of the clutch, it is not possible to determine the clutch play by checking at the clutch pedal.

Checking the pedal end position (pedal return/return force)

Check that the pedal is in end position by pulling at the pedal (without the use of force) towards the driver's seat.
The pedal must not give way during the process. If it gives way, the fault is in the boost spring (arrow) or in the pedals (observe the following instructions).



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Note

The clutch push rod and the boost spring are not adjustable. The boost spring has 2 functions, namely to provide pedal force assistance and to return the pedal.
The following are some of the points which are requirements for perfect clutch operation:

Correct bleeding of the clutch hydraulics

No leaks in the hydraulic system

Pedal return to the starting position

Installation position of the pedals in accordance with the series condition.

Throttle operation – GT3

Check for smooth operation.

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Steering gear – GT3

Visually inspect the bellows for damage

Track rod joints GT3

Check the play and dust bellows

Check the function of the dust bellows, bellows and joints and ensure that they are free of leaks.

The rubber dust bellows and bellows on the steering gear and on the tie rods can be damaged by external influences, e.g. stone impact, or during assembly work. If a rubber dust bellows leaks, the joint or the tie rod must be replaced, because dirt or moisture entering will destroy the joint.

Perform a visual inspection after cleaning. When doing so, the rubber dust bellows should be pressed down with the fingers in order to reveal hidden cracks.

The procedure for the front axle is as follows: Turn the front wheels as far as they will go. Perform a visual inspection of the visible surfaces on the left and on the right.

After turning the front wheels to the other steering stop, check the other half of each rubber dust bellows.

Note

In the vicinity of the brake cover panels, no visual inspection is possible in a small area. Check this area by touch.
If a rubber dust bellow leaks, the corresponding joint or control arm must be replaced, because dirt or moisture entering will destroy the joint.

Axle joints – GT3

Check the play and visually inspect the dust bellows for damage.

Inspect the dust bellows of the axle joints (ball joints) on the suspension (front and rear) as follows:

Put the vehicle onto a lifting platform with the steering lock disengaged.

Running gear adjustment (wheel alignment values) – GT3

Check that the screw connections of the suspension adjustment system (wheel alignment values) at the front and rear are secure.

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Seat belts – GT3

Check function and condition

Functional inspection:

It must be possible to smoothly unroll the belt strap from the belt retractor via the deflector fitting by pulling evenly, and the tongue of the seat belt must engage audibly in the buckle. An abrupt pull on the belt strap must lock the belt retractor.

Condition inspection:

The belt strap must undergo a visual inspection for damage. If it displays evidence of damage in the form of cuts, fraying, seam tears etc., the seat belt must be replaced.

Changing the brake fluid – GT3 (vacuum brake booster)

Important notes

Use only new DOT 4 brake fluid. **Observe the change interval and the brake fluid quality.** Total brake fluid change quantity **approx. 1 litre**.

The brake-fluid change interval is 2 years in conjunction with the Super DOT 4 brake fluid.

Procedure for changing brake fluid

– Fill up the brake fluid reservoir with new brake fluid up to its top edge. **Connect a bleeding device to the brake fluid reservoir.** Switch on the bleeding device. Bleeding pressure approximately 1.5 bar.

  Continue with the brake fluid change at the brake calipers (no particular tyre sequence).
  Open every bleeder valve until clear, bubble-free brake fluid emerges and until the corresponding change quantity per brake caliper is reached (approximately 250 cm^3).
  It must be noted that bleeding takes place at both bleeder valves on each caliper.

  Use a collecting bottle to accurately check the escaping brake fluid for cleanliness, lack of air bubbles and to determine the brake fluid used.

  Some brake fluid is also drained off at the bleeder valve of the clutch slave cylinder (approx. 50 cm^3).

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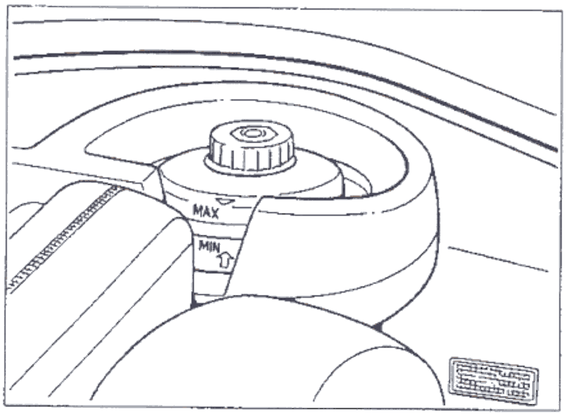
Switch off and disconnect the bleeding device. Correct the brake fluid level if necessary.



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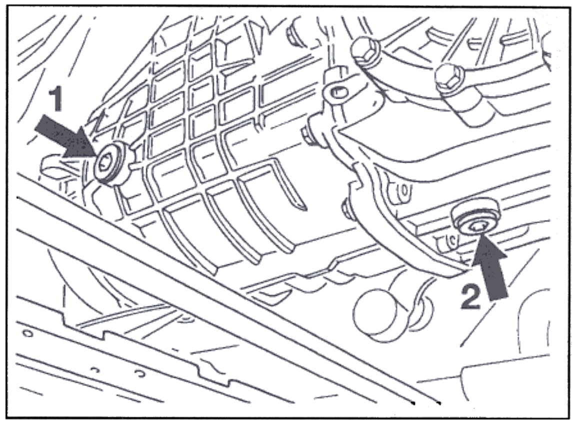
Changing transmission oil – GT3 (manual transmission G96/90)

Filling capacity: 3.8

Note

Use only oils approved by Porsche.
See Parts Catalogue!

1. Unscrew the oil filler screw and drain plug and drain the oil with the vehicle horizontal.



1 – Filler screw
2 – Drain plug

088_97

2. Clean the drain plug and filler screw.

3. Fill with oil up to the bottom edge of the oil filler opening.

4. Tighten the drain plug and filler screw with **30 Nm (22 ftlb.)**.

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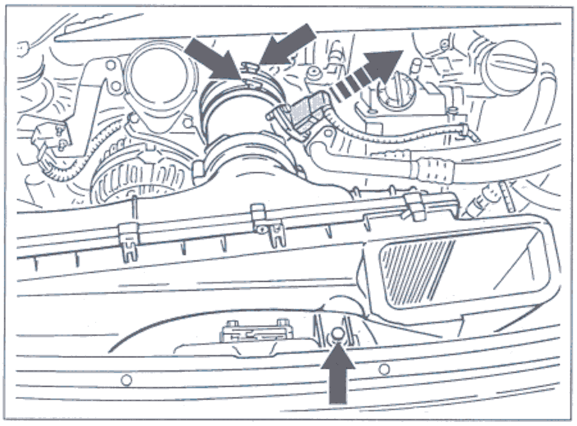
Air filter – GT3

Replacing the filter element

1. Remove the complete air cleaner assembly.

   Undo hexagon-head bolt M6 x 34. Undo the hose clamp on the throttle body. Pull off plug from hot film mass air flow sensor and completely remove air cleaner assembly.



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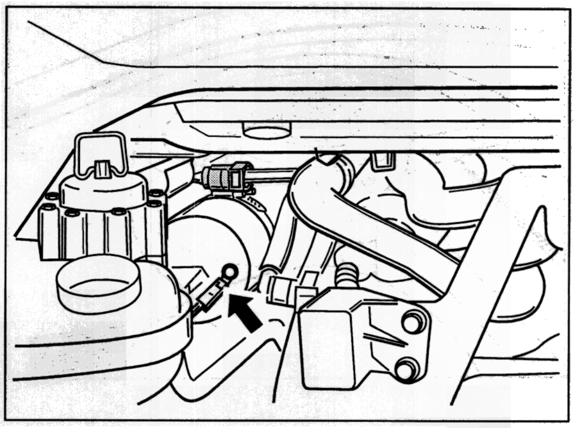
2. Undo captive fastening screws (9 ea.), remove air cleaner cover and take out air filter insert.
3. Clean air cleaner housing and air cleaner cover.
4. Insert new air filter insert.
5. Tighten captive fastening screws.
6. Push the cleaner housing into the throttle body. Tighten the hose clamp. Attach connector onto mass air flow meter. Tighten hexagon-head bolt M6 x 34.

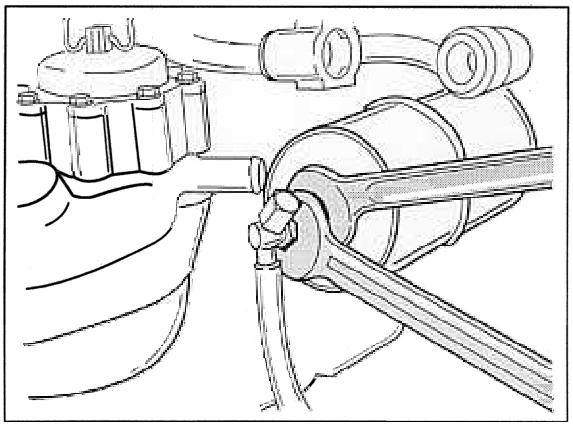
Replace fuel filter – GT3

1. Pull off the ground cable from the filter.



125_99

2. Undo fuel pressure line. Make sure to counter with a wrench when doing this. Collect emerging fuel.



127_99

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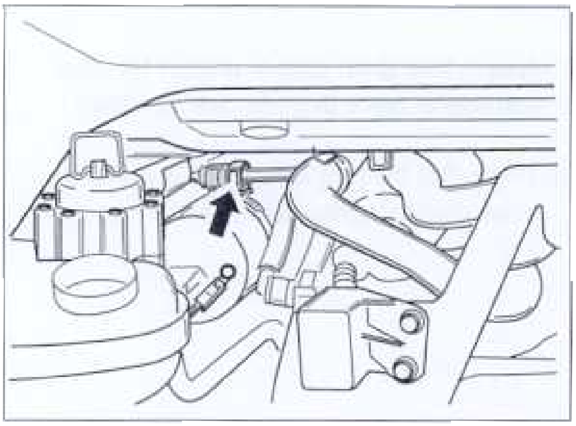
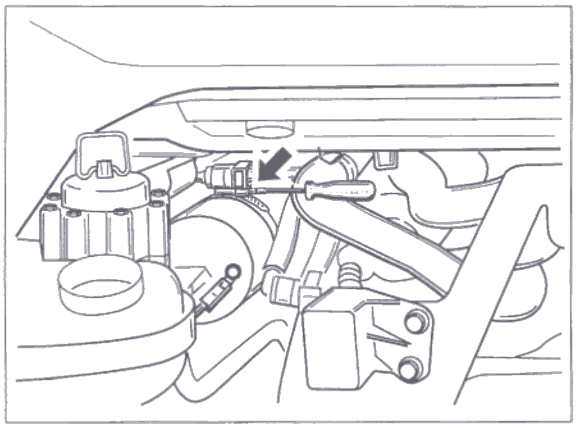
3. Disconnect the plug connection and collect the residual fuel. Protect open lines against dirt.



124_99

4. Open restraining strap fully and remove fuel filter in the direction of the coolant expansion tank.



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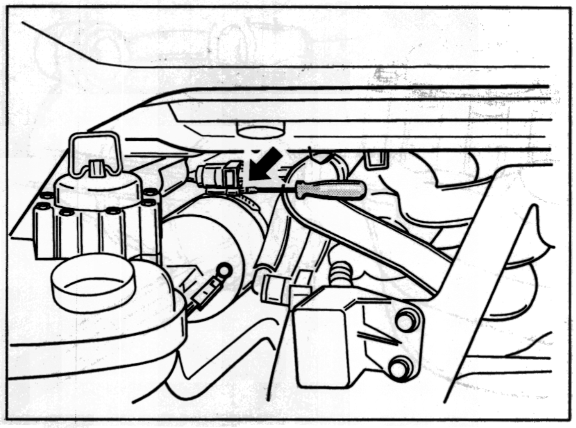
5. Place new fuel filter on the restraining strap and tighten.



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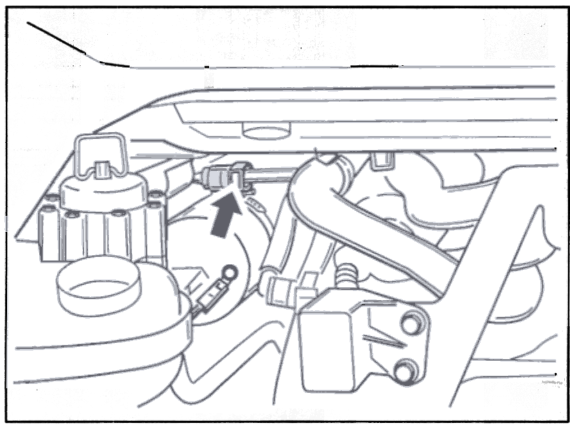
6. Connect the plug connection.



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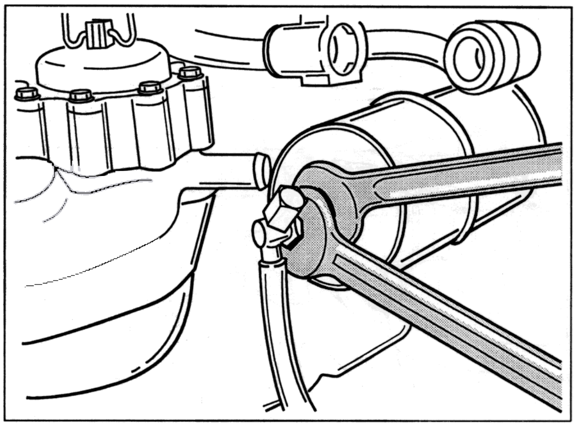
7. Tighten fuel pressure line. Make sure to counter with a wrench when doing this.



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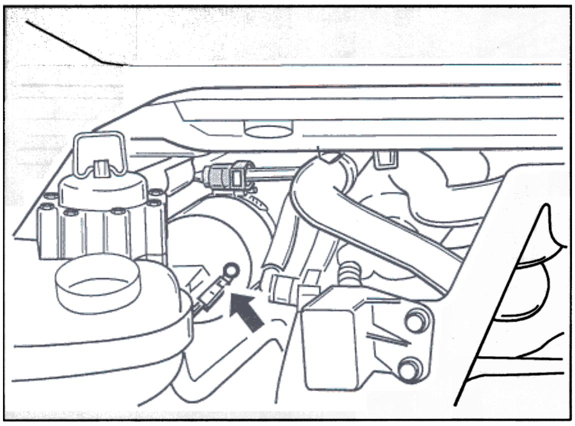
8. Connect the ground cable to the filter.



125_99

Note

a. Connect and disconnect the plug connection only in a straight line.

b. Never use excessive force.

c. Always take great care to protect the plug and socket piece from dirt and scratches.

d. Check that the plug connection is correctly connected by pulling gently.

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Checking operational readiness of airbag system

Function test of airbag warning light. Switch on ignition to carry out this test. The airbag warning light must light up for approx 3 seconds. If the warning light does not light up, check the bulb and power supply.

2. Function test of airbag system.

   - Connect and switch on the Porsche System Tester 2
   - Switch ignition on
   - Establish communication with the AIRBAG/POSIP control module
   - Read out fault memory: no fault present
   - Remove E1 fuse
   - Fault present after approx. 30 seconds: “Airbag warning light”
   - Insert E1 fuse again
   - Fault no longer present after approx. 30 seconds
   - Clear the fault memory

3. Check that no linings, stickers or similar are attached to the steering wheel and in the vicinity of the passenger's airbag or side airbag.

4. Visual inspection of the components for damage and changes.

5. The system check must be acknowledged in the stamp spaces provided in the Guarantee and Maintenance booklet

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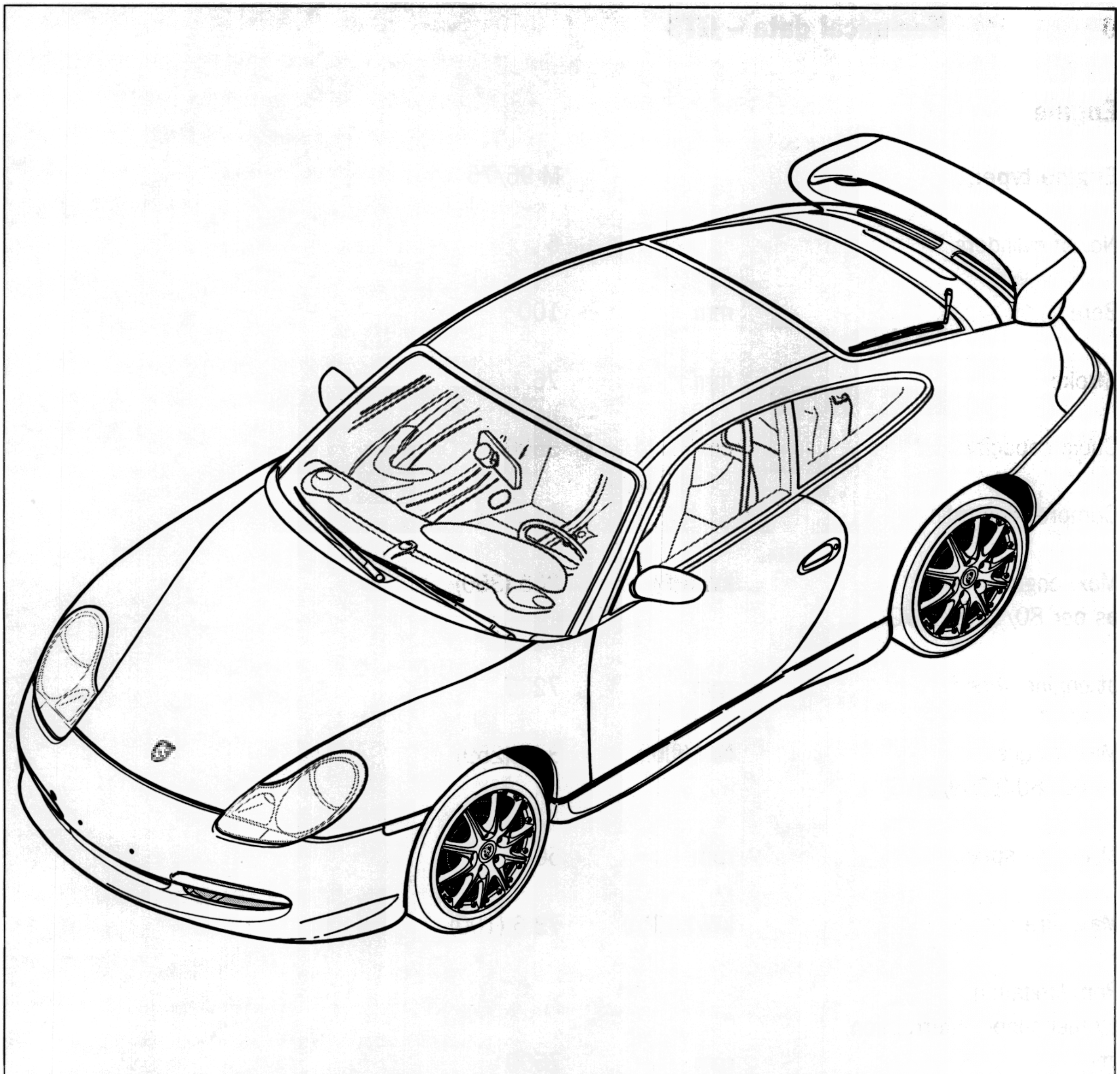

0 Technical data – GT3

Engine

Engine type:		M 96/76
No. of cylinders		6
Bore	mm	100
Stroke	mm	76.4
Cubic capacity	cm^3	3600
Compression ratio		11.7 : 1
Max. engine power as per 80/1269/EWG	kW (HP)	265 (360)
at engine speed	rpm	7200
Max. torque as per 80/1269/EWG	Nm (ftlb.	370 (259)
at engine speed	rpm	5000
Max. litre output	kW/l (HP/l)	73.6 (100)
Rpm limitation by fuel supply interruption at	rpm	7600
Idle speed	rpm	900 40
Engine weight as per DIN 70020 A kg (lbs)		Manual trans. 274.0* (595.2)

including ZMS (dual-mass flywheel)

Engine design

Type	6-cylinder aluminium opposed-cylinder engine, water cooled
Radiators	3 in the front end
Crankcase	Vertically split light alloy cylinder housing with separate crankshaft bearing housing
Crankshaft	Forged, supported by 8 bearings/glow nitride
Crankshaft bearings	Plain bearings
Connecting rods	Forged/titanium
Con-rod bearings	Plain bearings
Pistons	Light alloy, pressed
Cylinders	Nikasil cylinder lining
Cylinder head	1-part light alloy head
Valve guide	Pressed in
Valve arrangement	2 inlet valves suspended in parallel V arrangement 2 exhaust valves suspended in parallel V arrangement
Valve control	Via flat-based tappets
Camshaft	From the crankshaft via a double chain to the intermediate shaft, and from there to the inlet and exhaust camshafts via one double chain each.
Camshaft adjustment	Axial adjustment with 25° adjustment

Valve clearance	Hydraulic valve clearance compensation	
Valve timing with 1 mm valve travel and zero clearance	Inlet opens Inlet closes Outlet opens Outlet closes	1 degree before TDC 119 degrees before TDC 133 degrees after TDC 7 degrees after TDC
Intake system Shifting rpm	2-stage tuned-intake system (light-metal alloy) 2500 / 6000	

Engine cooling — Water cooling; 3 radiators ahead of the front wheels. Two electric fans, controlled in two stages

Engine lubrication

Type	Integrated dry sump
Oil cooling	Via oil-water heat exchanger
Oil filter	On pressure side behind oil pump
Oil pressure at n = 5000 rpm	Approx. 6.3 bar at 90 °C
Oil pressure indication	Oil pressure indicator light

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Exhaust system		2-pipe system with one 3-way catalytic converter per pipe, 2 rear mufflers
Emission control		Oxygen sensor closed-loop control and 3-way catalytic converter (metallic substrate)
Heating		Via water heat exchanger, closed loop-controlled on air side
Fuel system		
Fuel injection		DME (Digitale – Motor – Elektronik – engine control module ECM) Injection valves controlled sequentially
Fuel supply		1 electrical internal gear pump with 2 additional sucking jet pumps.
Fuel quality (RON)		98 unleaded
Electrical system		
Radio interference suppression		ECE - R 10 and 72/245/EWG
Rated voltage	V	12
Battery capacity	Ah/A	36 without air conditioning/fleece technique 46 with air conditioning/fleece technique
Rated generator output	W	1680 (three-phase generator)
Ignition		DME (ECM), individual ignition coils, knock control

Firing order		1 - 6 - 2 - 4 - 3 - 5
Ignition timing control		Via DME (ECM)
Spark plugs		Bosch FR 6 LDC Beru 14 FR 6 LDU
Electrode gap	mm (in)	0.7 + 0.1 (0.028 + 0.004)

Power transmission

Engine and transmission bolted together to form a power unit. Power is transferred to the rear wheels via double-jointed drive shafts.

Clutch

Manual transmission	Single-plate dry clutch Hydraulic actuation Double-mass flywheel
Contact plate	GGG 60 (nodular cast iron)
Clutch plate ø	240

Transmission	Manual transmission G 96.90
Number of gears, forward/reverse	6/1
Internal designation Transmission ratios (i)	
1st gear	3.82
2nd gear	2.15
3rd gear	1.56
4th gear	1.21
5th gear	0.97
6th gear	0.82
Reverse gear	2.86
Final drive:	Bevel gear wheel
Final drive ratio (i)	3.44
Transmission weight (dry) kg (lbs)	69.8 (153.87)
Transmission (wet and ready for installation) kg (lbs)	72.8 (1160.49)

Body designs

Lightweight, galvanised all-steel integral body-frame
Full-size airbag for driver and passenger
Coupé: Number of seats = 2

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Running gear

Front axle		Spring strut axle Wheels individually suspended by control arms with trailing arms and spring struts (McPherson type, Porsche optimised) Springs One truncated cone spring per wheel, with vibration damper inside spring
Vibration dampers		Double-acting hydraulic twin-tube gas-filled vibration dampers
Steering		
Steering wheel ø	mm (in)	360 (14.18)
Steering ratio		16.9 : 1 Left-hand drive vehicle 16.9 : 1 Right-hand drive vehicle
Turning circle ø	m (ft)	10.6 (34.8)
Track circle ø	m (ft)	10.2 (33.5)
Steering wheel revolutions from lock to lock		2.98 Left-hand drive vehicle 2.98 Right-hand drive vehicle
Power steering pump		Driven via poly V-belt Ratio i = 1 : 1.18
Rear axle		Multi-link axle
Wheel suspension		Wheels individually guided by 5 control arms
Springs		Cylindrical coil spring per wheel, with coaxial vibration vibration damper inside spring
Vibration dampers		Double-acting hydraulic single-tube gas-filled vibration dampers

Brakes

Operating brake		Foot operated, hydraulic-mechanical boost Dual-circuit brake system, 4-piston Al monobloc brake callipers at FA and RA, distributed per axle, internally ventilated brake discs at front and rear axles.
Vacuum brake booster (boost factor)		3.15
Brake master cylinder ø	mm (in)	25.4 (1.0)
Brake master cylinder stroke	mm (in)	18/18 (0.71/0.71)
Pressure reducer	- switching-on pressure - reducing factor	55 bar 0.46
Brake disc ø	mm (in)	Front 318 (12.53) Rear 299 (11.78)
Effective brake disc ø	mm (in)	Front 267.8 (10.55) Rear 271.2 (10.69)
Brake disc thickness	mm (in)	Front 28 (1.10) Rear 24 (0.95)
Effective total brake area per wheel	cm^2 (sq. in)	Front 157 (24.34) Rear 127 (19.69)
Piston ø in brake calliper	mm (in)	Front 44 (1.73) and 34 (1.34) Rear 30 (1.18) and 28 (1.10)
Parking brake		Drum-type parking brake
Brake drum ø	mm (in)	180 (7.092)
Brake shoe width	mm (in)	25 (0.985)

Lining area per wheel	cm^2 (sq. in)	85 (13.08)

Wheels and tyres

Summer tyres		Rim offset (mm)
Tyre size, front – on wheel	225/40 R 18 – 8 J x 18	52 *)
Tyre size, rear – on wheel	285/30 R 18 – 10 J x 18	65 *)
Winter tyres **		Rim offset (mm)
Tyre size, front – on wheel	225/50 R 18 88H – 8 J x 18	52*)
Tyre size, rear – on wheel	265/35 R 18 93H – 10 J x 18	50*)**)

Spacer 5 mm
with snow chain clearance

Spare wheel

Collapsible		Tire Mobility System
Tyre pressure		18"
Front	bar	2.2
Rear	bar	2.7
Spare wheel	bar	4.2

Dimensions

Length	mm (in)	4430 (174.54)
Width	mm (in)	1765 (69.5)
Height	mm (in)	1270 (50.04) at DIN empty weight
Wheel base	mm (in)	2350 (92.59)
Track widths		18"
Front	mm (in)	1475 (58.12)
Rear	mm (in)	1495 (58.90)
Ground clearance at max. gross weight	mm (in)	90 (3.55)

Weights according to DIN 700 20

	Manual transmission
Empty weights according to equipment kg (lbs.)	
Front	500 - 540
Rear	820 - 880
Total, Coupé	1350 - 1420* (2909.9 - 3042.2)

* For EU homologation plus 75 kg driver's share (35 kg at front axle, 40 kg at rear axle)

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Permissible axle load

Coupé, front	690 (1521.1)
rear	1000 (2601.3)
Max. gross weight	1630 (3593.3)

Max. trailer load

Braked	none
Unbraked	none
Permissible towed weight	none
Permissible drawbar load	none
Permissible roof load, kg (lbs. with original Porsche Roof Transport System	50 (110.2)

Filling capacities

Measurement of the engine oil level by instrument or oil dipstick. The Driver's Manual is definitive.

Engine specification		Approved:
	Europe	According to ACEA Specification A4 - 96 and special Porsche requirements (refer to Techn. Info. notice about engine oils)

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Engine oil quantity	(Imp. gal.)	Approx. 12.5 (2.71)
Change quantity with filter change		Approx. 8.5 (1.84)
Manual transmission with differential	l (Imp. gal.)	3.8 (0.82)
Transmission oil specification		Manual transmission SAE 75W90 Mobil fully-synthetic
Fuel tank	l (Imp. gal.)	Approx. 90 (19.6) actual volume Approx. 89 (19.3) refill volume 10 (2.2) reserve
	RHD:	Approx. 64 (13.9) refill volume Approx. 65 (14.1) nominal volume
Coolant	(Imp. gal.)	25 (5.42)
Brake fluid reservoir	(Imp. gal.)	Approx. 0.8 (0.17)
Tank for windscreen washer and headlight cleaning system	(Imp. gal.)	Approx. 2.5 (0.54)
Power steering	(Imp. gal.)	1.9 (0418) Pentosin CHF 11 S

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Performance data

Top speed		Manual transmission
	km/h	302
	mph	187.6
Acceleration	0 - 100 km/h	4.8 s
Acceleration	0 - 160 km/h	10.2 s
Elasticity		
80 - 120 km/h	5th gear	6.7 s
100 - 200 km/h	5th gear	16.9 s
Specific power	kg/kW	5.09
	kg/HP	3.74

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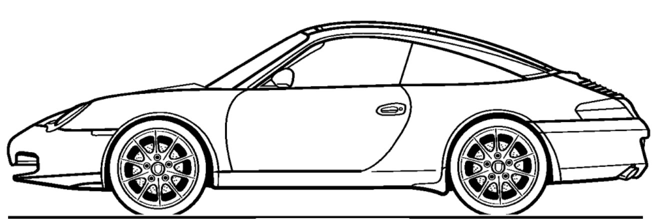
PORSCHE

Service Information
Technik

2002



911 Targa

Foreword

In addition to the vehicles described in the Service Information Technical Brochure (WKD 488 4XX), the 911 Targa and the 911 Carrera 4S are offered in the 2002 model year. Only the new features and/or changes to these vehicles are described in this Service Information Technical Brochure.

The engine, power train, basic running gear, body and interior of the 911 Targa is the same as the base 911 Coupé.

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The power train, basic running gear, body and interior of the 911 Carrera 4S are based on the 911 Turbo, however, it is equipped with the normally aspirated 3.6 liter engine.

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Note

Dimensions and adjustments, torque values and fluid capacities can be found in the Technical Manual.
The contents of the brochure are accurate as of October 2001.

Contents

911 Targa

4 Chassis and Suspension

General

The running gear of the 911 Targa is based largely on that of the rear-drive 911 Carrera for the 2002 model year. Minor modifications had to be carried out as a result of the different vehicle weights.

The 911 Targa is offered in different suspension versions. They include the Standard, Sport and US suspension.

Only the changes compared with the suspension versions of the 911 series for the 2002 model year are described in this section.

Front Suspension

4_02_02

4085 Springs

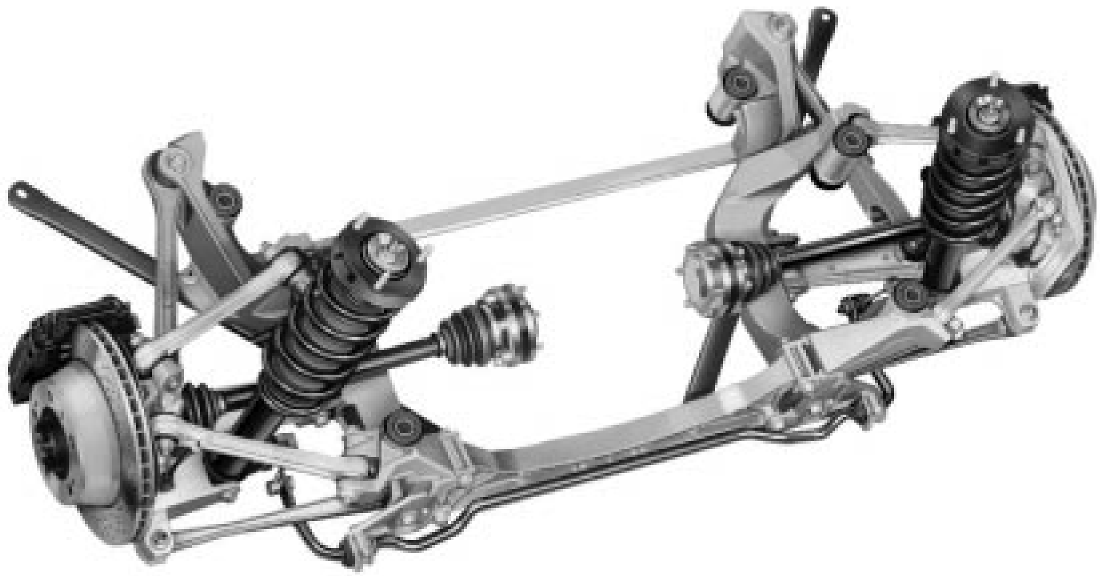
In the Standard and Sport versions the 911 Targa is equipped with the springs from the 911 Cabriolet. U.S. specification vehicles are equipped with the country-specific springs similar to the Standard and Sport suspension version.

The springs are color-coded to distinguish them.

4077 Sway Bar

The sway bars were modified to suit driving characteristics. Sway bars of two different diameters are used, which are installed in the corresponding suspension version.

Rear Suspension



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4272 Springs

In the Standard and Sport versions the 911 Targa is equipped with the springs from the 911 Cabriolet. U.S. specification vehicles are equipped with the country-specific springs similar to the Standard and Sport suspension version.

The springs are color-coded to distinguish them.

4290 Sway Bar

The sway bars were modified to suit driving characteristics. Sway bars of two different diameters are used, which are installed in the corresponding suspension version.

5 Body

General

The new 911 Targa is basically the same as the 911 Carrera below the window line.

To achieve this the side section, starting with the 911 Carrera Coupé, had to be shortened below the window line.

The roof module (glass sun roof, folding rear window, the roller blind for heat and cold protection, including attachments and fasteners) is attached to the basic bodyshell.

Both the windshield filler panel between the windshield and the glass sun roof and the side roof moldings are always finished in highly-polished black, regardless of the exterior body color.

5_07_02

Luggage Compartment

With its vertically positioned high-pressure spare tire, the 911 Targa has the same luggage compartment as the 911 Carrera Coupé (996) with a capacity of 130 liters.

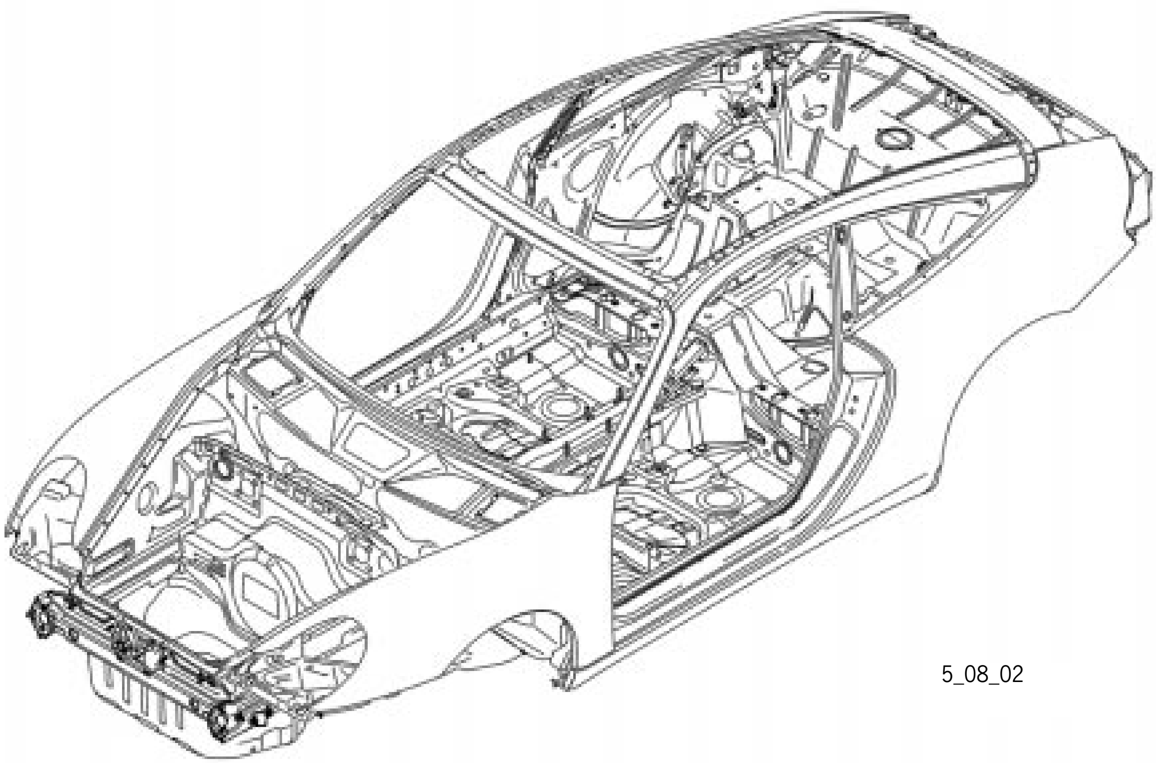
As a result of accessibility through the folding rear window, the interior space is considerably more useable and it can be made more versatile by folding down the rear seat backs. In addition, the maximum storage capacity of 230 liters resulting from the change in the roof line shape is also greater compared with the Coupé.

5_12_02

Bodyshell

The body structure of the 911 Targa is basically the same as that of the Coupé The modifications and the changes made to the Coupé for the 2002 model year to improve rigidity were adopted.

The side roof frames have been improved in strength and rigidity. Along with the reinforcing tubes integrated into the roof rails this results in an extremely strong passenger compartment.



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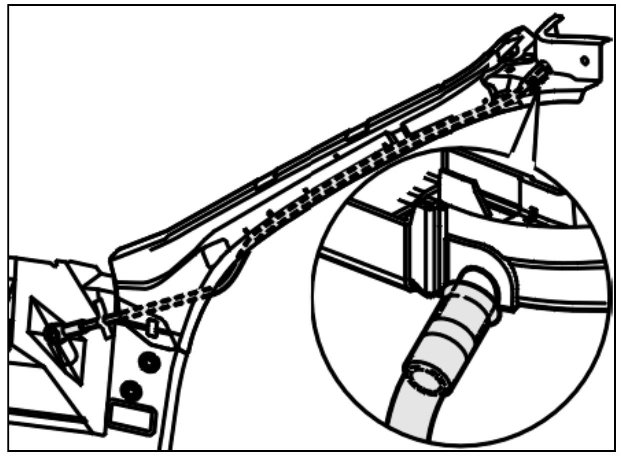
Front Water Drain

The drain pipe is located to the side at the assembly frame for the roof module. The hose for the water drain is pushed on and runs along the inner edge of the windshield frame to the discharge opening at the hinge pillar.



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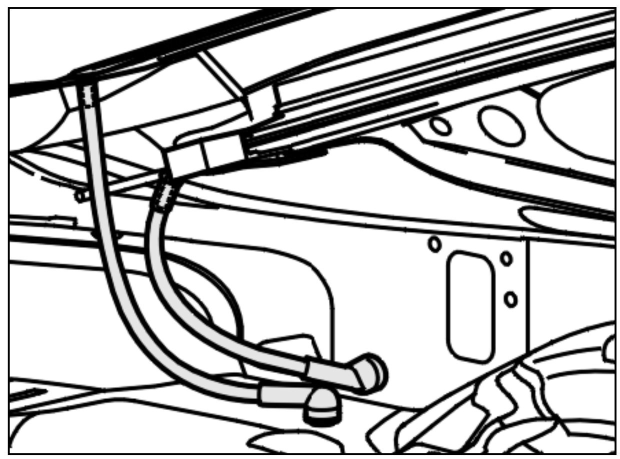
Rear Water Drain

The outer rear water drain hose is pushed onto the roof module drain support.

The inner rear water drain hose is pushed onto the upper drain channel of the roof module.

Both hoses are run in the rear side area.



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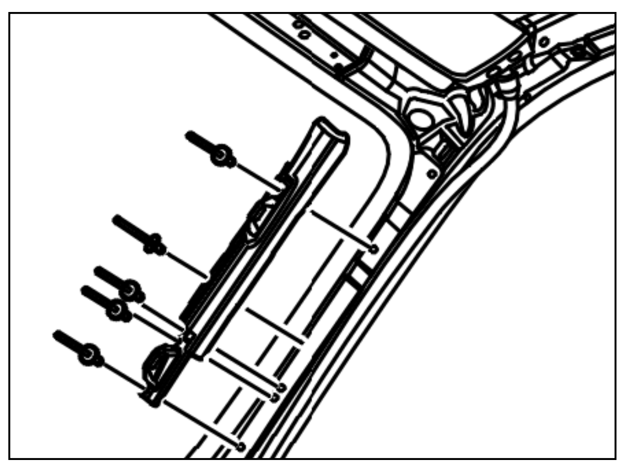
5163 Deformation Member

The deformation member is installed in the windshield frame behind the A-pillar trim and is attached with blind rivets.



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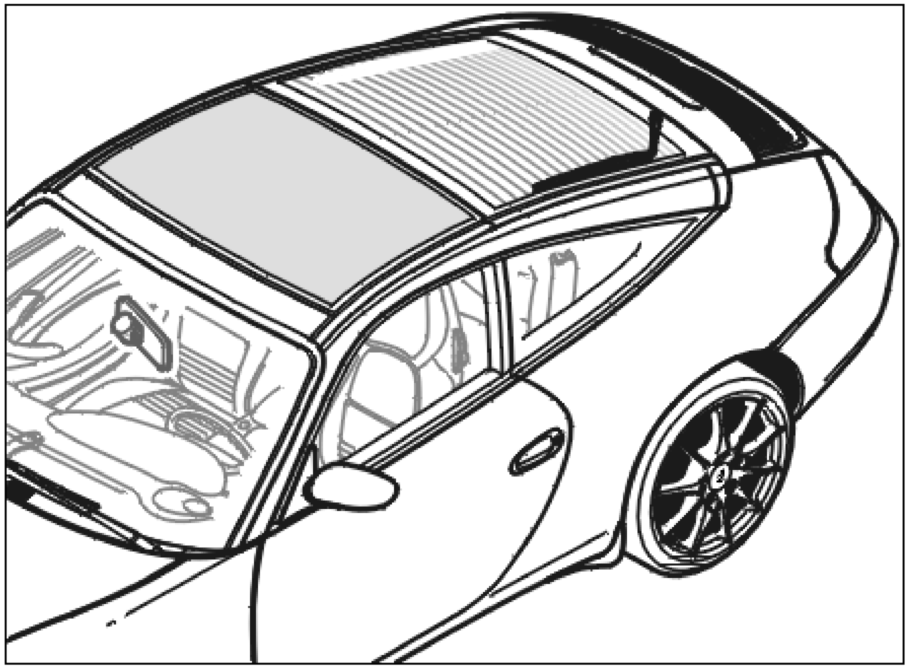
6 Body-Equipment, Exterior

General

The Targa roof module consists of the following principal components:



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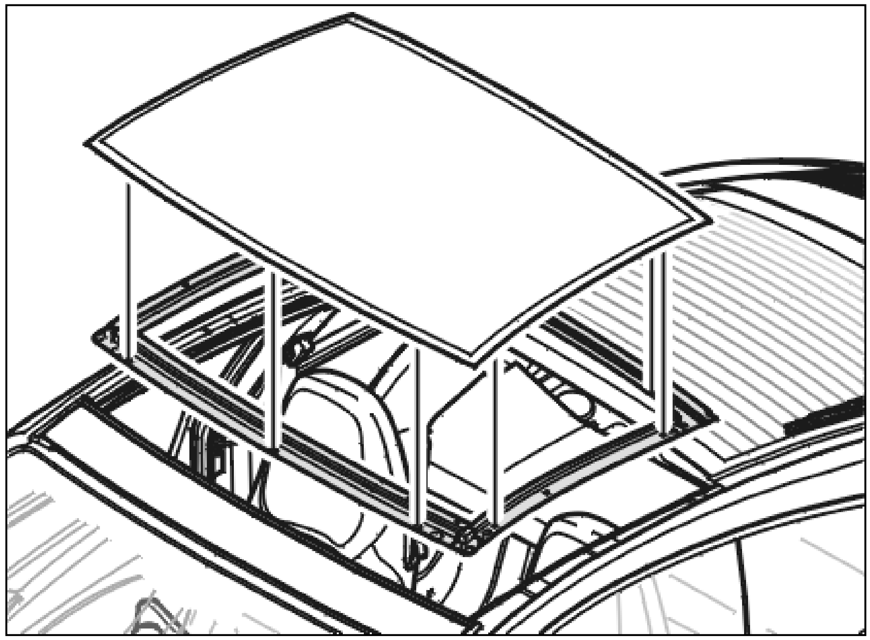
Glass sun roof with drive
Wind deflector
Folding Rear Window
Assembly frame with slotted track
Weather protection roller blind with drive
Automatic closing assist
Control module

Glass Sun Roof



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The glass roof consists of 7.45 mm-thick VSG/TVG glass (laminated safety glass/partially tempered glass).

The benefit of the types of glass used is first of all the splinter characteristics of laminated safety glass. The plastic foil sandwiched between two sheets of glass prevents the glass from splintering and thus eliminates the risk of injury from glass fragments in the event of breakage. Tempered glass is used on the other hand to ensure meeting required quality standards with its high dimensional accuracy.

To ensure low wind noise at the Coupé level even at high speeds, a sealing system was developed that seals from below. The benefit of this sealing system is the increasing sealing function at high speeds. As a result of the increasing vacuum on the outer contour of the roof, the large glass roof is pushed farther into the sealing strip and is thereby additionally sealed.

With the rest of the extensive sealing measures an extremely high degree of tightness and complete suitability for automatic car washes has been achieved.

