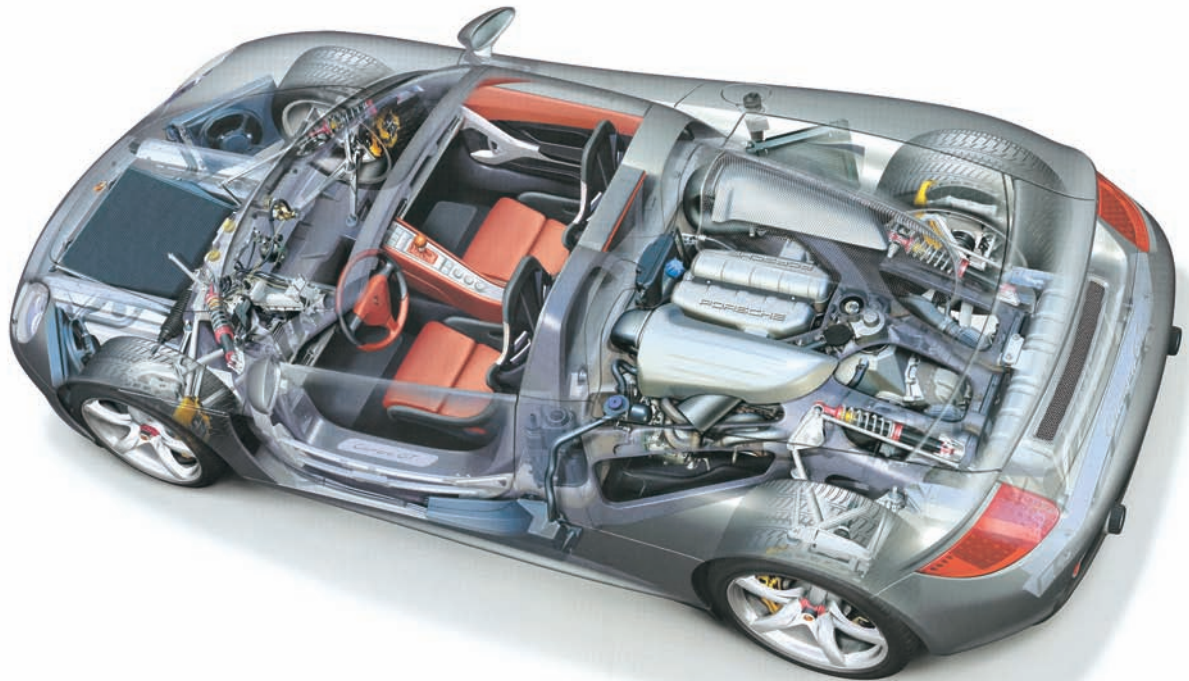




PORSCHE



Service Information

2004 Technik Introduction

Carrera GT

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This Technik Introduction brochure for the new Carrera GT will familiarize you with the technical highlights and innovations of this new addition to the Porsche model lineup.

This Technical Service Information is not intended as a basis for repairs or for diagnosis. More extensive workshop information systems such as the Technical Manual or POSES are available for these purposes.

1	Engine
2	Fuel and Ignition System
3	Transmission Control, Manual Transmission
4	Chassis and Suspension
5	Body
6	Body Equipment, Exterior
7	Body Equipment, Interior
8	Heating/Air-Conditioning
9	Electrics/Electronics

Symbols**Diagnosis****Adjustment****Note****Programming****Safety****Technical Manual**

General

History

It has long been a Porsche tradition to surprise the car world by building a symbol of special significance. An early symbol was given in 1969 with the Porsche 917. Porsche engineers built this car as a winner, and it fulfilled all expectations, dominating world long-distance racing in commanding style. The proof of this was the clean sweep for Porsche at Le Mans in 1970.

In 1985, the Porsche 959 set an example for technical feasibility. With sequential twin-turbocharging, the six-cylinder Boxer engine produced 450 bhp (331kW) of power from a small displacement of 2.85 liters. The 959 was ahead of its time in many respects: e.g., the water cooling in the Boxer engine, at that time only for the cylinder heads, the four valve technology, the permanently engaged four-wheel drive with variable power distribution between the axles.

The idea of a new super sports car for on-road use was born on June 14th, 1998, in the Porsche box at the Le Mans 24 hour race, when Porsche won the race for the 16th time.

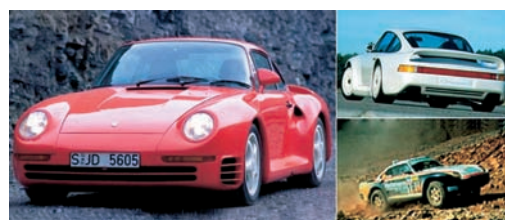
The year 2000 was for Porsche a welcome pretext to set another striking symbol before the world. The Porsche Carrera GT, a racing car licensed for use on the roads, was the sensation of the motor show in Paris at the end of September 2000. The development model of the Carrera GT was presented with a 5.5 liter V-10 engine, with a power output of 558 hp (411 kW).



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Carrera GT

Carrera GT

Porsche has redefined the status of engineering in sports car manufacture with the Carrera GT.