6033 Wind Deflector

6_42_02

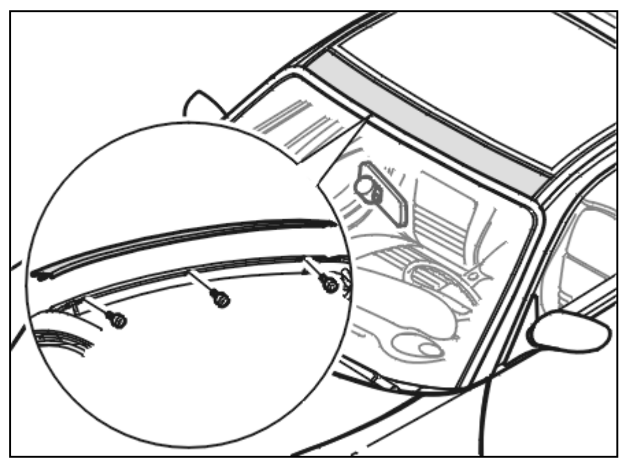
In order to ensure draft-free driving even with the glass sun roof open, a wind deflector about 35-mm high is extended automatically whenever the glass roof is opened.

The wind deflector extends across the entire width of the roof opening. The extension height, the design shape and the approach angle were optimized with respect to draft-free driving, wind noise and drumming.

The wind deflector itself consists of a black powder-coated metal airfoil and is controlled automatically by means of a spring-loaded rotation and sliding mechanism when the glass roof is opened and closed.

Windshield Filler Panel

The windshield filler panel covers the roof module joint and forms the visual transition between the windshield and the glass sun roof. The panel is colored black.



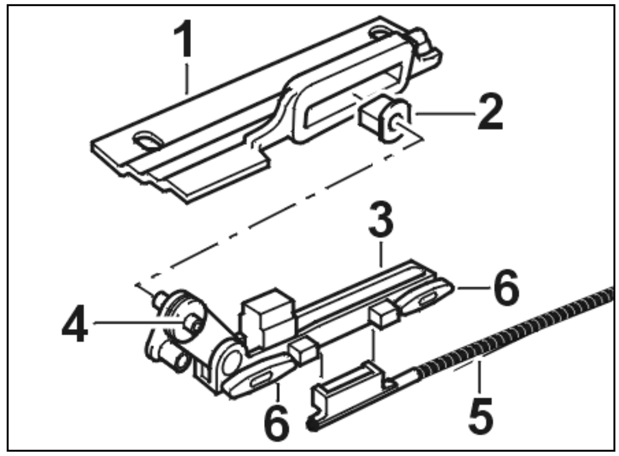
6_34_02

6035 Front Lifting Unit

The lifting unit at the front is made up of the mounting plate (1) with guide bushing (2) the front lifting slide (3) and the lifting link (4). The drive cable (5) is inserted into the lifting slide with the connector.

The guide bushing is carried in the slotted track. The lift function results from the lifter being raised when the roof is closed due to the shape of the slotted track. When the glass roof panel is opened, it is lowered and opened by being guided in the slotted track.

The guide shoes (6) mounted on both sides of the lifting slide are carried in the slotted track at the bottom. The mounting plate is bolted to the glass roof panel frame.



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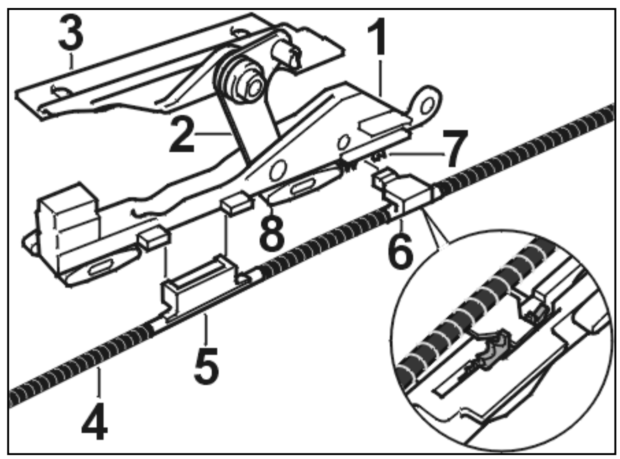
6035 Rear Lifting Unit

The rear lifting unit consists of the rear lifting slide (1) which is connected to the lifting link (2) and the mounting plate (3).

The drive cable (4) is inserted into the lifting slide with the connector (5). The rear connector (6) is positioned in the wedge clamp (7). The wedge clamp is a safety component which locks the glass roof panel frame if the drive cable connections shear.

The guide shoes (8) mounted on both sides of the lifting slide are carried in the slotted track at the bottom. The mounting plate is bolted to the glass roof panel frame.



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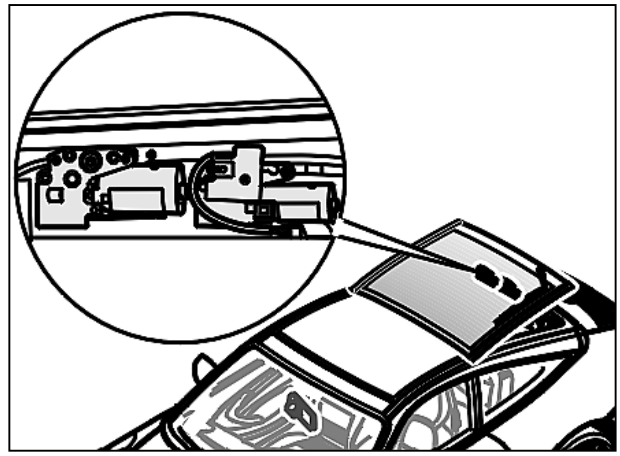
Glass Sun Roof Electric Motor

Drive for the glass sun roof is provided by two electric motors which are accessible after removing the rear compartment trim panel. In order to retain the allocation of electric motor to drive, only one electric motor at a time should be removed. This ensures that the glass sun roof does not become misaligned and that no further adjustment is required.



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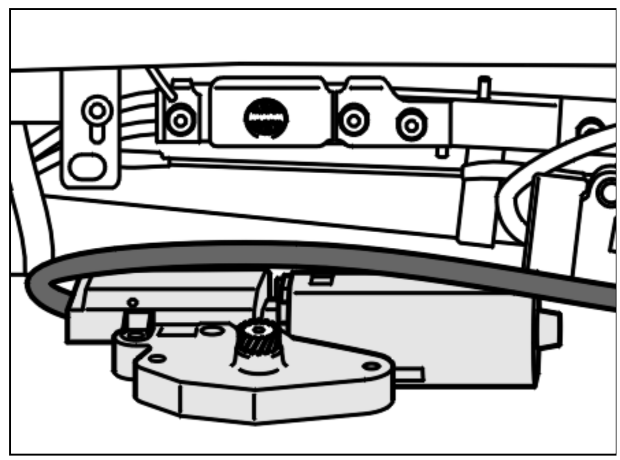
The electric motor is attached to the bracket for the glass sun roof drive and engages the two drive cables with the pinion.



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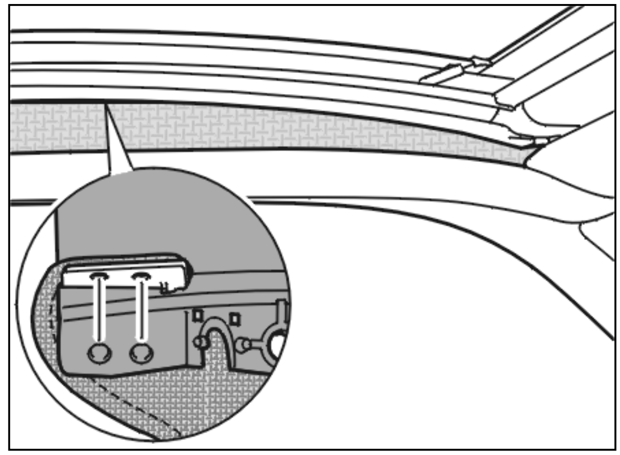
6061 Cloth Lining

The front cloth lining conceals the drive mechanism on both sides and is retained at the top in the clip strip and at the bottom in a channel for the slotted track.

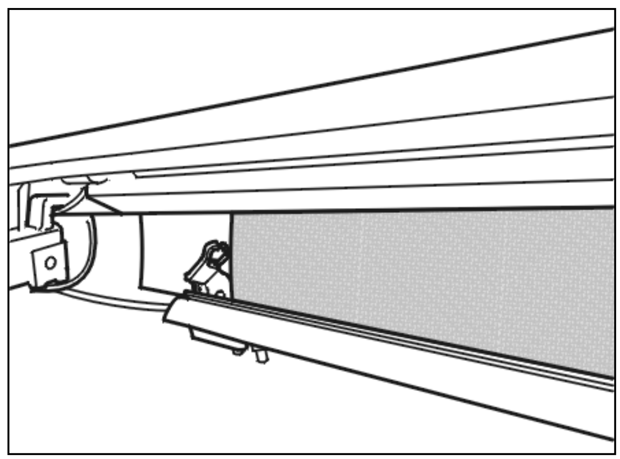


6_25_02

6061 Rear Cloth Lining

In its closed position the rear cloth lining conceals the drive mechanism on both sides. When the glass roof is opened, the cloth lining is moved to the rear through the connector to the lift-up slide.

The cable to the roll-up sun shade electric motor is a part of the left-side cloth lining and is kept under tension by means of a spring-loaded tensioner and deflection pulley.



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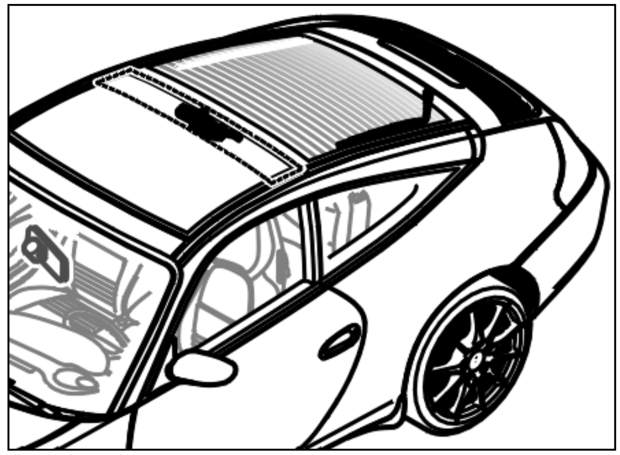
Roll-Up Thermal Protection Sun Screen

A one-piece electrically operated roll-up sun screen is located under the glass sunroof; it is attached to the sunroof frame and deploys forward.

The sun screen itself consists of a partially translucent black material, imparting an impression of transparency even in the closed position. The material is retained in the center across the vehicle by means of a bow which conforms to the shape of the roof. In addition to providing increased headroom, the material is prevented from billowing.

Because the sun screen is attached to the glass roof panel, it can be operated with the roof panel in any open position.

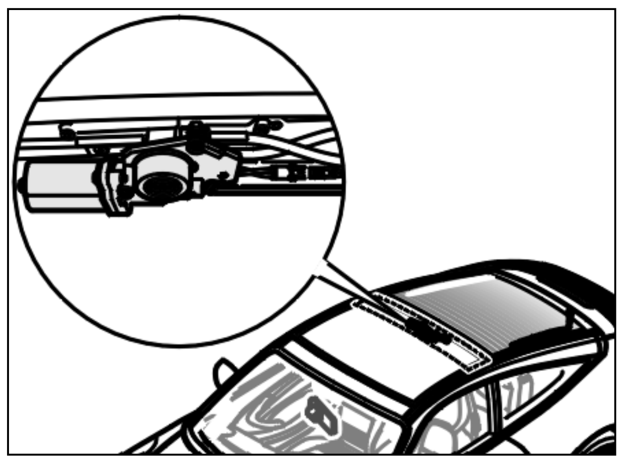


6_47_02

6072 Electric Motor for Sun Screen

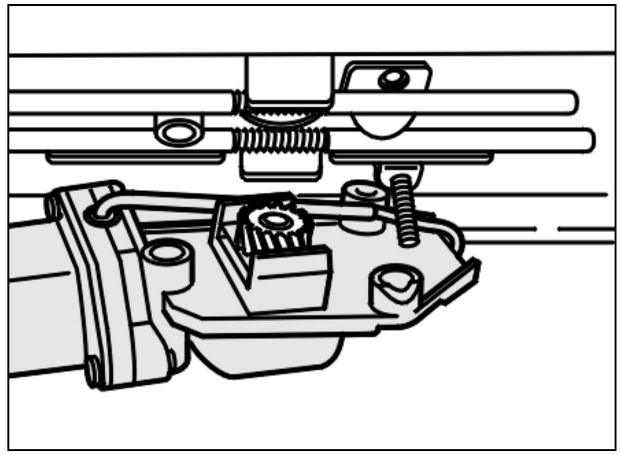
The electric motor is installed at the center rear on the frame for the glass roof panel and is accessible after removing the cover for the sun screen.

The drive mechanism for the sun screen consists of the drive cables running in the two guide tubes with their attachments and it is installed on the glass roof panel frame.



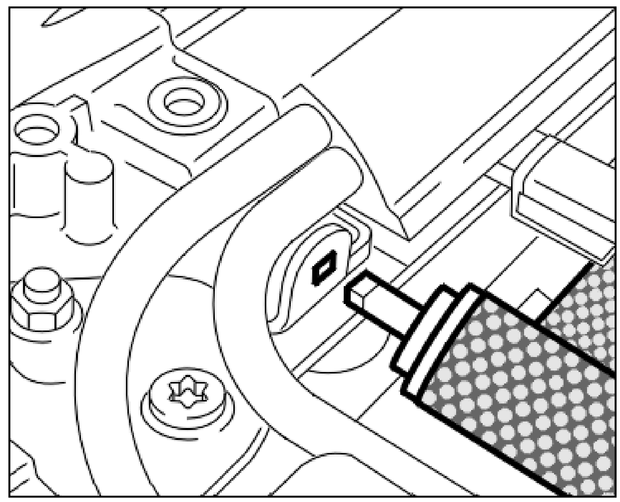
6_45_02

The electric motor for the sun screen is attached to the locating frame for the sun screen drive guide tubes and it engages the drive cables with the pinion.



6_46_02

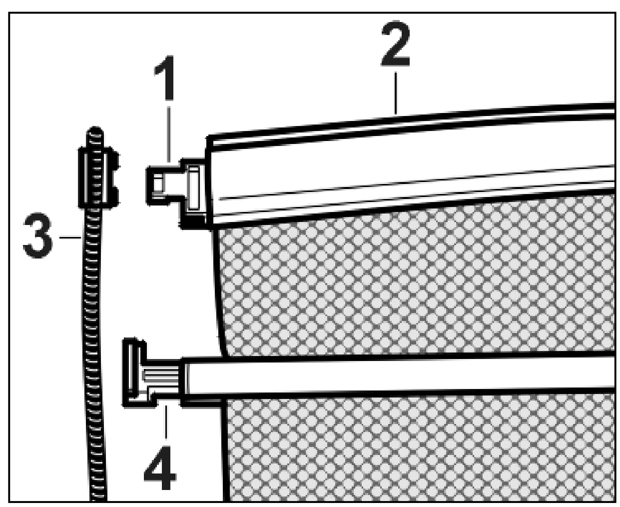
On the right side the sun screen is inserted into the bracket with the tensioning roller. On the opposite side, the mount and the tensioning roller are formed as one. This keeps the pretension (17 turns) on the sun screen.



6_38_02

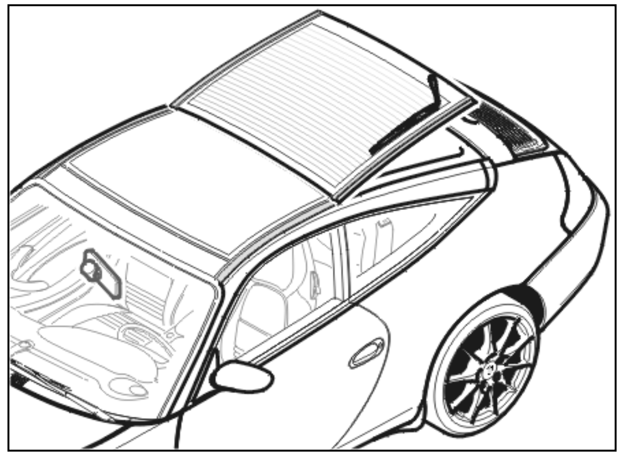
The slide bearing for the sun screen (1) on the guide bow (2) is carried in the track of the glass roof panel frame. The connector for the drive cable (3) is pushed onto the slide bearing.

The support bow (4) is also carried in the glass roof panel frame.



6_37_02

6486 Folding Rear Window


6_24_02

The 911 Targa folding rear window improves accessibility to the storage area behind the rear seats.

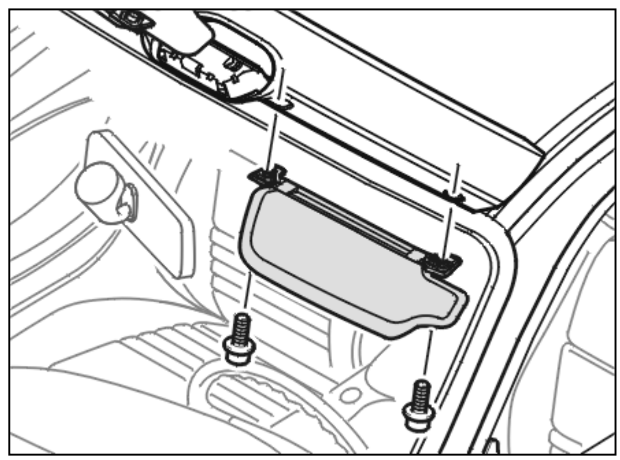
The folding rear window consists of a 3.85 mm-thick tinted pane of single-layer safety glass and is kept in the open position by means of two gas-pressure struts.

When the glass is raised, any water on the window runs over the glass to the integral rain channel in the roof module.

The glass itself is bonded to a supporting frame and has two black-finished roof surrounds.

Heating wires for the standard rear-window defogger are integrated into the glass.

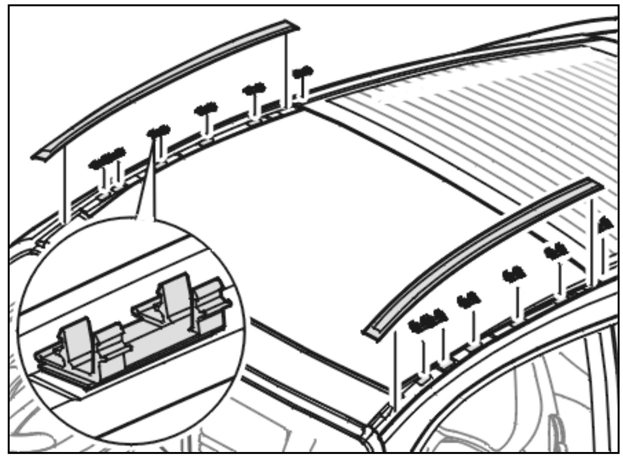
6023 Sun Visor


6_27_02

The sun visors with the make-up mirror and matching lights have been redesigned.

66232 Roof Channel Strip

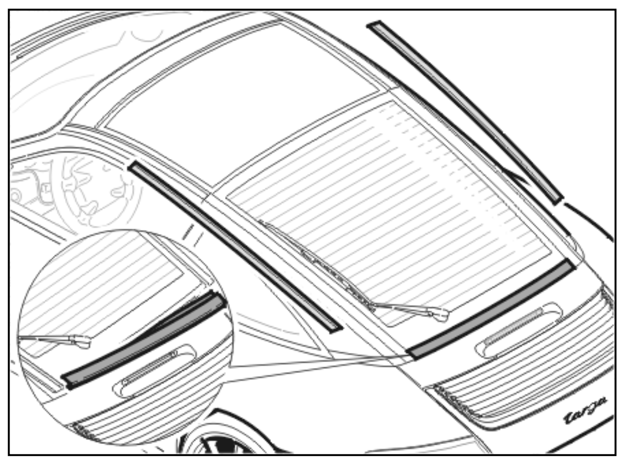
The roof channel strip with its lip seals is installed on the inside of the roof rail in the roof panel area. The roof channel strip is attached by means of adhesively bonded clips.



6_28_02

6669 Folding Rear Window Trim Strip

The trim strips are attached with screws at the sides of the folding rear window. The rear trim strip consists of a shaped plastic insert with a lip seal.



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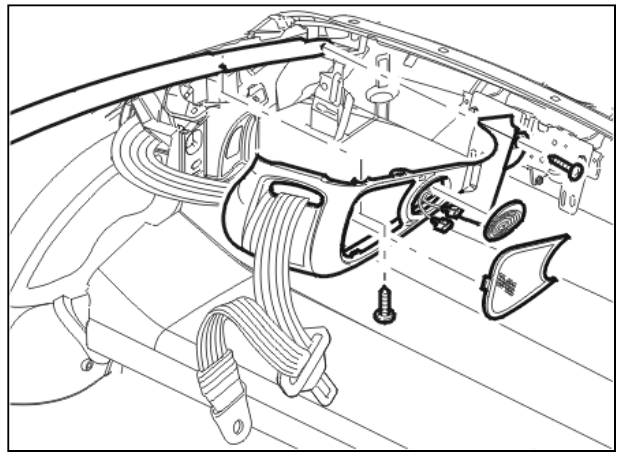
6912 Rear Seat Belt

The rear seat belts are bolted to a bracket at the side. The auxiliary interior light is integrated in the seat belt cover trim panel.

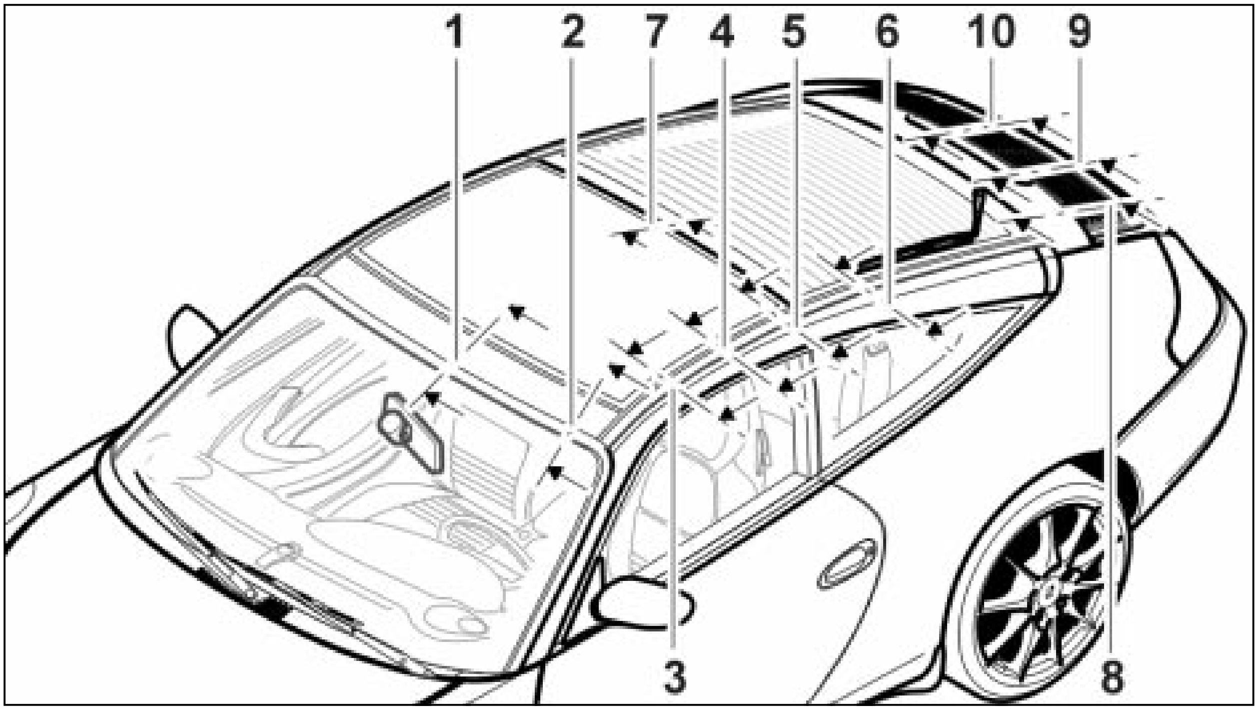


6_30_02

6006 Targa Roof Module Construction

List of Sectional Drawings

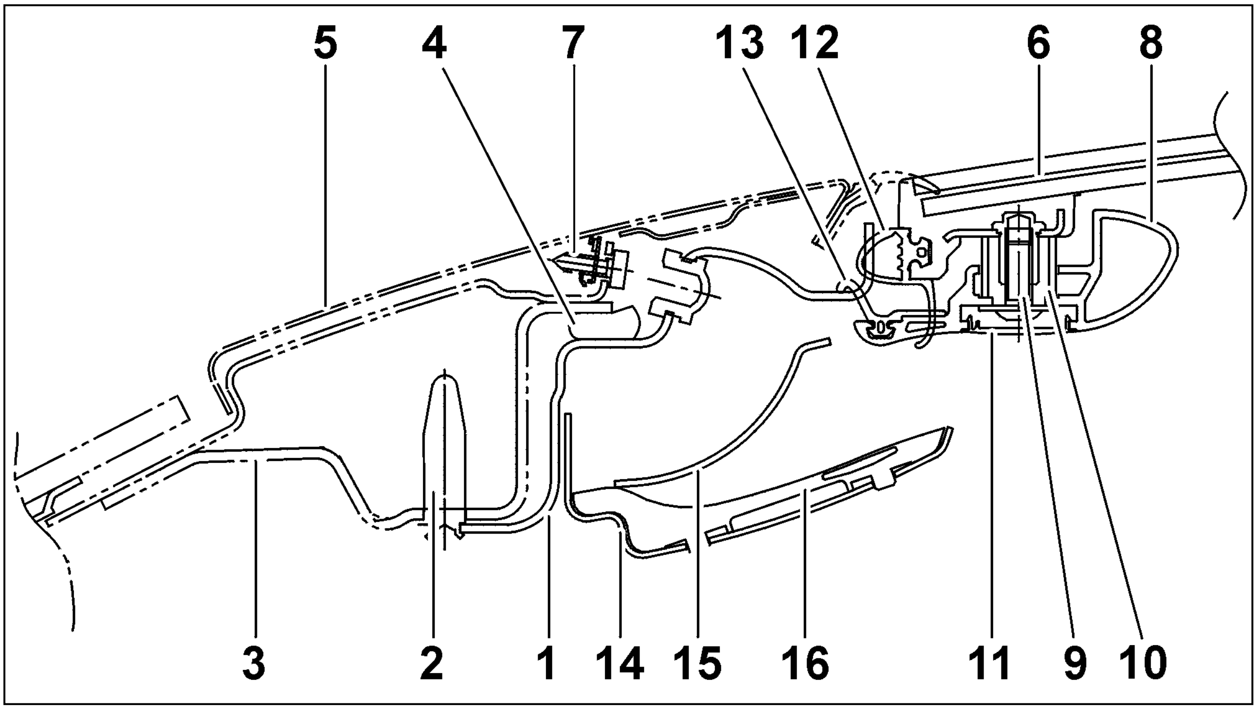
The list of sectional drawings shows the location of the cross sections which are shown in greater detail on the following pages.



6_06_02

Section 1	Windshield Frame – Glass Roof Panel Center
Section 2	Windshield Frame – Glass Roof Panel Front Side
Section 3	Roof Frame – Glass Roof Panel Front Side
Section 4	Roof Frame – Glass Roof Panel Front Side
Section 5	Roof Frame – Glass Roof Panel Center Side
Section 6	Roof Frame – Glass Roof Panel Rear Side
Section 7	Glass Roof Panel Center – Folding rear window Center
Section 8	Rear Center Section – Glass Roof Panel Rear Side
Section 9	Rear Center Section – Glass Roof Panel Rear Side
Section 10	Rear Center Section – Glass Roof Panel Rear Side

Section 1 Windshield Frame – Glass Roof Panel Center



6_02_02

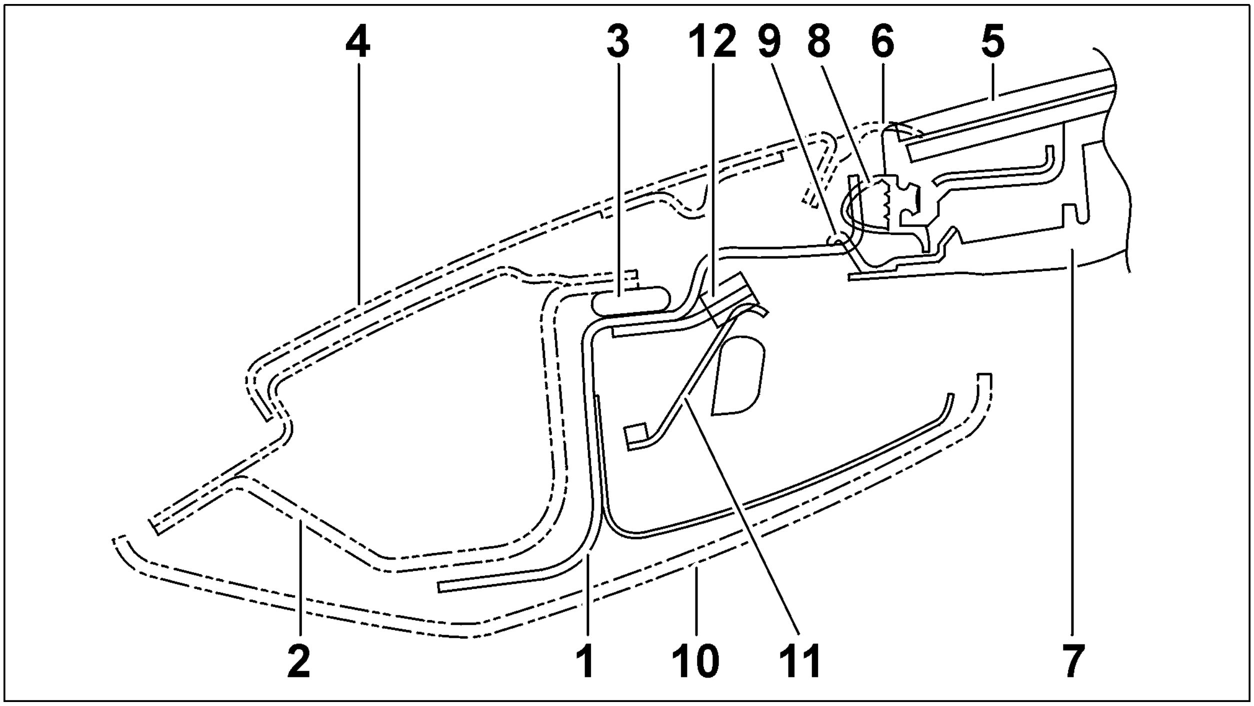
The roof module (1) is set into the windshield frame (3) from below with the centering pin (2). Tape (4) is installed between the roof module and the windshield frame to provide a peripheral seal. The windshield filler panel (5) covers the roof module join and forms the visual transition between the windshield and the glass roof panel (6). The filler panel is attached by three screws (7), with the screw locations being concealed by caps. The weatherstrip runs between the filler panel and the glass roof panel and is installed at the filler panel.

The glass roof panel is bolted to the frame (8) using M6 tensioning bolts (9) and spacers (10). The bolt locations are concealed by caps (11).

The upper (12) and lower (13) glass roof panel weatherstrip is installed on the frame of the roof panel.

The front roof (14) trim panel covers the wind deflector (15) and the seat for the wind deflector (16).

Section 2 Windshield Frame – Glass Roof Panel Front Side



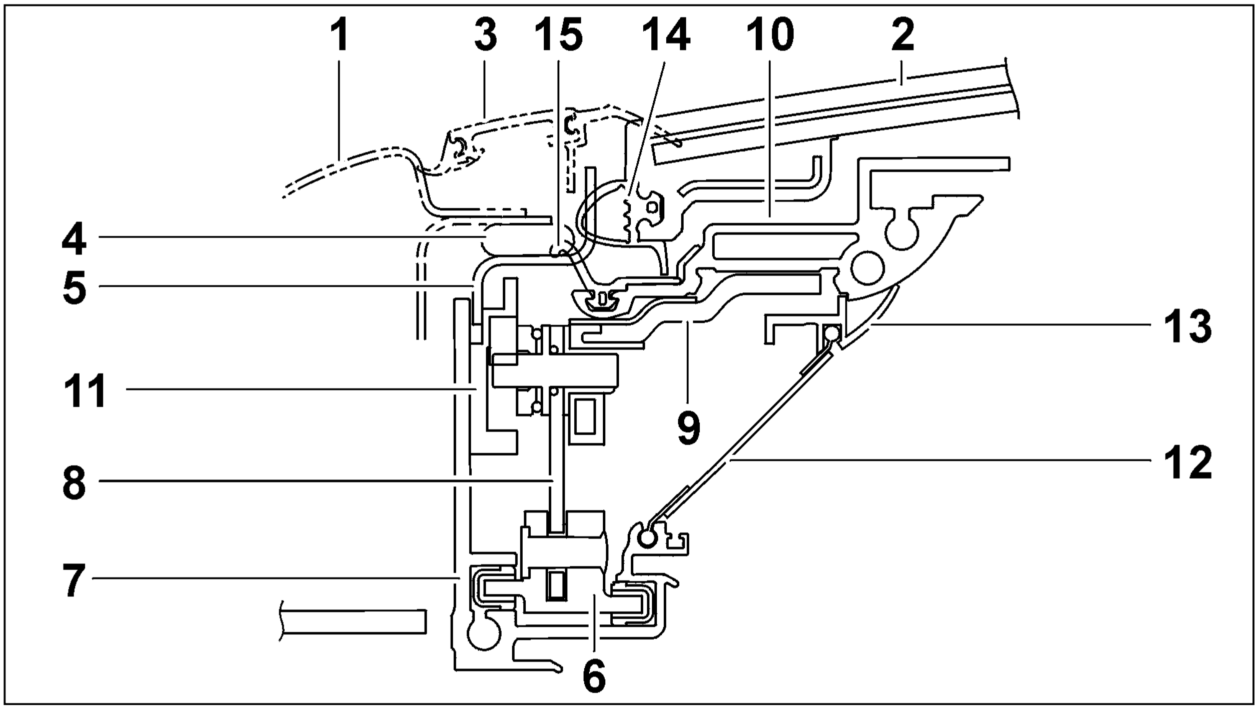
6_21_02

Tape (3) is installed between the roof module (1) and the windshield frame (2) to provide a peripheral seal. The windshield filler panel (4) covers the roof module join and forms the visual transition between the windshield and the glass roof panel (5). The weatherstrip (6) runs between the filler panel and the glass roof panel and is installed at the filler panel.

The upper (8) and lower (9) glass roof panel weatherstrip is installed on the frame of the roof panel (7).

The front roof (10) trim panel covers the wind deflector (11) and the seat for the wind deflector (12).

Section 3 Roof Frame – Glass Roof Panel Front Side



6_17_02

The roof join strip (3) with the lip seal is installed between the roof rail (1) and the glass roof panel (2).

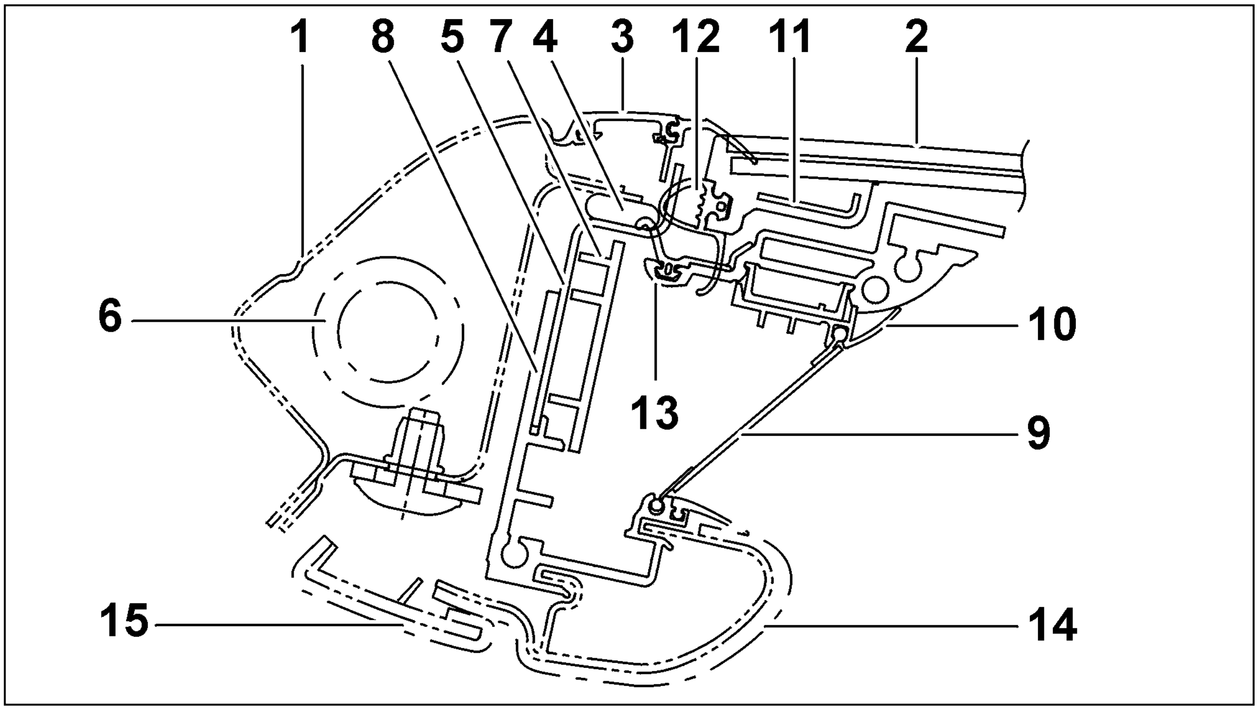
The tape (4) around the periphery assumes the sealing functions between the roof rail and the roof module.

The front lift unit (5) is installed at the bottom with the lift slide into the slotted guide (7) and attached to the mounting plate (9) by means of the link (8). The frame for the glass roof panel (10) is bolted to the mounting plate.

The guide bushing for the link is carried in the upper track (11).

The front cloth lining (12) is retained at the top in the clip track (13) and at the bottom in one of the grooves of the slotted guide. The upper glass roof panel weatherstrip (14) and the lower weatherstrip (15) is installed in the roof panel frame.

Section 4 Roof Frame – Glass Roof Panel Front Side



d6_05_02

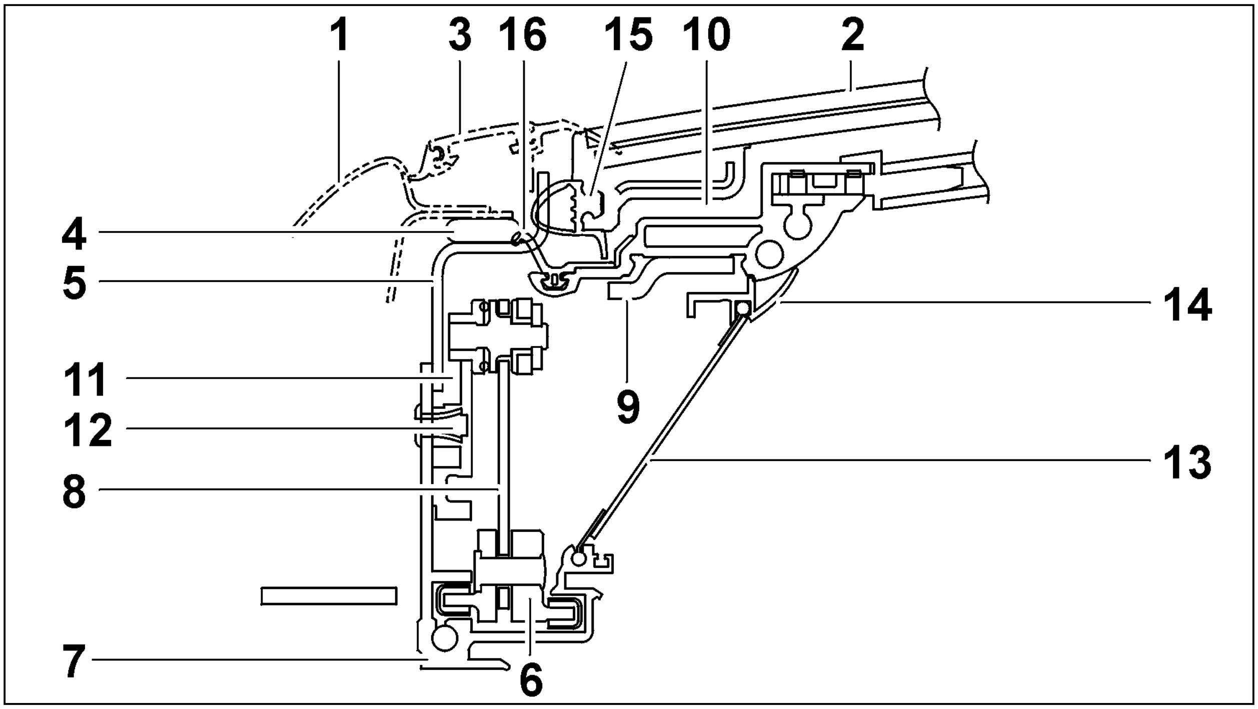
The roof join strip (3) with the lip seal is installed between the roof rail (1) and the glass roof panel (2).

The tape (4) around the periphery assumes the sealing functions between the roof rail and the roof module (5). The reinforcing tube (6) is integrated in the roof rail.

The upper channel (7) and the slotted track (8) are attached to the roof module mounting frame. The front cloth lining (9) is retained at the top in the clip track (10) and at the bottom in one of the grooves of the slotted guide. The upper glass roof panel weatherstrip (12) and the lower weatherstrip (13) is installed in the roof panel frame (11).

The roof rail trim panel (14) conceals the lower area of the slotted track. The A-pillar trim (15) provides additional coverage.

Section 5 Roof Frame – Glass Roof Panel Front Side



6_19_02

The roof join strip (3) with the lip seal is installed between the roof rail (1) and the glass roof panel (2).

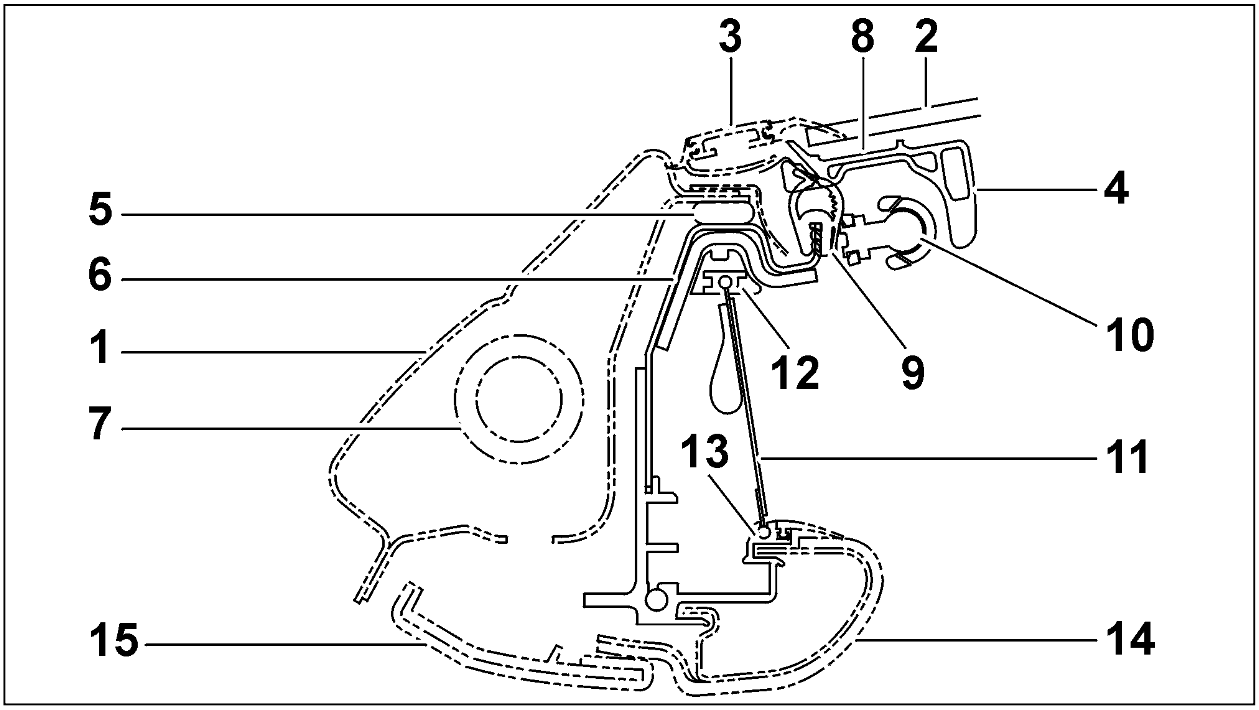
The tape (4) around the periphery assumes the sealing functions between the roof rail and the roof module (5).

The rear lift unit (6) is installed at the bottom with the lift slide into the slotted track (7) and attached to the mounting plate (9) by means of the link (8). The frame for the glass roof panel (10) is bolted to the mounting plate.

The guide bushing for the link is carried in the upper track (11). The upper channel is attached to the mounting frame (12) with blind rivets.

The front cloth lining (13) is retained at the top in the clip track (14) and at the bottom in one of the grooves of the slotted track. The upper glass roof panel weatherstrip (14) and the lower weatherstrip (15) are installed in the roof panel frame.

Section 6 Roof Frame – Glass Roof Panel Rear Side



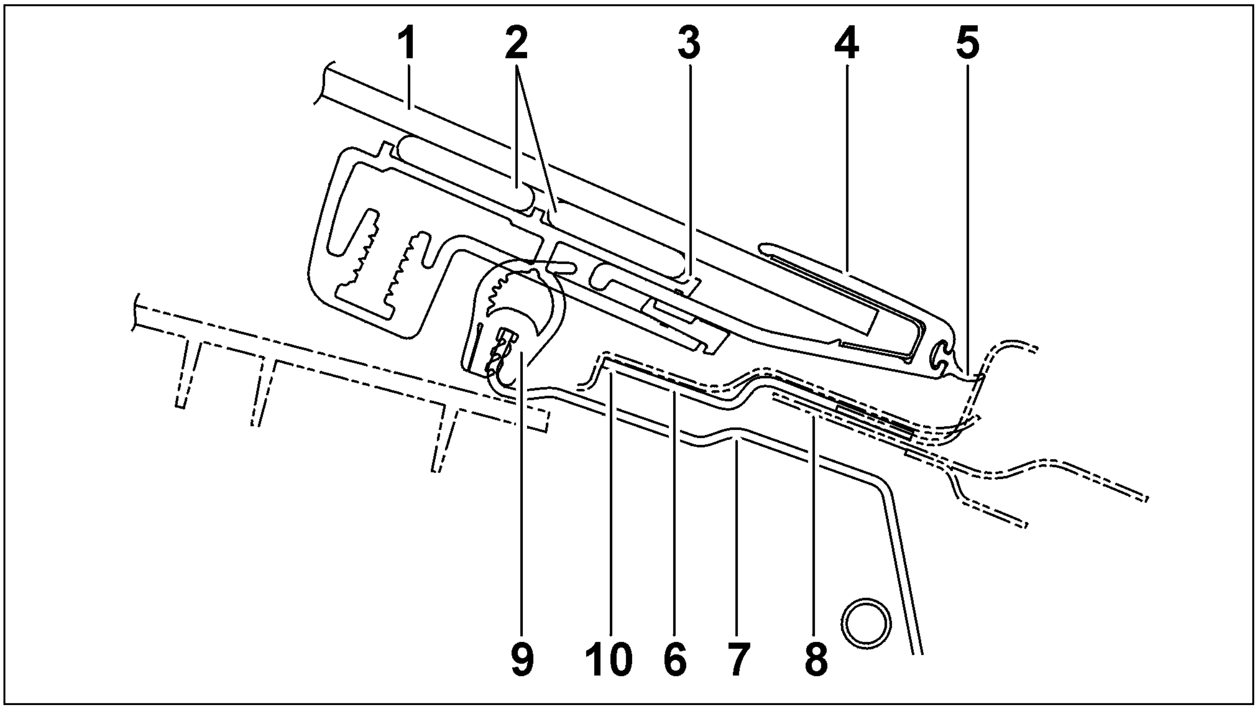
6_18_02

The trim surround (3) with the lip seal is installed between the roof rail (1) and the folding rear window (2). The trim surround is attached to the folding rear window frame (4). The tape (5) around the periphery assumes the sealing functions between the roof rail and the roof module (6). The reinforcing tube (7) is integrated in the roof rail.

The glass for the folding rear window is bonded to the frame using adhesive (8) around the periphery. The weatherstrip (9) installed on the edge of the roof module forms a seal to the folding rear window. The ball head (10) for locating the gas-pressure strut is attached to the frame.

The rear cloth lining (11) is retained at the top in the clip track (12) and at the bottom in one of the grooves of the slotted guide (13). The roof rail trim panel (14) conceals the lower area of the slotted track. The C-pillar trim (15) provides additional coverage.

Section 7 Glass Roof Panel Center – Folding Rear Window Center



6_20_02

The glass roof panel (1) is bolted to the frame (2) using M6 tensioning bolts (3) and spacers (4). The bolt locations are concealed by means of caps (5).

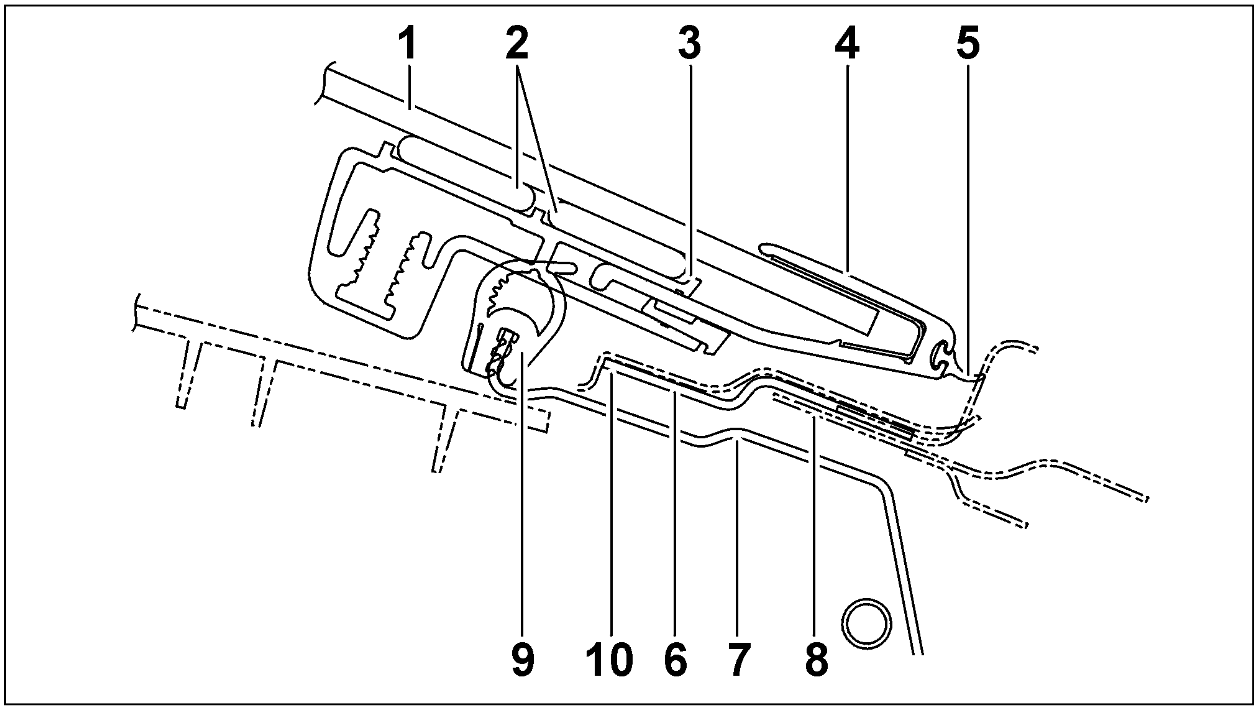
The upper glass roof panel weatherstrip (6) and the lower weatherstrip (7) is installed in the roof panel frame.

The weatherstrip for the folding rear window (9) is installed on the edge of the roof module transverse member (8). The center joint weatherstrip (10) forms a seal between the glass roof panel and the folding rear window.

The glass for the folding rear window is bonded to the frame (12) using adhesive (11) around the periphery.

The electric motor (13) for the sun screen (14) is attached to the locating frame for the guide tubes (15) for the sun screen drive mechanism. The sun screen is covered by the trim panel (16). The material (17) of the sun screen is pulled out by the guide bow (18) with rubber lip (19) and positioned by the tensioning bow (20). The protective cover (22) is installed on the edge of the trim panel mounting plate (23).

Section 8 Rear Center Section – Glass Roof Panel Rear Side

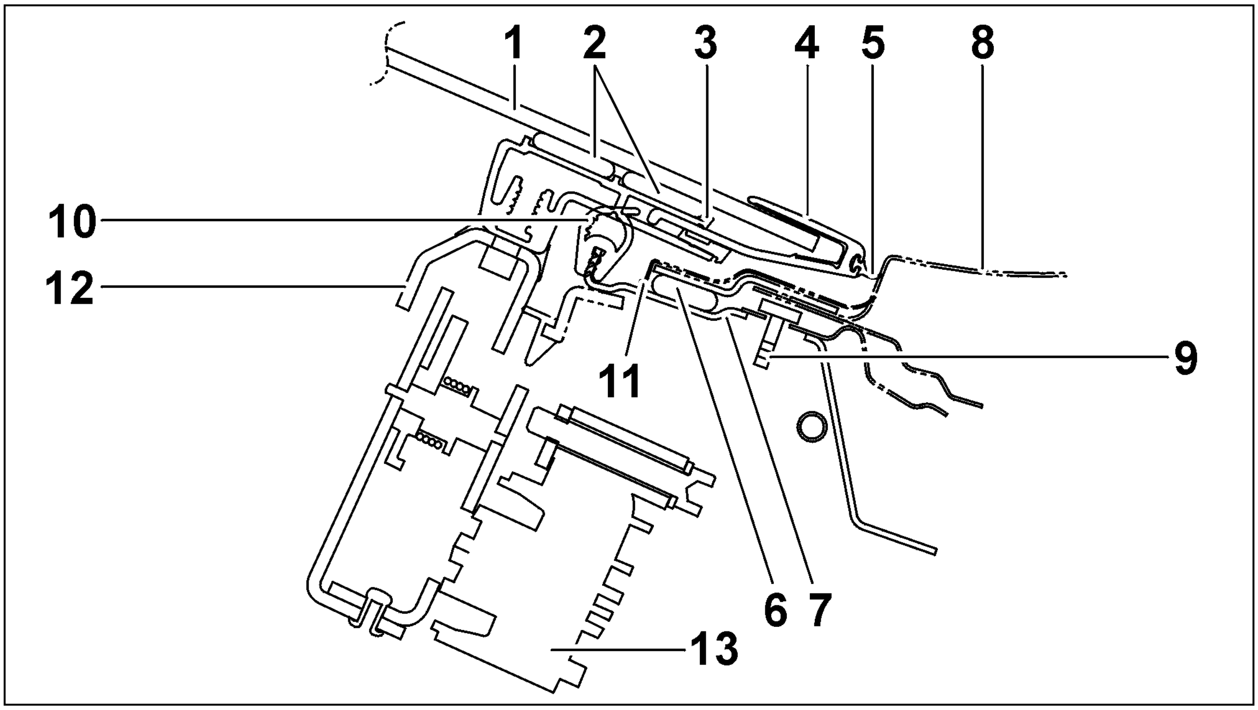


6_22_02

The glass (1) for the folding rear window is bonded to the frame (3) using adhesive (2) around the periphery. The rear trim surround (4) with sealing lip (5) consists of a shaped plastic bead. The tape (6) around the periphery assumes the sealing functions between the roof module (7) and the rear center section (8).

The weatherstrip (9) installed on the edge of the roof module forms a seal to the folding rear window. A plastic film is bonded to the body in the area where the folding rear window rests.

Section 9 Rear Center Section – Glass Roof Panel Rear Center



6_04_02

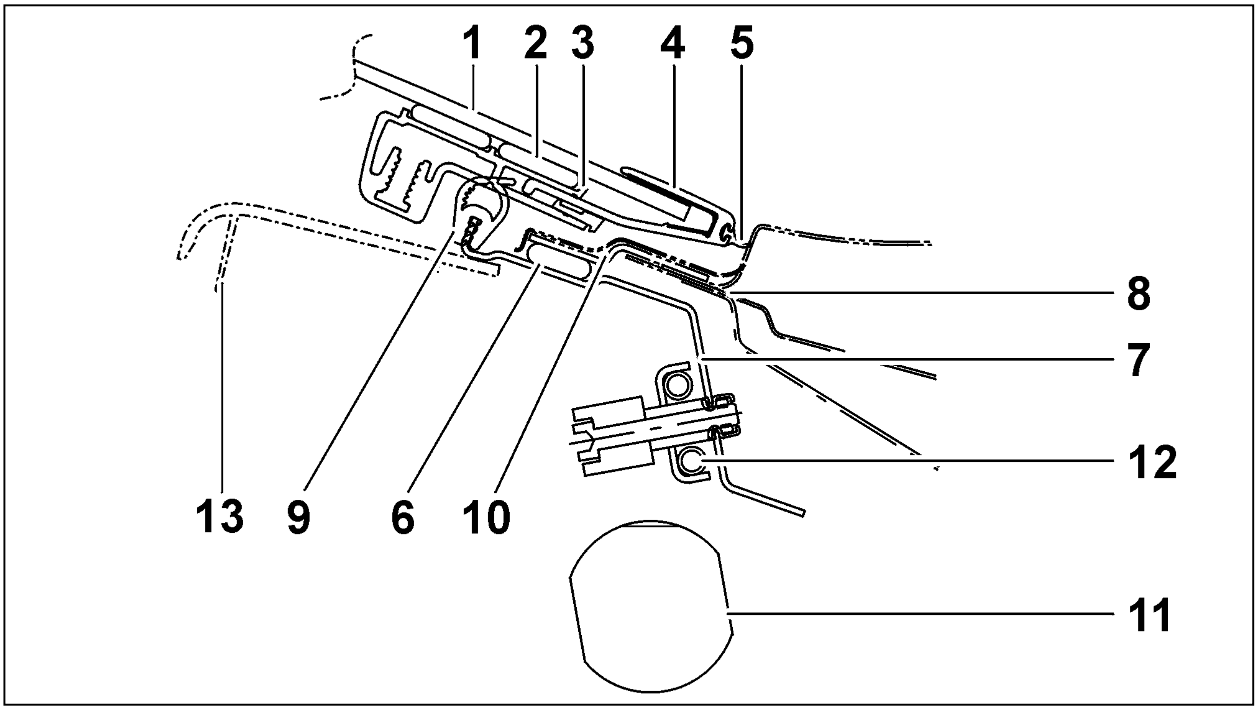
The glass (1) for the folding rear window is bonded to the frame (3) using adhesive (2) around the periphery. The rear trim surround (4) with sealing lip (5) consists of a shaped plastic bead. The tape (6) around the periphery assumes the sealing functions between the roof module (7) and the rear center section (8).

The roof module is attached by the rear center section stud bolts (9).

The weatherstrip (10) installed on the edge of the roof module forms a seal to the folding rear window. A plastic film (11) is bonded to the body in the area where the folding rear window rests.

The striker (12) is bolted to the frame. The closing assist (13) is attached to a bracket and engages the striker in in the closed position.

Section 10 Rear Center Section – Glass Roof Panel Rear Center



6_03_02

The glass (1) for the folding rear window is bonded to the frame (3) using adhesive (2) around the periphery. The rear trim surround (4) with sealing lip (5) consists of a shaped plastic bead. The tape (6) around the periphery assumes the sealing functions between the roof module (7) and the rear center section (8).

The weatherstrip (9) installed on the edge of the roof module forms a seal to the folding rear window. A plastic film (10) is bonded to the body in the area where the folding rear window rests.

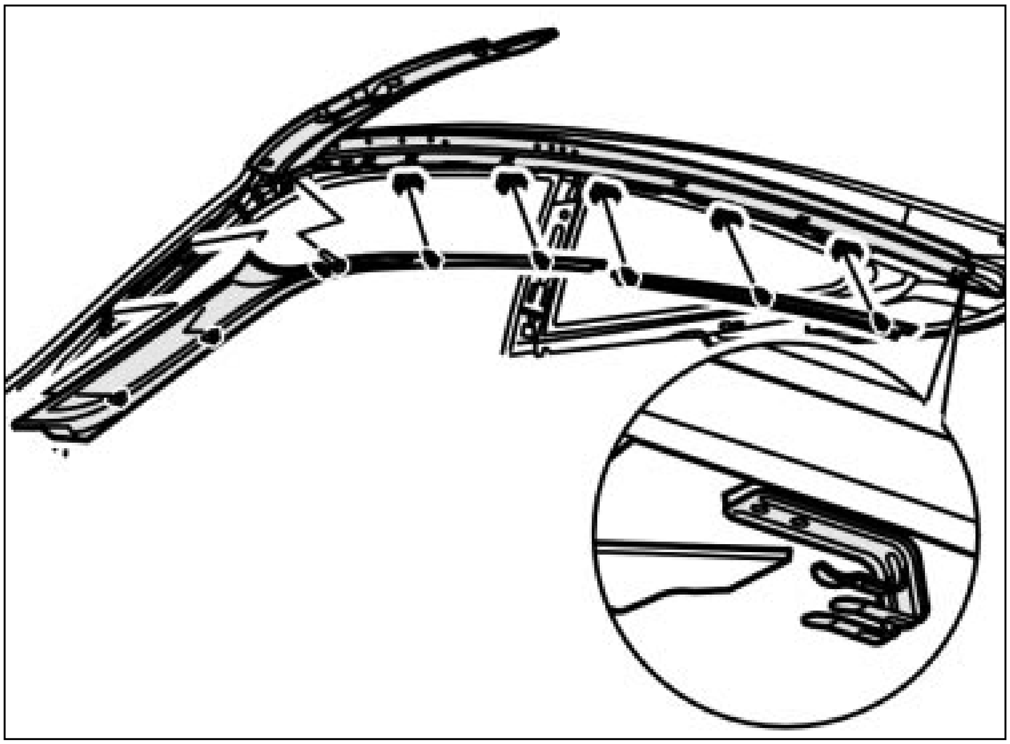
The electric motors (11) for the glass roof panel drive are installed on the mounting frame for the guide tubes. The rear compartment trim panel (13) is pushed under the weatherseal.

7 Body-Equipment, Interior

General

To integrate the shape of the Targa roof module, modifications had to be made to the interior trim on the A-, B- and C-pillars, to the rear side trim panel, the closeout panel in the rear compartment, as well as to the windshield frame with the interior light and the interior security monitoring.

7057 A- and C-Pillar Trim Panels



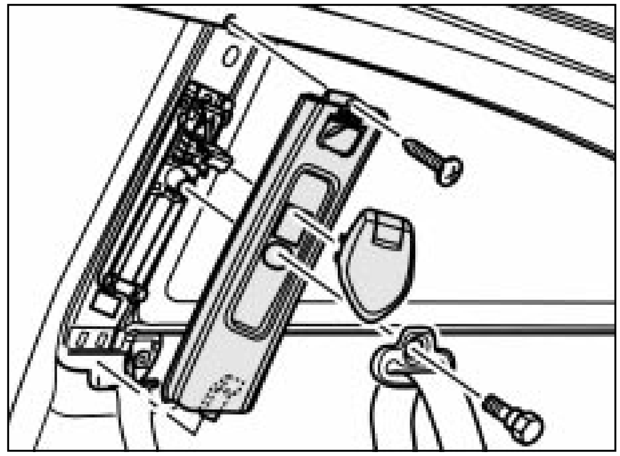
7_02_02

The A-pillar trim is attached to the windshield frame and roof frame by means of metal brackets.

The C-pillar trim is attached to the roof frame with metal clips and inserted into a bracket at the rear. Around the roof frame the trim panels are clipped to pre-attached plastic mounts.

B-Pillar Trim Panel

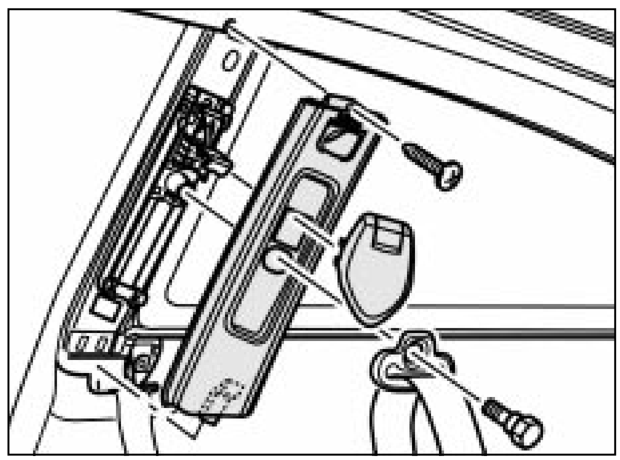
The coat hook and the seat belt height ajduster are integrated into the B-pillar trim panel. The B-pillar trim panel is a snap-fit at the bottom and retained by a bolt at the coat hook. The cover plate conceals the upper bolt for the seat belt.



7_01_02

7075 Rear Compartment Trim Panel

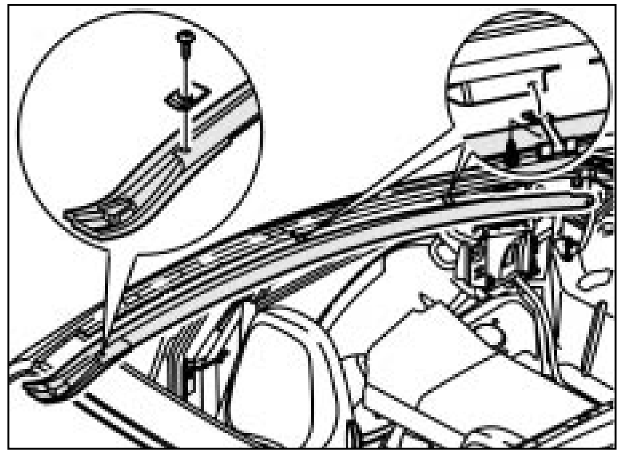
The side trim panel covers the rear seat belt area and acts as a mount for the rear loudspeaker.



7_03_02

7080 Roof Rail Trim Panel

The roof rail trim panel conceals the guides for the glass roof panel; it is a push fit on the roof module and additionally bolted in three places.

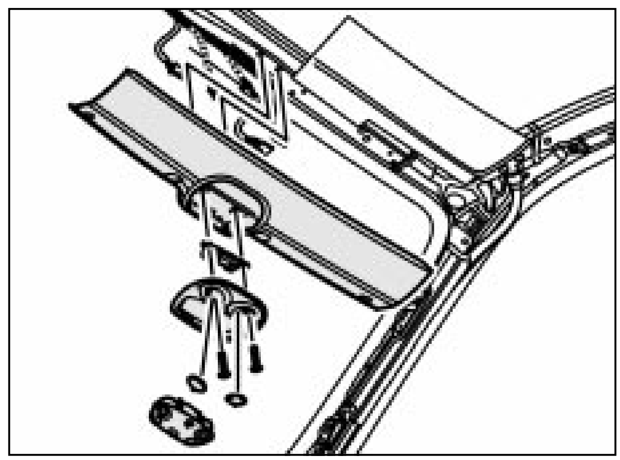


7_04_02

7083 Front Roof Trim Panel

The roof trim panel is a push-fit where the roof module is attached and retained by metal tabs.

The cover with the interior lights and the interior security monitor is installed in the center of the roof trim panel, with the sun visors at the side.

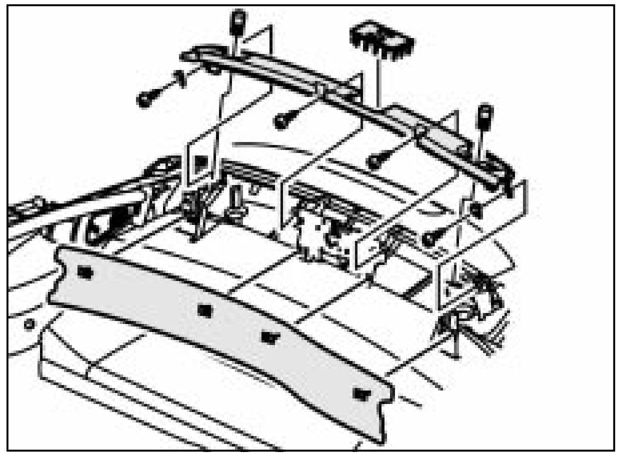


7_05_02

7084 Rear Compartment Closeout Panel

The rear compartment closeout panel is a two-piece design. The lower part is attached to the roof module frame by 4 clips. The hex-head keys for emergency opening of the rear hatch are located on the rear of the trim panel.

The upper part of the trim panel is attached with 4 sheet metal screws. The two rubber adjusters for postioning the rear hatch are mounted at each side. The rosette in the center conceals the lock.

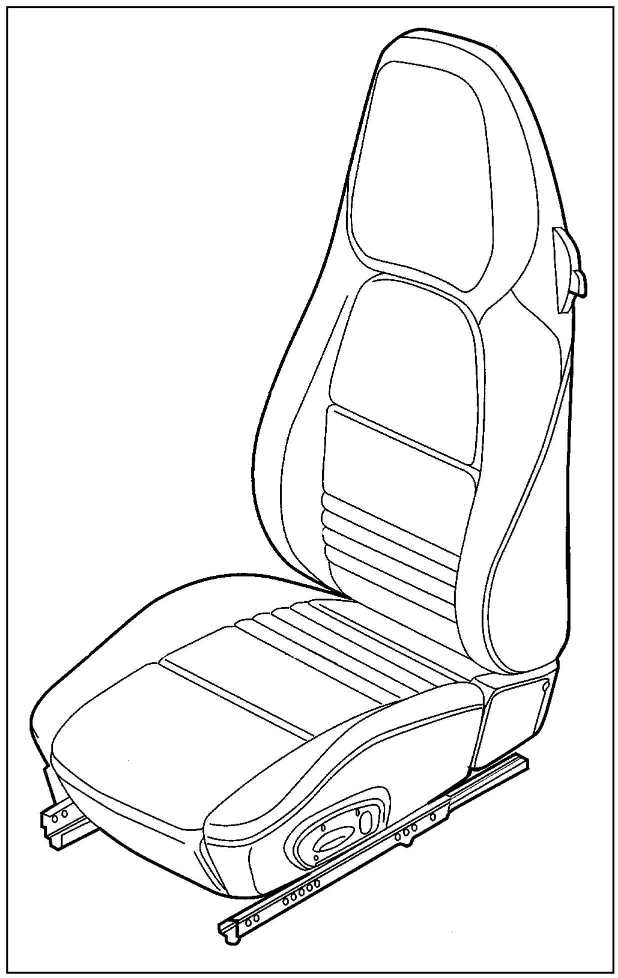


7_06_02

7201 Seat

The seat surface on all seat versions is lowered by 8 mm. To accomodate the lowered seat cushion and to improve seat ergonomics, the center of the seat back and the side bolsters for the seat cushion and the seat backs have been redesigned.

In addition, the front padding in the head restraint area of this Targa seat has been increased by a further 20 mm.



7_07_02

9 Electrical System

6100 Targa Roof Module

General

The 996 Targa has an electrically adjustable glass roof panel, an electrically adjustable roll-up sun screen on the glass roof panel and a folding rear window with a power lock for loading and unloading.

A control module acquires and processes data and controls the individual functions.

The Targa roof system can be diagnosed.

Operation of the glass roof panel is controlled by a rocker switch in the center console.

The glass roof panel can also be opened and closed using the key remote and from the door lock cylinder.

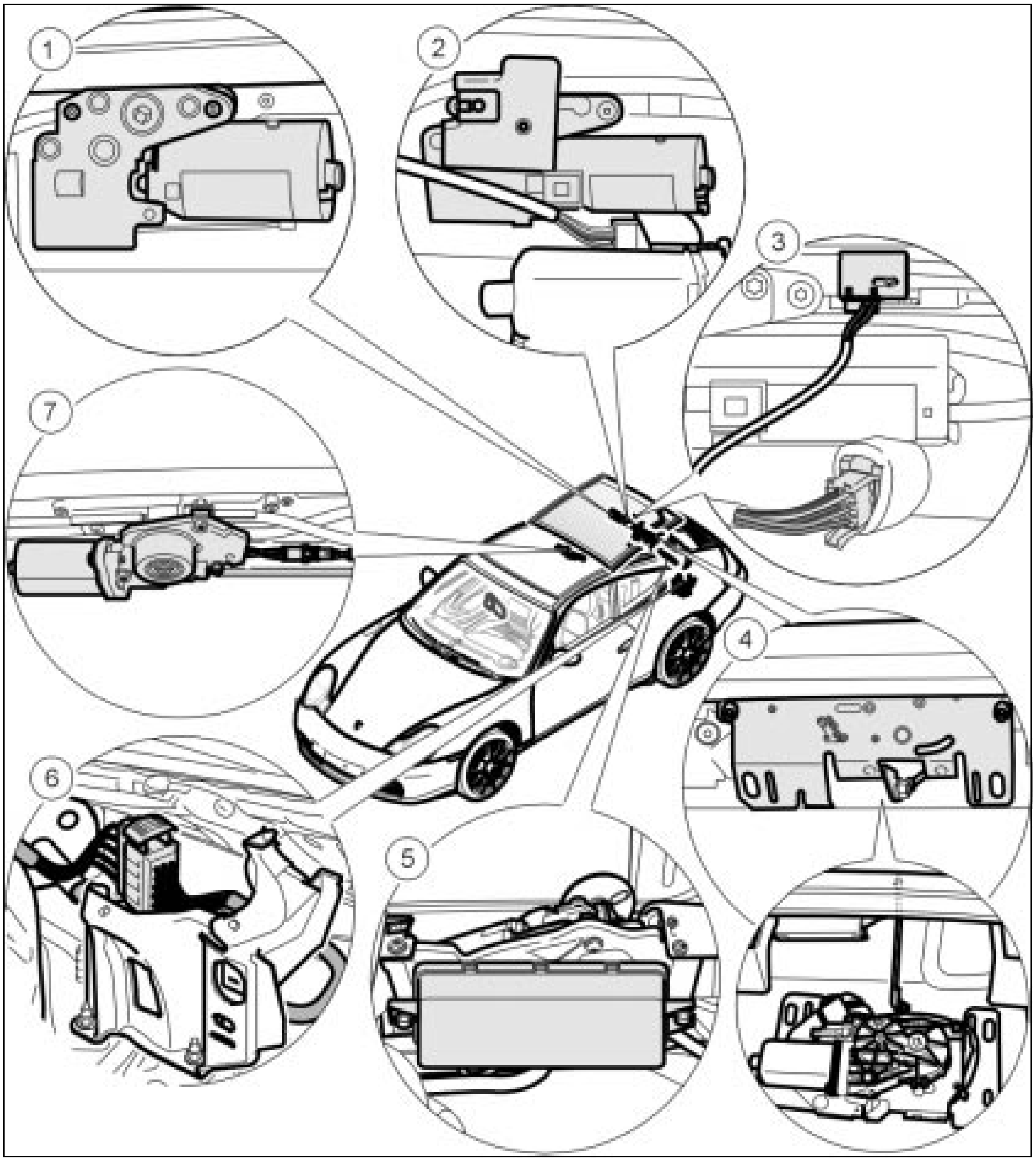
The roll-up sun screen can be opened and closed with a second rocker switch on the center console with the glass roof panel open or closed.

The folding rear window can be unlocked electrically with a switch in the interior or with the key remote when the glass roof panel is closed.

Power assist makes closing the folding rear window easier.

0_09_02

Component Location



9_06_02

1 – Electric motor for glass roof panel
2 – Electric motor for glass roof panel
3 – Microswitch for glass roof panel (roof open/closed)

4 – Automatic closing assist for folding rear window
5 – Control module
6 – Disconnect glass roof panel
7 – Electric motor for roll-up sun screen

Glass Roof Panel Opening and Closing Procedure
Recognition of the roof position is carried out by Hall sensors on the motor and by a microswitch for the "Closed" position.

Operating Status

- The folding rear window must be closed
- With the ignition switch ON (engine running or not running) or
- With a door open or
- With the door closed and ignition key removed, only until the door is opened the first time

Opening and Closing with the Rocker Switch

Actuate rocker switch until the glass roof panel has reached the desired position.

Releasing the switch immediately stops roof panel motion

B21 005

Opening the Gass Roof Panel Automatically when Unlocking the Vehicle

(independent of equipment for individual countries)

Actuate key remote (at least 3 seconds) until the glass roof panel has reached the desired position.

Closing the Glass Roof Panel Automatically when Locking the Vehicle

(independent of equipment for individual countries)

Actuate key remote (at least 3 seconds) until the glass roof panel has reached the desired position, or:

Keep vehicle key in door lock in the lock position until the glass roof panel has reached the desire position.

Roll-Up Sun Screen

Its operating status is the same as that of the glass roof panel.

The roll-up sun screen can be operated independently of the position of the glass roof panel.

To **Close** and **Roll up** the sun screen actuate the appropriate half of the rocker switch until the desired position is reached.

One-Touch Function

Touch the appropriate half of the rocker switch.

The sun screen moves to the end position.

Touching the rocker switch again stops the sun screen in any position.

Folding Rear Window

B21 010

Opening the Folding Rear Window

Prerequisite:
The glass roof panel must be closed.
Vehicle speed < 5 km/h

To **Unlock** press button **A**, or:
Actuate switch for folding rear window on key remote.

When it is opened, the folding rear window is moved to the open position by a spring-loaded latch and from here it can be opened by reaching a hand under it.

With the folding rear window unlocked, the area behind the rear seats is illuminated by lights on both sides and the interior is also illuminated.

Closing Folding Rear Window

To close the screen from the mechanical position “First Detent” it is pulled closed and locked with the help of an electrically driven mechanism (closing assist).

Lower folding rear window manually.

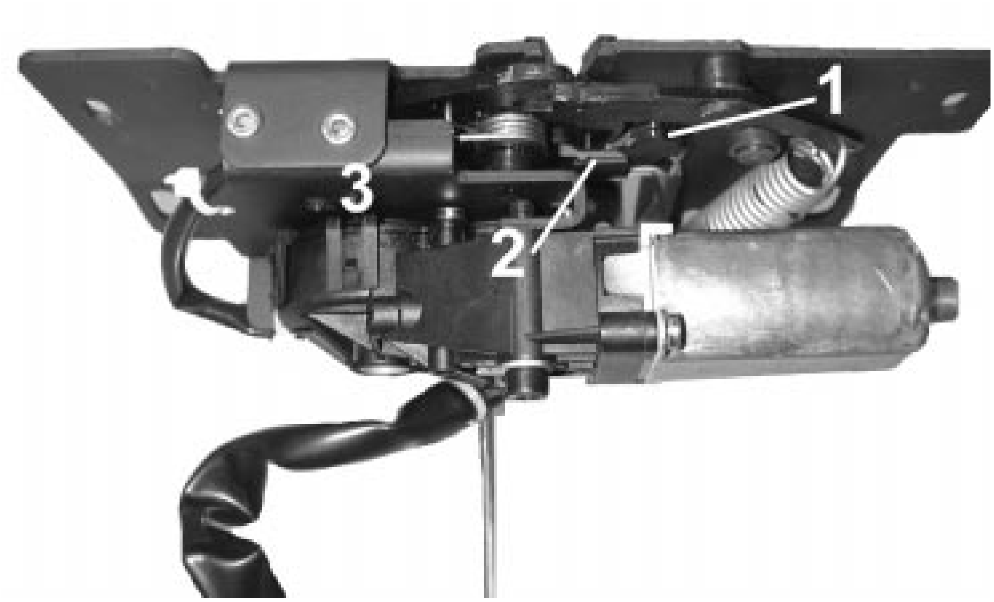
Be sure that fingers are not caught under the folding rear window.

Push the folding rear window closed by hand until it is pulled shut and locked automatically.

Warning Light

If the folding rear window is not completely closed, the warning lights on the instrument panel and in the in-car computer light up.

Closing Assist – Folding Rear Window



9_08_02

1 – Microswitch “First Detent”
2 – Microswitch “Unlocked”
3 – Microswitch “Locked”

Closing Assist Operation

Locking Control Sequence

1. Closing assist operational, “First Detent” and “Unlocked” microswitches are not actuated, “Locked” microswitch is actuated.

2. The striker of the trunk lid presses on the lock latch which actuates the “First Detent” micro-switch. Motor turns until “Locked” microswitch is actuated again.

3. Folding rear window is locked. All 3 microswitches are actuated.

Microswitch actuated = open
Microswitch not actuated = ground

Unlock Control Sequence

1. Closing assist operational, folding rear window locked. “First detent” or “Unlocked” microswitch must be actuated.

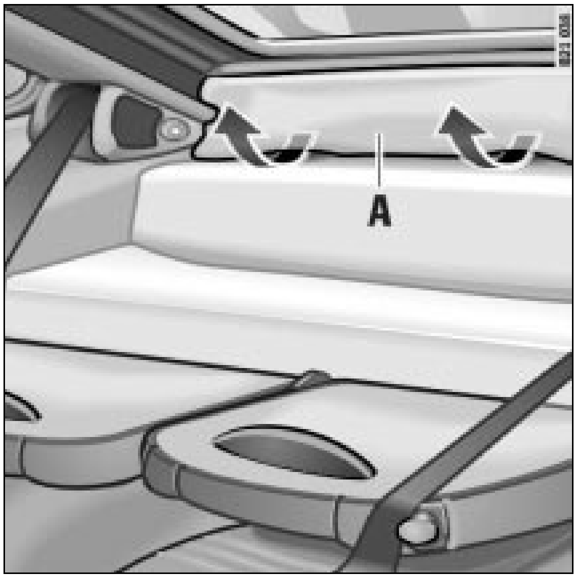
2. “Unlock” signal is applied at control module Motor turns until “Locked” microswitch is actuated again. folding rear window is unlocked, the microswitches are in their normal positions again.

Power is applied to the closing assist motor for a maximum of 3 seconds.

Emergency Operation Glass Roof Panel

Before carrying out emergency operation, the electrical fuses must be inspected.

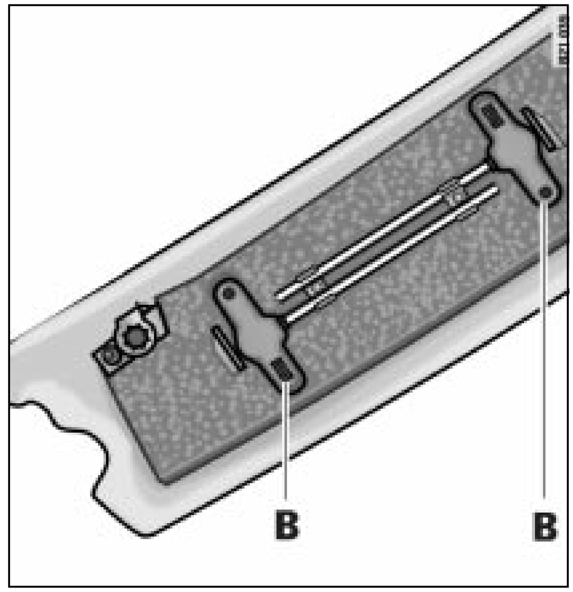
Do not operate the glass roof panel with the switch or the key remote during and after emergency operation.



B21 038

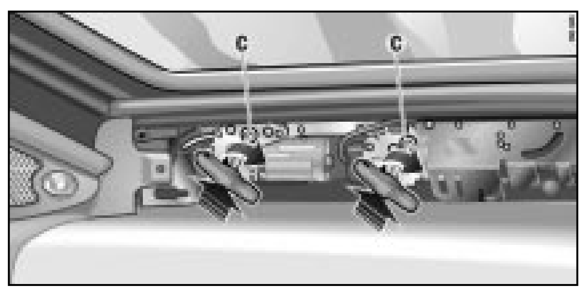
1. Remove ignition key. Move seats forward and fold down rear seat backs.
2. Reach hands under rear compartment trim panel **A** and pull forward.

The internal hex-head keys for emergency operation are located on the back side of the trim.



B21 039

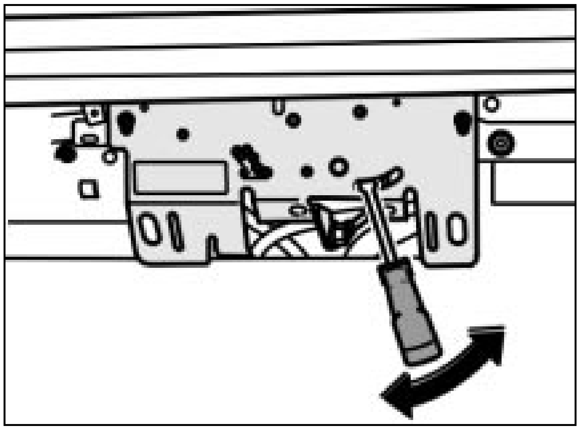
3. Remove both internal hex-head keys from the brackets.



B21 046

4. Insert the internal hex-head keys into the drive shafts **C** of the electric motors.
5. **Push** both internal hex-head keys into the drive shafts, **keep them pushed and turn simultaneously to the right.**
   Continue to turn until the glass roof panel is closed.
6. Remove internal hex-head keys. Install rear compartment trim.

Folding Rear Window Emergency Unlocking



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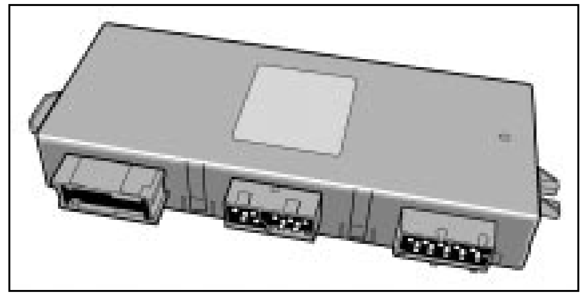
1. Remove rear compartment trim by pulling forward.
2. With the aid of a screwdriver push the lock on the closing aid to the outside.

Rear Windshield Wiper (M-No.)

A rear windshield wiper is available as individual equipment, whose mount is integrated in the rear window and which is connected by a plug connector with the drive motor in the rear center section.

When the folding rear window is opened the Targa roof control module interrupts the windshield wiper control signal.

Control Module Targa Roof



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In conjunction with two roof drive motors, a sun screen motor and an electromechanical closing aid, the control module allows the glass roof panel, the sun screen and the folding rear window to be opened and closed.

The control module interrupts the control signal to the rear wiper motor when the folding rear window is opened.

Additional Functions:

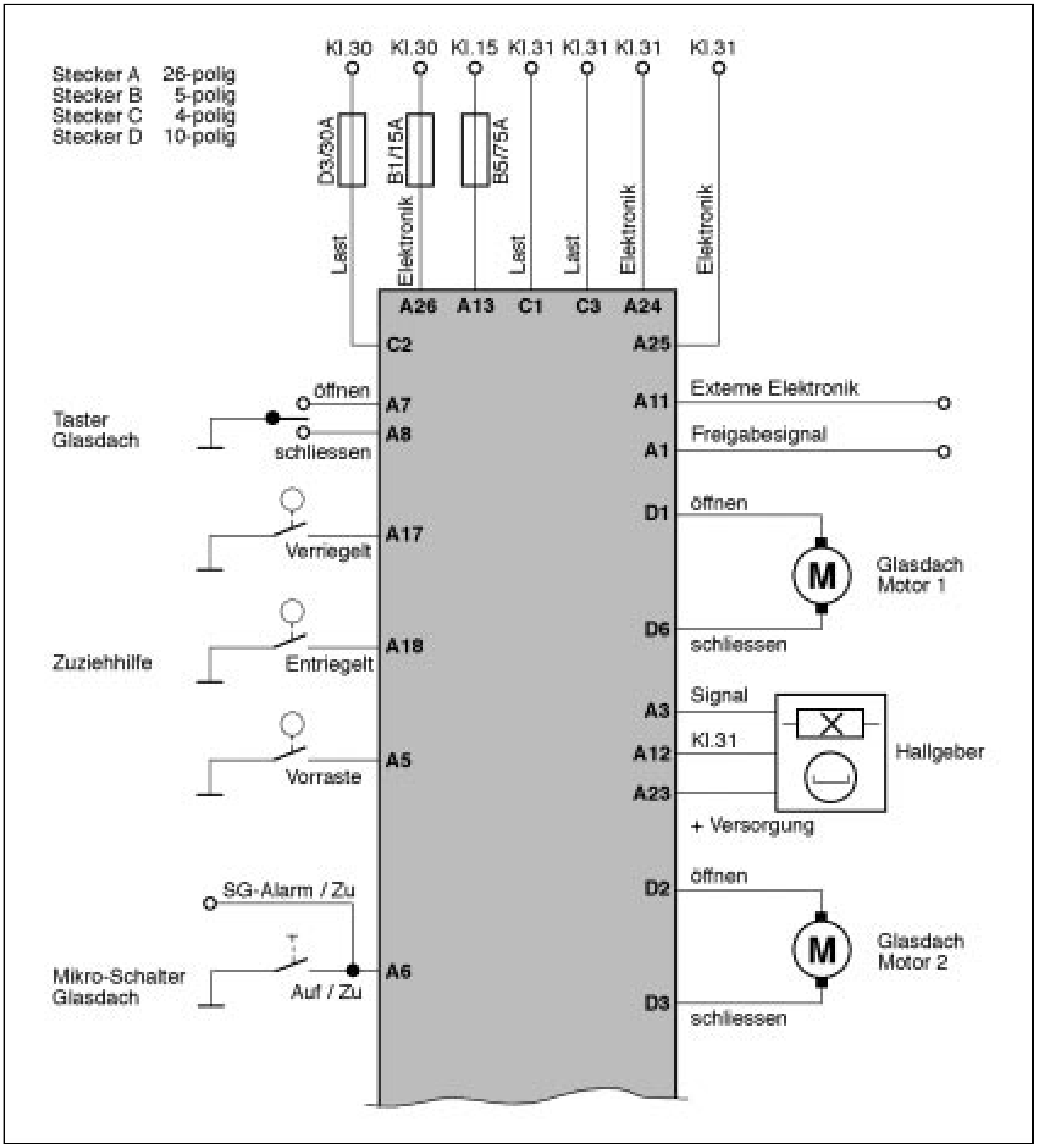
Acquisition and processing of inputs and actuation of drive units.

Interruption, resumption and reversal of movement is possible from any position.

Motor currents are switched off in the event of a malfunction after a preset lockup time.

The control module is in Sleep mode at terminal 30. It is activated through terminal 15, enable signal or external electronic signal.