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Porsche wishes not only to demonstrate its technical competence in the sports car segment with the Carrera GT. This car also reflects the strength, the dynamism and the self-confidence of the company and the Porsche marque. The starting shot in the development of the Carrera GT was fired in February 1999. After 15 months of intensive work, the first prototype was ready in May 2000, and emerged as the superstar of the Paris Motor Show on September 28th, 2000. The response was overwhelming, and after further tests, the final decision to build the car was made in February 2002.

One objective was to be in the forefront when developing the Carrera GT: to cultivate the true character of a racing car and, in doing so, achieve the ultimate driving experience in a road-licensed car.

For designers experienced in racing cars, only a vehicle with the lowest possible weight, maximum torsional stiffness, weight distribution as close to center as possible, and, an extremely low center of gravity would be considered for the ultimate sports car. These characteristics are as important as sophisticated aerodynamics with high power outputs and excellent chassis dynamics in achieving quick lap times.

The only bodywork construction that could be considered was the “monocoque” carbon fiber (CRRP) material that is so successful in motor racing. This method of construction permits manufacturing processes developed for aerospace which exploit to the fullest the carbon fiber material. Its use permits the open top Carrera GT to achieve stiffness values that in some respects are significantly higher than comparable enclosed vehicles with sheet steel bodywork. One look at the “equipment carrier beam” used for the first time in a production vehicle, proves that this design concept is not only technically possible, but also achieves a high level of aesthetic perfection.

The hand of racing designers can also be seen in the aerodynamically active components. The tail diffuser and the large extendable rear spoiler wing, which for the first time in the Carrera GT is not dependent on speed alone, but can stay extended at lower speeds based on engine power demands influenced by the driver. The aerodynamics engineers have also been busy on parts hidden from view. The undertray has an ingenious system of flow channels to improve downforce, together with special cooling air ducts that contribute to aerodynamic balance.

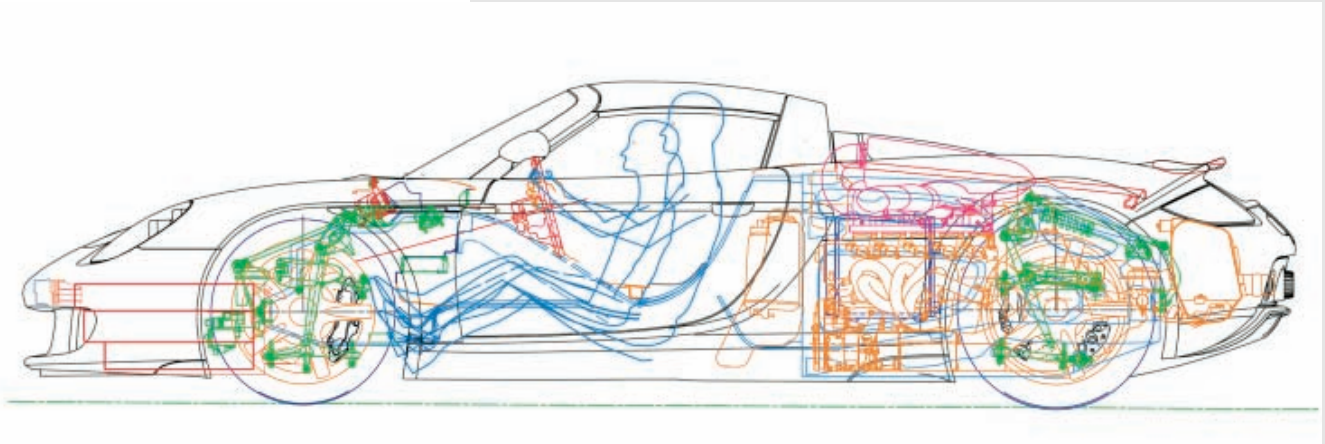
The same perfection and care has been lavished on the suspension. The double control arm suspension on the front and rear axles clearly the work of the same designers who developed the successful Le Mans race cars. The result is race bred firm and precise road handling, with unsurpassed shock rebound and agility.

Carrera GT

The Porsche Ceramic Composite Brake (PCCB) on the Carrera GT is distinguished by 15" (380 mm) diameter front and rear brake rotors, with 6-piston aluminium monobloc fixed calipers. This racing tested brake system is at the forefront of automotive brake development, both in relation to the stopping power, but also in brake system responsiveness and durability. An anti-lock braking system and electronically controlled brake force distribution make the system perfect, and ensure together, with traction control, precise vehicle handling.

The wheels and tires were also designed to match the Carrera GT's performance criteria. The wheels are made of super-light forged magnesium, 19" at the front, and 20" at the rear, with 265/35 ZR 19 tires at the front, and 335/30 ZR 20 at the rear.

The heart of the Carrera GT is the 5.7 l, V10, four valve engine, which was developed as a racing car engine for use in the Le Mans prototype class. In the homologated road-use version, it delivers 605 hp SAE (450 kW) at a torque of 435 ft lb (590 Nm). Even at this high power output, it satisfies all exhaust and noise emissions regulations worldwide. The combination of competition-based qualities with everyday usability is what makes a Porsche stand out from the competition, and was the challenging goal of the engineers.