Targa Roof Control Module (Schematic Wiring Diagram 1)



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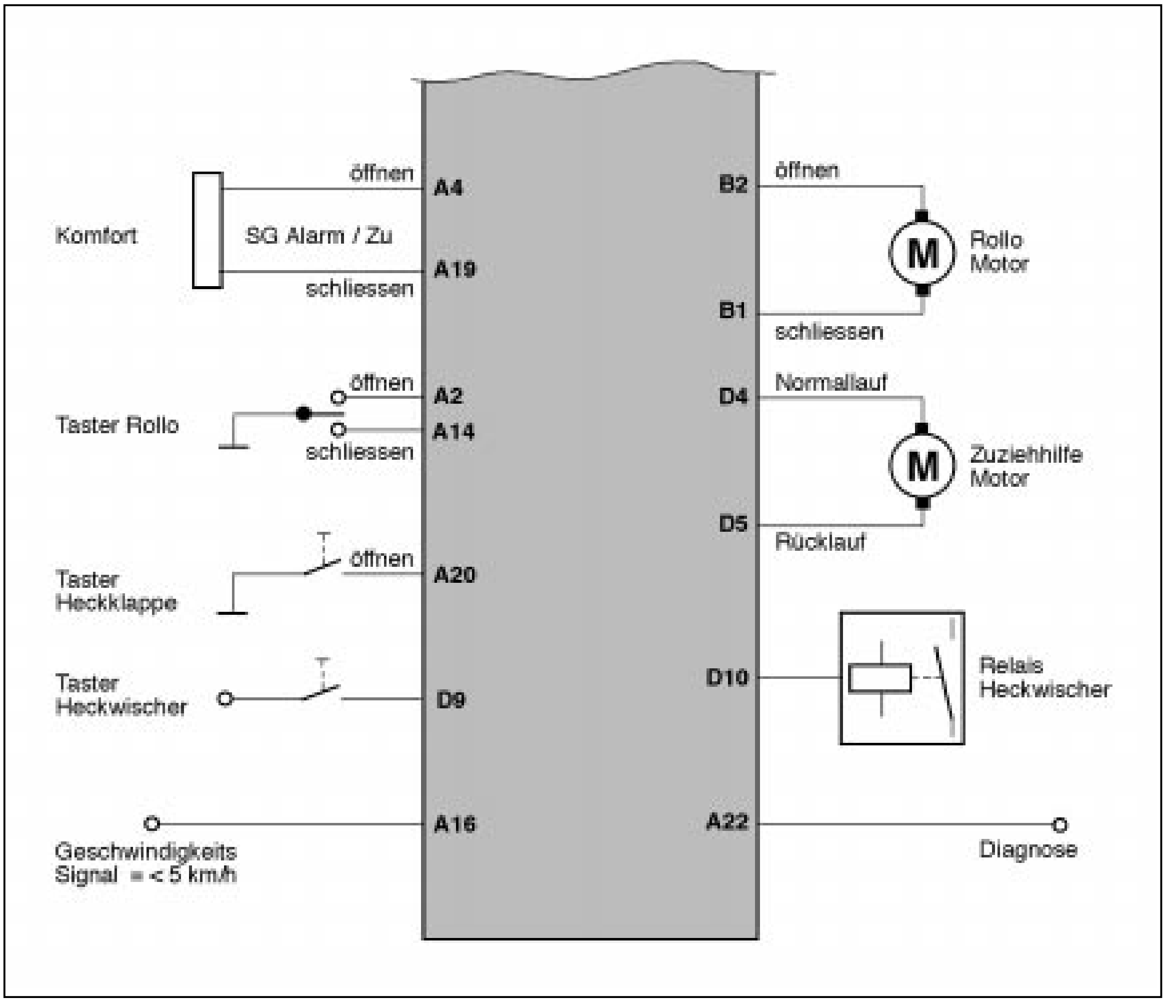
Targa Roof Control Module (Schematic Wiring Diagram 2)



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Diagnosis

Diagnosis is carried out with the "Porsche System Tester 2."

The following functions are available:

- Identification
- Trouble code memory
- Deleting trouble code memory
- Current readings
- Switch inputs
- Actuators

121 different potential errors can be saved and read out in the trouble code memory.

Complete diagnostic description can be found in the Technical Manual "Group 0, Diagnosis, Part 2".

Porsche Cars North America, Inc.

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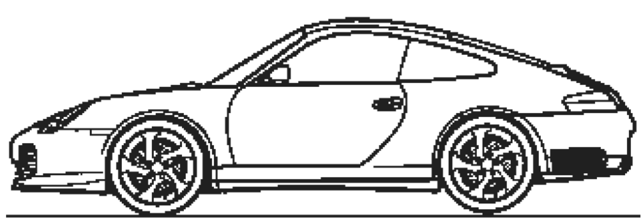
Service Information
Technik

2002

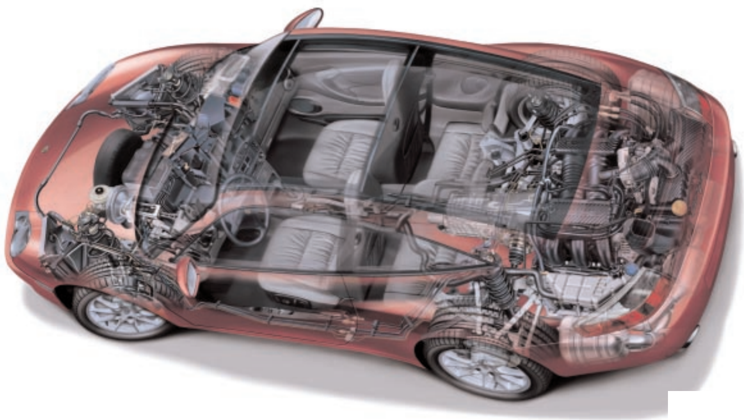


911 Carrera 4S

Foreword

In addition to the vehicles described in the Service Information Technical Brochure (WKD 488 4XX), the 911 Targa and the 911 Carrera 4S are offered in the 2002 model year. Only the new features and/or changes to these vehicles are described in this Service Information Technical Brochure.

The engine, power train, basic running gear, body and interior of the 911 Targa is the same as the base 911 Coupé.



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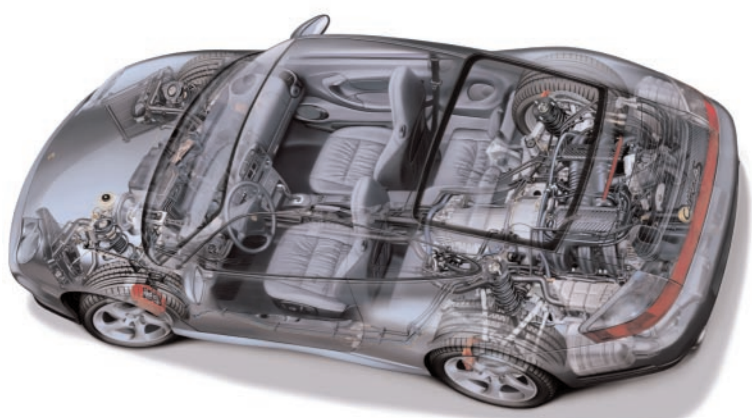
The power train, basic running gear, body and interior of the 911 Carrera 4S are based on the 911 Turbo, however, it is equipped with the normally aspirated 3.6 liter engine.



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Note

Dimensions and adjustments, torque values and fluid capacities can be found in the Technical Manual.
The contents of the brochure are accurate as of October 2001.

Contents

911 Carrera 4S

4 Chassis and Suspension

General

The 911 Carrera 4S receives most of its suspension components and its brake system from the 911 Turbo. Like the 911 Turbo, the 911 Carrera 4S sits 10 mm lower than the standard 911 models.

Only the changes compared with the 911 Turbo for the 2002 model year are described in this section.

Front Suspension

4_11_02

4085 Strut

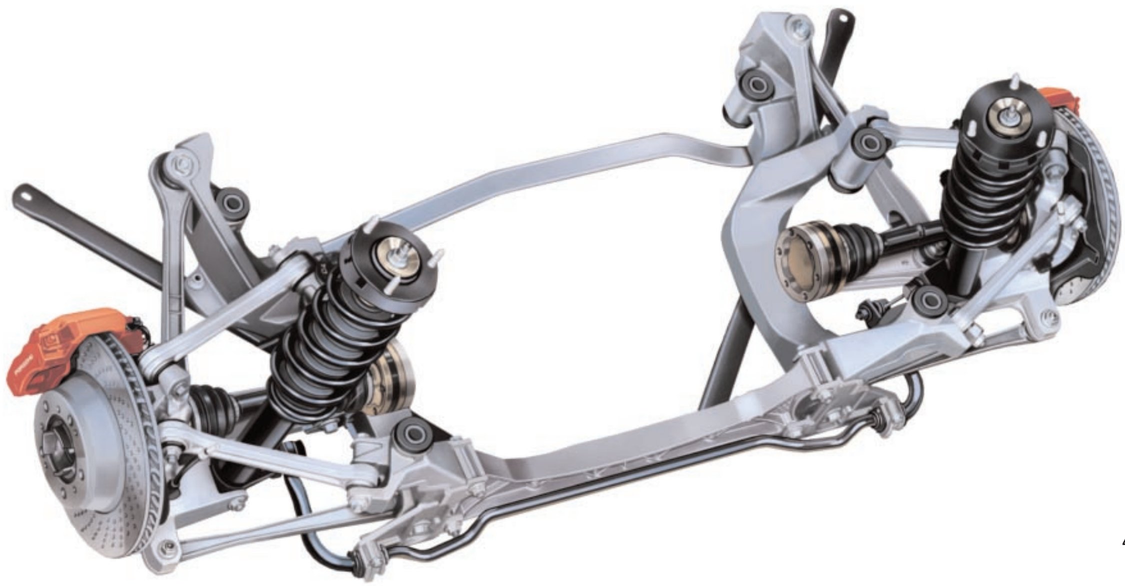
The strut was carried over as a unit from the 911 Turbo, but the springs and shock absorbers were modified to suit vehicle height and weight.

The springs are identified with colored markings to distinguish the different vehicle versions.

4879 Sway bar

The sway bar was carried over from the 911 Carrera with the sport suspension.

Rear Suspension



4_12_02

4285 Strut

The springs and twin-tube gas-pressure shock absorbers are modified to suit vehicle height and weight.

The springs are identified with colored markings to distinguish the different vehicle versions.

4290 Sway Bar

The sway bar is carried over from the 911 Carrera Coupé.

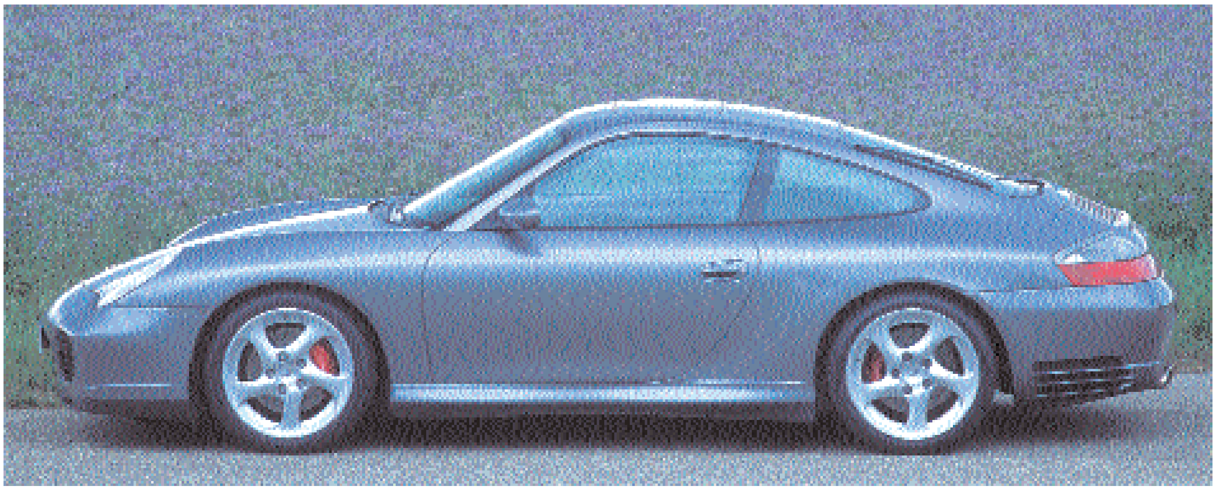
4206 Cross Member

The light alloy cross member from the 911 GT2 is used.

5 Body

General

The wide Turbo bodywork was carried over for the 911 Carrera 4S without the side air inlets for charge air intercooling. The lower rocker panels are also the same as the Turbo version. The integrated rear spoiler is from the 911 Carrera.



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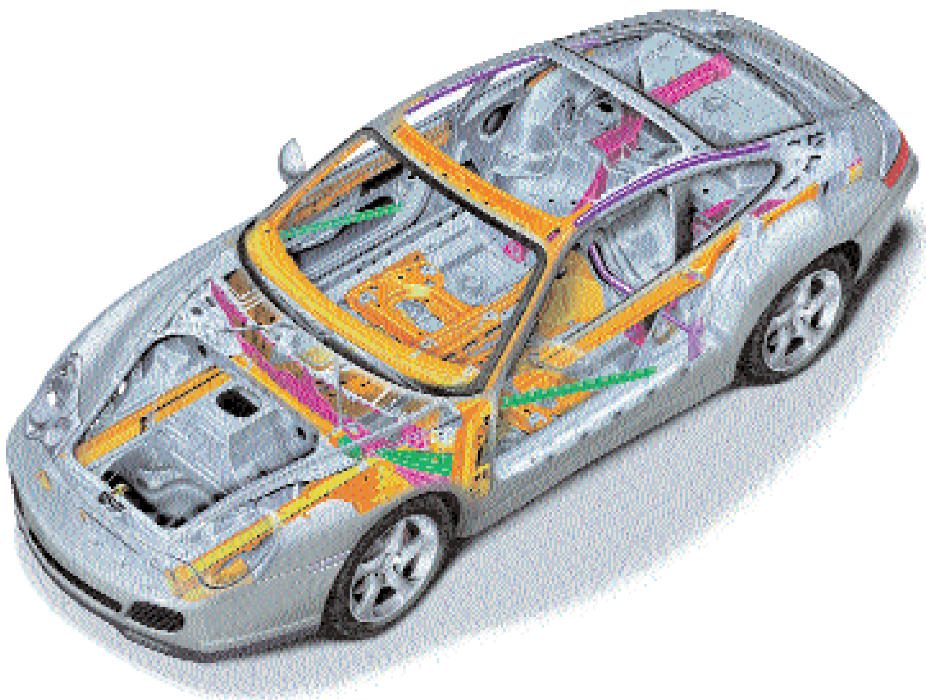
Bodyshell

The bodyshell is the same as that of the 911 Turbo. The side air intakes which the Turbo needs to supply the charge air intercooler are not used. The rear quarter sections are wider by a total of 65 mm compared with the 911 Carrera.

In addition, the internal charge air ducts and the matching openings in the rear wheel well are gone. The rear center section with the third brake light was modified to match the Turbo rear quarter sections.

The increase in width necessitates a new hinge location for the trunk lid with corresponding modification of the sealing channel, close-out panel and cross member.

The body location of the engine mounts is the same as that of the 911 Carrera, the location of the transmission mounts is the same as that of the 911 Turbo.



5_14_02

6 Body-Equipment, Exterior

6315 Front Trim

The front trim from the 911 Turbo leads off the 911 Carrera 4S. A lip spoiler which is raised in the center, controls aerodynamic lift at the front suspension so that a balance of front and rear lift forces is achieved for optimal handling.

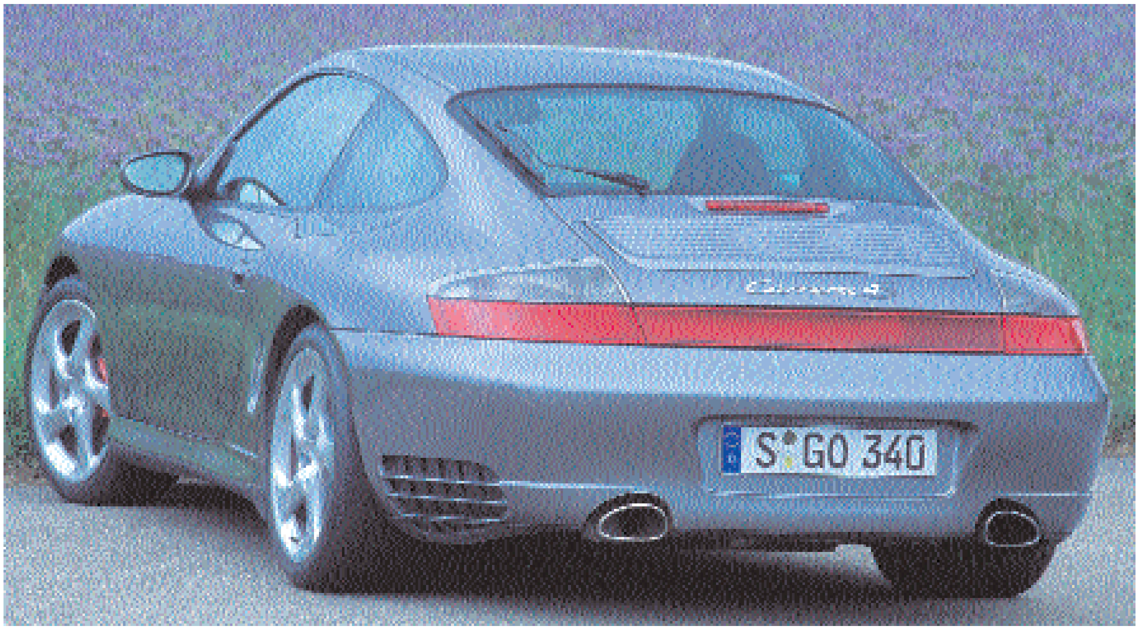
In place of the center radiator used in the 911 Turbo, a perforated grille opening with an exhaust air vent is used.

6_39_02

6355 Rear Trim

The rear trim is based on that of the 911 Turbo. However, the center heat shield and the heat shield bracket were modified to fit the different contours and specifications of the 3.6 liter engine.

The air outlet consists of a louvered grille opening and provides air extraction for heat given off from the exhaust system.



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Rear Trim with US Specification Impact Absorbers (US only)

The new USA/CDN 911 Carrera 4S has the required impact absorbers only at the rear. This version is identical to that of the 911 Turbo in the form of two additional black rubber inserts which are mounted in the license plate recess in the rear trim.

6656 Engine Compartment Lid

The engine compartment lid of the 911 Carrera 4S consists of an inner and an outer skin which are manufactured in two separate SMC (Sheet Molding Compound) press tools and then bonded together. The engine compartment lid is made using reinforced fiberglass technology to save weight and to implement the desired design.

Design changes to accommodate the rear quarter sections and the rear lights carried over from the 911 Turbo, require a new location for the engine compartment lid hinges and new mounting points, and stops for the gas-pressure struts. The automatically extendable composite rear spoiler, which is integrated into the engine compartment lid, is a carry over part from the 911 Carrera.

Light Strip

The light strip is a filler panel integrated into the engine compartment lid and visually links the rear lights. Because of the limited space available and the restricted depth, the strip is only 5 mm thick.

The part consists of two components. A black ABS composite (acrylonitrile-butadiene-stryrole) base is mounted to the deck lid. A red-colored PMMA lens (polymethyl-metha-acrylic), which is painted silver on the back, is the visible component. Both parts are laser-welded together after they have been injection-molded and painted.

6_41_02

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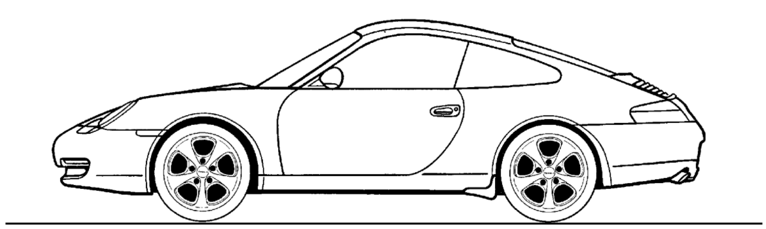
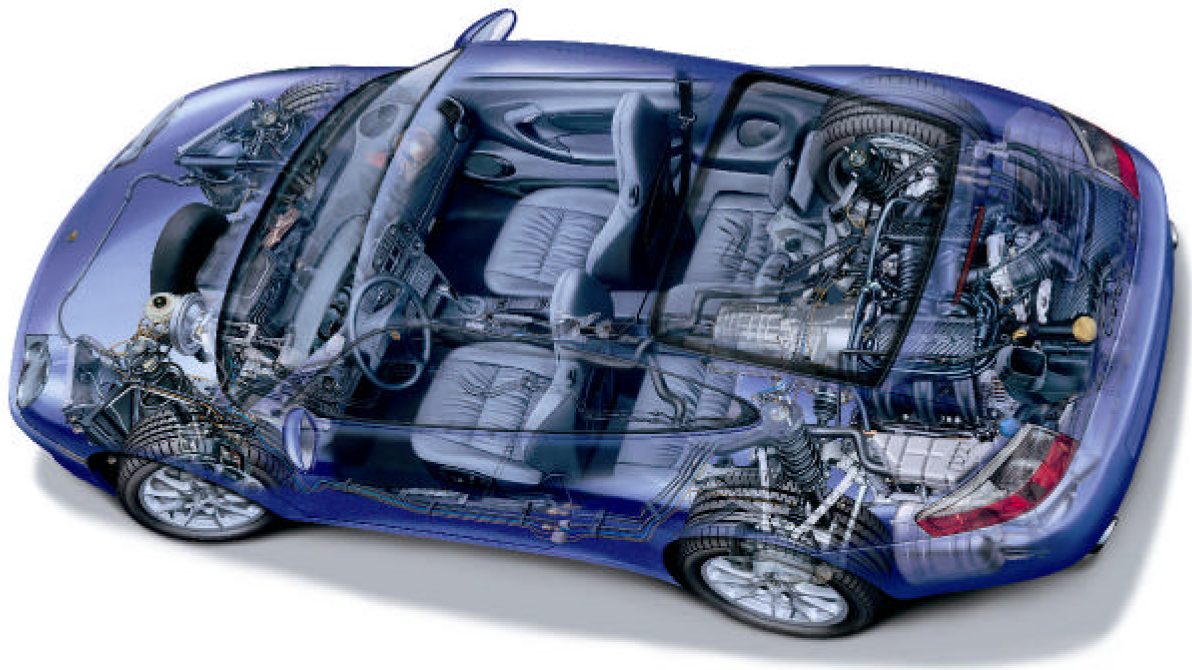
Technical Service Information

2002



911 Carrera, 911 Carrera 4, 911 Turbo, 911 GT2

Foreword



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This Technical Service Information brochure describes the new features and modifications implemented in the new 911 Carrera, 911 Carrera 4, and the 911 Turbo and 911 GT2.
In order to be able to assign the content on the individual pages to specific vehicles, the car types are given in the headings.

Note

Measured values, adjustment values, torques and filling capacities can be found in the Technical Manual.

The contents of the brochure correspond to the status as of August 2001.

Contents

1 Engine 911 Carrera/911 Carrera 4

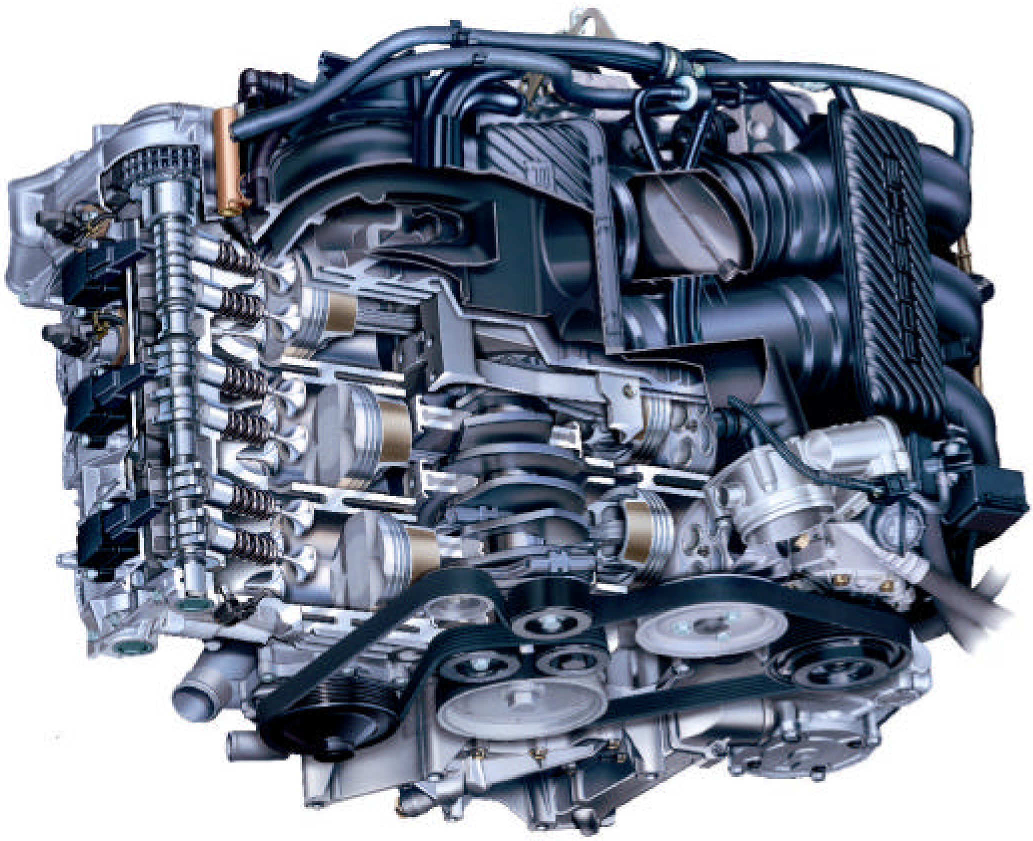
Engine M 96/03

General

The engine for the 911 Carrera in model year 2002 is a further development of the previous engine.
During the development of this engine, particular attention was directed at reducing fuel consumption while simultaneously increasing engine performance and torque.

Summary of modifications:

? Crankshaft - bearings and stroke
? Crankcase
? Pistons with Graphal coating
? Valve gear
? Cylinder head
? Valve stroke control on intake side with axial variable camshaft timing (VarioCam Plus)



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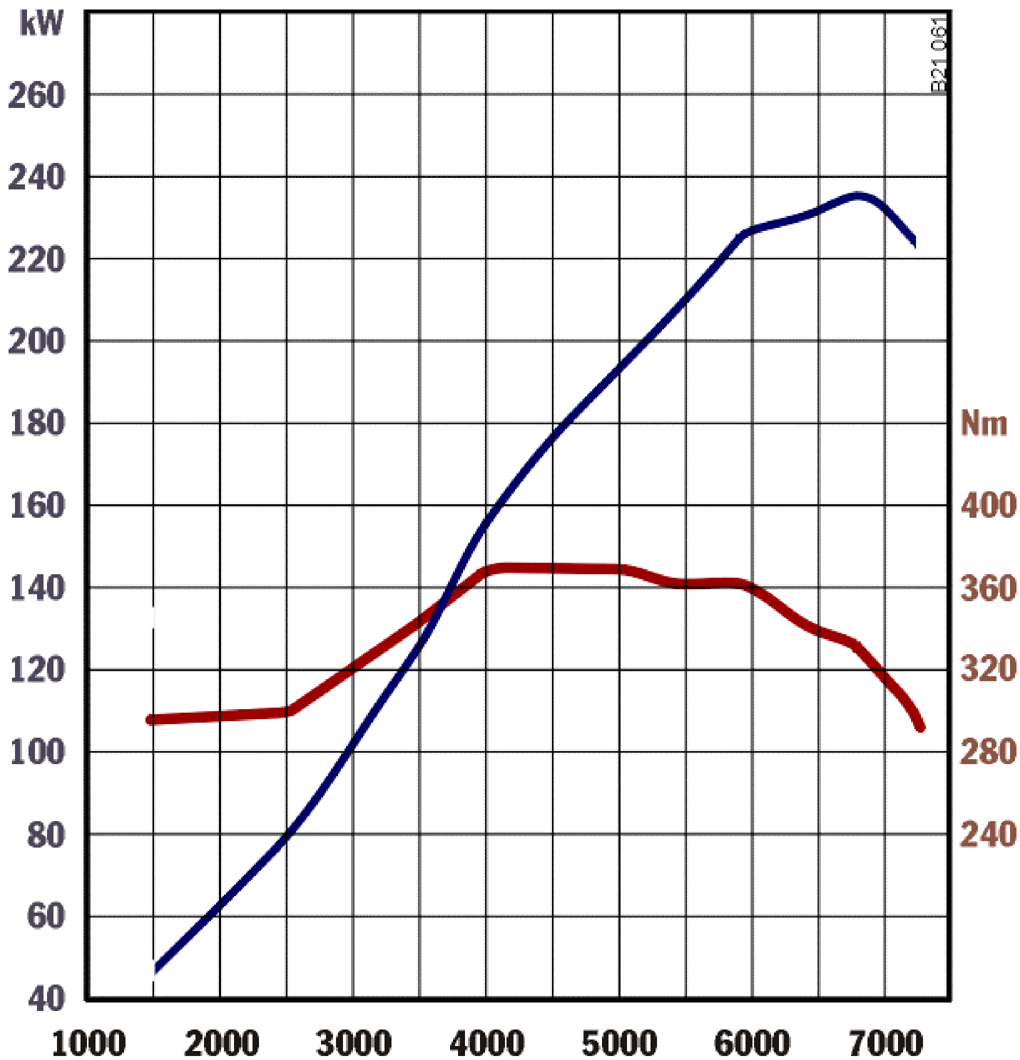
Full-load curves



Most important data at a glance:

Displacement	3596 cm³
Bore	96 mm
Stroke	82.8 mm
Power output	235 kW (320 hp)
at engine speed	6800 rpm

Max. torque	370 Nm
at engine speed	4250 rpm
Compression ratio	11.3 : 1
Governed speed	7300 rpm
Fuel grade	98 RON/88 MON (unleaded premium plus)

1010 Crankcase

The constructional design of the four-part crankcase with separate bearing sleeve and LOKASIL cylinder sleeves, along with the 96 mm bore was retained.
To reduce pump losses in the crankcase, the lower ends of the cylinder sleeves (see arrow) were provided with arches which allow a low-loss circulation of gasses in the crankcase. This reduces the ventilation losses and consequently the power losses at higher engine speeds thereby increasing the overall power in this engine speed range.

1_9_02

The crankshaft bearings were modified due to the displacement increase and subsequent increase of power unit loading. The bearing diameter was increased from 60 to 63 mm, the lubricating-oil feed optimised by partial grooving.

1348 Crankshaft

The stroke of the drop-forged crankshaft was increased from 78 mm to 82.8 mm. The crankshaft journals were also thickened to 63 mm.

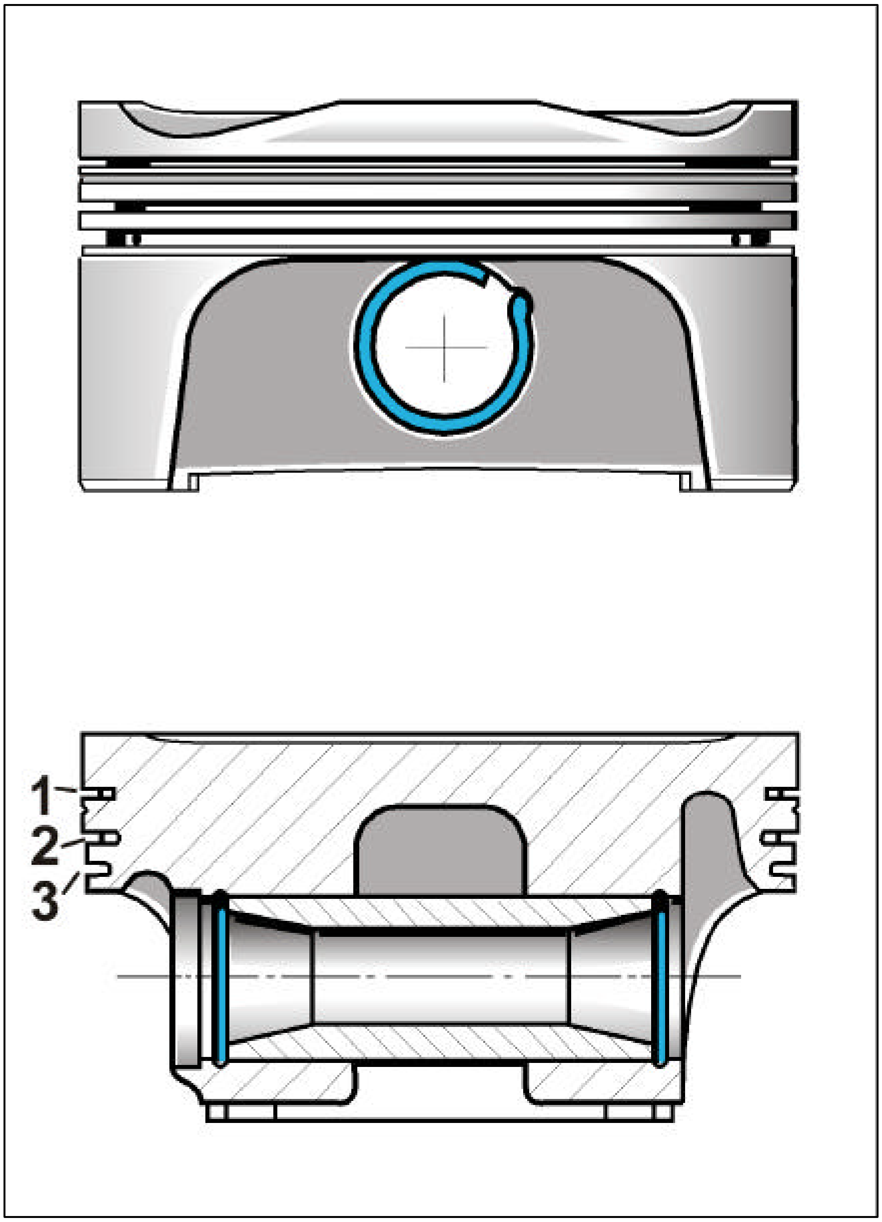
1340 Connecting rods

Because of the altered stroke, the forged and cracked connecting rods were shortened by
3 mm and have now a length of 142 mm (measured from respective bore centre).

1310 Pistons

The moulded light-alloy pistons have a diameter of 96 mm. The pistons are Graphal coated for acoustic reasons. The piston pin is on a fully-floating bearing and lubrication is via oil spray.

The piston-pin circlip is twist-locked and must be fitted in the installation position as shown in the drawing.



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1 - Rectangular compression ring
2 - Stepped taper-face ring
3 - ST band oil scraper ring

1570 Cylinder head

The introduction of VarioCam Plus necessitated a new design of the cylinder head and the camshaft control.
As in the previous model the cylinder head is in three parts, consisting of basic cylinder head, bucket tappet guide housing and cylinder head cover. The oil protection tubes are now part of the bucket tappet guide housing and are sealed at the cylinder head cover side with fitted sealing rings.
The valve springs of the exhaust valves are single valve springs and of tapered design, the intake valves are designed as a double valve spring set due to the increased forces.
For immediate lubrication of tappets when starting engine, the bucket tappet housing is provided with oil chambers on the intake side.

1571 Cylinder head gasket

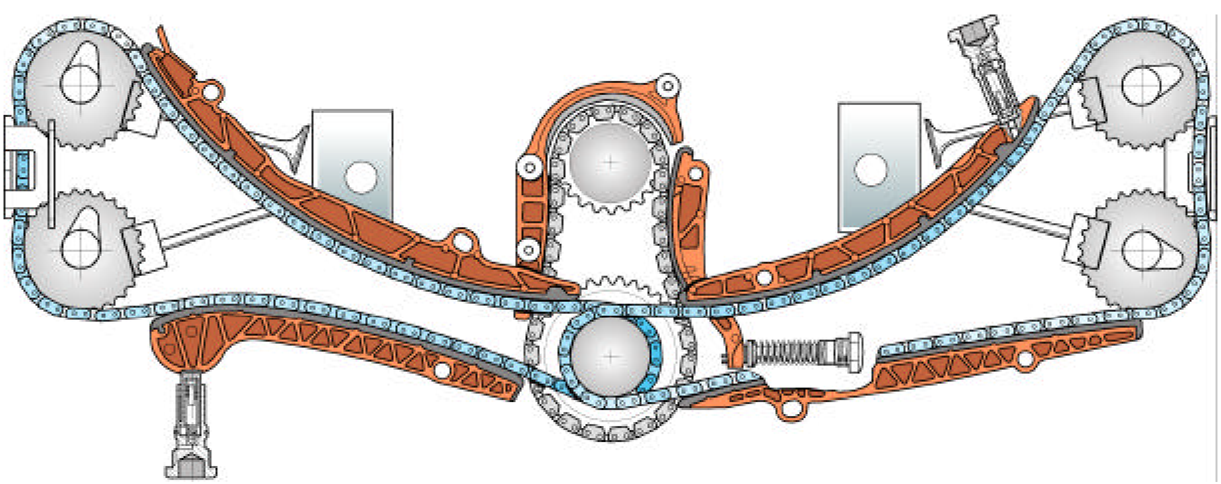
The multi-layer steel gasket is covered with high-temperature-resistant plastic in order to enhance the sealing quality of its surface.
The advantage of this steel gasket is that heat can be dissipated from the cylinder head very efficiently.

15 Chain drive

A separate intake and exhaust camshaft is used for each cylinder bank. These camshafts are driven directly by a double roller chain. The chains are guided by plastic guide rails and hydraulic chain tensioners located at the untensioned end of the chain.
The intake camshafts in the new 911 Carrera also have a valve stroke control on the intake side in addition to the VarioCam Plus system (the system is described in a separate section). The respective solenoid valves are fitted in the cylinder head.
This optimises the compromise between maximum power output and maximum torque while simultaneously reducing fuel consumption and improving running smoothness of the engine.
A driving flange for the oil suction pump is attached on the input side of each exhaust camshaft.

1505 Camshafts

The camshafts are hard-chilled components and hollow-cast to reduce weight. The shank diameter of all camshafts is 26 mm.
The intake valve stroke is variable (3.0 mm or 10.0 mm).



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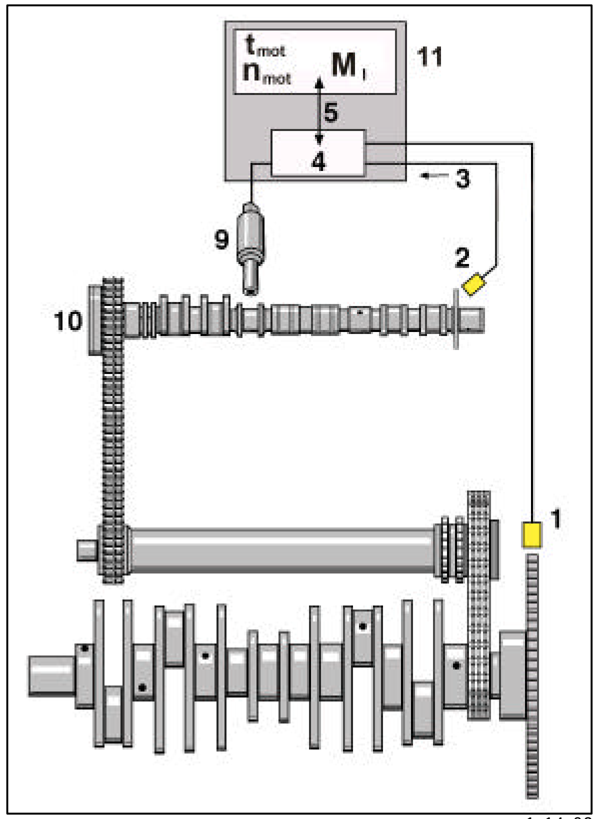
1584 Variable camshaft timing with valve stroke control (VarioCam Plus)

The demands placed on the design of an engine, i.e. increased performance, improved driving comfort, observance of legal emission limits and reduced fuel consumption, result in contradictory construction criteria.
The idea behind the development of the VarioCam Plus was to create a variable engine which can be optimised both for maximum performance and for frequent use in urban traffic or on main roads.
A system to adjust the intake camshaft to vary the opening and closing time combined with a valve stroke adjustment system is the solution to this problem.



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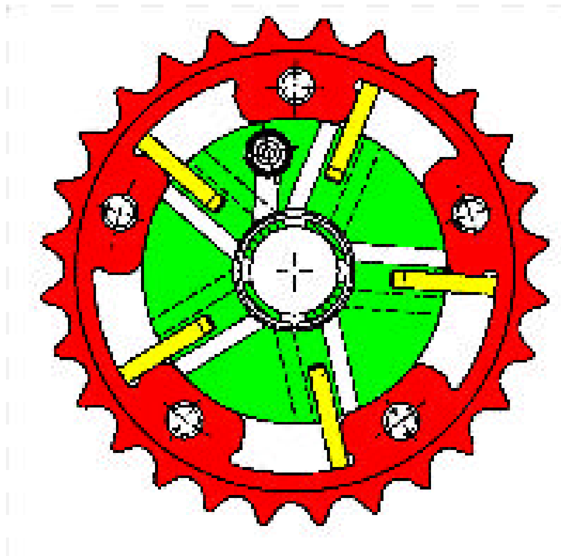
1 - Speed sensor-
2 - Hall sensor
3 - Camshaft actual angle
4 - Camshaft control
5 - Desired angle
t_{mot} - Engine temperature
M_l - Engine load
N - Engine speed
9 - 4-way proportioning valve
10 - Control element for camshaft

1580 Control element for camshaft

The camshaft adjuster is based on the principle of a vane cell adjuster. The control unit determines the current position of the camshaft in relation to the crankshaft (actual angle) using the engine speed and hall sensor signal.
The position control in the control unit receives the desired angle via the programmed map values (engine speed, load, engine temperature). If the desired angle and actual angle differ, a controller in the Motronic actuates the 4-way proportioning valve to the desired position.

Vane cell adjuster

The vane cell adjuster mainly consists of the stator (red, above the chain sprocket, crankshaft-fixed), the rotor (green, camshaft-fixed) and the inserted vanes (yellow, inserted in rotor) and two covers. The stator is fitted with the chain sprocket on the outer diameter. It interlocks with the crankshaft via the chain drive. The rotor is securely bolted to the camshaft. Repositioning between rotor and stator is possible (inner bearing of adjuster). This repositioning is limited by the vanes inserted into the rotor and by the stops on the stator. The vanes also split the recesses on the stator into two chambers each. These chambers can be filled with oil via oil holes and oil guides in the rotor. To ensure efficient sealing, small springs are fitted between vanes and rotor. The chambers are each sealed laterally by a chain sprocket fixed cover. The adjuster is locked at a stop (retard stop).
For this a spring-loaded pin in the retard stop of the adjuster moves into a hole in the cover. This creates a interlocking connection between the stator and rotor during the engine starting process. Noise during this oil-pressure-free period is avoided by this locking process.



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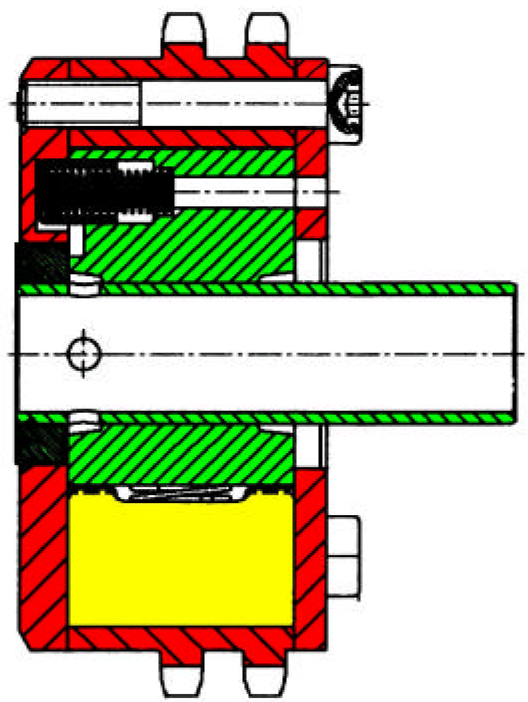

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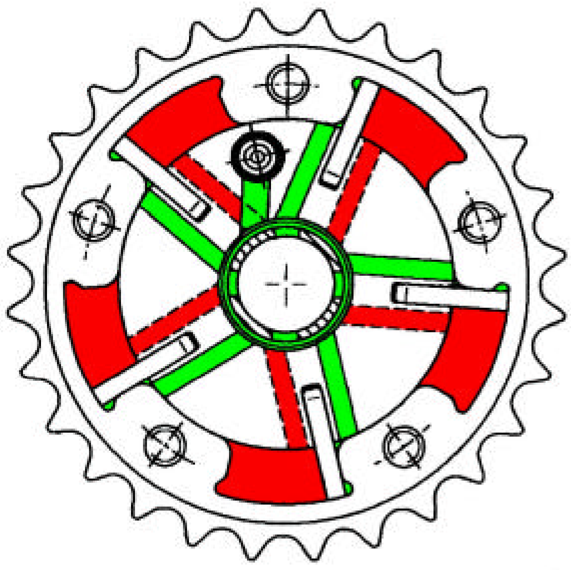

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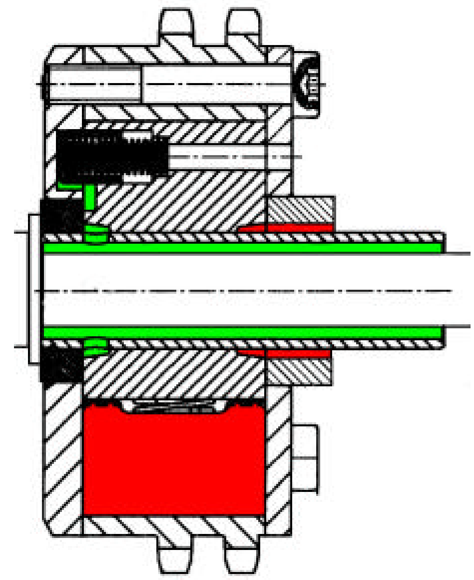

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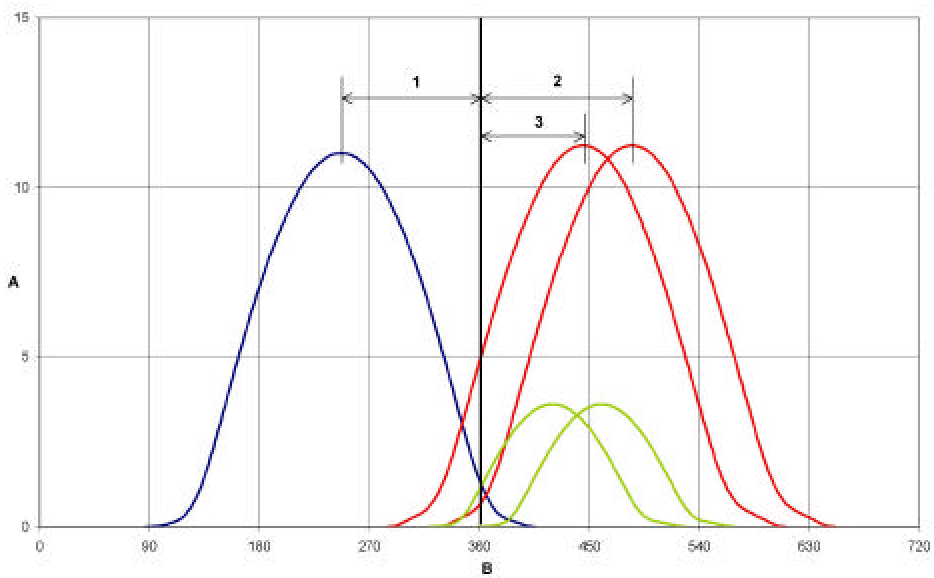
In the adjuster, two chamber types with differing directions of action are employed. Filling one chamber type causes rotation of the rotor against the stator. Filling the other chamber type, the rotor and with it the camshaft can be returned to its initial position. The oil of the non-pressur ised chamber returns via the 4-way proportioning valve back into the crankcase.

If during the filling of a chamber the oil supply and the oil return flow at the 4-way proportioning valve is interrupted (centre position of valve), the adjuster remains in the currently assumed position. The chambers lose oil through leakage and the adjuster leaves its position. The 4-way proportioning valve is activated accordingly via the control unit and the adjuster returns to the desired position.

Shifting options of VarioCam Plus system



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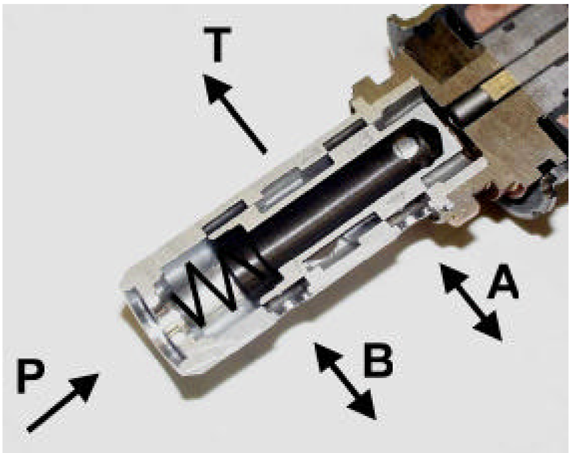
A - Cam stroke in mm
B - °Crank angle

1 - Exhaust medium
2 - Intake medium, retard
3 - Intake medium, advanced

Solenoid hydraulic valve

The solenoid hydraulic valve is designed as a 4-way proportioning valve and depending on the control unit command, connects one of the two control lines (A/B) with the oil pressure feed line (P) and also opens the other line to allow the oil to flow out into the crankcase (T-line) If the A-line is pressurised with oil, the adjuster is turned in the advanced direction. If the B-line is pressurised with oil, the adjuster is turned in the retard valve timing direction. In the centre position, both control lines are closed. The camshaft is held in the desired position.
Furthermore, any intermediate position in between the three switch positions described above is adjustable via the control unit. This not only allows for very rapid processing of the adjustment position, but also very slow processing with minor valve deviations from the centre position.

The 4-way proportioning valve therefore determines the adjustment direction and the adjustment speed of the adjuster.



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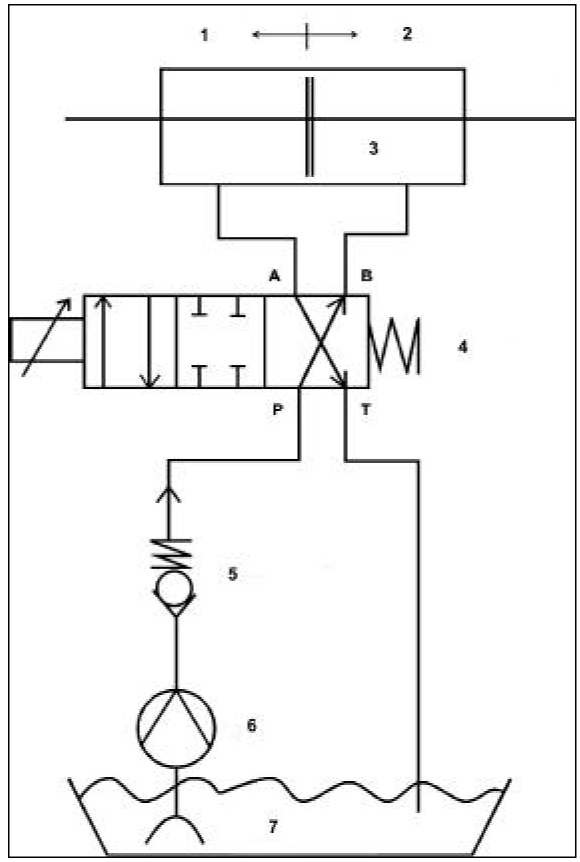
Non-return valve

Due to the valve operation, the camshaft requires a high drive torque at times, at other times the camshaft runs independently (changer-over torque). If a non-return valve is operated in the P-line and the 4-way valve is energised (adjustment in advanced valve timing direction), the adjuster, with the camshaft running on, independently draws oil via the feed line, the 4-way proportioning valve and the non-return valve. If the camshaft then stays behind due to the high drive torque, the non-return valve closes and the oil cannot escape. During this period, the camshaft is taken over the oil cushion by the chain sprockets, as when free-wheeling. The advancing and retarding of the camshaft repeats itself, so that the camshaft independently moves progressively towards advanced valve timing. As the above described principle only functions on very leak-tight adjustment systems and low-friction valve gears, oil pressure is required. To avoid the necessity of an extremely large oil pump, the above described principle is exploited, with a hot engine and low engine speed i.e. with low oil pressure, through the use of the non-return valve. The non-return valve is used to increase the adjustment speed at low oil pressures.



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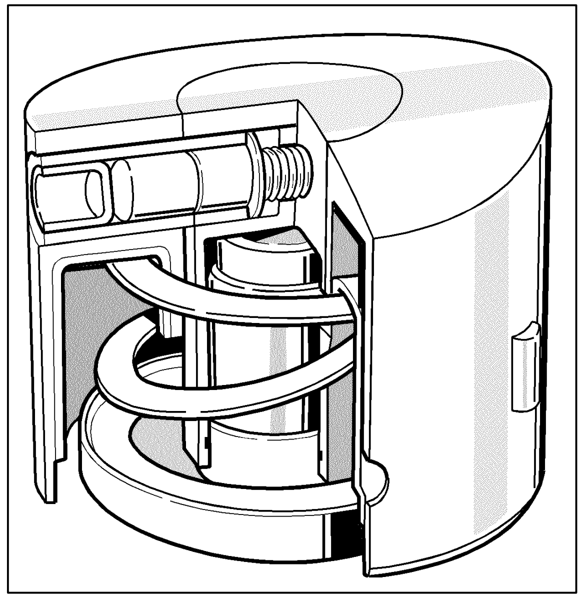
1 - Adjustment direction, retard
2 - Adjustment direction, advance
3 - Camshaft adjuster
4 - 4-way valve
5 - Non-return valve
6 - Oil pump
7 - Oil sump

Functional description of valve stroke adjustment

The valve stroke adjustment system consists of switchable flat-base tappets which are actuated by means of an electrohydraulic 3 / 2-way valve. Since two different cam shapes are used on the camshaft, it is possible to select the different cams (by switching the flat-base tappets) so that their respective valve stroke characteristics act on the engine. These flat-base tappets are mounted on the inlet side of the engine. The flat-base tappets consist of two nested tappets which can be interlocked hydraulically by means of a pin. Once interlocked, the inner tappet comes into contact with the small cam and the outer tappet with the large cam. An element for compensating the valve clearance is always integrated in the power flow of the tappet.



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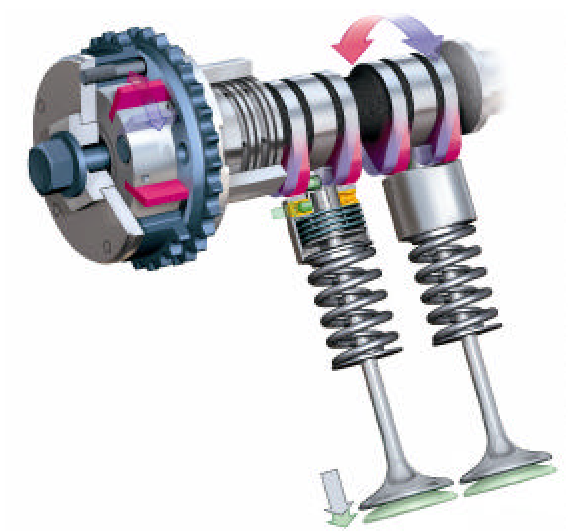
The variable camshaft timing has a variable adjustment range of 0 - 40° kW. The valve stroke control facilitates decreased or increased valve strokes.
When idling or near idling, the engine control is optimised by switching the intake valve stroke to a small cam with 3.6 mm and an adjustment of the valve timing for minor valve overlap. This results in a frictional loss reduction owing to the small valve stroke, decreased charge-exchange losses by extremely decreased opening times and few exhaust fumes from previous combustion in the combustion chamber for an even and rapid combustion. These measures produce a clear reduction in consumption together with noticeably improved idling quality.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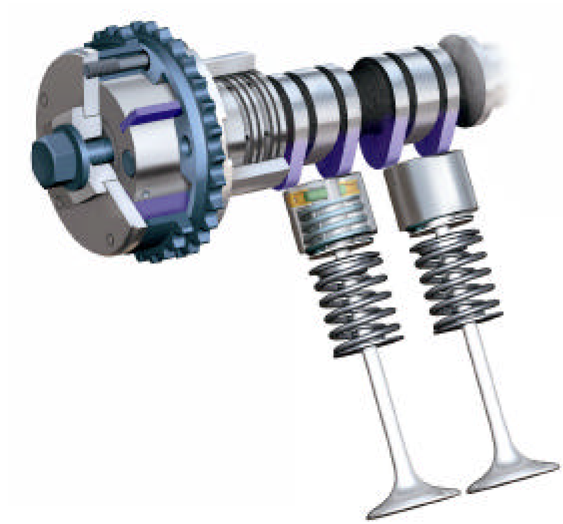
As the valve timing is variable, the decreased valve stroke can be maintained in the partial load range and the valve overlap can be optimised.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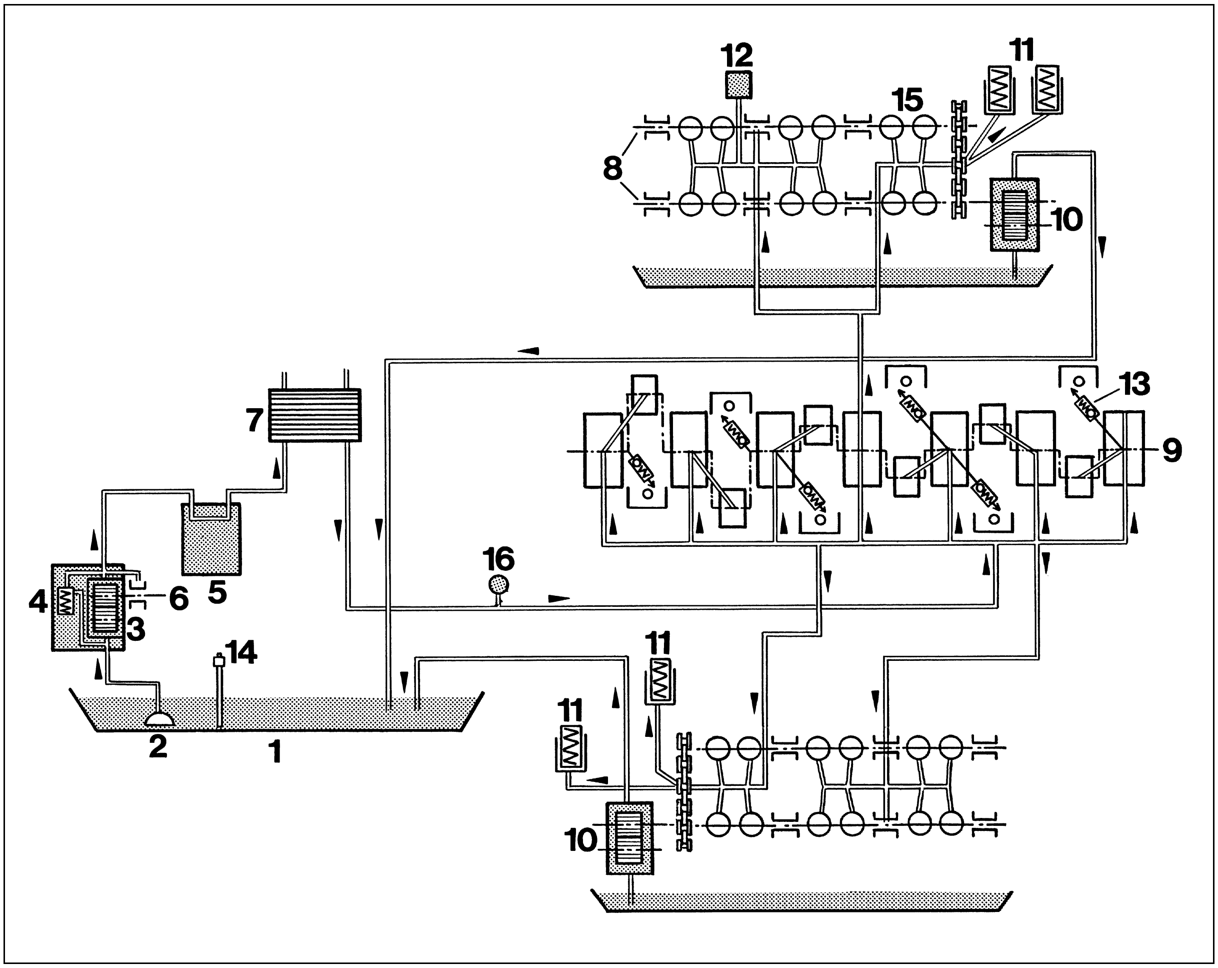
In full-load conditions, a high torque and high peak power output is achieved through low-loss charge exchange process and precision designed cam contour at an intake valve stroke of 11 mm. Furthermore, the opening and closing times of the valve lift are also adjusted towards advanced.

Oil circuit



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1 - Oil sump
2 - Oil intake snorkel
3 - Oil pump
4 - Pressure relief valve
5 - Full-flow oil filter
6 - Intermediate shaft
7 - Oil/water heater exchanger
8 - Camshaft
9 - Crankshaft
10 - Oil return pump
11 - Chain tensioner
12 - Oil pressure sensor
13 - Valves
14 - Oil level probe
15 - Hydraulic valve tappet
16 - Oil temperature sensor

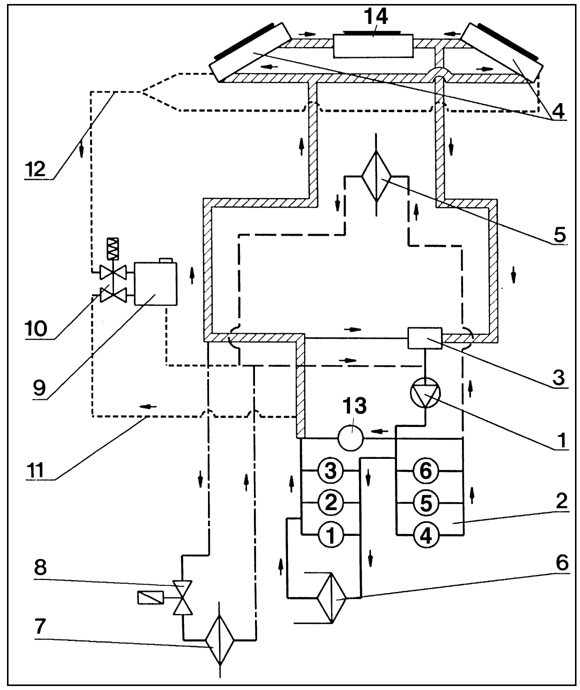
17 Oil supply

To ensure a reliable engine oil supply even during extreme longitudinal and lateral acceleration, the new 911 Carrera also has integral dry sump lubrication (without external oil tank).
By restricting the axial play tolerance of the impellers, the delivery rate of the oil pump has been increased by approx. 5 %.

19 Cooling system

To achieve uniform distribution of coolant for all cylinders, the same principle of cross-flow cooling circuit with fully integrated coolant ducting is used on the new 911 Carrera as was used on the previous model. This prevents temperature differences between the individual cylinders. The coolant is fed through integral lines.
On models with manual transmission, the cooling takes place via two coolers (4). These are fitted in the wings in front of the front wheels. On models with Tiptronic transmission, an additional 3rd cooler (14) is located in the front of the vehicle. This facilitates cooling of the ATF via an additional oil/water heat exchanger in the common water circuit.
To avoid icing up of oil separator at low temperatures, the oil separator is flushed with coolant.
Because of the special coolant, a coolant change on the new 911 Carrera is also not necessary.

Ensure to fill up or top-up only with the coolant specified by Porsche.



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1 - Water pump
2 - Crankcase
3 - Thermostat
4 - Radiator
5 - Heat exchanger, heating
6 - Oil/water heat exchanger
7 - ATF heat exchanger (only Tiptronic)
8 - Electric shut-off valve (only Tiptronic)
9 - Expansion tank
10 - Shut-off valve
11 - Bleeder pipe (engine)
12 - Bleeder pipe (radiator)
13 - Oil separator
14 - Cooler (only Tiptronic)

1 Engine 911 Turbo/GT2

General

No new features or modifications have been implemented in the 911 Turbo engine for model year 2002.
If any new features or modifications are incorporated during the current model year, these will be described in a technical information bulletin.

2 Fuel and ignition system 911 Carrera/911 Carrera 4

General

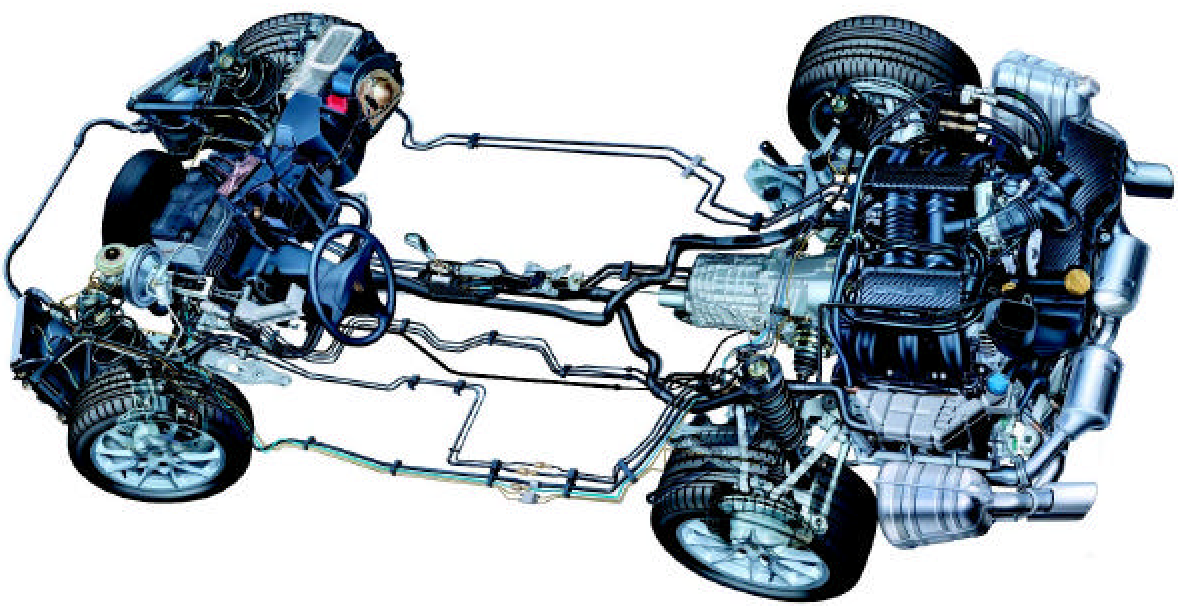
Based on the well known 3.4 l engine, with the displacement increased to 3.6 l for model year 2002.
This displacement increase and the variable valve timing VarioCam Plus, which now has additional valve stroke control (see 911 Turbo 996), the engine power output and torque could be further increased.
The Motronic engine management system ME 7.8 controls the mixture preparation electronically.

Development aims

- Increasing the nominal output from 221 to 235 kW (300 to 320 hp) at 6800 rpm
- Increasing max. torque from 350 to 370 Nm at 4250 rpm
- Lower fuel consumption
- Acoustic optimisation of exhaust system
- Ensuring compliance of all legal emission requirements.

The following technical aspects have been achieved:

- Displacement increase from 3.4 l to 3.6 l by increasing stroke from 78 mm to 82.8 mm
- The fuel system has no return line from engine to fuel tank
- Incorporation of Motronic ME 7.8
- VarioCam Plus with variable camshaft timing and valve stroke control
- Silencer with sound-optimised interior
- New look tail pipes



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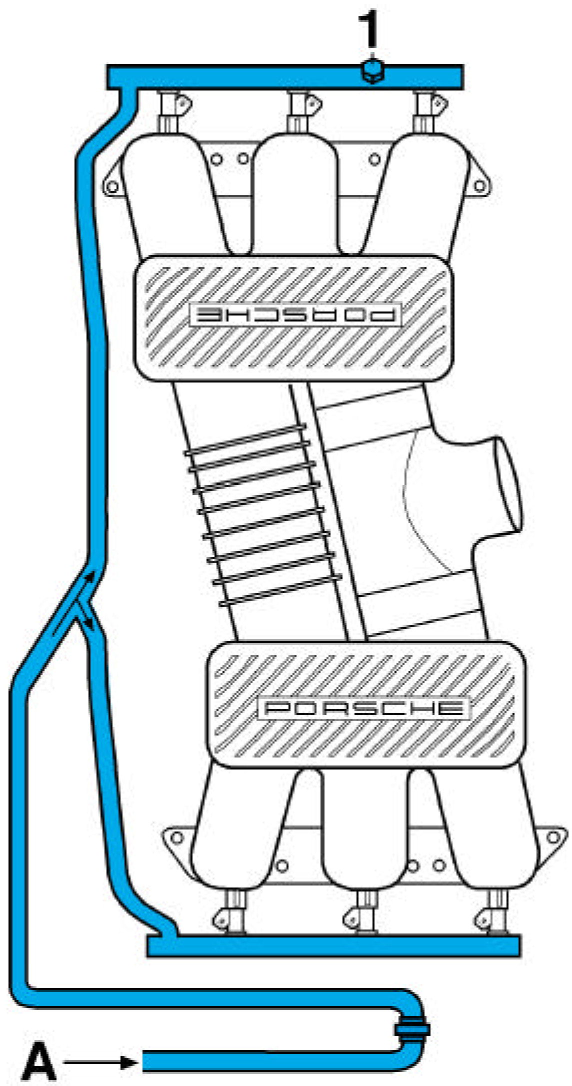
20 Non-return flow fuel supply system (RF)

In the non-return flow fuel supply system (**R**eturnless **F**uelsystem) the fuel pressure regulator and the fuel filter are integral with the fuel tank. Therefore, the fuel return line from the fuel rail in the engine compartment to the fuel tank is not needed. The surplus fuel delivered from the electric fuel pump consequently enters the fuel tank directly from the pressure regulator. Only the fuel quantity injected from the injection valves is delivered to the fuel rail in the engine compartment. Dispensing with the return line has the advantage that no fuel warmed in the engine compartment returns to the fuel tank thereby raising the temperature in the fuel tank. This results in a further decrease in hydrocarbon emissions (HC) in the fuel tank and also less strain on the tank ventilation.
Tasks such as checking fuel pressure, holding pressure and delivery rate of fuel pump and any special tools requirements are described in the Technical Manual.

2070 Control unit for the demand control of fuel delivery rate (EKPSM)

Only Carrera 4 cars for the USA have an additional electronic control unit installed below the fuel tank cover located between the fuel pump relay and the fuel pump.
This allows reduction of the fuel pump delivery rate during low fuel consumption, which also reduces the warming of fuel in the fuel tank. Activation of the electronic fuel pump control module (EKPSM) through the Motronic ME 7.8 is carried out via an earth switched PWN signal with a frequency of 10 Hz. This realises an engine-speed-dependent, two-stage control. Up to approx. 2000 rpm the delivery rate is reduced to approx. 50 l/h. At a higher engine speed the delivery rate is increased to approx. 80 l/h.

Fuel routing in engine compartment



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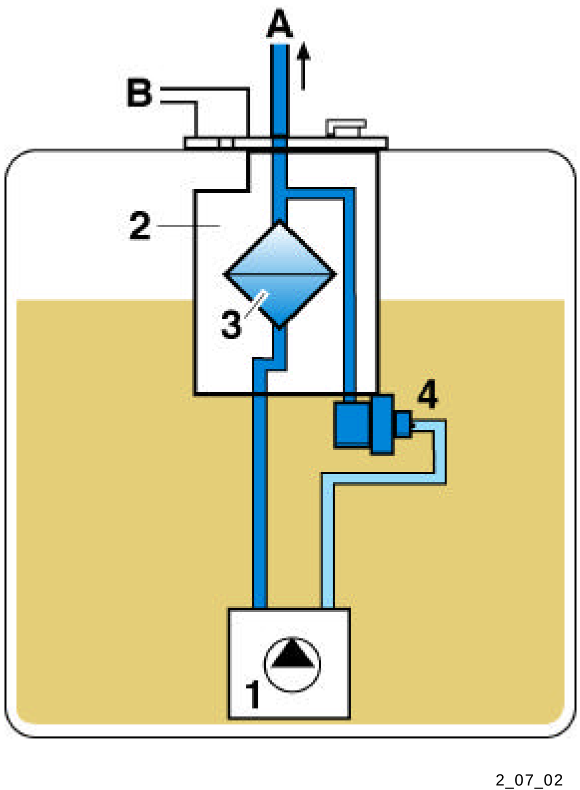
A – Fuel supply (system pressure 3.8 bar)
1 – Connection for pressure test

Functional diagram Carrera

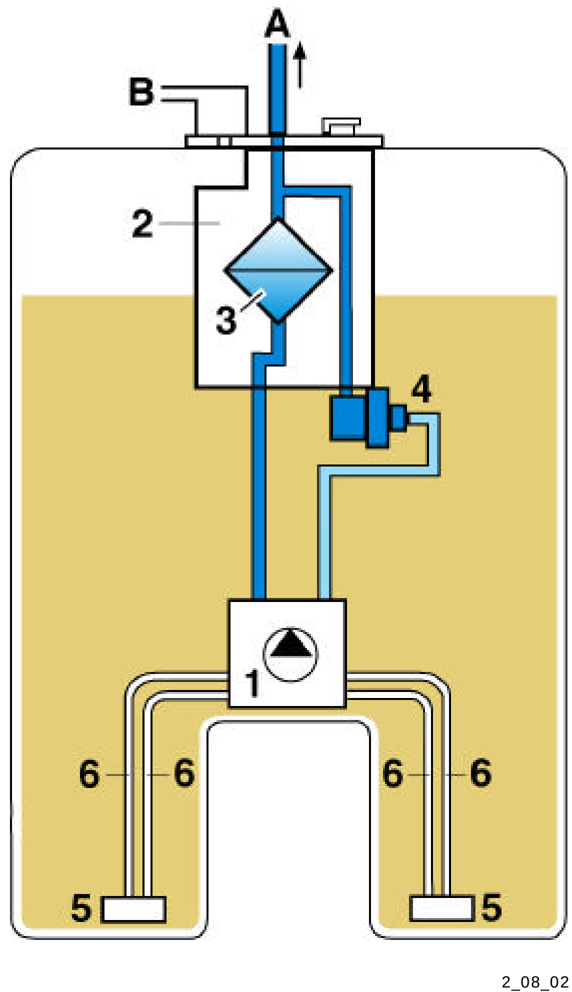


A – Fuel pressure line (3.8 bar)
B – Tank ventilation
1 – Fuel pump
2 – Filter housing
3 – Fuel filter
4 – Pressure regulator

2060 Fuel filter

The fuel filter is integral in the tank unit and no longer requires changing. A reduction in deliver rate can be detected via the mixture adaption.

Functional diagram Carrera 4



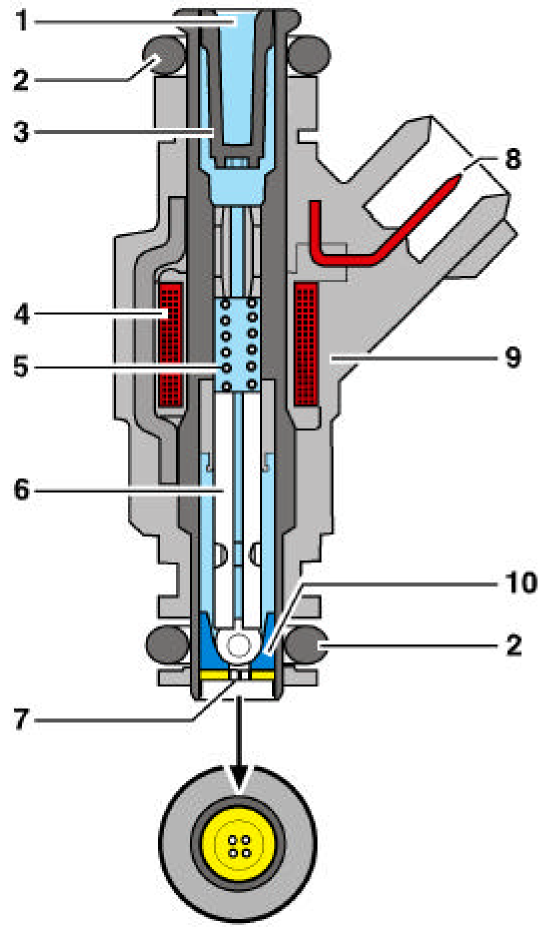
A – Fuel pressure line (3.8 bar)
B – Tank ventilation
1 – Fuel pump
2 – Filter housing
3 – Fuel filter
4 – Pressure regulator
5 – Sucking jet pumps
6 – Lines to and from sucking jet pumps

2458 Fuel-pressure regulator

The fuel pressure regulator is integral in the tank unit and has no connection for the intake-pipe pressure. The fuel pressure is 3.8 bar from idling to full load. The injection rate is then also dependent on the intake-pipe pressure. This is taken into consideration by the Motronic control unit when calculating the injection period.

2440 Injection valve (EV-6)

A feature of this injection valve is its small overall size and low weight. Also on this injection valve, there is very low risk of vapour lock with hot fuel. This makes it very suitable for use on non-return fuel supply systems, as the fuel temperature in the injection valve here is higher compared to systems with return flow.
The atomisation of the fuel is carried out by a spray-hole disk with 4 holes. The punched injection holes achieve high fuel injection rate consistency, as well as insensitivity to fuel deposits. Good valve sealing in the valve seat area is ensured by the cone/ball sealing principle.



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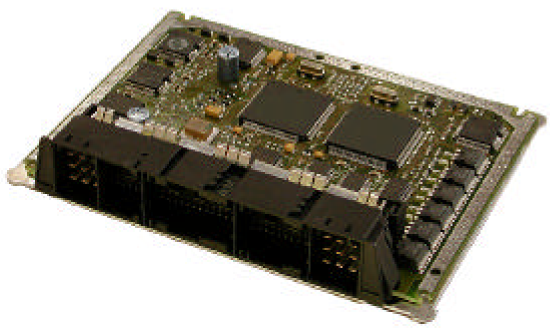
1 – Hydraulic connection
2 – Sealing rings (O-rings)
3 – Filter screen
4 – Coil
5 – Spring
6 – Valve needle with magneto armature and sealing ball
7 – Spray-hole disk (4 hole)
8 – Electric connection
9 – Valve housing
10 – Valve seat

2470 ME 7.8 Motronic engine management system

As of model year 2002, the 911 Carrera is fitted with ME 7.8 Motronic. This Motronic is derived from the 911 Turbo (996) and adapted to the engine-specific requirements (without boost pressure control).



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The ME 7.8 provides the following new functions and components

- Extended diagnosis facilities of the Motronic management system
- On-board diagnosis (wordwide)
- Actuation of continuous closed-loop position control of intake camshafts
- VarioCam Plus control (valve stroke)
- Modified Hall sensor signal
- Oxygen sensor, LSF
- Modified hot film air mass flow sensor HFM-5
- Injection valves EV-6
- Non-return fuel supply system

2470 New diagnosis facilities of ME 7.8 Motronic

- Compared to ME 7.2, the ME 7.8 Motronic as of software version 12.0 of the Porsche System Tester 2, extended diagnosis facilities can by used.
- To protect the converter on vehicles with Tiptronic, the engine speed with vehicle stationary is restricted to approx. 4000 rpm.

Actual values:

- When directly entering the actual values, only a reduced number of actual values are displayed.
- The full range of actual values can be read out via the "Filter" soft key and "All Actual Values".
- The filters can also be selected according to systems or functions, or individual ones can be created via "New" filter.

System check

- Valve stroke control, shorter stroke:
  Unlike on the 911 Turbo (996), with this vehicle the check must be carried out in a workshop, in accordance with instructions of the Porsche System Tester 2.
- Valve stroke control, longer stroke:
  As on the 911 Turbo (996), this test is carried out during a test drive in accordance with instructions of the Porsche System Tester 2.

Actuator activated

- Valve stroke control, cylinder bank 1 and 2:
  In this test, the engine speed must be increased to a value which will be registered on the tester, otherwise the engine will stall.

Control unit programming

Additional functions

? Control unit type:
This checks, if the data status of the control unit is current or not current.

? Saving document field in working protocol:
All completed Motronic control unit programming is shown with vehicle identification number, service number, part number, date and program status.

OBD (EOBD)

World-wide via the on-board diagnosis system (**OBD – USA**) or Europe on-board diagnosis system (**EOBD – Europe / RoW**) the driver is informed by an appropriate warning (Check Engine lamp) in the instrument cluster. The functions are adapted to the different world-wide legal regulations.

2_19_02

? A permanently lit "Check Engine" lamp indicates an emission-related fault

? A flashing "Check Engine" lamp indicates a combustion fault which may damage the catalytic converter

2470 Functions of VarioCam Plus in ME 7.8 Motronic engine management system

Both individual systems of the VarioCam Plus (valve timing and valve stroke) are actuated by the Motronic engine management system

Control of the VarioCam Plus requires as input variables, the engine speed, accelerator pedal position, engine oil temperature, coolant temperature and gear recognition (Tiptronic and manual transmission). The driver's torque and power requirements are compared with the control unit maps and then a decision is made as to whether the VarioCam Plus system has to be switched. The switch-over point is then calculated from these values.

Elements of the following functions run simultaneously during a switch-over process

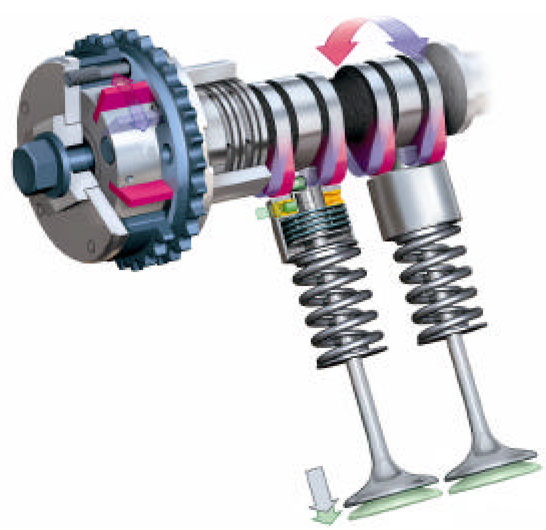
? Throttle valve position (E-gas)

? Mixture formation

? Ignition

? Actuation of solenoid hydraulic valve to adjust valve timing

? Actuation of solenoid hydraulic valve for valve stroke



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1537 Actuation of solenoid hydraulic valve to adjust valve timing

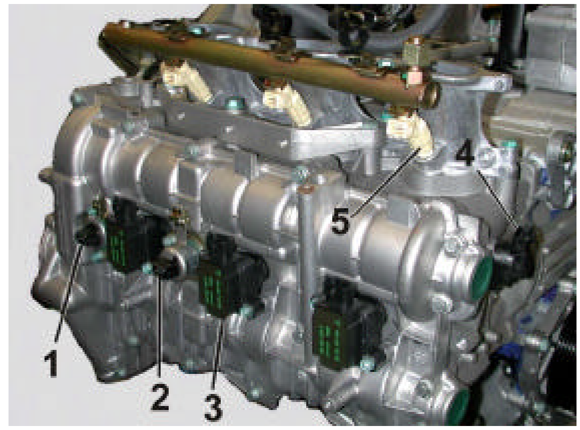
The control unit determines the current position of the intake camshafts in relation to crankshaft (actual angle) using the engine speed signal and Hall sensor signal. The position control in the control unit receives the desired angle via the programmed map values (engine speed, load, engine temperature). If the desired angle and actual angle differ, the control electronics in the control unit actuates the solenoid hydraulic valve to move the control element for inlet camshaft in the desired direction. Actuation of the valve takes place via a pulse-width-modulated square-wave signal. The voltage is switched between 0 volts and 12 volts in 4ms cycles (250 Hz), while the proportion of switch-on and switch-off time is changed. A control current adjusts itself according to this proportion, which sets the piston position in the solenoid hydraulic valve and thereby releases the different oil lines, facilitating an adjustment range of 0 °kW up to approx. 40 °kW.

1555 Valve stroke control on bucket tappets of intake camshafts

The map of the valve stroke control is adapted to the engine-specific requirements.
The valve stroke control facilitates switching of the valve stroke of the intake camshaft from 3.6 mm to 11.0 mm.

2873 Engine speed sensor

The engine speed sensor on the crankshaft detects the engine speed and current position of the crankshaft via 60 – 2 teeth and relays the information to the ME 7.8 control unit.



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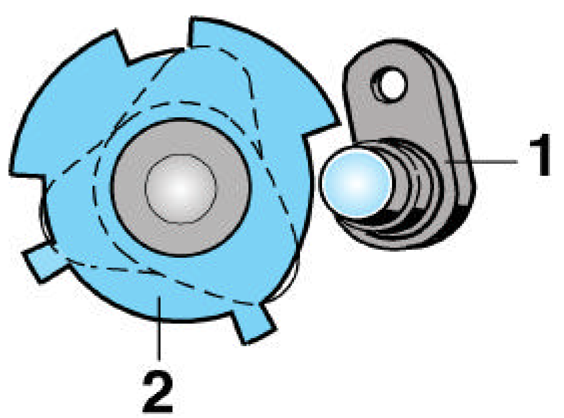
1 – Solenoid hydraulic valve (for variable camshaft timing) valve timing
2 – Solenoid hydraulic valve (for valve stroke)
3 – Ignition coil
4 – Hall sensor
5 – Injection valve

2839 Hall sensor and camshaft rotor

A modified rotor is fitted to the intake camshafts of both cylinder banks. Due to the rotor position, the Hall sensor determines the current position of the intake camshaft 4 times per camshaft revolution and relays this value to the control unit. This determines precisely the position of both intake camshafts.



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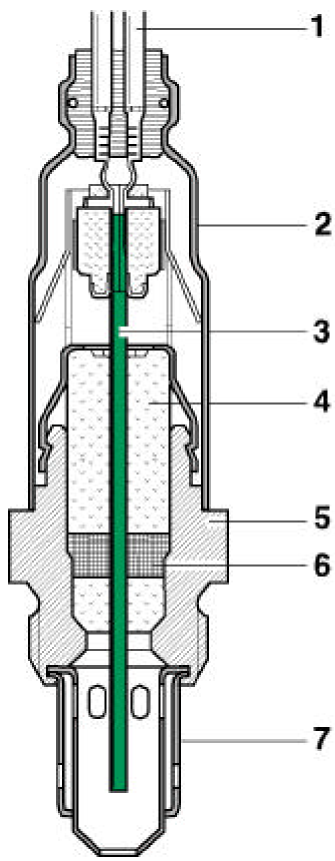
1 – Hall sensor2 – Camshaft rotor

2469/2473 Oxygen sensor (LSF)

The planar oxygen sensor LSF is a further development of the heated oxygen sensor LSH. It equates functionally to the heated oxygen sensor (Lambda probe) with a step map at Lambda 1. Unlike the LSH, on the oxygen sensor LSF the solid-state electrolyte is made up of ceramic sheets. The oxygen sensors up and downstream of the catalytic converter have different part numbers.



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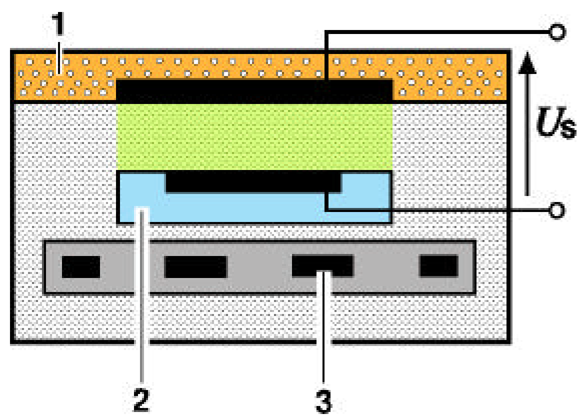
1 - Connection cable
2 - Protective sleeve
3 - Planar sensor element (ceramic sheets)
4 - Ceramic supporting tube
5 - Sensor housing
6 - Ceramic sealing pack
7 - Protective tube

Special characteristics of the new oxygen sensor

- Brief on-times of oxygen sensing
- Stable regulating characteristics
- Low heating power demand
- Quickly operational
- Small overall size, low weight

The sensor element of the planar oxygen sensor is made up of ceramic sheets and has the form of a rectangular wafer with rectangular cross section. The individual function layers (electrodes, protective layers, etc.), are produced with screen printing technique. The laminating of various printed sheets on top of each other allows for a heater to be integrated in the sensor element.



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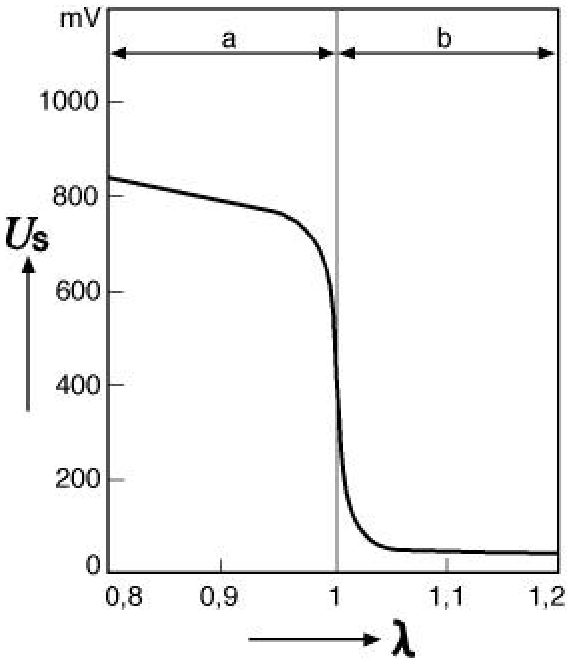
Design of the planar oxygen sensor (Lambda probe)

1 – Exhaust gas
2 – Reference air channel
3 – Heating element
Us – Voltage of oxygen sensor

Voltage characteristics of oxygen sensor



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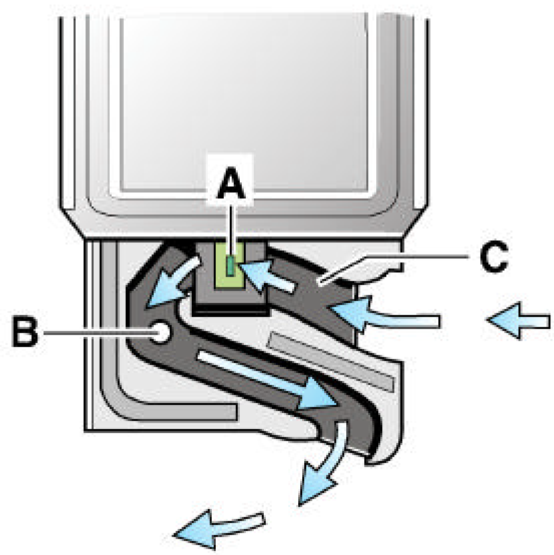
Us – voltage of oxygen sensor
? – air/fuel ratio
a – rich mixture (air deficiency)
b – lean mixture (excess air)

2445 Hot film air mass flow sensor (HFM 5)

The modified hot film air mass flow sensor HFM 5 is used, as was already fitted to the Boxster in model year 2000.
With the C-shaped air duct, this air mass flow sensor is more resistant to contamination and water droplets, as these can only reach the
sensor element after deflexion. A cross bore through the air duct reduces pulsation faults.
Note:
This air mass flow sensor must not be fitted in pre 2002 996 models, as the data records of the control unit are adapted to the corresponding air mass flow sensor.



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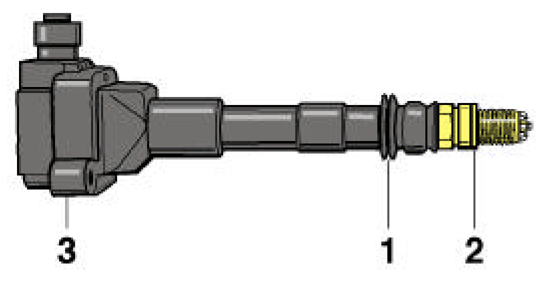
A – Sensor element
B – Cross bore
C – C-shaped air duct

2858 Spark-plug connector

The spark-plug connectors are fitted with additional sealing lips above the spark plug.



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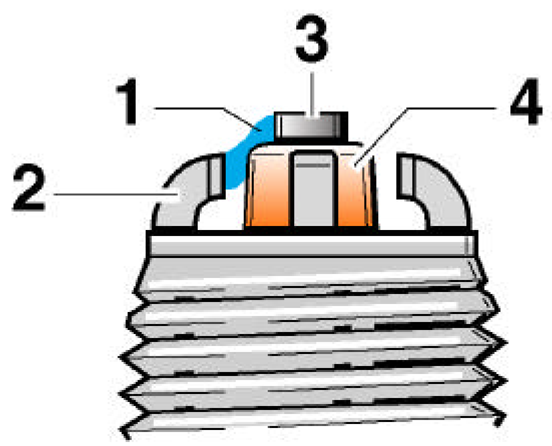
1 – Spark-plug connector with sealing lip
2 – Spark plug
3 – Ignition coil

2870 Spark plugs

On these surface-gap spark plugs, the 4 earth electrodes are arranged laterally to the ceramic. This makes the sparks (1) glide over the insulation surface and jump across a short air gap to the earth electrode, which achieves improved combustion characteristics.
The spark plugs must be changed every 80 000 km (50 000 miles).