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Success has come not only by meticulous detailed work on engine tuning, but also by implementing completely new solutions such as the world's first clutch with ceramic friction linings, the Porsche Ceramic Composite Clutch (PCCC). The advantage of this new development, is a clutch with a small outer diameter, low rotating mass, and extremely long service life. These features contribute to the Carrera GT's low center of gravity, and high engine dynamic response. The coherence of the concept, the attention to detail, and the characteristic styling give the Carrera GT a well-earned special cachet – “The Porsche of Super Sports Cars”.

Materials

In the Carrera GT, the materials used are not just carbon fiber, but also depending on the application, selected, low weight, high strength specialty metals.

Depending on the application it may be the weight or the strength that is the primary consideration. Basic materials can be improved by alloying or special process treatments, such as high pressure forging, which allow different materials characteristics to be combined. The classic light metal materials aluminium and magnesium are used only as components of special alloys.



-  Aluminium
-  Magnesium
-  Stainless Steel (H400)

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(Operating fluids are designed so that no additives need be mixed with them).

Engine oil change quantity (without oil filter)	approx. 10.5 qts Mobil 1 0 – W 40
Engine oil change quantity (with oil filter)	approx. 11 qts Mobil 1 0 – W 40
Engine oil change on first filling	approx. 14.8 qts Mobil 1 0 – W 40
Oil fill level max.	10-10.5 qts Mobil 1 0 – W 40
Coolant	approx. 29.5 qts Artec XT 40/30 mixture –40°
Manual gearbox with compensation	approx. 4.2 qts Mobilube 1 SHC 2.4 qts gearbox + 1.8 qts cooling circuit
Fuel tank	approx. 24.3 US Gallons
Fuel reserve quantity	approx. 3.5 US Gallons
Fuel grade	93 Octane $\frac{R+M}{2}$
Power steering	approx. 1.2 qts Pentosin CHF 11S
Hydraulic pump for rear wing	2.2 oz Aral Vitamol
Operating cylinder for rear wing drive	2.5 oz Pentosin CHF 11S
Brake fluid	approx. 1.4 qts DOT 4
Windshield and headlight washing fluid	approx. 4.7 qts
Air conditioning refrigerant	1.3 ± .1 lbs R134A
Air conditioning refrigerant oil	4.9 oz



Use only the fluids and lubricants approved by Porsche. The approved lubricants can be found in the Technical Manual.

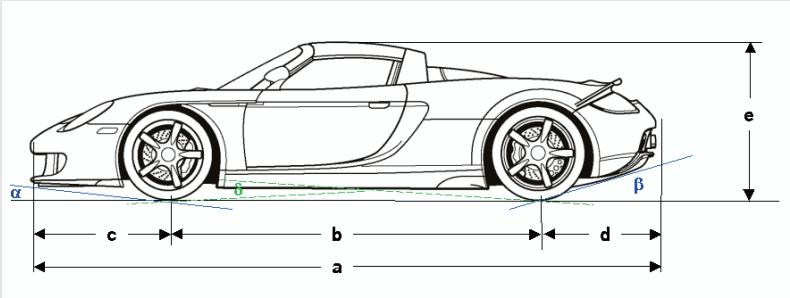
Unladen weight (DIN)	3042 lbs - 3185 lbs
Unladen weight max. (w/options)	3152 lbs
Permitted gross weight	3604 lbs
Permitted front axle loading	1554 lbs
Permitted rear axle loading	2050 lbs
max. payload	562 lbs *
Power-to-weight ratio	5.02 lbs/HP SAE
Weight distribution f/r	42/58 %
* According to Specification	

Performance

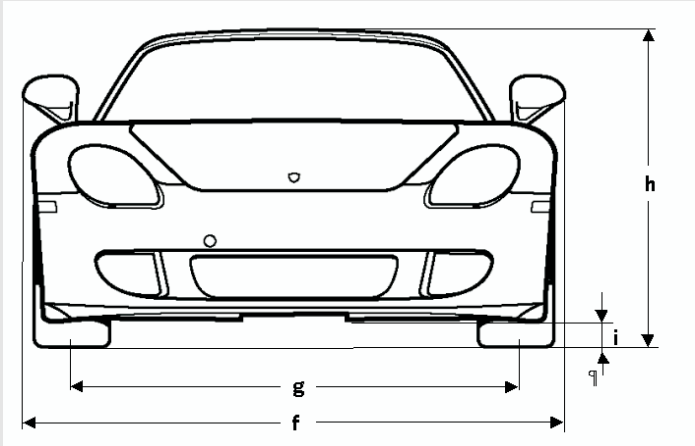
Top speed	205 mph (330 km/h)
Acceleration 0 – 62 mph (100 km/h)	3.9 sec
0 – 100 mph (160 km/h)	6.9 sec
0 – 124 mph (200 km/h)	9.9 sec
1000 m from standing start	20 sec
1/4 mile from standing start	11.4 sec
Flexibility 50 -79 mph (5th gear)	4.0 sec
62-124 mph (5th gear)	9.7 sec



Data based on a vehicle (unladen weight) and 440 lbs payload.