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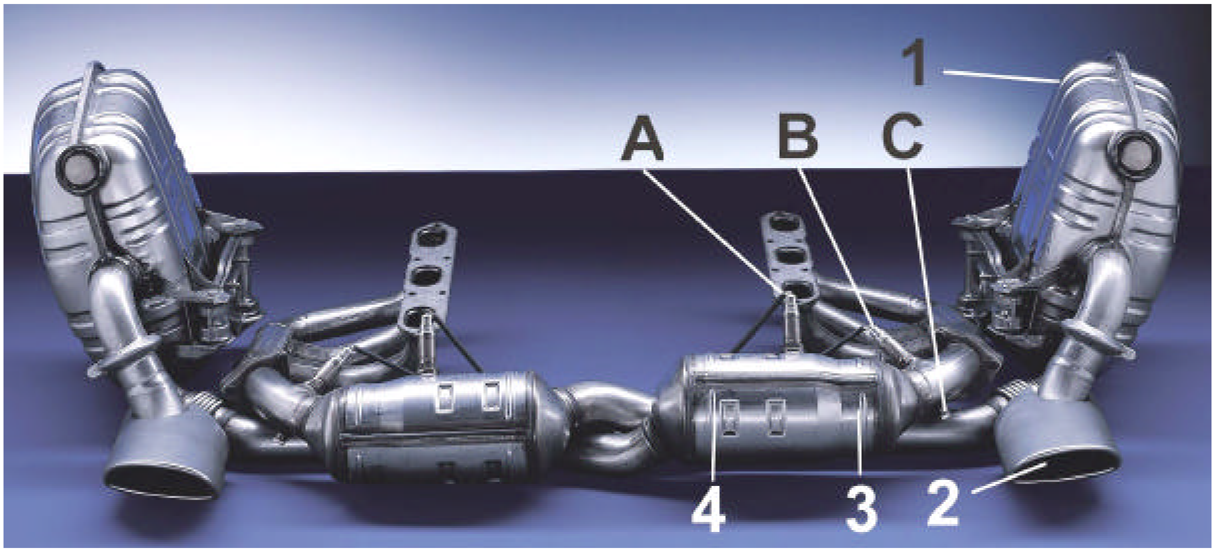
Surface-gap spark plug

1 – Surface gap
2 – Earth electrode
3 – Centre electrode
4 – Insulator

26 Exhaust system



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1 – Silencer
2 – Tail pipe trims
3 – Primary catalytic converter
4 – Main catalytic converter

A – Oxygen sensor, downstream of catalytic converter
B – Oxygen sensor, upstream of catalytic converter
C – Measuring point upstream of catalytic converter

The exhaust system is arranged as a 2-stream, 3-way catalytic-converter exhaust system with 2 end silencers. This proven concept was adapted to the new cylinder heads and the different installation position of the drive units/accessories. The engine sound was optimised for all operating ranges within the permissible noise limit values through specific sound engineering of the silencers. The look of the tail pipe trims was also modified.

Exhaust emission standard

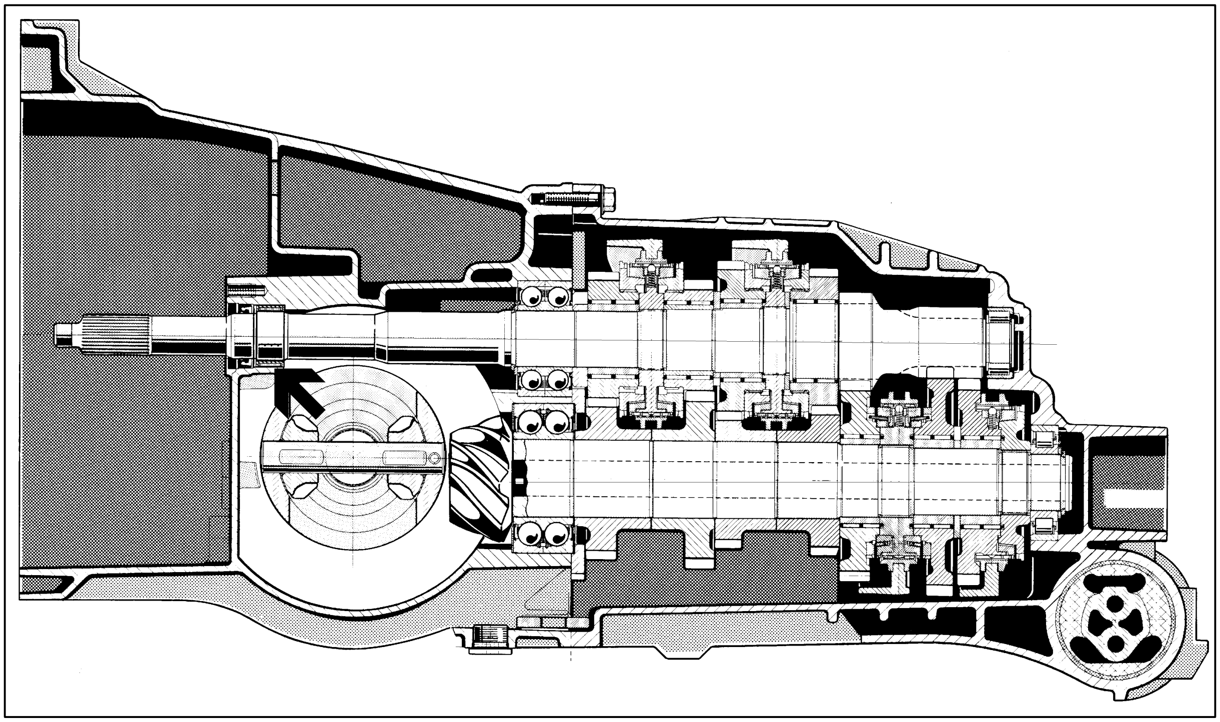
All vehicles comply with world-wide legal requirements. Due to the design of Vario-Cam Plus and the catalytic converters, the exhaust emission standard Euro3/D4 is also achieved.
EURO 2 - Oxygen sensing with 2 pre- catalyst sensors, 3-way catalytic converter with one catalytic converter on both left + right (RoW).
EURO 3 - Additional secondary air system and post catalyst sensing (4 sensors) EOBD, (Germany EURO III and D 4).
USA LEV - Oxygen sensing + post catalyst sensing (4 sensors) 3-way catalytic converter system with 1 cascade katalyst both left + right (with two metal supports) secondary air system.

Fuel and ignition system 911 Turbo/911 GT2

No new features or modifications have been implemented in the fuel and ignition system of the 911 Turbo and 911 GT2 for model year 2002.
If any new features or modifications are incorporated during the current model year, these will be described in a technical information bulletin.

3 Manual transmission 911 Carrera/911 Carrera 4

Six-speed manual transmission G 96/01



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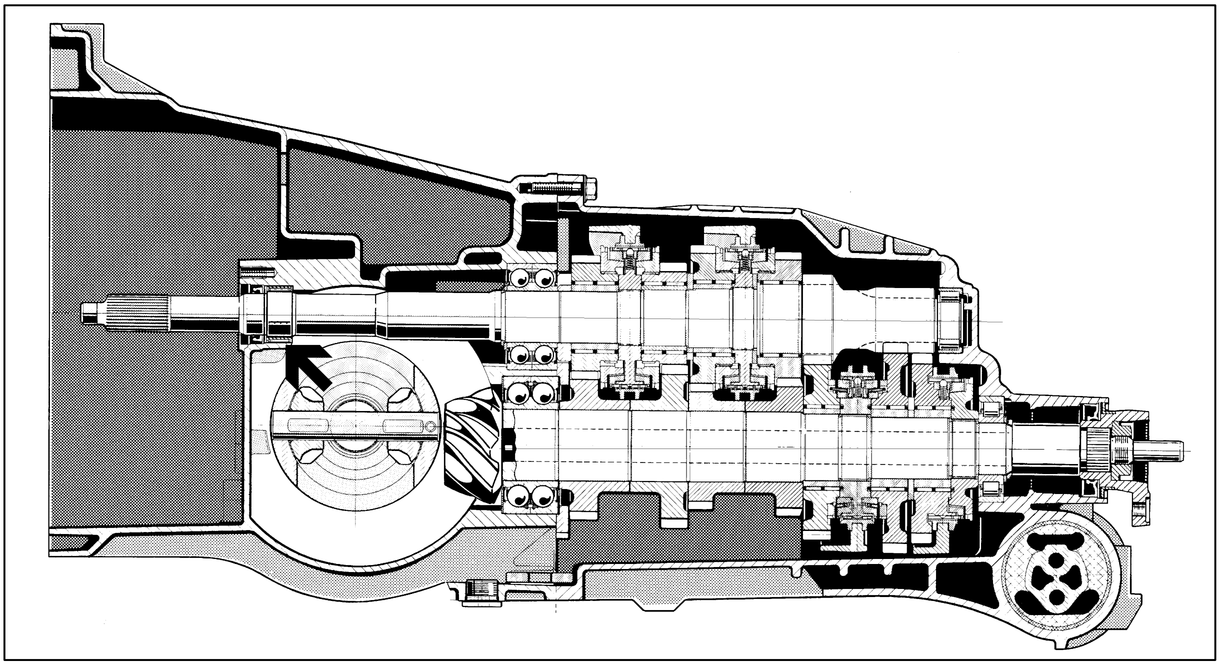
General

The manual transmission for the rear-wheel drive vehicle and the four-wheel drive vehicle is based on the 911 Carrera of the previous model.
The manual transmission has been adapted to the higher engine torque of the 3.6 l engine with the dimensions and transmission ratios remaining unchanged. the necessary higher dynamic strength of the components has been achieved through the use of higher alloy steels and precision shot blasting at the pinion shafts.

The aluminium die-cast housing has been further optimised with regard to acoustics and vibration and has been adapted to the new installation position due to the standardising of the transmission mounts (manual and Tiptronic).
The efficiency has been improved by reducing the drag factor through decreased preloading on the tapered roller bearings.
For vibration reasons, the input shaft has been converted from a 2-bearing to a 3-bearing arrangement (see arrow).
Improved transmission cooling through directed air flow in the underbody of the vehicle, an open ventilator with labyrinth sealing and waxed sealing rings completes the optimisation.

Six-speed manual transmission G 96/31



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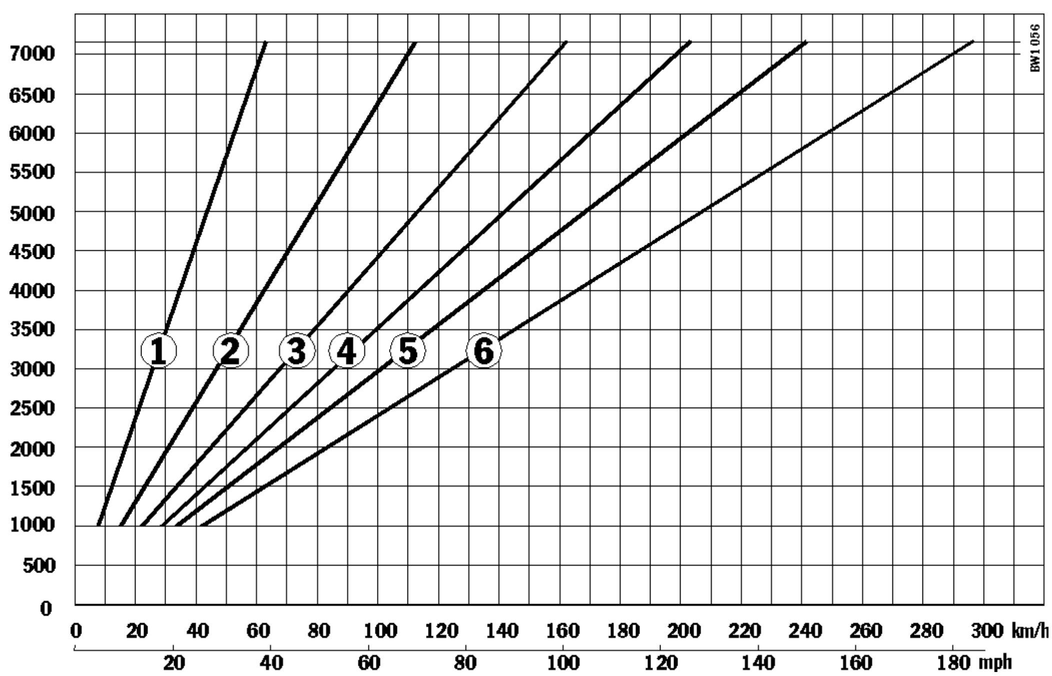
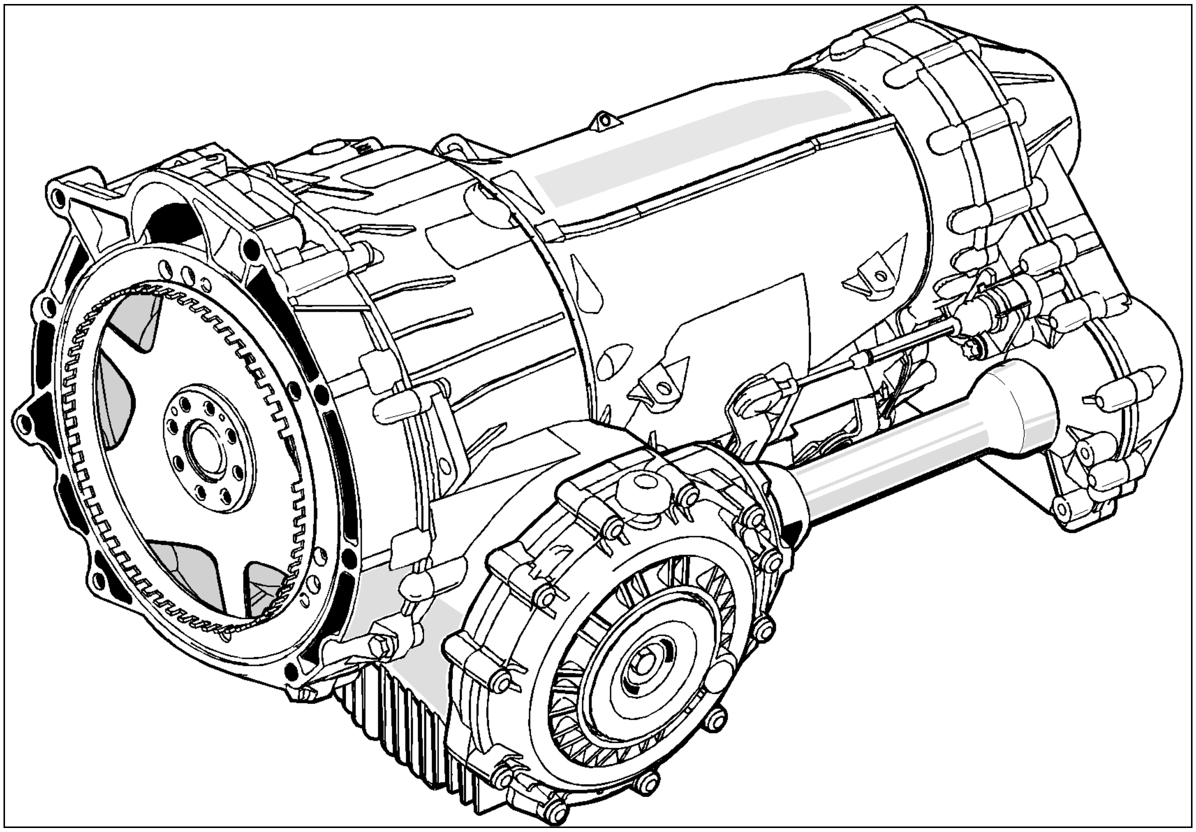
Gear ratio diagram G 96/01 and G 96/31



3 Transmission control Tiptronic 911 Carrera/911 Carrera 4

The Porsche Tiptronic transmission A96/50



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A power-shifted five-speed sports transmission is available as an alternative to the conventional six-speed manual transmission with mechanical disengaging clutch.
The transmission of the 911 turbo has been installed to withstand the torque and performance requirements.

The basic transmission is manufactured by DaimlerChrysler under the internal type designation W5A 580.
W – Hydraulic torque converter
5 – Number of forward gears
A – internal mode code
580 – Max. input torque in Nm

The Porsche type designation for this transmission is A96/50.
In order to satisfy handling dynamics requirements, the familiar shift strategies and special functions have also been adopted here.

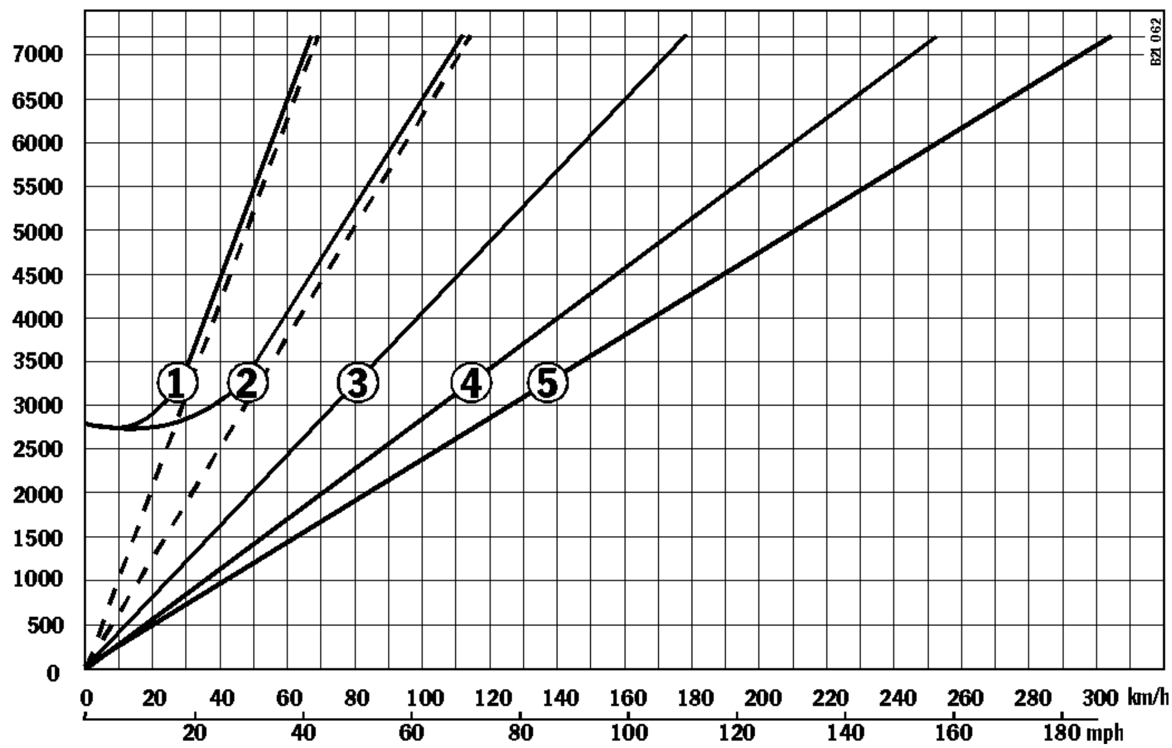
The important data at a glance

Automatic five-speed sports transmission with integrated hypoid axle drive, with manual or automatic shifting.

Porsche version designation	A96/50
Number of gears	5 forward gears, 2 reverse gears
Total weight of transmission unit	ca. 125 kg with converter, oil and radiator
Additional weight, for Tiptronic vehicles	ca. 50 kg
Transmission ratios	1st gear i = 3.60
	2nd gear i = 2.19
	3rd gear i = 1.41
	4th gear i = 1.00
	5th gear i = 0.83
	R. gear 1 i = 3.17
	R. gear 2 i = 1.93
Final drive ratio	3.37 : 1

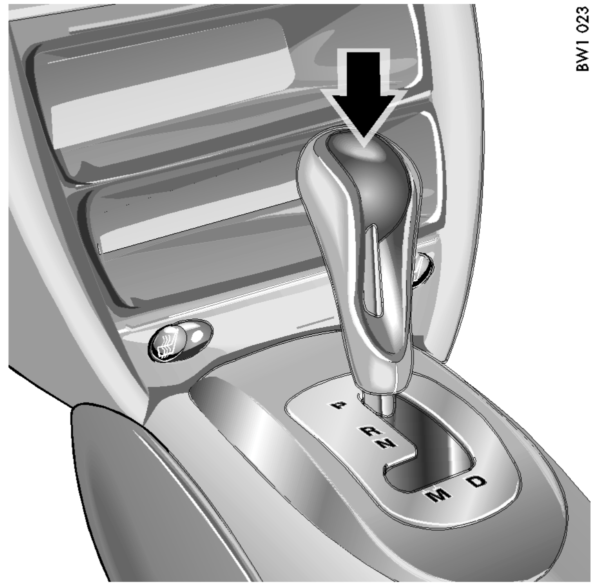
Filling capacities

Automatic unit	From empty: ca. 9 l ATF Shell 3403-M115 ATF change every 160 000 km (100 000 miles).
Rear-wheel drive assembly	From empty: 1.2 l SAE 85 W 90 BP Olex GO 4927 Change every 160 000 km (100 000 miles).



Functional description of Porsche Tiptronic

Like the Tiptronic used in previous models, the Tiptronic in the 911 Turbo has two selector gutters.
In the right-hand gutter and with the selector lever in position "D", shifting into higher and lower gears is performed automatically. If the selector lever is moved into the left-hand gutter ("M"), it is possible to shift into higher and lower gears manually.
As with other models, no gear lock is provided in the 911 Turbo which means that the selector lever positions P – R – N – D are available.



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P = Park
R = Reverse
N = Neutral
D = Drive (automatic shifting
1st – 2nd – 3rd – 4th – 5th gear)
M = Manual program

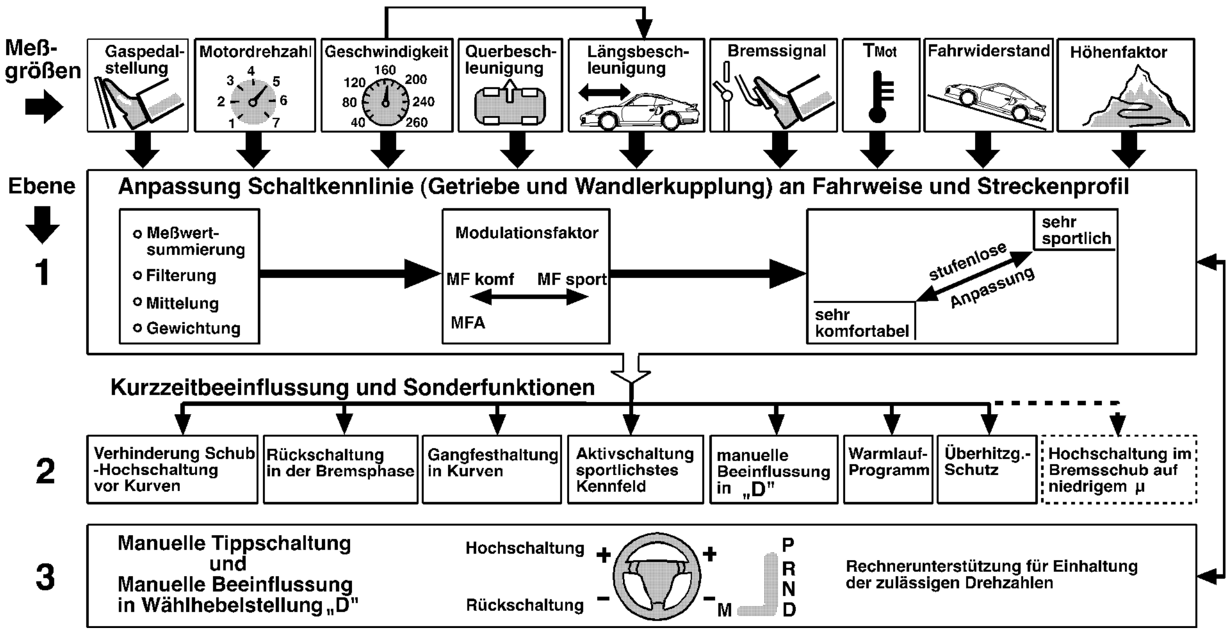
Driving in selector lever position "D"

If the selector lever is moved to "D", an extremely intelligent driving program is performed. Virtually stepless adaptation to the driving style and road conditions is carried out on the basis of the fol-lowing information.

Variable	Type of measurement
Accelerator pedal position	Resistance value and change in resistance at potentiometer of accelerator pedal sensor over a certain period, by DME control unit via CAN*
Vehicle speed	By PSM control unit via CAN
Longitudinal vehicle acceleration	By PSM control unit via CAN
Lateral vehicle acceleration	Signal from lateral acceleration sensor of PSM
Engine speed	By DME control unit via CAN
Road resistance (incline)	Calculated value for vehicle speed and accelerator pedal posi-tion from DME control unit
Altitude	Pressure sensor in DME control unit

* CAN = Controler Area Network

And this is how the information is processed in the Tiptronic control unit:



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The Tiptronic control unit determines the driver's current requirements on the basis of the incoming information and then changes to an appropriate map. In contrast to previous transmissions, the new Tiptronic control unit has 250 different shift maps instead of just five. The maps permit virtually step-less adaptation.
While selecting this adaption, along with the driving style, the shift program also takes into consideration the driving resistance, which is particularly noticeable on uphill and downhill stretches. Furthermore, the Tiptronic control unit also calculates an altitude correction factor, i.e. since the volumetric efficiency of the engine decreases with increasing altitude, the driver automatically accelerates more and the transmission would change over to a map with more frequent gear shifting. However, this situation is detected by the altitude sensor and the map most suitable for the driver continues to be provided.

Apart from the stepless adaptation to the driver's requirements ranging from very smooth and eco-nomical to very sporty and power-oriented, the Porsche Tiptronic also has the following special functions:

? **Prevention of thrust upshift-ing, e.g. before curves**

If the accelerator pedal is released before a curve, i.e. the throttle is closed quickly, the gear currently being used is retained.
If the brake is then also actuated, downshifting appropriate to the current vehicle speed is performed so that the engine braking torque is provided before the curve and the optimum gear is selected for acceleration out of the curve.
If the accelerator pedal is depressed again (the throttle is opened), shifting is again performed according to the driver's requirements.

? **Gear retention when cornering**

The lateral acceleration sensor (integrated in the same component as the rotary speed sensor), which is located on the centre console and pro-vides the PSM system with information, detects the lateral acceleration and retains the respective gear depending on the map and lateral acceleration.

? **Downshifting when braking**

If the accelerator pedal is released quickly, e.g. in a hazardous situation or when approaching curves (sporty driving style), and the brake is also actuated, the transmission shifts down to the lowest possible gear for the vehicle speed.
The gear which is then activated remains engaged until the driver once again depresses the accelerator pedal.
This function allows the engine braking effect to be used. This also applies to downhill driving.

? **Active gear skip into most sporty shift map**

Whenever the vehicle is started, the transmission control unit is set to the smoothest and most economical shift map.
In order to achieve the best possible acceleration (e.g. for an overtaking manoeuvre), the associated fast movement of the accelerator pedal is detected by the potentiometer and the transmission changes over to the more sporty and poweroriented shift map.
If the accelerator pedal is now released by more than 25%, the previous shift characteristics are resumed.

? **Kick-down**

If the accelerator pedal is depressed beyond the full-throttle pressure point (kick-down), e.g. when overtaking, the transmission shifts down to the lowest possible gear and most sporty shift map for the current vehicle speed. This map is retained until the accelerator is released by more than 70%, and then the previous shift characteristics are resumed.

? **Shift-up with overrun on slippery (icy) road surfaces**

In overrun conditions, especially in the low gears and on slippery road surfaces, the engine braking effect may cause slippage or locking of the rear wheels.
This driving condition is detected by the Tiptronic control unit which continuously compares the speed of the rear wheels with the speed of the front wheels. If the speed of the rear wheels is less than that of the front wheels, the transmission immediately shifts into a higher gear so that the speed of the rear wheels matches the speed of the front wheels and the hazardous driving situation with locking rear wheels cannot occur.
If the "PSM off" button is pressed, the function described above is also deactivated and can only be reactivated by pressing the button again or by switching the ignition off and then on again.
On vehicles without PSM, switching off of this function is not possible.

? Warm-up map

A warm-up map which is activated at engine temperatures < 32 °C is integrated in the stepless shift map adaptation. In the warm-up map, the shift-up points are offset to higher engine speeds, the transmission starts in 1st gear and the torque converter lockup clutch is opened. If the reverse gear is engaged during the warm-up phase, the vehicle starts in a short reverse gear. These measures result in both the engine and catalytic converter rapidly reaching their operating temperatures.
Unlike previous transmissions, the new Tiptronic transmission shifts back into the first gear if the vehicle is started in first gear and then stopped again.
In addition, if the selector lever passes through "N" as it is moved to a different position, the first gear is always engaged for approx. one second, irrespective of temperature. If the vehicle is driven off during this time, the transmission shifts into the first gear.

? Road resistance

The road resistance can be derived from the position of the accelerator pedal, the engine speed and vehicle speed, and the transmission can then be changed to a shift map which provides the best gear. This, in turn, reduces shift frequency.

? Reduction in engine torque

When gear shifting is performed, the DME control unit briefly suppresses ignition in order to reduce engine torque which, in turn, ensures smooth
shifting.

? Manual intervention in selector position "D"

To permit manual downshifting in the automatic gutter, e.g.

? before curves

? when entering built-up areas

? when driving downhill

? when selecting first gear before moving off

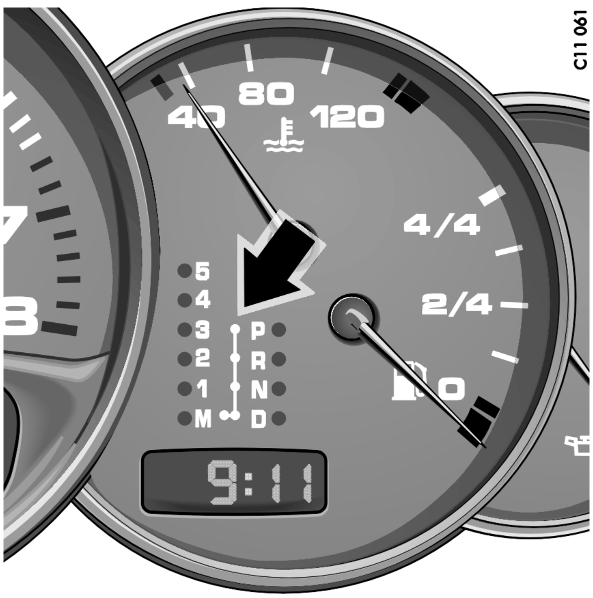
it is also possible to actuate the upshift and downshift buttons in the automatic gutter, i.e. the Tiptronic enters the manual program when the upshift or downshift button is pressed. "M" appears in the instrument cluster and the required shift operation is performed.
At the same time, an 8-second timer is started in the control unit. If the upshift or downshift button is pressed again within the 8 seconds, the timer is restarted. The Tiptronic automatically returns to automatic mode ("D" appears in the instrument cluster) if:

? the timer has expired, the vehicle is not cornering and is not overrunning.

? the driver has activated the kick-down function.

Driving in manual program

If the gear selector lever is moved from "D" and to the left, the currently selected gear remains en-gaged. By pressing the switches on the steering wheel, it is now possible to quickly execute upshifts and downshifts. Manually actuated upshifts and downshifts are monitored by the Tiptronic control unit and are not permitted above or below defined limit speeds.
The transmission shifts automatically up or down at certain limit speeds.
"M" as well as the actual gear are displayed in the instrument cluster.



C11_061

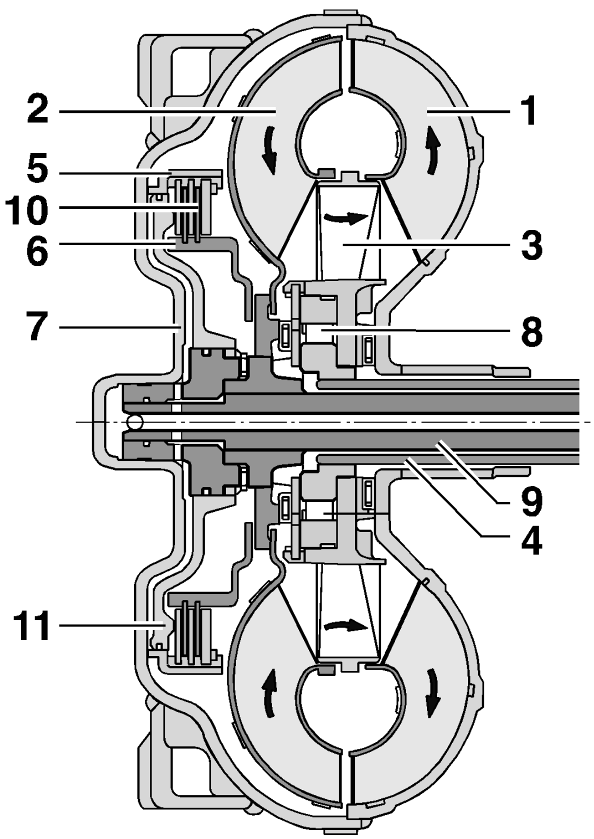
3 250 Torque converter

Functional description of torque converter

The torque converter consists of the impeller, turbine, stator and the oil required for torque transmission.
The impeller driven by the engine causes the oil in the torque converter to be pumped in a circular flow. This oil flow reaches the turbine and its flow direction is changed.
The oil leaves the turbine at the hub and flows to the stator where its direction is once again changed. The oil is thus supplied to the impeller in the appropriate flow direction.
The change in direction creates a moment at the stator. The reaction moment of this moment increases the turbine moment.
The ratio of turbine moment to pump moment is known as the moment increase.
The greater the difference in speed between the pump and turbine is, the greater the moment increase (which is at its maximum when the turbine is stationary) will be. The moment increase drops as the turbine speed increases.
If the turbine speed reaches approx. 85% of the pump speed, the moment increase is 1, i.e. the turbine moment is equal to the pump moment.
The stator which is held off the transmission case by the overrunning clutch and the stator shaft now runs freely parallel to the flow and the overrunning clutch overruns. From this point onwards, the torque converter functions purely as a hydraulic clutch. During conversion, the stator is stationary and is held off the case by the overrunning clutch.

Regulated torque converter lockup clutch

The torque converter lockup clutch (CLC) is a device which eliminates slippage of the torque converter and thus contributes to the optimisation of fuel consumption and to a sporty style of driving.



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1 – Impeller
2 – Turbine
3 – Stator
4 – Stator shaft
5 – Outer disc carrier
6 – Inner disc carrier
7 – Case shell
8 – Overrunning clutch
9 – Input shaft
10 – Disc pack
11 – Piston

The CLC is controlled by a pulse-width-modulated solenoid valve which converts the pulse-width-modulated input current into an appropriate pressure. This pressure activates a CLC control valve. Depending on the pressure level, the torque converter clutch is either

? activated

? deactivated

? or in regulated operating mode

In the regulated phase, a speed differential between the impeller and turbine of ca. 50 rpm is set. As a result, the torsional vibrations of the engine are not transferred to the transmission. This procedure optimises shift quality and reduces noise.

Design

The outer disc carrier (5) is connected to the im-peller (1) via the case shell (7). The inner disc
car-rier (6) is connected to the turbine (2).

Function
When triggered by the ETC control unit, oil pressure produced by the PWM solenoid valve is fed through the input shaft (9) to the pressure chamber behind the piston (11). The piston pushes the disc pack (10) together and thus permits direct torque transmission between the impeller and turbine.

Converter clutch activation depends on the engine speed and engine load and is only possible in
2nd gear or higher.

Note
To protect the converter, the engine speed is restricted to 4000 rpm if no driving speed signal is present.

Limited driving program

If an electric or electronic fault occurs when the Tiptronic drive system is in use, the Tiptronic control unit deactivates automatically and switches to a limited driving program depending on the type of fault.

Effect:

? Initially, the last gear selected remains engaged.

? The modulating pressure and shifting pressure increase to the maximum value.

? The torque converter lockup clutch is deactivated.

Is the engine switched off and restarted after an interval of approx. 10 seconds, the 2nd gear is engaged. The reverse gear is also available. The instrument cluster displays "Emergency running".

The following always applies:
It is absolutely safe to continue driving the vehicle for any distance in the limited driving program even if the electronic link between the Tiptronic control and the transmission is no longer functioning.

Tow-starting

The vehicle cannot be tow-started and no attempt should be made to do so, otherwise considerable damage could be caused to the transmission.

Towing

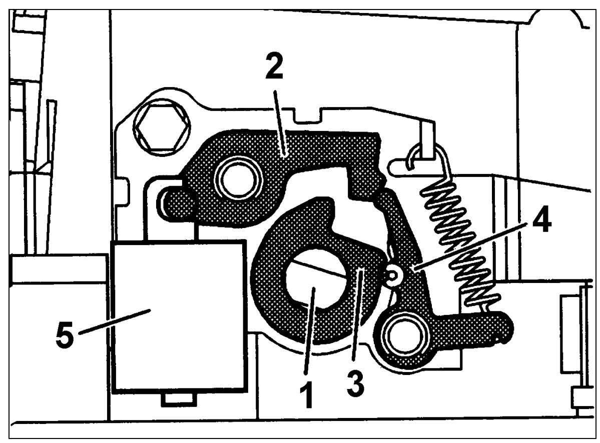
Sufficient lubrication of the transmission cannot be ensured if the engine is not running. The following points must, therefore, be observed:

1. Move selector lever to "N"
2. Maximum speed: 50 km/h (30 mph)
3. Maximum towing distance: 50 km (30 miles)
4. With greater towing distances, the vehicle must be transported on a trailer. Owing to the four-wheel drive, the vehicle must not be raised at its rear axle.

Selector lever lock

At speeds over 10 km/h (6 mph), an R/P lock is activated to prevent the selector lever being moved to "R" or "P" inadvertently while the vehicle is being driven.

Functional description



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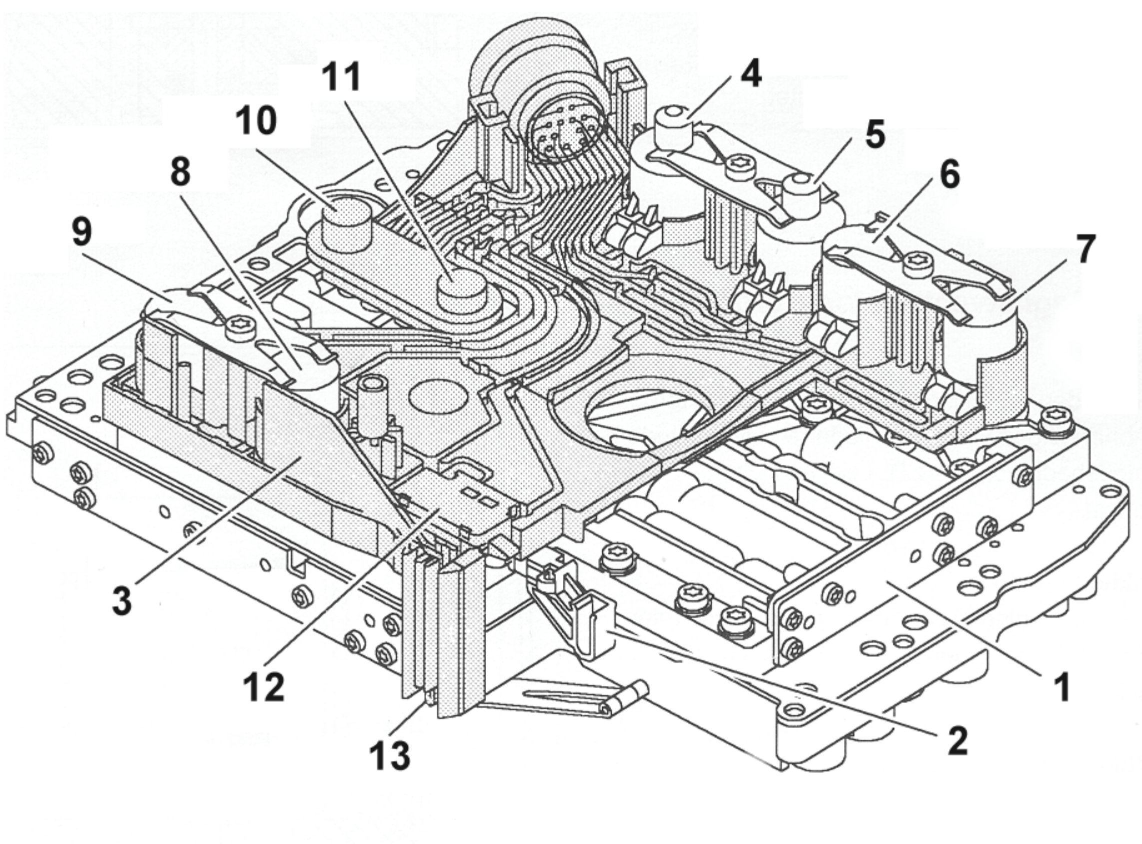
1 – Selector shaft
2 – Lever
3 – Cam
4 – Supporting lever
5 – Operating solenoid

The operating solenoid (5) is actuated by the Tiptronic control unit and moves the lever (2) towards the cam (3) so that the selector shaft (1) is locked. When the solenoid is de-energised, the supporting lever (4) holds the lever (2) in position so that it does not engage in the case of severe vibrations.

3 877 Slide valve box

The slide valve box containing the solenoid valves and pressure control valves converts the electrical signals from the Tiptronic control unit into hydraulic functions. The sensors in the slide valve box supply the control unit with electrical input signals.
The slide valve box consists of six solenoid and pressure control valves, the starter interlock contact, two speed sensors, a temperature sensor and a 13-pin plug connector. These electrical components are mounted on a plastic base.
The components are electrically linked to the 13-pin plug connector via conductors which are integrated in the base.
A cable gland forms the connection to the vehicle's wiring harness and the Tiptronic control unit.
The slide valve box is attached to the mounting plate by means of two centring pins. The slide valve box is a two-piece component. The two sections are joined with three bolts which also preload the flat springs for the solenoid and pressure control valves.
All electrical components, with the exception of the valves, are connected to the conductors.



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1 – Slide valve box
2 – Selector valve
3 – Base
4 – Pressure control valve, modulating pressure
5 – Pressure control valve, shifting pressure
6 – Solenoid valve, 1 - 2 and 4 - 5 shifting
7 – Solenoid valve, 3 - 4 shifting
8 – Solenoid valve, 2 -3 shifting
9 – PWM solenoid valve, CLC

10 – Speed sensor
11 – Speed sensor
12 – Starter interlock contact
13 – Temperature sensor

Transmission ratio and shifting components

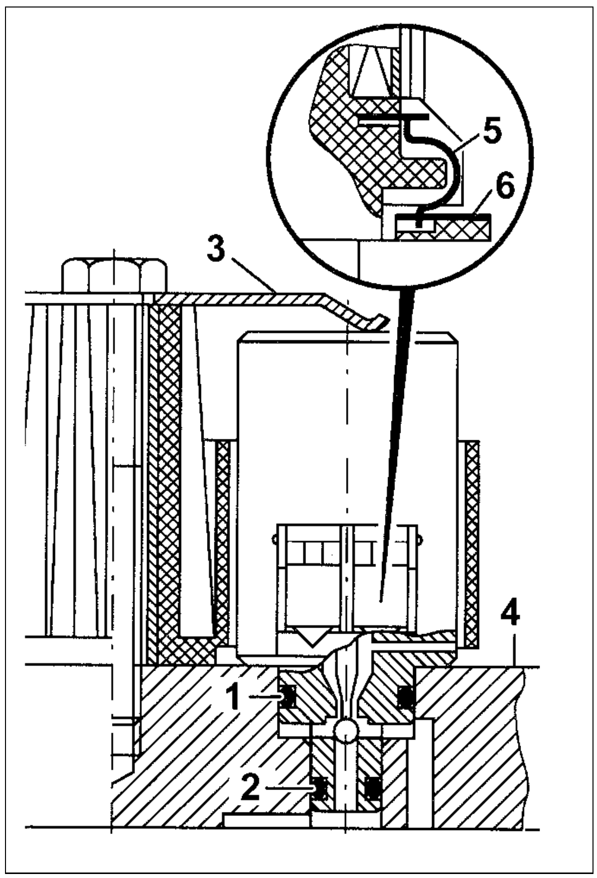
Gear	Trans. ratio	B1	B2	B3	K1	K2	K3	F1	F2
1	3.60	X 3)	X				X 3)	X	X
2	2.19		X		X		X 3)		X
3	1.41		X		X	X			
4	1				X	X	X		
5	0.83	X 3)				X	X	X	
N	--	X					X		
R (1)	3.17	X 3)		X			X	X	
R (2)	1.93			X	X		X		

1) = Reverse gear transmission ratio, standard
2) = Reverse gear transmission ratio, reduced torque
3) = Shifting components only actuated in overrun mode

3 889 Solenoid valves

The solenoid valves are 3 / 2-way valves and are actuated by the Tiptronic control unit to initiate upshifts and downshifts. If a solenoid valve is actuated, it opens and directs control pressure to the assigned command slide valve. The solenoid valve remains actuated and therefore open until the shifting operation has been completed. If the solenoid valve is de-energised, the pressure along the control line to the command slide valve is reduced to zero.

Two O-rings (1 and 2) form the seal between the solenoid valves and the control plate. The valves are pressed against the control plate (4) by flat springs (3). The contact springs (5) on the solenoid valve engage in a slot in the conductors (6). The spring force ensures reliable contacting.



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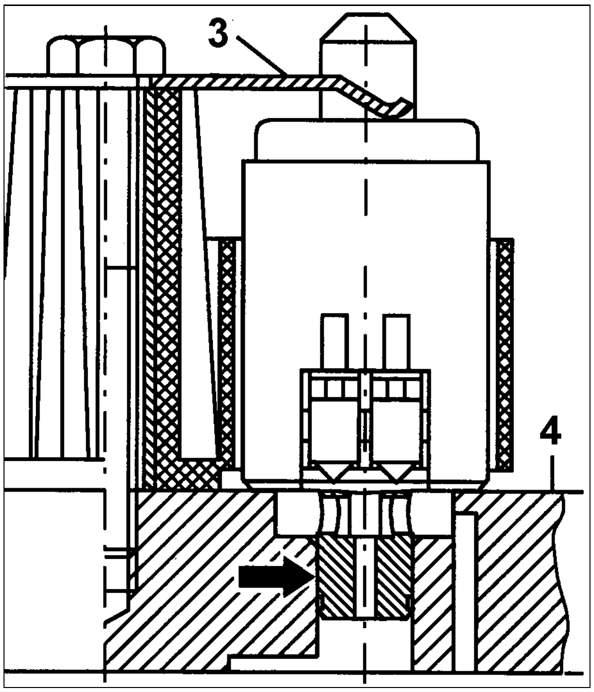
Pressure control valves

The pressure control valves convert an electrical current into a proportional, hydraulic pressure and control the modulating and shifting pressure ac-cording to various variable operating conditions.



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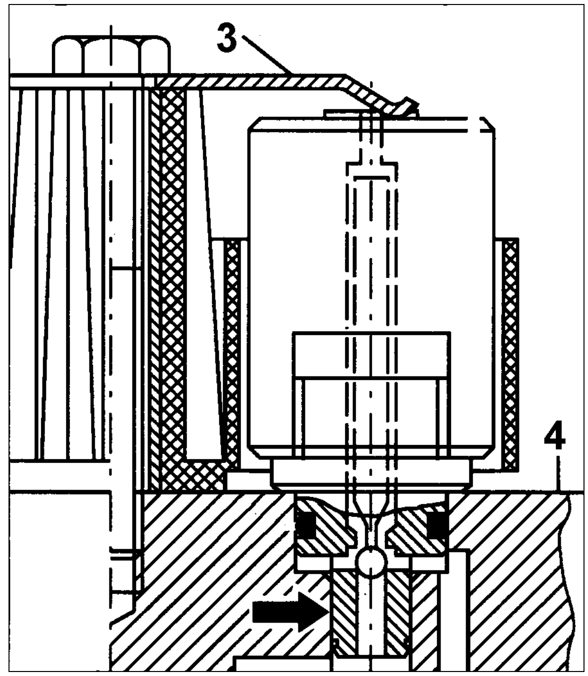
The pressure control valves have a locating seat. A slit seal (arrow) forms the seal between the pressure control valve and slide valve box.

PWM solenoid valve, CLC



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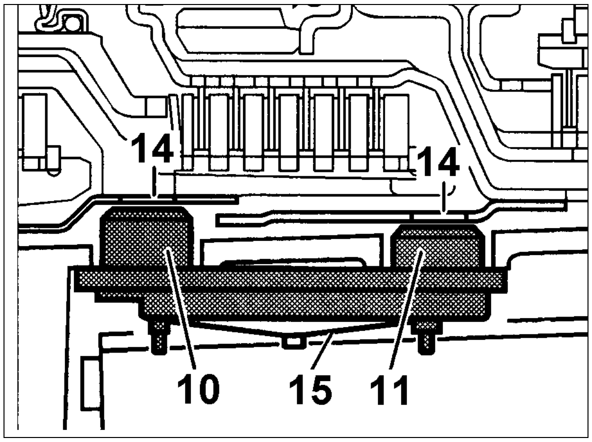
The PWM solenoid valve, actuated by a pulse-width-modulated input current, supplies appropriate pressure for the torque converter lockup clutch. It is sealed with an O-ring and a slit seal (arrow).

3.8.1.7 Speed sensor

The speed sensors are used to determine the transmission input and output speeds and also pass these signals on to the Tiptronic control unit for further processing.



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10 – Speed sensor
11 – Speed sensor
14 – Pulse rings
15 – Flat spring

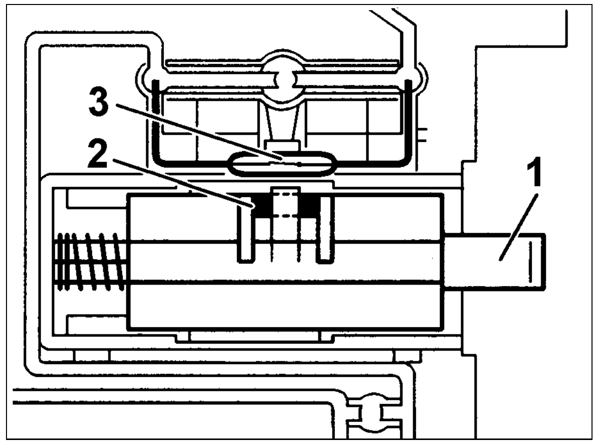
The speed sensors (10 and 11) are fixed to the base via contact studs. The speed sensors are pressed against the transmission case by the flat spring (15) which is supported by the slide valve box. This arrangement ensures a defined gap between the speed sensors and pulse rings (14).

ATF temperature sensor

The ATF temperature has a major effect on the shifting time and, therefore, on shifting quality. By establishing the temperature of the ATF, it is possible to optimise shifting in all temperature ranges.
The temperature switch is connected to the starter interlock switch in series, i.e. the temperature signal only reaches the Tiptronic control unit if the reed contact is closed.

Starter interlock contact

The starter interlock contact is used to detect when the selector lever is at "P" and "N". This information is passed on to the Tiptronic control unit.



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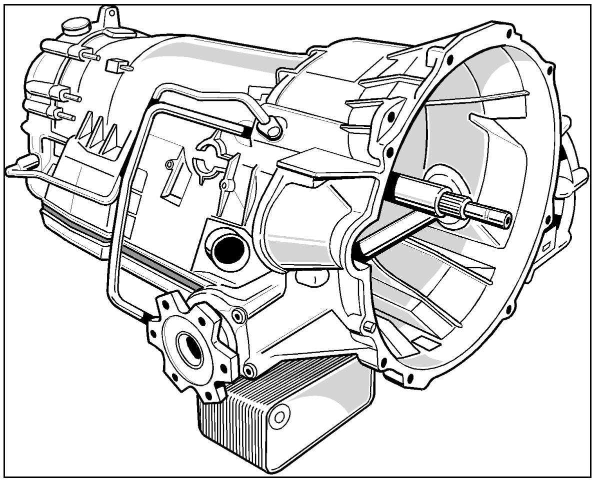
1 – Plunger
2 – Permanent magnet
3 – Reed contact

Functional description

When the selector lever is at "P" and "N", the permanent magnet (2) is moved away from the reed contact (3) and thus opened. The Tiptronic control unit uses this electrical signal to determine the position of the selector lever. This information is passed on to the DME control unit which then issues the start release.

3 860 ATF cooling



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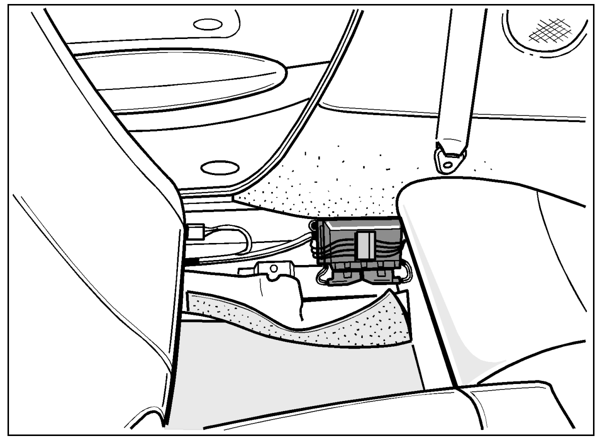
The ATF fluid heats up and must be cooled; this especially applies to operation with open torque converter lockup clutch.
An ATF-to-water heat exchanger attached to the transmission is used for cooling.
Depending on the ATF and water temperature, the electric switch-over valve is actuated by the DME control unit and allows a vacuum to enter the shut-off valve.

Cooling on	Coolant temp.	> 100°C
	ATF temperature >	90°C
Cooling off	Coolant temp.	< 90°C
	ATF temperature <	83°C

The DME control unit reduces power output when the ATF temperature exceeds 143°C.

3 730 Tiptronic control unit installation position

The 32-pole transmission control unit is manufactured by Siemens and is installed on the right-hand side of the passenger compartment at the bottom of the B-post in front of the rear-seat well.



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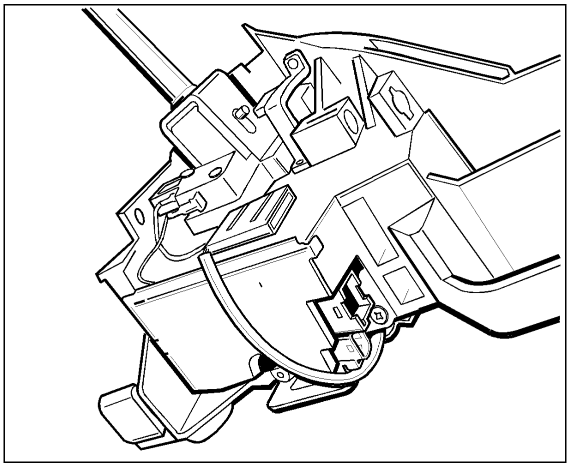
Diagnosis can be performed on this control unit using the Porsche System Tester 2.

3.7.3.1 Multifunction switch

The multifunction switch (MFS) is attached directly to the selector lever bracket and cannot be replaced separately. An additional 2-pin plug for the reverse lamp is attached to the MFS. PIN 1 connects earth to the reverse lamp. PIN 2 connects terminal 15 to the reverse lamp.



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The MFS supplies information regarding the position of the selector lever to the instrument cluster and Tiptronic control unit.

Pin assignment

PIN	Terminal	Function
1	58	12V
3	31	Earth
8	86S	12V
2/6/7	Coding lines	For instr.
4/5/9/10	Coding lines	For ETC

Coding table

Selector lever position	P	R	N	D
Line W3 ETC	0	1	1	0
Line W2 ETC	1	1	1	0
Line W1 ETC	1	1	0	1
Line W0 ETC	1	0	1	0
Line W3 instr.	1	0	0	1
Line W1 instr.	0	0	1	0
Line W0 instr.	0	1	0	1

1 = active   0 = not active

Data exchange between DME and Tiptronic control unit

The signals between the DME and Tiptronic are exchanged via CAN lines, i.e. data blocks are transferred in both directions via two lines (CAN high and CAN low).
These data blocks contain, for example, the following information:

DME ? Tiptronic:

Engine speed, nominal engine torque, actual engine torque, accelerator pedal position, driver requirements, engine temperature, brake light switch, kick-down, ambient pressure.

Tiptronic ? DME:

Torque reduction, "check engine" prompt, selector lever position, start release, actual gear, shifting active, cooling water shut-off valve.
The data is updated approx. every 10 ms.

Data exchange between PSM and Tiptronic control unit

PSM ? Tiptronic:

Shift intervention, vehicle speed, lateral acceleration, longitudinal acceleration.

Data exchange between instrument cluster and Tiptronic control unit

Instrument cluster ? Tiptronic:

Upshift and downshift button.

Tiptronic ? instrument cluster:

Actual gear, selector lever position, limited driving program.

Input and output signals of control units (simplified diagram)

? CAN low DME ?

? CAN high DME ?

Speed sensor ?

Speed sensor ?

Terminal 30 ?

Terminal 15 ?

Terminal 31 ?

? CAN low PSM ?

? CAN high PSM ?

? CAN low instr. ?

? CAN high instr. ?

Oil temperature ?

TIPTRONIC CONTROL UNIT

? Solenoid valve 1 - 2 / 4 - 5

? Solenoid valve 2 - 3

? Solenoid valve 3 -4

? PWM valve, torque converter lockup clutch

? Control solenoid for modulating pressure

? Control solenoid for shifting pressure

? Voltage supply for solenoid valves

? Voltage supply for sensors

? Earth for sensors

? Diagnosis

? Shift-lock solenoid

3 Transmission 911 Turbo /911 GT2

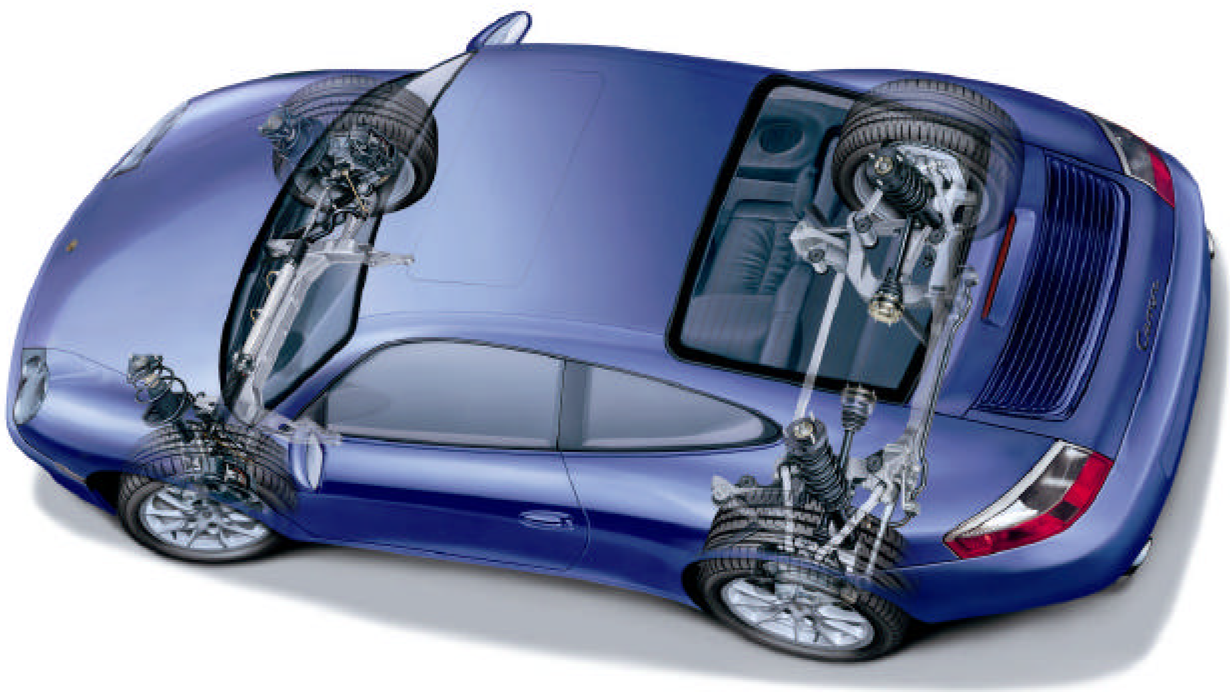
General

No new features or modifications have been implemented in the transmissions of the 911 Turbo and 911 GT2 for model year 2002.
If any new features or modifications are incorporated during the current model year, these will be described in a technical information bulletin

4 Chassis and suspension 911 Carrera/911 Carrera 4

General

The running gear is based extensively on the proven components of previous model versions. It has been adapted to the new conditions in relation to the more powerful engine and consequent increased driving performance, as well as the modifications carried out on transmission and body.



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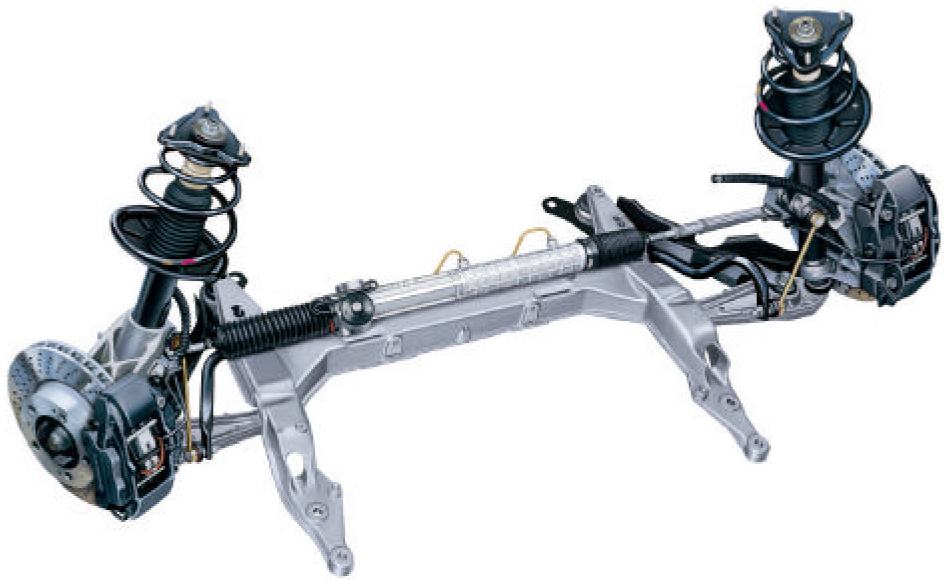
The modifications are as follows.

4001 Front axle



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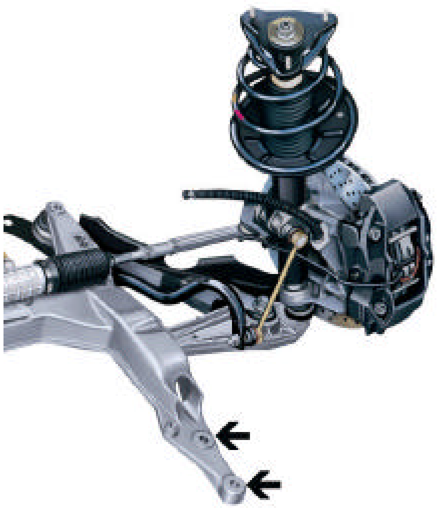
4009 Front-axle cross member

The front-axle cross member is now secured at its rear fastening to the body (arrow) with two bolts instead of one.



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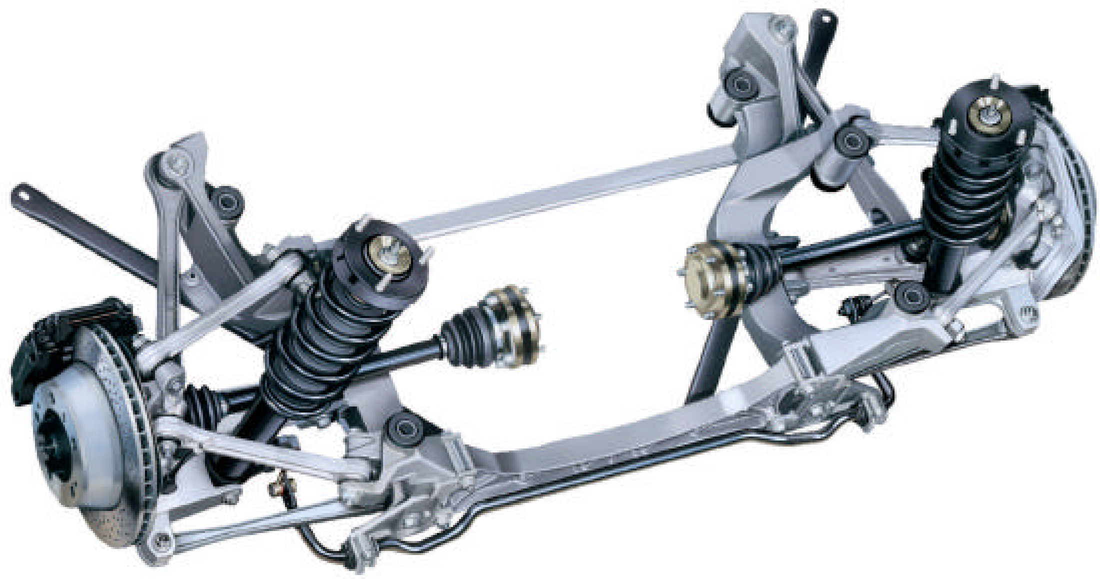
4085 Spring strut

Whilst maintaining the spring rate, the higher
vehicle weight has been compensated with a longer spring.
The twin-tube gas-filled shock absorbers have been adapted in their tuning to the new conditions.
The springs and shock absorbers are colour coded according to tolerance and type for the different vehicle versions.

4203 Rear axle



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4206 Rear-axle cross-member
4235 Upper control arm

The rear-axle cross member and the upper control arm were adapted to the space requirements of the new Tiptronic transmission.

4085 Spring strut

Whilst maintaining the spring rate, the higher
vehicle weight has been compensated with a longer spring.
The twin-tube gas-filled shock absorbers have been adapted in their tuning to the new conditions.
The springs and shock absorbers are colour coded according to tolerance and type for the different vehicle versions.

4405 Wheels, tyres

The 911 Carrera is fitted as standard with the **17"** "Carrera II wheel". To improve the overall look, the rim offset on the front wheels is reduced by 5 mm. The rim offset on the rear axle remains unchanged to allow clearance for snow chains.


17" Carrera II wheel


18" Carrera wheel

4_05_02

Various **18"** wheels are available as optional extras.
The new 18" "Carrera wheel" has a rim offset of
50 mm on the front wheels. All other 18" wheels have a rim offset of 52 mm. The rim offset on the rear wheels is 65 mm.

The following wheels and tyres are approved:

Tyre and wheel dimensions			Tyre make and tyre type
front	205/50 ZR 17		Continental SportContact 2 N2
on	7 J x 17	RO 50	Pirelli P Zero rosso N3
			Bridgestone Potenza S-02 A N4
rear	255/40 ZR 17		Michelin Pilot Sport N2
on	9 J x 17 RO 55		

Optional extras

front	225/40 ZR 18		Continental SportContact 2 N2
on	8 J x 18	RO 50 (52)	Pirelli P Zero rosso N4
			Bridgestone Potenza S-02A N3
rear	285/30 ZR 18		Michelin Pilot Sport N1
on	10 J x 18 RO 65		

4530 Brake system

PSM 5.7

The PSM hydraulic units are adapted in their software to the specific parameters. Also, to improve the control quality, a new generation of "linear technology" solenoid valves (LMV) is used.

Functional description of linear technology

In linear technology, the valves are controlled by the flow. Compared to the previous generation, where valves could only be opened and closed, the new valve can adapt intermediate positions or can be opened or closed slowly. Particularly through the "open again slowly" feature, the pressure increase in critical areas (low friction coefficients) can be applied more softly. This technology is of particular benefit when braking on icy road surfaces. Vehicle yawing moments do not build up at all due to the softer pressure increase and the car is easier to keep on track.

ABS 5.7 - Speed sensor

On the ABS generation 5.7, a new speed sensor generation (DF 11) is introduced with the change of model. This is a active speed sensor with Hall element and IC (integrated circuit).
In comparison to the passive speed sensor, the active speed sensor generates a variable pulse width square-wave signal through the internal electronics. This technology not only determines the wheel speed, but also the direction of rotation, wheel stop and the signal quality.

4 Chassis and suspension 911 GT2

General

Along with the introduction of the PCCB (Porsche Ceramic Composite Brake), a number of modifications have been carried out, which are listed below.

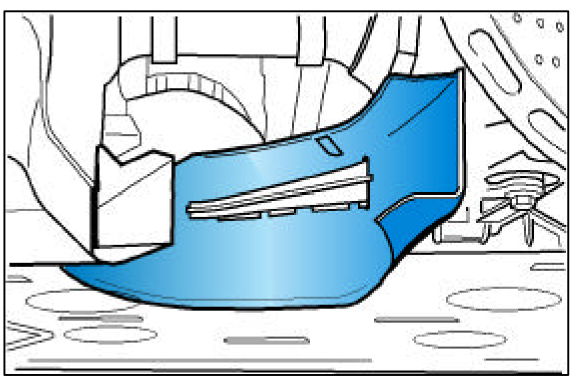
4616 Air ducts, front brake discs

For optimal cooling of the PCCB brake discs on the front axle, the wishbones have larger air ducts than on the grey cast iron brake disc.

Note

When converting from grey cast iron brake discs to PCCB brake discs, the air ducts must be fitted.

The distance between the air ducts and the road is approx. 50 mm. Before driving onto test stations (e.g. brake test station) or driving onto lifting platforms, depending on the design, measures may need to be taken to prevent damaging or severing of the air ducts.



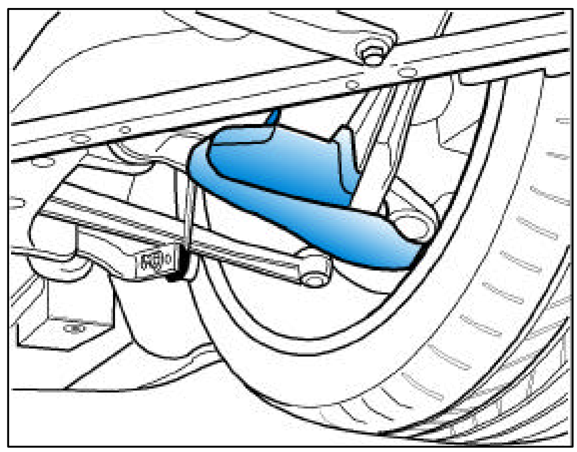
4_09_01

4616 Air duct, rear brake disc

For optimal cooling of the PCCB brake discs on the rear axle, air ducts are fitted to the lower wishbones.

Note

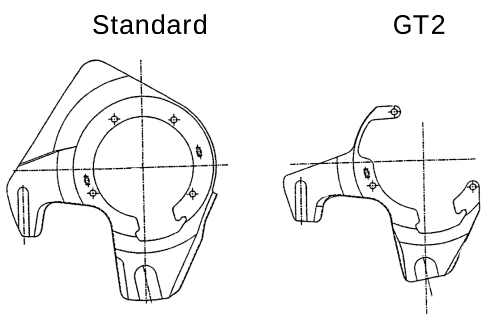
When converting from grey cast iron brake discs to PCCB brake discs, the air ducts must be fitted.



4_08_02

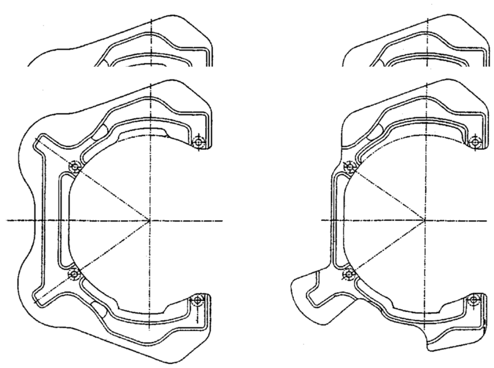
4617/4618 Brake disc splash plate

For optimal cooling of the PCCB brake discs, the splash plates on front and rear axle have been cut away further than on the grey cast iron brake discs. When converting, the appropriate splash plates must be fitted.



Front axle

4_06_02



Rear axle

4_07_02

4636/4637 Brake pads

The 911 GT2 is fitted as standard with brake pads (quality P90-2), which are designed for use in motor racing. The advantage of these brake pads is the high strength, consistent braking performance and good response. Because of this pad quality, braking noise may occur on front and rear axle. To reduce these noises, the brakes can be subsequently converted to a different pad quality (P40-2). These brake pads are orientated more towards comfort, therefore the above listed performance characteristics are reduced.

4 Chassis and suspension 911 Turbo

General

No new features or modifications have been implemented in the chassis and suspension of the 911 Turbo for model year 2002.
If any new features or modifications are incorporated during the current model year, these will be described in a technical information bulletin.

5 Body 911 Carrera/911 Carrera 4

General

The cars of the 911 Carrera series are fitted with the headlight design of the 911 turbo, along with completely redesigned front and rear trim. New air ducts and spoiler in the underbody area improve both cooling air flow and aerodynamics.

5_03_02

5_04_02

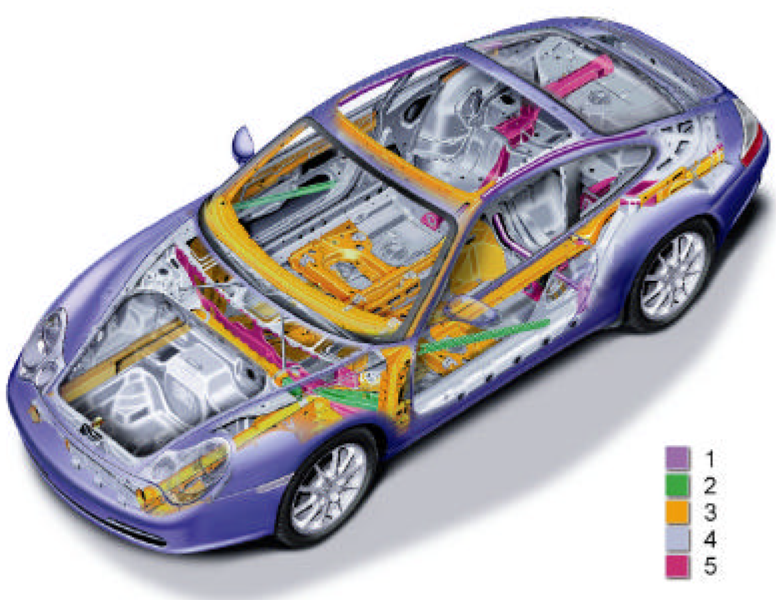
Aerodynamics and air ducting

The emphasis of the aerodynamic optimisation is at the front end. The modification allows for improved wind flow around the front of the vehicle which also produces a 15 percent increase in cooling air flow.
The side nose section radii and wheel arches forward of the front wheels are designed so that the front wheel side walls are optimally screened from the wind achieving much improved wheel arch ventilation. The modification package as a whole results in a reduction of front wheel lift coefficient from CAV = 0.08 to CAV = 0.06 and rear axle wheel lift coefficient from CAV = 0.05 to CAV = 0.03. The drag coefficient remains unchanged at CW = 0.30 (cW x A = 0.58, frontal area A = 1.94 m2

5_05_02

Bodyshell

Extensive reinforcement measures in sill, roof frame and seat pan area increase the flectional and torsional strength by a further 25% on coupes and by 10% on convertibles.
Apart from the wings, which have been adopted from the 911 Turbo, the bodyshell has been modified in various areas for model update purposes.
The B-post has been modified to take the new belt tensioner and belt-force limiter. In the tunnel and seat pan area, an additional tube with side support has been fitted for lateral reinforcement.
The tunnel area has been modified to take the new (Tiptronic S) transmission. The position of the transmission mounting on the body now corresponds to the 911 Turbo.
A reinforcement tube has also been fitted in the side of the roof frame.



5_06_02

1 - Very-high-strength steel
2 - Boron steel
3 - High-strength steel
4 - Sheet steel
5 - Tailored blanks

Bodyshell 911 Turbo/911 GT2

Extensive reinforcement measures in sill, roof frame and seat pan area increase the flectional and torsional strength by a further 25%.
The bodyshell has been modified in various areas for model upgrade purposes.
The B-post has been modified to take the new belt tensioner and belt-force limiter. In the tunnel and seat pan area, an additional tube with side support has been fitted for lateral reinforcement.
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5_04_01

1 - Very-high-strength steel
2 - Boron steel
3 - High-strength steel
4 - Sheet steel
5 - Tailored blanks

6 Body equipment, exterior 911 Carrera/911Carrera 4

6315 Front trim

The engine power increase and the subsequent higher necessary cooling capacity required an optimised design for the new air intake frame in the panelling. Furthermore, the optimisation of the air ducting and outflow area satisfies the increased cooling air requirement.
The transitions to the underfloor panels were also optimised.

6_11_02

Rear trim

The modifications on the rear trim include the cut-outs for the oval exhaust tailpipes and a swage line running through the lower section.
The rear trim together with the integral thermal protection allows for the increased thermodynamic requirements of the modified engine.
On vehicles for USA/CAN the standard deformation elements in car matching colour are used for the first time. Their shape has also been modified and a new fastening concept has been integrated into the rear trim. The Park Assistant (optional extra) now equates to the 911 Turbo.

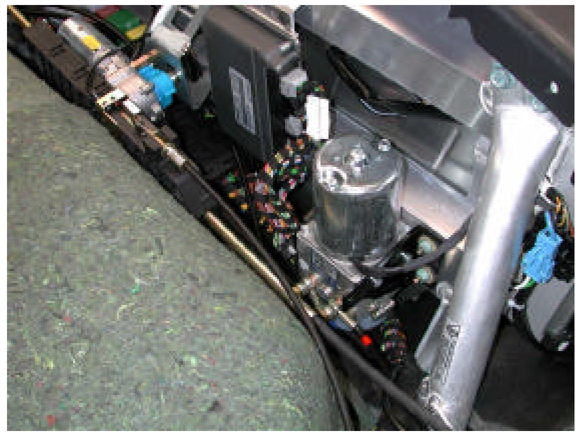
6_12_02

Convertible fixed window

On the 911 Convertible, the plastic rear window has been replaced with a fixed heated rear window. The fixed window is made from 3.15 mm thick single-layer safety glass and is connected to the soft top via an exchange system.
The interior lining is in two parts and has a new connection in the rear window area.

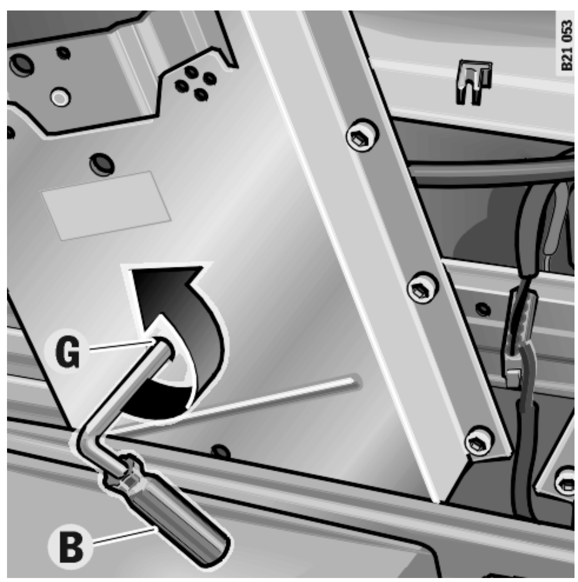
6_13_02

Removal of the rear window is facilitated through various modifications. The hydraulic pump has been moved to the right. The supporting tube of the roll over protection auxiliary frame is modified. The Tiptronic control unit is located in front of the rear seat well (as on 911 Turbo).



6_14_02

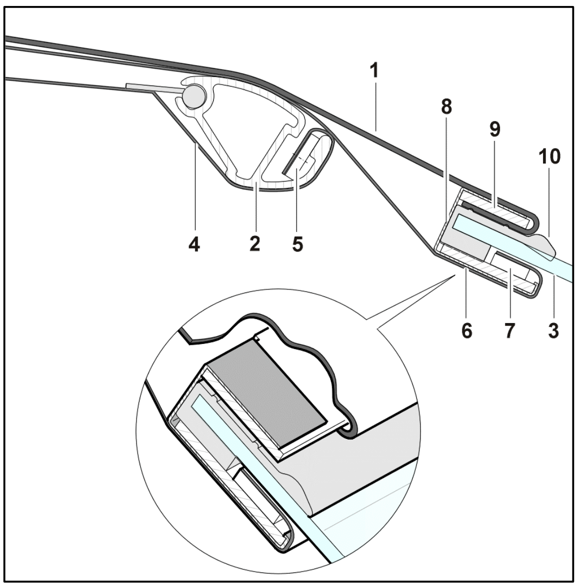
Due to the repositioning of the hydraulic pump,
the hydraulic valve, e.g. emergency operation is
accessible through an opening in the roll over protection housing.



B21_053

Soft top cover connection / rear window on corner bow

The soft top material (1) runs through the corner bow (2) up to the rear window (3). The front lining (4) with the sewn-in piping and cardboard strip (5) is tucked into the respective fixture of the corner bow and covers the corner bow.
The rear lining (6) runs over the corner bow and is inserted with its flat section (7) between the rear window and the window frame (9).
The lining is connected to the rear window and inside window frame with a total of 32 clips (6). The rear window sealing (10) runs along the outside between lining and rear window.

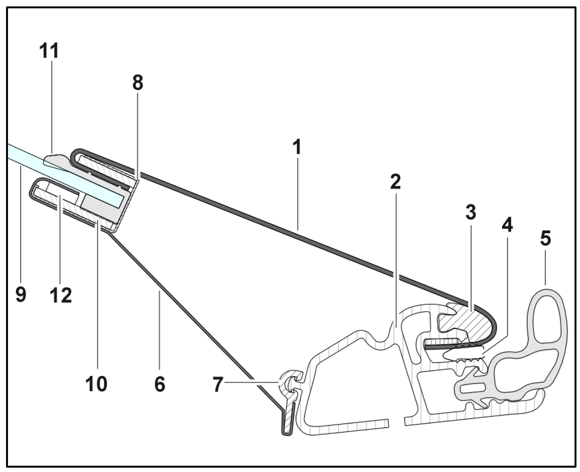


6_09_02

1 - Lining
2 - Corner bow
3 - Rear window
4 - Lining, front
5 - Cardboard strip, lining
6 - Clip
7 - Flat section
8 - Clip
9 - Window frame
10 - Rear window sealing

Soft top cover connection / rear window on tensioning bow

The lining (1) is pulled at the rear end over the additional sealing (3) inserted in the tensioning bow (2) and secured in the groove with the piping (4). The sealing of the tensioning bow (5) is inserted into the lower groove of the tensioning bow and seals against the soft top compartment cover.
A plastic strip (7) is sewn onto the rear lining (6), which is attached to the section of the tensioning bow. The rear lining is inserted with its flat section (12) between the rear window (9) and the window frame (10).
The lining is connected to the rear window and inside window frame with a total of 32 clips (8). The rear window sealing (11) runs along the outside between lining and rear window.



6_10_02

1 - Lining
2 - Tensioning bow
3 - Additional sealing
4 - Piping
5 - Sealing, tensioning bow
6 - Lining, rear
7 - Plastic strip
8 - Clip
9 - Rear window
10 - Window frame
11 - Rear window sealing
12 - Flat section

6815 Glove box

The glove box located below the passenger's side airbag has a capacity of 5 litres. The glove box has a catch on each side and can be opened by a contoured hinged handle positioned to one side and easily accessible also to the driver. The handle is in silver look.
The opening of the glove box is controlled by two air dampers located at the sides.
The glove box is also connected to the alarm system. A micro switch, which also activates the glove box lighting informs the alarm system control unit if it is open or closed.
With the improvement of the storage system through the new glove box, the open storage space below the steering wheel is discontinued.

6_08_02

6830 Cup holder

The new, very flat designed cup holder is formally integrated into the switch trim. It is extended in two stages and in the first stage takes a 25 oz (0.74 l) cup, in the second stage an additional 30 oz (0.89 l) size cup.

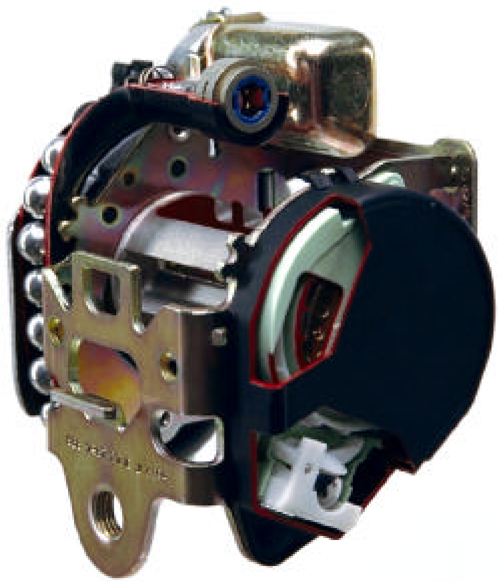
6_15_02

6_16_02

69 Occupant protection

6913 Belt tensioners with belt-force limiters

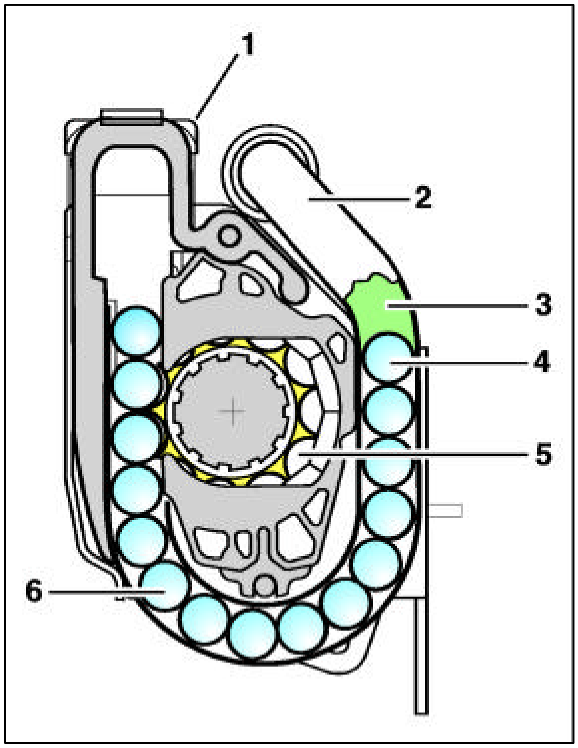
For model year '02, all 911 models are fitted with belt tensioners and belt-force tensioners.



6_07_02

The pyrotechnic ball belt tensioner is combined with the belt-force limiter in one unit. The threshold value for triggering the pyrotechnic belt tensioner is calculated as for the airbag actuation from the sensor signals for vehicle deceleration. The triggering of the belt tensioner during a frontal collision takes place together with the triggering of the front airbags.
During a rear collision only the belt tensioner is triggered.

Tensioning process



6_01_02

1 Ball arrester
2 Tube with propellant charge
3 Gas pressure
4 Pistons
5 Pinion
6 Mass body (balls)

The balls are driven through a pyrotechnic propellant charge.
This kinetic energy is carried over to the belt reel via a pinion.
Belt slack is taken up by winding in belt.

Belt-force limiters

To avoid bruising and internal injury, the belt's pulling force must be limited to a bearable level.
Further tensioning beyond a dangerous pulling force level is prevented.
The belt can be balanced up to a certain length via a torsion shaft in the belt mechanism.

This blank page is due to a last-minute change

6 Body equipment, exterior 911 Turbo/911 GT2

6815 Glove box

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6_15_02

6_16_02

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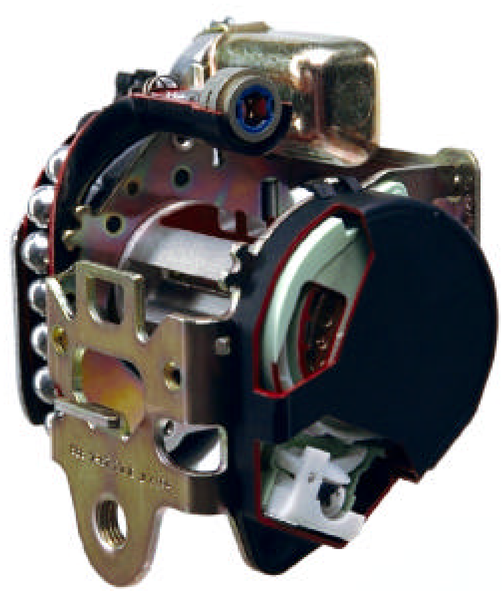

6_07_02

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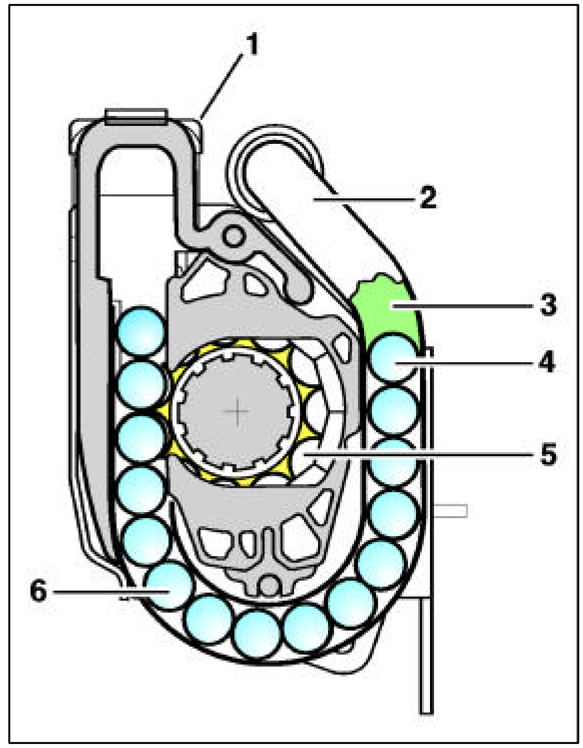

6_01_02

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7 Body equipment, interior 911 Carrera/911Carrera 4

The familiar switches in high-polished look are replaced by switches in matt black. The respective black plastic trims, e.g. radio, PCM, PCM computer and the trim on the exterior mirror adjustment switch match the black paint of the switches.

7 Body equipment, interior 911 Turbo/911 GT2

The familiar switches in high-polished look are replaced by switches in matt black. The respective black plastic trims, e.g. radio, PCM, PCM computer and the trim on the exterior mirror adjustment switch match the black paint of the switches.

8 Heating/air conditioning 911 Carrera/911 Carrera 4

General

Together with the integration of a new cup holder, the centre vent has also been re-designed. The cross-sectional area has been increased by 20 %, which improves interior ventilation.

No other new features or modifications have been implemented in the heating/air conditioning system for model year 2002.
If any new features or modifications are incorporated during the new model year, these will be described in a technical information bulletin.

8 Heating/air-conditioning 911 Turbo/911 GT2

General

Together with the integration of a new cup holder, the centre vent has also been re-designed. The cross-sectional area has been increased by 20 %, which improves interior ventilation.

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9 Electrical system 911 Carrera/911 Carrera 4

Seat and mirror memory via remote control

B21 008

Individual seat and exterior mirror settings for the driver can be saved for subsequent retrieval.
The remote control detects which key is being used at any given time and sends this data to the seat memory control module.
This then initiates an automatic adjustment of both the seat and the outside rear-view mirror.
If a locked car is opened by means of the radio remote control, the seat and the outside rear-view mirror move to the positions stored for this particular key.
4 keys, which are colour coded so one can tell them apart, can be programmed for each car.