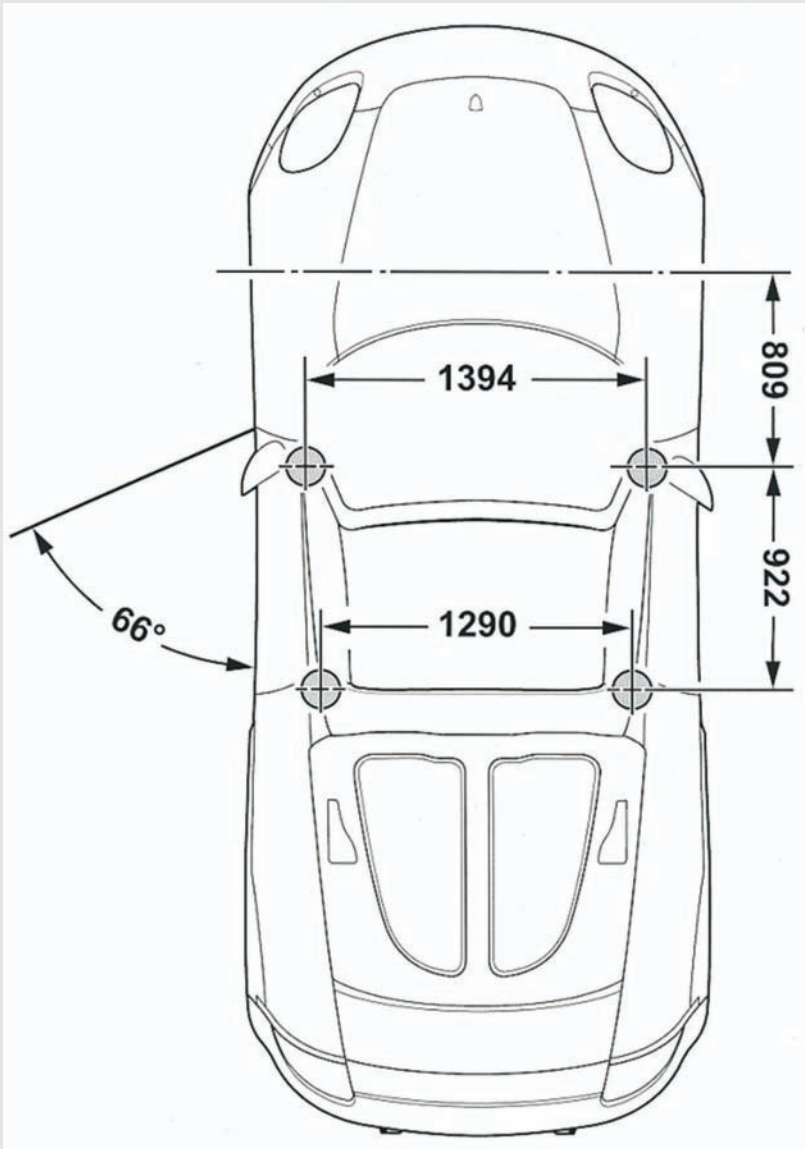
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Letter Designation	Dimensions of Vehicle	
a	Length	4613 mm
f	Width	1921 mm
h	Height for DIN unladen weight	1166 mm
g	Front track	1612 mm
	Rear track	1587 mm
b	Wheelbase	2730 mm
c	Front overhang	1016 mm
d	Rear overhang	867 mm
i	Ground clearance	86 mm
-	Turning circle	12,9 m
-	Steering wheel turns (lock to lock)	2,59
-	Stowage space under front hood	DIN 76 liters USA 63 liters
α	Front slope angle	5,7°
β	Rear slope angle	16,2°
δ	Breakover angle	7,6°

The following diagram shows the mounting points for the Carrera GT, when it is being lifted using an approved vehicle hoist.



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The 4 aluminium plates are supplied as Porsche special tools. To fit the mounting plates to the vehicle so that it can subsequently be lifted using a vehicle hoist, the vehicle must be placed on the wooden drive-on blocks which are supplied as Porsche special tools.



For lifting using a vehicle hoist, aluminium mounting plates must be screwed in place at the points on the undertray indicated on the illustration. Do not lift the vehicle without using these plates. Remove these plates from the vehicle before returning it to the customer. Replace the plastic covers over the attachment points before using the vehicle on the road again.



The precise procedures and operations on vehicle hoist can be found in the Technical Manual.



When performing work that reduces the weight on the vehicle nose, or when removing the engine, the vehicle must be secured with the tie down strap supplied as Porsche special tool to prevent the vehicle from tipping of the vehicle hoist.

Carrera GT



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The detailed description of towing can be found in the relevant section of the Owner's Manual.



The tow lug is solely for recovery of the Carrera GT and must not be used for any other purpose. Under no circumstances may another vehicle be towed using these lugs.



When the engine is not running, no power steering is available!

Towing the Carrera GT

For towing a disabled Carrera GT forwards or backwards the towing lug provided in the vehicle tool kit must be screwed into the corresponding socket at the nose or the tail (see also the Owner's Manual); the vehicle must not be towed by any other means.