Storing seat position

1. Using the key of your choice switch on the ignition.

2. Set the seat and mirror to the positions you require. If, when reversing, the front passenger-side outside mirror is to be used as a parking aid, then the reverse gear must be engaged when storing the seat position.

3. Hold down memory button "M" and additionally press button (next to memory button).
The individual setting is now assigned to this remote control and button .

Retrieving seat position

Unlock car or boot using remote control.

A seat position assigned to a remote control can also be retrieved with button, if the respective key has unlocked the vehicle or switched on the ignition.

If no seat position is assigned to a remote control, button has not function.

<u>Note</u>

Automatic seat adjustment can be aborted at any time by pressing the central locking button, or any memory or seat adjustment button.

Deleting stored seat position

1. Using the key of your choice switch on the ignition.

2. Press and hold button and personal button 2 simultaneously for at least 5 seconds.

Changing stored seat position

The original stored position is automatically overwritten when a new one is entered.

Parking aid outside mirror on passenger's side

If programmed accordingly, the passenger side outside mirror is automatically lowered a certain degree when reversing. The original position is returned to when reverse gear is disengaged.
The lowered mirror can be returned to its original position by pressing the mirror-adjust switch for
< 1 second.
A change in the lowering angle of the outside mirror on the passenger's side is carried out through PST2.

9120 Radio

Basically, the standard and individual program in model year '02 equates to model year '01.
Accordingly, all 911 Carrera and 911 Carrera
4 models are fitted as standard with the radio cassette CR 22 (USA CR 220), 4 wide-band loudspeakers and a cassette holder in the front centre console.

"Bose" high End sound package (analogue)

The individual program (I 680) for model year '02 offers the new "Bose" High End sound package, which replaces the "Digital Sound Processing" (DSP) package.
This system offers remarkably higher sound quality, even in cars with open soft top.
Completely new amplifier technology, located in the dash panel, door trims and rear side trims with very high efficiency drives the sound source.
This High End sound package also has an additional subwoofer system in its own housing, which is fitted behind the rear seats on coupe´s and in the passenger foot-well on convertibles.
All adjustment options are discontinued, which would hinder the performance spectrum of the new sound system, as well as all previously known, permanently programmed tone parameters for various music genres.
The sound package is still available, however no longer with the DSP system.
With the new High End sound system, the acoustics can only be adjusted to individual listening taste on the radio or PCM.
Although this should not be necessary, as the overall layout of the audio system is linear, i.e. all tone relevant controls are set to "0" and the tone parameters of the amplifier software are optimised to the car's interior conditions.

Features of the individual components

Bose patented TSM switching amplifier
(two state modulation)

These compact and high performance output stages in digital switching technology generate less heat and operate 50% more efficiently than standard linear amplifiers, as these only switch on when required. They are also lighter and have a considerably longer working life.

Integrated signal processing:

It automatically lifts the bass tones and equalises the reduced sensitivity of the human ear in the bass range at reduced volumes. The process is significantly more differentiating than the standard loudness control. It permits a dynamic adaption of bass tones, so that the listener notices no change. The music sounds true to life, with full, low bass tones at every volume. Voice playback is natural, and the system can achieve volumes as in a concert hall without perceivable distortions.

Active Equalisation:

This Bose patented system is individually adapted to the interior acoustics of each Porsche and guarantees a balanced and clear tone across the whole frequency spectrum.
It creates an environment in which the listener can enjoy music playback, without constantly having to re-adjust the controls. This is only possible on systems especially developed for specific cars, as acoustic measurements are taken, analysed and incorporated during the development process.

Active compressor switching:

This ensures precision fine tuning of the dynamic range of the music. Even during loud sections, the system allows no audible distortions. The tone is always pleasant to the ear.

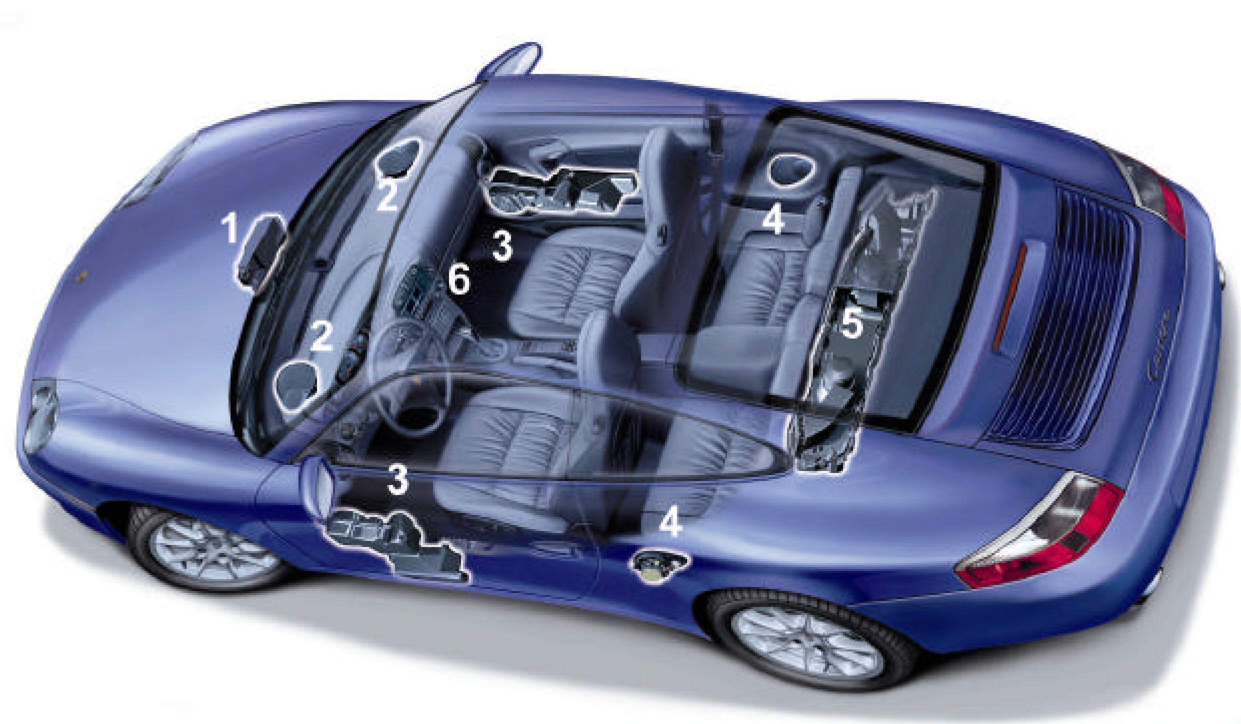
Raising the sound pressure level:

To play back bass notes deep and full, sufficient sound pressure must be generated. Standard solutions with huge heavy woofer loudspeakers move the necessary large volumes of air. As this could not be an appropriate solution for a sports car, we have constructed made-to-measure loudspeaker housings. These bass reflex technology housings have two great advantages:
A low convincing bass with impact in the whole interior and avoidance of vibration, whereby the air volume to generate the lower frequencies is moved by so called resonance tubes.

With this series of technical innovate solutions the BOSE sound system in the Porsche is convincing with its unique, pure and original sound.

Arrangement of components

BOSE sound system	**911 Carrera / 4 Coupé**	**911 Carrera / 4 Convertible**
1 Audio electronics (on front bulkhead) Bose signal processing for spatial tone and distortion-free sound at every volume	1 Bose patented TSM switching amplifier (TSM = two state modulation) 5 Linear amplifiers, 5 x 25 watts 6 channels for made-to-measure equalisation	
High-performance loudspeakers	**12**	**11**
2 Dash panel	2x 8.9 cm midrange units 2x 4.3 cm tweeters	
3 Doors	2x 11.4 cm woofer / mid-range speakers in 5.5 litre bass reflex housing	
4 Rear side trim panels	2x 8.9 cm midrange units 2x 4.3 cm tweeters	
5 Behind rear backrests	2x 13.3 cm woofers in 13.8 litre bass reflex housing	
6 Passenger footwell		1x special 10.2 x 15.3 cm woofer in 6 litre bass reflex housing



9_04_02

97 Wiring

On the new models, the wiring harnesses are arranged specific to the individual customer. The on-board electrical system is divided into a total of 153 separate modules from which the supplier prepares the cable harnesses – labelled with the respective serial number – within 7 working days.

The on-board electrical system consists of up to 11 individual cable harnesses. New inclusions regarding diagram and routing are:

? CAN-*wiring in area of instrument cluster - engine management, Tiptronic S control, PSM control and control of air conditioning

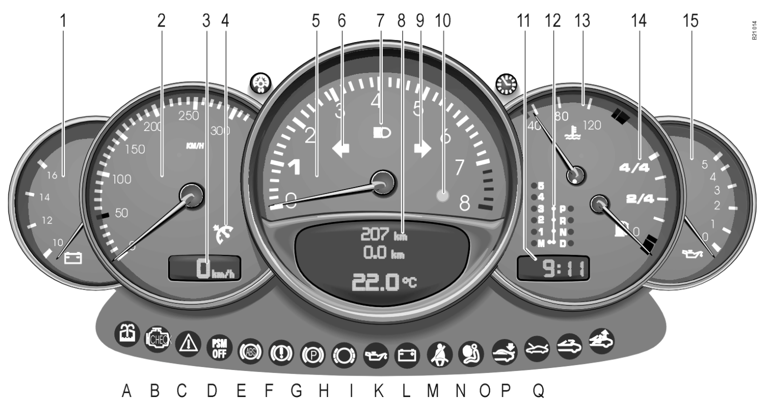
? Nose section wiring harness integrated in right of interior

***** CAN = Controller Area Network

9025 Instrument cluster

On all new 911 models, the basic concept of the 911 Carrera instrument cluster has been retained.
One significant modification is the integrated **multifunction display (computer)** in the lower part of the rev counter.
This clearly organised display allows several items of information to be shown simultaneously.
In addition to the total mileage/kilometrage and trip odometer, an on-board computer display (e.g. outside temperature) is also displayed permanently in the **multifunction display.**

However, the content of the display can also be determined by the individual customer.
The display is a **"dot matrix"** display.
Thanks to the higher pixel resolution of the dot-matrix display compared to the segment display used in the 911 Carrera '01, figures and letters are much clearer and it is also possible to display information texts.



B21,014

Instrument cluster

1 – Voltmeter
2 – Speedometer with analogue display
3 – Speedometer with digital display
4 – Cruise control indicator lamp
5 – Rev counter
6 – Flashing turn indicator (left)
7 – High-beam indicator lamp
8 – Multifunction display (computer)
9 – Flashing turn indicator (right)
10 – Light sensor for instrument lighting
11 – Clock
12 – Tiptronic display
13 – Temperature indicator for cooling system, indicator lamp
14 – Fuel level indicator, warning lamp
15 – Engine oil pressure indicator

A – Washer fluid level warning lamp
B – Emission monitoring warning lamp
C – Porsche Stability Management PSM information light
D – Porsche Stability Management PSM warning lamp
E – ABS warning lamp
F – Brake fluid level warning lamp
G – Handbrake warning lamp
H – Brake-pad wear warning lamp
I – Engine oil pressure warning lamp
K – Battery charge warning lamp

L – Seat belt warning lamp
M – Airbag warning lamp
N – Extending rear spoiler warning lamp
O – Luggage/engine compartment warning lamp
P – Soft top warning lamp
Q – Roll over protection warning lamp

Multifunction display / on-board computer

B21 022

The main menu points are:

Computer
Average speed, average consumption, range on remaining fuel, outside temperature, boost pressure

Limit
Speed gong

Check
Stored warnings

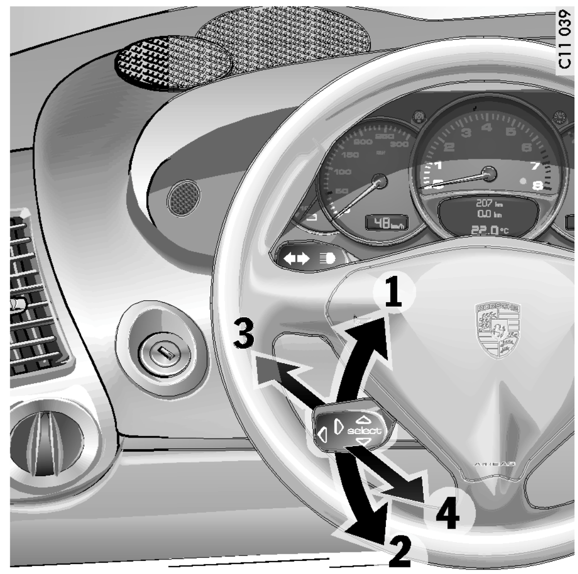
Oil
Failure

Set
Driver settings and resetting

Off
To switch off the multifunction display

Control stalk

The on-board computer is operated using the lower left-hand steering column control stalk.



C11 039

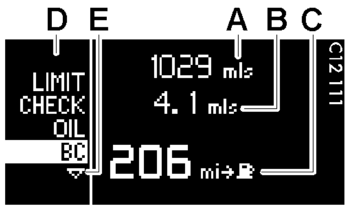
Selecting the on-board computer functions
? Push the stalk up **1** or down **2**.

Confirming the selected menu item (Enter)
? Push the stalk forward **3**.

Moving back to previous selection levels
? Pull the stalk back **4** one or more times.

You can return to the main menu at any time by repeatedly pulling back the control stalk.

Functions and display options



A – Upper display
B – Centre display
C – On-board computer display
D – Menu field
E – Arrow indicating additional menu items

Basic setting

? Upper display: Odometer
? Centre display: Trip odometer

Both displays can be changed individually in the "SET" menu.

Displaying the on-board computer functions in display "C"

Push the control stalk up or down.
(The menu field "D" must be deactivated.)

- Outside temperature (°C / °F)
- Average speed (? mph)
- Average consumption (? l/100mph)
- Range (mph)

The above functions can be called up in sequence.

In the "BC" menu, it is possible to reset all values or just the values for "trip odometer", "average speed" and "average consumption".

<u>Note</u>

By pulling back the control stalk, you can move from a resettable value directly to the menu "C".

Activating / deactivating the menu field "D"

Push forward or pull back the control stalk.

"E" Arrow indicating additional menu items

Arrow :
Push down the control stalk to display the additional menu items.

Arrow :
Push up the control stalk to display the additional menu items.

LIMIT
Acoustic warning signal for speed limit

The acoustic warning signal can be activated for speeds above 10 km/h (6 mph).
The signal is issued when the set speed is exceeded.
The signal is not issued again until the set speed is exceeded by at least 5 km/h (3 mph).

Activate the menu field D
Push forward the control stalk.

Set the speed
Select "LIMIT" using the control stalk.

Push forward the control stalk.

Option 1:
Accepting the current speed

Push forward the control stalk.

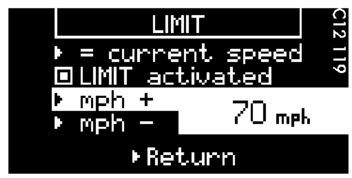
The acoustic warning signal is activated for the current speed.
Display: ?

Option 2:
Preselecting the speed

Select "LIMIT active" using the control stalk.
not activated ?
activated ?

Push forward the control stalk if "not activated".

Select "mph +" or "mph –"using the control stalk.



Repeatedly push forward the control stalk until the desired speed has been reached.
The acoustic warning signal is activated for the desired speed.

Deactivating the acoustic warning signal
Select "LIMIT active" using the control stalk.
Push forward the control stalk.
Display: ?

CHECK warnings

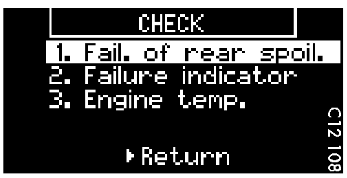
Activate the menu field D

Push forward the control stalk.

Call up the warning messages

Select "CHECK" using the control stalk.

Push forward the control stalk.



If warning messages are available, they can now be called up using the control stalk. You can also call up warning messages which you acknowledged while driving (acknowledged messages are deleted the next time the ignition is switched on).

Push forward the control stalk.

OIL display and measurement of oil level

Requirements for oil level measurement:
1. Engine is idling.
2. Engine has reached operating temperature.
3. Vehicle is horizontal.
4. Vehicle is stationary.

Activate the menu field "D"

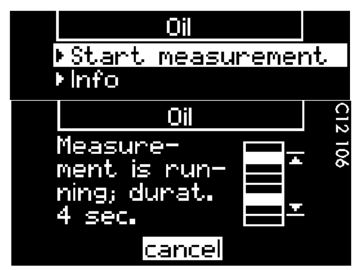
Push forward the control stalk.

Start the oil level measurement

Select "OIL" using the control stalk.

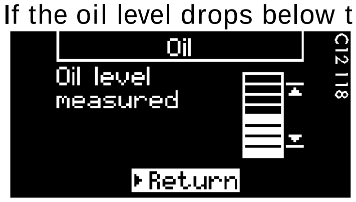
Push forward the control stalk.

Push forward the control stalk.
Measurement is started.



The waiting time for the oil level measurement is shown in the display and also indicated by the scrolling segments in the oil level indicator.

When measurement has been completed, you can read off the engine oil level from the segment display.
If the oil level drops below the min. marking,



the segment below the min. marking flashes.

The difference between the min. and max. marking is approx. 1.5 litres.
One segment of the display bar corresponds to approx. 0.25 litre filling volume.
Top up with engine oil as necessary.
Do not top up engine oil above the max. mark.

Info
You can call up the list of requirements for oil level measurement using the "Info" function.

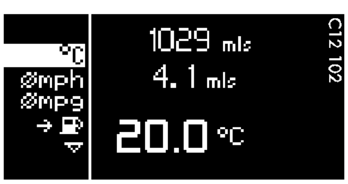
Failure
Failure of the oil level display is indicated by a warning message in the on-board computer.

BC
Calling up and resetting computer functions

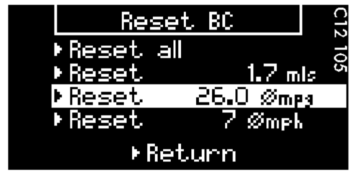
Activate the menu field D
Push forward the control stalk.

Example:
Resetting average consumption
Select "BC" using the control stalk.

Push forward the control stalk.



Select "? l" using the control stalk.



Push forward the control stalk.

Push forward the control stalk.

Average consumption is reset to "-- --.- ? l/100 km".

SET
Computer basic setting

Activate the menu field D
Push forward the control stalk.

Changing the computer basic setting
Select "SET" using the control stalk.

Push forward the control stalk.

00066

With this function, you can reset:
- The trip odometer
- The average speed
- The average consumption

Note
The other menu items up to the "OFF" function are listed without the associated display.

Switching between kilometres/miles

Changing the display
The top and centre on-board computer displays can be changed individually.

Basic setting
To restore the computer basic setting.

Language
To select the display language: Deutsch, English,
Francais, Italiano or Espaniol

Consumption
To select the units for fuel consumption:
l/100 km, mls/gal (USA), mpg (UK), km/l

Temperature
To select the units for temperature:
°C, °F

Clock
To select the clock mode:
24h, 12h

"OFF"
Switching off the display

Push forward the control stalk.
Select **OFF** using the control stalk.

Push forward the control stalk.

00154

Push forward the control stalk to switch off the display.


00003

Switching on the display again

Push the control stalk in any direction.

9003 Analogue speedometer

The speed of all four wheels is used to determine the vehicle speed. The speed signal is transmitted from the PSM control unit to the instrument cluster via the CAN interface. If a wheel-speed fault is detected for one of the wheels (e.g. faulty wheel-speed sensor), the vehicle speed is determined using the speed signals from the remaining wheels.

Speedometer A output (speed signal)

The speedometer A signal continues to be generated as long as term. 15, term. 58 or term. 86 S is switched on.
The output frequency is derived directly from the determined wheel speed.
As before, the speedometer A signal supplies 8 pulses per wheel revolution.

1709 Sensor for oil level indicator

A sensor (probe) which consists of a heating wire and simultaneously functions as a PTC (electrothermal measuring method) is used to measure the oil level.
The sensor is installed in the engine. It is immersed in the oil and is briefly energised during the measuring process.
It is possible to determine the oil level from the start and end voltage of the energisation phase.

General information on on-board computer functions

Range on remaining fuel

During a journey, the range on remaining fuel is continuously recalculated based on the fuel content of the fuel tank, and current and average consumption.
The display reacts more spontaneously as the level of fuel in the tank drops. For this reason, ranges below 15 kilometres (9 miles) are not displayed.

The varying inclination of the vehicle during the journey or when refuelling may lead to imprecise range information.

Note

If a nearly empty tank is refuelled with only a small amount of fuel, this is not registered for the calculation of the remaining fuel range.

Average consumption and average speed

The displayed values refer to the journey made since the average consumption and average speed displays were last reset to zero.
It is possible to set the starting point for measurement before or during the journey.
The measurements are not reset when the ignition is switched off. The values can, therefore, be collected over long periods.
The average consumption and average speed memories are erased if the vehicle battery is disconnected.

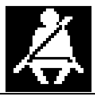
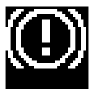
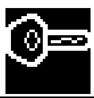
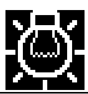
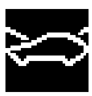
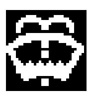
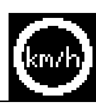
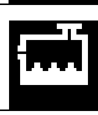
Outside temperature

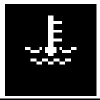
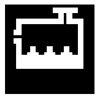
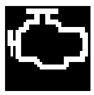
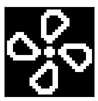
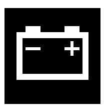
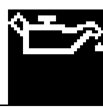
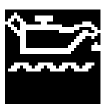
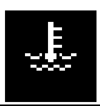
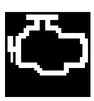
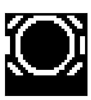
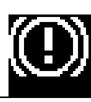
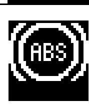
The outside temperature display should not be used as an ice warning.
The road surface may be icy even if temperatures above 0 °C are displayed.

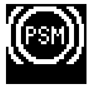
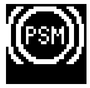
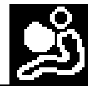
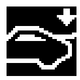
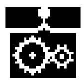
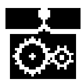
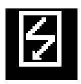
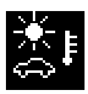
Warning symbols displayed in instrument cluster and by computer

If a warning message displays, always observe the appropriate chapters of the operating instructions.

Warning messages can only be displayed if all of the measuring preconditions have been satisfied. Therefore, regularly check all fluid levels - especially the engine oil level always before filling up with fuel.

Instrument cluster	Computer	Text displayed by computer	Meaning / Action
		Seat belt	All vehicle occupants must fasten their seat belt.
		Handbrake	Handbrake not released.
		Ignition key not removed	
		Lights on	
		Front/rear lid not closed	Close lids properly.
		Refill washer fluid	
		Trip odometer reset	Trip odometer has been reset to 0.
		Units are changed	Units of measurement (kilometres/miles) have been changed for speed and distance.
		LIMIT Cannot be accepted with vehicle stopped	A current speed can only be accepted for the acoustic warning signal if the vehicle is moving.
		LIMIT exceeded	Selected speed limit for acoustic warning signal has been exceeded. Adjust speed if necessary.
Warning lamp, fuel level indicator		Consider range on remaining fuel	Refuel at next opportunity.
		Engine oil pressure too low	Stop immediately at suitable location. Check oil level. Refill with oil if necessary.

Instrument cluster	Computer	Text displayed by computer	Meaning / Action
Warning lamp, temperature indicator		Engine temperature too high	Switch off engine and allow to cool down. Check coolant level. Refill with coolant if necessary.
Temperature indicator warning lamp flashing		Check coolant level	Switch off engine and allow to cool down. Check coolant level. Refill with coolant if necessary.
		Check Engine	Have fault repaired at Official Porsche Centre.
Temperature indicator warning lamp flashing		Failure engine compartment blower	Have fault repaired at Official Porsche Centre.
		Warning battery / generator	Stop at safe location and switch off engine. Do not continue journey in vehicle. Have fault repaired at Official Porsche Centre.
		Failure indicator	Oil pressure indicator is faulty. Have fault repaired at Official Porsche Centre.
		Failure Oil level indicator	Have fault repaired at Official Porsche Centre.
		Failure indicator	Coolant temperature indicator is faulty. Have fault repaired at Official Porsche Centre.
		Failure indicator	Coolant temperature indicator, rev counter, cruise control, etc. may be faulty. Have fault repaired at Official Porsche Centre.
		Service wear on brake pads	Have brake pads changed immediately at Official Porsche Centre.
		Warning brake fluid level	Stop immediately at suitable location. Do not continue journey in vehicle. Have fault repaired at Official Porsche Centre.
		Warning brake force distribution	Stop immediately at suitable location. Do not continue journey in vehicle. Have fault repaired at Official Porsche Centre.
		ABS failure	Have fault repaired at Official Porsche Centre.

		Failure indicator	Speedometer, warning lamps for ABS, PSM, etc. may be faulty. Have fault repaired at Official Porsche Centre.
		PSM failure	Have fault repaired at Official Porsche Centre.
		Airbag failure	Have fault repaired at Official Porsche Centre.
		Failure spoiler control	Dynamic stability affected. Adapt driving style. Have fault repaired at Official Porsche Centre.
Display of selector lever position flashing		Selector lever not engaged	Selector lever may be between two positions. Fully engage selector lever.
Display of selector lever position flashing		Tiptronic emergency mode	Have fault repaired at Official Porsche Centre.
		Failure indicator	Indicators for several systems may have failed. Have fault repaired at Official Porsche Centre.
		Failure fuel level indicator Go to workshop	Have fault repaired at Official Porsche Centre.
		Failure outside temperature indicator	Have fault repaired at Official Porsche Centre.
		Convertible roof not in end position	Completely open or close soft top.
		Roll over protection defective	Have fault repaired at Official Porsche Centre.

Exit the warning messages

Warning messages can be cleared from the computer display.

Push forward the on-board computer control stalk.

You can call up cleared warning messages in the "CHECK" menu.

9415 Headlamps (base headlamps)

The new 911 Carrera models have complete new main headlamps in halogen technology as standard. The form is fundamentally that of the
911 Turbo and adds a new individual look to the new nose trim of the new 911 series.
To differentiate to the 911 Turbo, the cover lens has additional grooves length wise between the lens-aperture areas.

9_01_02

On standard halogen main headlamps of newer models (same as with previous models MY 01) the **low beam** is fitted with a **H7 bulb (12V/55W)** but the **high beam** with a **H9 bulb (12V/65W)**. This H9 bulb produces considerably higher illumination.
In terms of range and road surface illumination, the headlamps are adapted to the superior performance.

Compared to the basic headlamps of MY '01, the **low beam** of the H7 bulb is not projected onto the road via free-form reflectors but via a **projection module** with a large glass lens having a diameter of 70 mm.

In the low beam sector, the H7 bulb system offers the following advantages:

? high light volume
? more light in the boundary zone in front of the light/dark boundary
? homogeneous illumination of the entire road surface
? to prevent the driver of the vehicle and the drivers of oncoming vehicles from being dazzled, the headlights are coated with "anti-dazzle" paint at the necessary points

The high beam of the H9 bulb ensures a good range (advantageous at high speed on straight roads) and improved homogeneity when flashing the headlight.

9415 Headlights

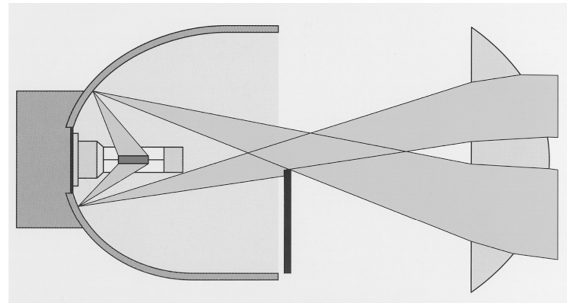
Xenon main headlights

Additional equipment (I-no.) for all models instead of the previously known "Litronic", is now the new **gas discharge light system** known as **"Bi-Xenon"**, which, in terms of range and road surface illumination, is adapted to the superior performance.
In technical terms these headlamps are basically the same as the standard headlamps of the
911 Turbo, the only difference being an additional grooving in the protective glass (same as halogen basic headlamps)

<u>Note</u>

Technically speaking, there is no difference between "Litronic" and "Xenon". Both systems are based on the principle of the gas-discharge lamp. Trademark protection of different manufacturers accounts for the different system names. The name "Bi-Xenon" is a reference to the fact that **gas-discharge lamp technology** is also used in the **high-beam headlights**. Unlike the "Bi-Xenon" system, the "Litronic" system uses a conventional halogen lamp for the high-beam headlight.

With the **Bi-Xenon projection module**, the light generated by the D2S xenon lamp is projected onto the road surface by means of a large glass lens measuring 70 mm in diameter. By moving a beam mask, the beam exit area can be enlarged compared to that for the low-beam headlight so that the xenon light (similar to normal daylight) can also be used to produce the spread beam of the high-beam headlight.



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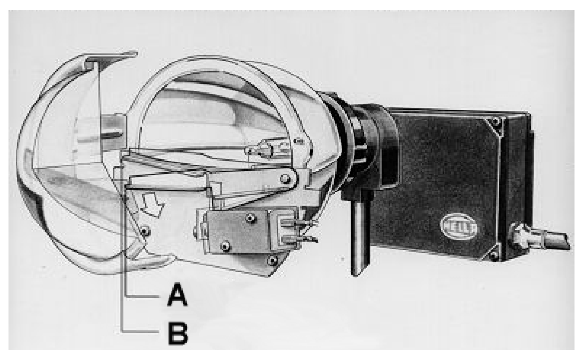
The mechanical concept of the beam mask is based on an electronically actuated solenoid which moves the beam mask to the high-beam position when the high-beam signal is issued.
When the high-beam headlight is switched off, the moving beam mask is raised to the low-beam position and held there by a pre-tensioned spring so that the specified light/dark boundary is maintained reliably even in the event of a system failure.



9_02_00

A – High beam
B – Low beam

The "Bi-Xenon" system offers the following advantages in **low-beam mode**:

? very high light volume

? more light in the boundary zone in front of the light / dark boundary

? homogeneous illumination of the entire road surface

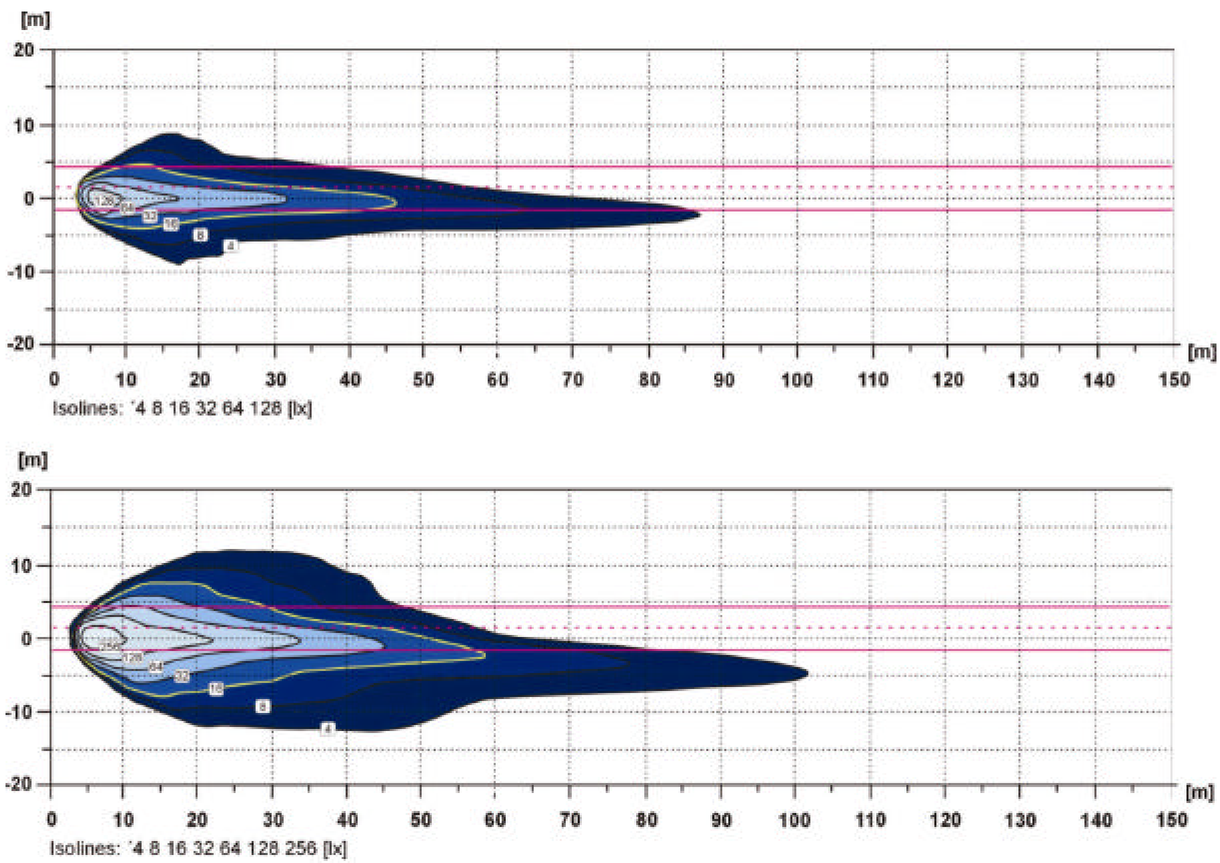
? high colour temperature enables good colour vision

? the sharply defined light / dark boundary prevents passing vehicles from being dazzled

? to prevent the driver of the vehicle and the drivers of oncoming vehicles from being dazzled, the headlights are coated with "anti-dazzle" paint at the necessary points and have a periphery illumination reflector

In comparison:

Top: Low beam with halogen headlamps
Bottom: Low beam with Bi-Xenon headlamps



9_02a_02

The "Bi-Xenon" system offers the following advantages in **high-beam mode**:

? Xenon high-beam headlights

? lowering the beam mask provides a wide and very brightly lit illumination zone even at long range (particularly important on winding roads)

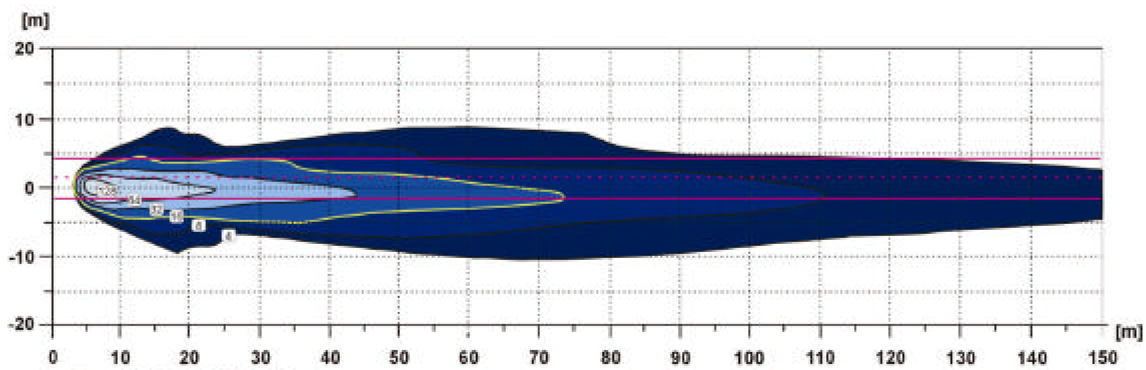
? supplementary halogen headlights ensure long-range illumination (important when driving at high speeds along straight roads)

? considerably better switching behaviour when flashing the headlights as well as improved homogeneity compared to previous gas-discharge systems

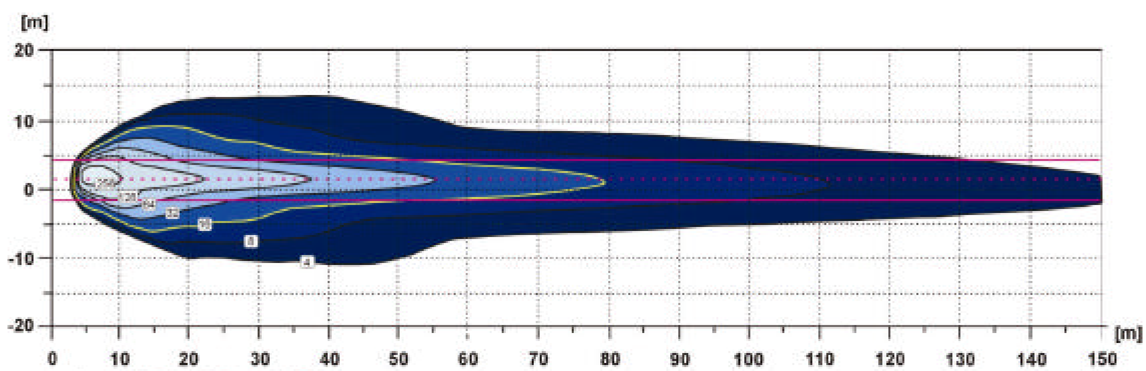
The overall impression of the large headlight with typical Porsche design is achieved thanks to an **illumination reflector** (to reduce the subjective dazzling of oncoming traffic) and a halogen lamp which is used for the side marker light and which produces light that perfectly matches the colour of the xenon lights.

In comparison:

Top: High beam with halogen headlamps
Bottom: High beam with Bi-Xenon headlamps



Isolines: '4 8 16 32 64 128 [lx]



Isolines: '4 8 16 32 64 128 256 [lx]

Dynamic automatic beam angle adjustment (AHBA)

The dynamic beam angle adjustment for the Bi-Xenon system equates to the unit fitted into
Carrera and Boxster models (986/996) and 911 Turbo since model year '99.
The system is a major contribution to road-traffic safety. Automatic correction of the beam angle when the load on the car changes or during pitching movements of the car caused by braking and accelerating reliably prevents dazzling of oncoming traffic and improves road surface illumination on braking.

60 Headlight cleaning system

The headlight cleaning system (fitted as standard) is for the first time integrated directly in the headlight. Owing to this arrangement with its very high component density, it has been possible to reduce the distance that the cleaning water has to travel. The result is a reduced water requirement and, in turn, a reduction in vehicle weight of approx. 1.5 kg.

9431 Tail lights

The rear lights of the new 911 Carrera are the same as those on 911 Carrera models of MY 01.

96 Alarm system

From MY '02 all 911 Carrera models have a **functional extension** in the **alarm system**.

If the doors are opened **manually** with a **key** via the **door lock**, the ignition must be switched on within 10 seconds, or the alarm is activated.

If the alarm system is activated, it can be deactivated by switching on the ignition or by actuation of the hand-held transmitter.

Note

This modification makes the former function of lowering of door window and opening of soft top by holding vehicle key in unlocking position no longer possible.

9110 PCM (Porsche Communication Management)

During MY '01 (January 2001) a **new navigation computer** has been introduced for the PCM.

The following improvements on the previous model have been introduced:

? A 4x CD-ROM drive allows much faster access times to navigation data. This allows rapid computing of routes and deviations from the given route guidance are generated faster. Furthermore, producing maps in various scales is speeded up.

? A 12-channel GPS receiver replaces the 8-channel version. This results in quicker and more accurate position fixing of the vehicle.

? A selective gyroscope supports the positioning fixing and enables, when required, faster calibration of the PCM.

? Processor with 72 MIPS (mega instructions per second) instead of previous 16 MIPS.

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? Memory with 16 MB instead of 2 MB.

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9 Electrical system 911 Turbo/911 GT2

Seat and mirror memory via remote control

B21 008

Individual seat and exterior mirror settings for the driver can be saved for subsequent retrieval.
The remote control detects which key is being used at any given time and sends this data to the seat memory control module. This then initiates an automatic adjustment of both the seat and the outside rear-view mirror.
If a locked car is opened by means of the radio remote control, the seat and the outside rear-view mirror move to the positions stored for this particular key.
4 keys, which are colour coded so one can tell them apart, can be programmed for each car.

Storing seat position

1. Using the key of your choice switch on the ignition.

2. Set the seat and mirror to the positions you require. If, when reversing, the front passenger-side outside mirror is to be used as a parking aid, then the reverse gear must be engaged when storing the seat position.

3. Hold down memory button "M" and additionally press button (next to memory button).
The individual setting is now assigned to this remote control and button .

Retrieving seat position

Unlock car or boot using remote control.

A seat position assigned to a remote control can also be retrieved with button , if the respective key has unlocked the vehicle or switched on the ignition.

If no seat position is assigned to a remote control, button has not function.

<u>Note</u>

Automatic seat adjustment can be aborted at any time by pressing the central locking button, or any memory or seat adjustment button.

Deleting stored seat position

1. Using the key of your choice switch on the ignition.

2. Press and hold button and personal button 2 simultaneously for at least 5 seconds.

Changing stored seat position

The original stored position is automatically overwritten when a new one is entered.

Parking aid outside mirror on passenger's side

If programmed accordingly, the passenger side outside mirror is automatically lowered a certain degree when reversing. The original position is returned to when reverse gear is disengaged.
The lowered mirror can be returned to its original position by pressing the mirror-adjust switch for
< 1 second.
A change in the lowering angle of the outside mirror on the passenger's side is carried out through PST2.

9120 Radio

Basically, the standard and individual program in model year '02 equates to model year '01.
Accordingly, all 911 Carrera and 911 Carrera 4 models are fitted as standard with the radio cassette CR 22 (USA CR 220), 4 wide-band loudspeakers and a cassette holder in the front centre console.

"Bose" high End sound package (analogue)

The individual program (I 680) for model year '02 offers the new "Bose" High End sound package, which replaces the "Digital Sound Processing" (DSP) package.
This system offers remarkably higher sound quality, even in cars with open soft top.
Completely new amplifier technology, located in the dash panel, door trims and rear side trims with very high efficiency drives the sound source.
This High End sound package also has an additional subwoofer system in its own housing, which is fitted behind the rear seats on coupe´s and in the passenger foot-well on convertibles.
All adjustment options are discontinued, which would hinder the performance spectrum of the new sound system, as well as all previously known, permanently programmed tone parameters for various music genres.
The sound package is still available, however no longer with the DSP system.
With the new High End sound system, the acoustics can only be adjusted to individual listening taste on the radio or PCM.
Although this should not be necessary, as the overall layout of the audio system is linear, i.e. all tone relevant controls are set to "0" and the tone parameters of the amplifier software are optimised to the car's interior conditions.

Features of the individual components

Bose patented TSM switching amplifier:
(two state modulation)

These compact and high performance output stages in digital switching technology generate less heat and operate 50% more efficiently than standard linear amplifiers, as these only switch on when required. They are also lighter and have a considerably longer working life.

Integrated signal processing:

It automatically lifts the bass tones and equalises the reduced sensitivity of the human ear in the bass range at reduced volumes. The process is significantly more differentiating than the standard loudness control. It permits a dynamic adaption of bass tones, so that the listener notices no change.
The music sounds true to life, with full, low bass tones at every volume. Voice playback is natural, and the system can achieve volumes as in a concert hall without perceivable distortions.

Active Equalisation:

This Bose patented system is individually adapted to the interior acoustics of each Porsche and guarantees a balanced and clear tone across the whole frequency spectrum.
It creates an environment in which the listener can enjoy music playback, without constantly having to re-adjust the controls. This is only possible on systems especially developed for specific cars, as acoustic measurements are taken, analysed and incorporated during the development process.

Active compressor switching:

This ensures precision fine tuning of the dynamic range of the music. Even during loud sections, the system allows no audible distortions. The tone is always pleasant to the ear.

Raising the sound pressure level:

To play back bass notes deep and full, sufficient sound pressure must be generated. Standard solutions with huge heavy woofer loudspeakers move the necessary large volumes of air. As this could not be an appropriate solution for a sports car, we have constructed made-to-measure loudspeaker housings. These bass reflex technology housings have two great advantages:
A low convincing bass with impact in the whole interior and avoidance of vibration, whereby the air volume to generate the lower frequencies is moved by so called resonance tubes.

With this series of technical innovate solutions the BOSE sound system in the Porsche is convincing with its unique, pure and original sound.

Arrangement of components

BOSE sound system	911 Turbo
Audio electronics (on front bulkhead) Bose signal processing for spatial tone and distortion-free sound at every volume	1 Bose patented TSM switching amplifier (TSM = two state modulation) 5 Linear amplifiers, 5 x 25 watts 6 channels for made-to-measure equalisation
High-performance loudspeakers	**12**
Dash panel	2x 8.9 cm midrange units 2x 4.3 cm tweeters
Doors	2x 11.4 cm woofer / mid-range speakers in 5.5 litre bass reflex housing
Rear side panelling	2x 8.9 cm midrange units 2x 4.3 cm tweeters
Behind rear backrests	2x 13.3 cm woofers in 13.8 litre bass reflex housing

96 Alarm system

From MY '02 all 911 Carrera models have a **functional extension** in the **alarm system**.

If the doors are opened **manually** with a **key** via the **door lock**, the ignition must be switched on within 10 seconds, or the alarm is activated.

If the alarm system is activated, it can be deactivated by switching on the ignition or by actuation of the hand-held transmitter.

Note

This modification makes the former function of lowering of door window and opening of soft top by holding vehicle key in unlocking position no longer possible.

9110 PCM (Porsche Communication Management)

During MY '01 (January 2001) a **new navigation computer** has been introduced for the PCM.

The following improvements on the previous model have been introduced:

? A 4x CD-ROM drive allows much faster access times to navigation data. This allows rapid computing of routes and deviations from the given route guidance are generated faster. Furthermore, producing maps in various scales is speeded up.

? A 12-channel GPS receiver replaces the 8-channel version. This results in quicker and more accurate position fixing of the vehicle.

? A selective gyroscope supports the positioning fixing and enables, when required, faster calibration of the PCM.

? Processor with 72 MIPS (mega instructions per second) instead of previous 16 MIPS.

? Flash memory (memory for saving program and other important data, e.g. last position before power failure, etc.) with 4 MB instead of 2 MB.

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Porsche Cars North America, Inc.

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We have attempted to render the text within this publication to American English as best as we could. We reserve the right to make changes without notice.

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