The socket for the front towing lug is located at the front right of the aluminium bumper, and for the rear towing lug in the center of the tail diffuser. The respective towing lugs are at the rear left in the storage compartment for the vehicle tool kit. The front towing lug can be screwed into the threaded socket accessible by removing a plastic cover to the right of the license plate. This procedure, and the towing lug, are similar to that for the 996/986 sports cars. The rear towing lug is a pressed steel plate and must be secured to the tail diffuser by screwing the two M8 screws provided into the threaded holes. The screws are 16 mm AF hexagon and must be tightened to 24 ft lbs (33 Nm).

When the Carrera GT is being towed, the following basic rules must always be observed:

- Whenever possible the Carrera GT should be lifted on to a suitable flatbed wrecker and transported stationary
- If it is necessary to tow the Carrera GT on its wheels, all four wheels must be freely rotating and the vehicle steerable (steering lock released). All four wheels must run on the asphalt, a "towing cradle" must not be used
- If the brakes have failed, the vehicle must be towed, if at all, using a towing bar
- The ignition should be switched on while being towed (so that all the vehicle lights are functional)
- The Carrera GT should be towed on its own wheels only as far as the nearest authorized workshop.

Before delivering the Carrera GT to the customer, the pre-delivery inspection detailed in the Technical Manual should be performed. Only after the pre-delivery inspection has confirmed that all functions are operating correctly may the vehicle be delivered to the customer.

Service

The service interval for the Carrera GT is 15,000 miles (24,000 km). The service performed is alternately a minor and a major service. If the annual mileage is less than the service interval, an annual service should be performed.

The exact service maintenance schedules and information about each service can be found in the Technical Manual. The service plans shown in section O of the Technical Manual are provided with cross-references to the individual service work.



For service before delivery of the Carrera GT a separately described “Pre-delivery inspection of the Carrera GT” is available.



The scope and operations for additional services can be found in the Technical Manual.



Additional information can be found in the appropriate sections of the Technical Manual for the systems concerned.



Detailed information regarding the scope of each diagnostic command can be found in section 0 of the Technical Manual.

Additional Service

Every 60,000 miles (100,000 km) an additional service shall be performed. Further services should be performed at intervals of 2, 4, 8, 10 and every subsequent 2 years.

Service Diagnostic System

To check the operation of the diagnostics system, the fault memories for the various control units should be read.

Service Road Test

Only a trained and reliable member of staff may perform the road test! Under no circumstances may the traction control be disabled!

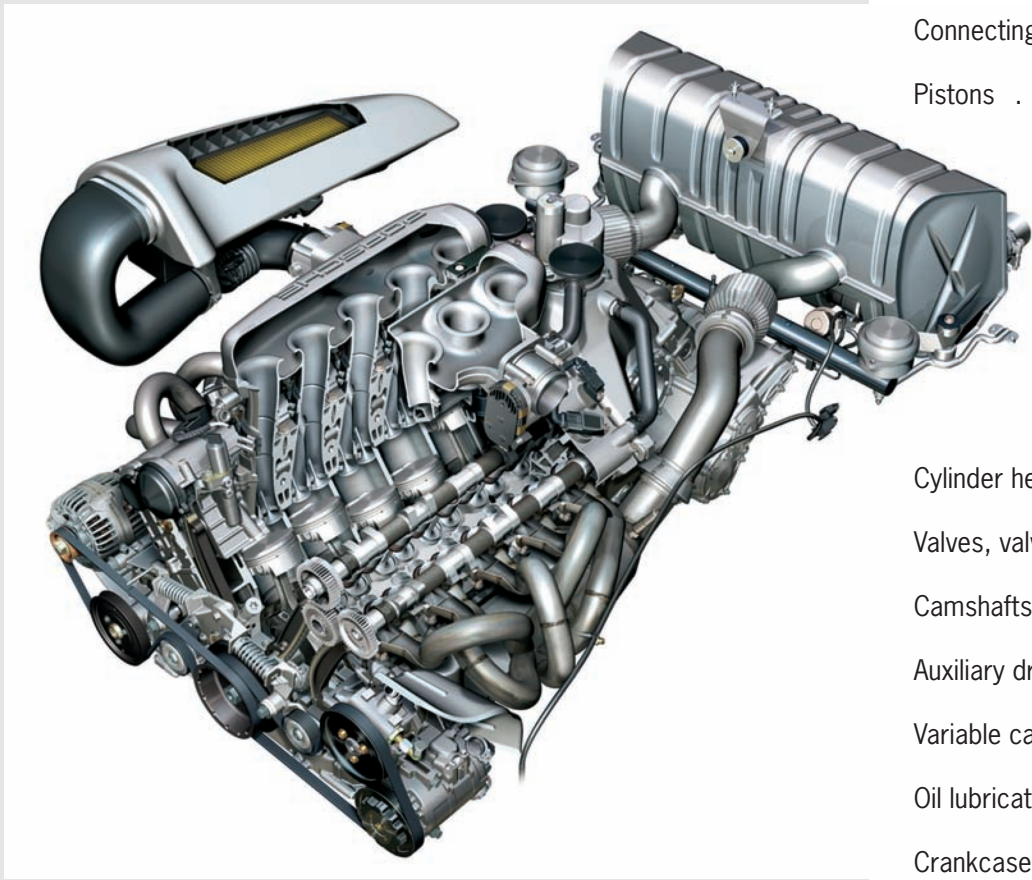
The following points are included in the scope of the road test:

- Operate the central locking by remote control and check that it operates correctly
- Check service brake and parking brake for correct operation and actuation travel
- Start engine, check for correct operation
- Actuate clutch, check for correct operation
- Gearbox: select gears, check for correct operation
- Actuate steering, check for correct operation
- While driving, check cruise control for correct operation
- With engine at operating temperature, check heater controls and settings for correct operation
- With engine running, check air conditioning (if fitted) for correct operation
- Check instruments and display lights for correct operation

General

The M80 engine for the Carrera GT is a compact V10 spark-ignition mid-engine layout unit developed from and for motor racing, with the crankshaft placed low in the motor block for optimum center of gravity.

The 5.7 liter engine of the Carrera GT is naturally aspirated and has 4-valves per cylinder, four camshafts and dry sump lubrication with separate oil tank to ensure positive lubrication even at the highest lateral acceleration.



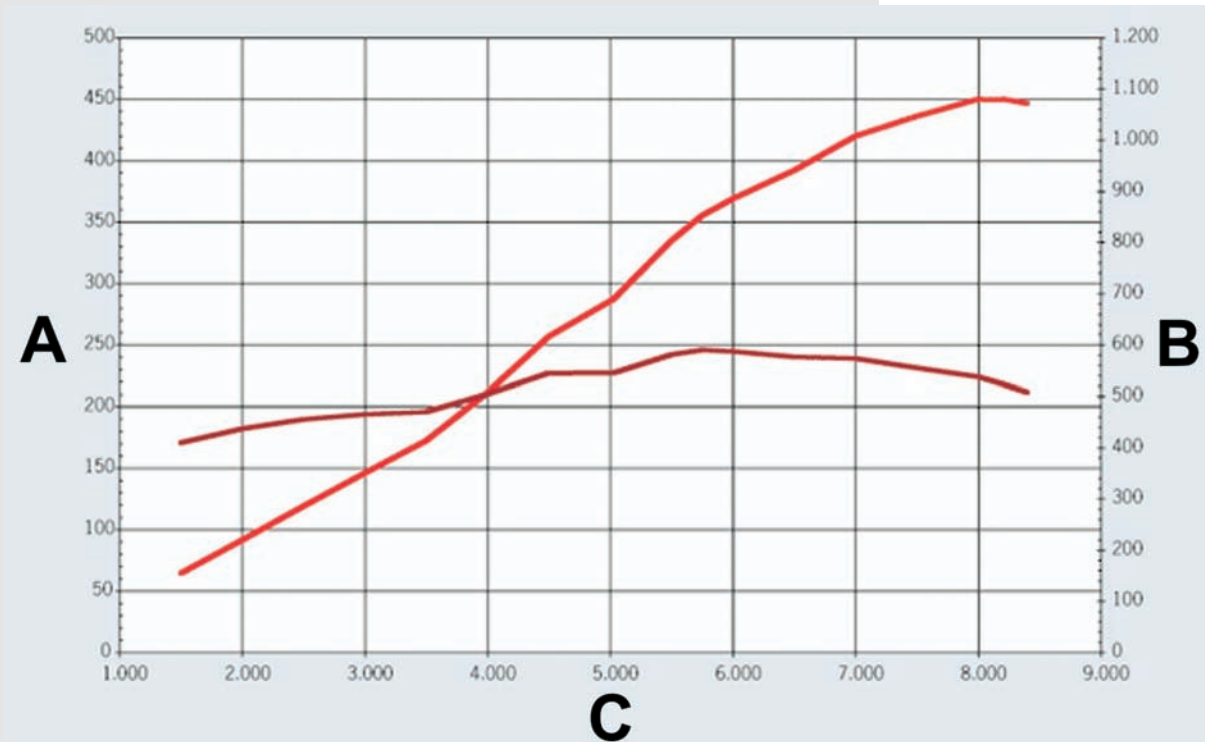
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Important Features

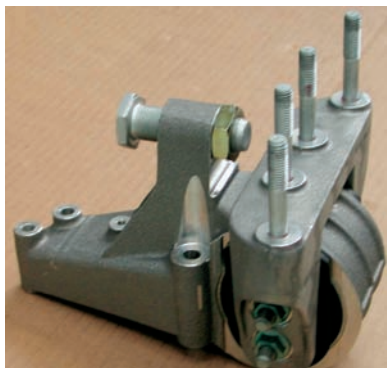
- 10 cylinder in V layout
- Mid-engine power train layout
- 68° cylinder angle
- Dry sump lubrication with oil tank incorporated into the transmission housing
- Oil scavenging from each crankcase and gear casing, also front and rear of cylinder heads, with oil defoaming before the oil tank
- 2 externally fitted gear pump housings for oil, 9 scavenging pumps, 1 pressure pump
- Lowest possible center of gravity due to crankshaft position low in engine block.
- Forged crankshaft with vibration damper integral with the belt pulley
- Very rigid crankcase
- Water and oil passages integral within the crankcase
- Steplessly variable intake camshaft timing. VarioCam (adjustment range 40° crankshaft)
- Piston cooling via oil spray jets
- Titanium connecting rods
- Oil-water heat exchanger
- Engine cooling on the cross-flow principle
- Motronic ME 7.1.1 for dual engine management system concept (Master-Slave)
- Exhaust emission standard EU/LEVII
- Light flywheel with segmented ring gear without dual mass vibration damper
- 2-plate ceramic clutch PCCC with 169 mm plate diameter
- Hydraulic clutch actuation acting centrally on the pressure plate



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A – Power**B – Torque****C – Engine Speed****Engine Data – Carrera GT**

Engine type	V- engine with 68° cylinder angle
Engine type	M80
No. of cylinders	10
Valves/cylinder	4
Camshafts 4	(intake camshafts with continuous adjustment)
Bore	98 mm
Stroke	76 mm
Displacement	5.7 Liter
Compression ratio	12:1
Max. power	@ engine speed 605 HP (450 kW), 8,000 rpm
Max. torque:	@ engine speed 435 ft lbs (590 Nm), 5,750 rpm
Max. power/liter	106.1 hp/l (78.5 kW/l)
Ignition cut-out speed	Max. 8,400 rpm
Idling speed	800 rpm (900 rpm when AC in use)
Engine weight	474 lbs (215 kg)
Firing order	1-6-3-8-5-10-4-9-2-7
Ignition intervals	68/76° crankshaft
Engine management	Bosch ME 7.1.1
Engine lubrication sys.	Dry sump with separate oil tank and oil-water heat exchanger



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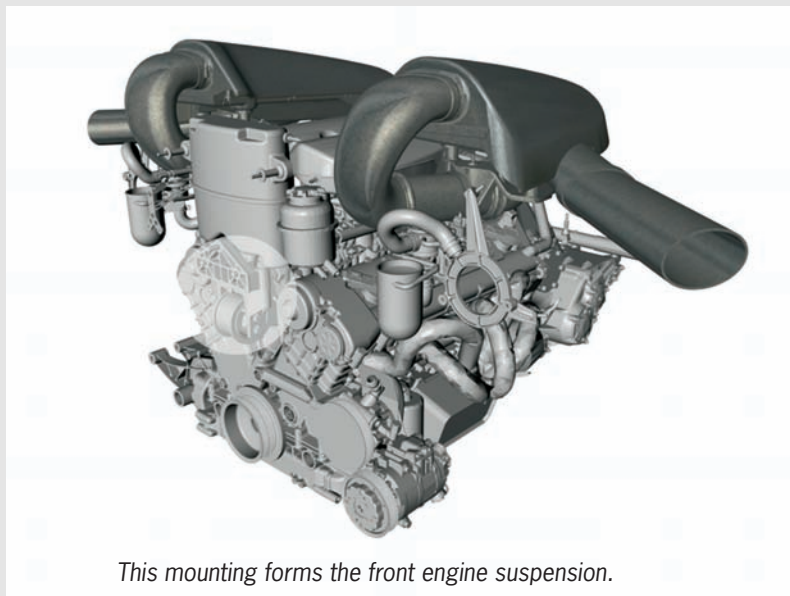


Setting procedure and dimensions for setting the slide travel can be found in the Technical Manual.

Power Unit Mounting

The engine/transmission drive train is mounted via 3-points on the Carrera GT equipment support beam.

On the engine face between cylinders 1 and 6 there is a rubber/metal vibration damping element fitted between the mounting faces of the cylinder heads, which is secured to the front protection plate of the equipment support beam by a cast aluminum mounting fixture.

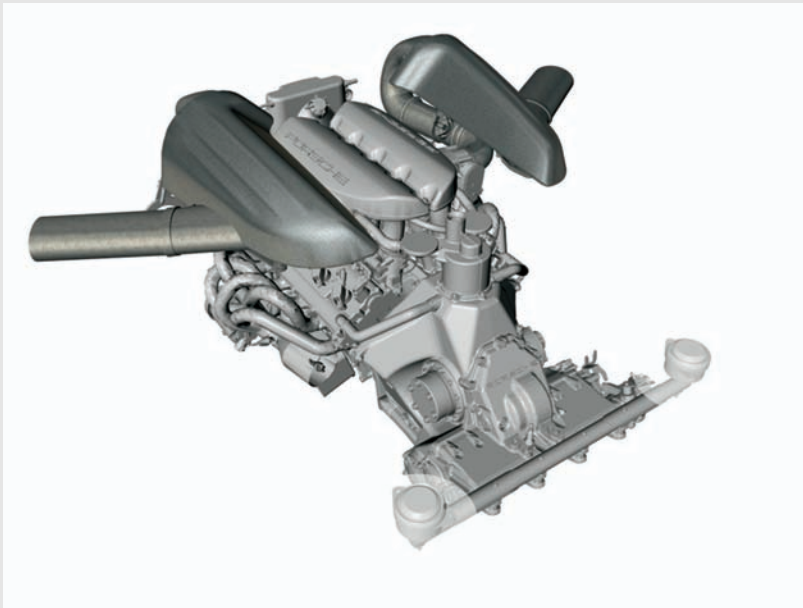


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The rubber/metal damping element is very similar to that used in the 911 Carrera (996) and Boxster models. The horizontally mounted bolt with lock nut is set to limit the maximum displacement of the drive train in the event of a rear-end collision.

The rear suspension of the drive train is taken up by 2 hydraulic mountings bolted to the rear corners of the equipment support beam. Both hydraulic mountings are attached to a common transverse beam with the lugs of the transmission housing.

The hydraulic mountings are similar in their basic outline to those used on the 911 Carrera (996). The vibration damping arrangement has been specially tuned for the Carrera GT.



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Crankcase

The crankcase of the V10 engine is an aluminium alloy (AlSi10MgCuSt6) low pressure gravity casting.

The crankcase consists of two parts bolted together.

Crankcase Upper Part

The crankcase upper part is of the closed-deck type and the cylinder liners are incorporated in the casting. The timing cases with holes to accept components of the camshaft drive are also integral within the crankcase. All oil and water passages are incorporated within the housing.

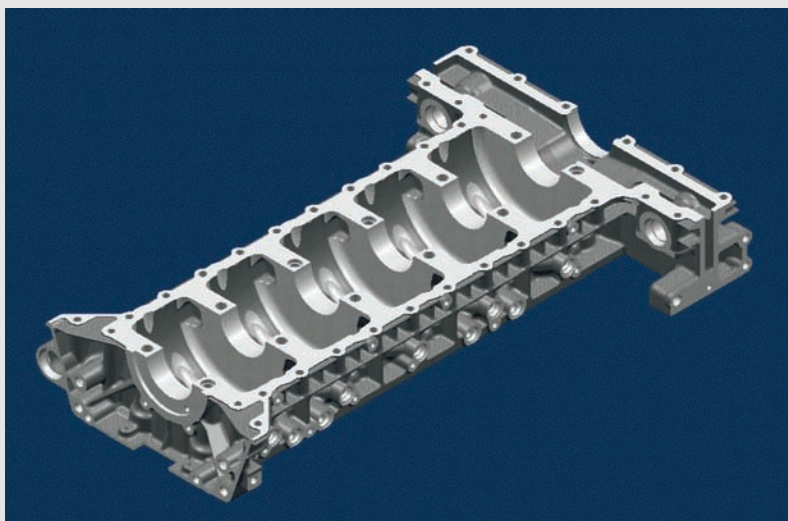


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Crankcase Lower Part

All scavenging points for oil removal from the crankcase are within the crankcase lower part. The crankcase lower part also forms the base of the engine body. There is no sump attached to the crankcase. Attached to the outside of the crankcase lower part are the oil scavenging pumps and the oil pressure pump with oil filter and oil-water heat exchanger (on a common bracket). The oil passages for feed and collection are integrated within the lower crankcase casting.

The coolant pump with the thermostat body is also mounted on the lower crankcase assembly.



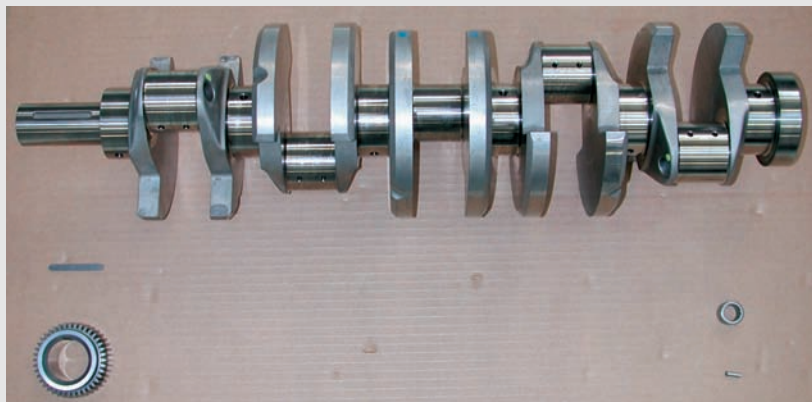
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Crankshaft

The drop forged crankshaft is of nitrided (42CrMo4V). The crankshaft is gas nitro-carburised for surface hardening at the bearing points. The crankshaft has six bearings in the crankcase. It is provided with 10 counterbalance weights to the left and right of the connecting rod journals.

The crankshaft throws are at 72° crank angle. The axial play of the crankshaft is determined by two thrust washers on bearing block 4. The semicircular thrust washers are inserted into the crankcase upper and lower parts. The main bearings are tri-metal alloy bearings and have a bearing diameter of 60 mm.

The connecting rod bearings are also tri-metal alloy bearings and have a bearing diameter of 50 mm. On the crankshaft journal before bearing 1, a groove to accept the cam drive key and internal threads for the pulley fixing bolt. At the opposite end of the crankshaft is the pilot bearing for the gearbox input shaft and dowel pin for positioning the flywheel.



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Belt Pulley

The pulley with integral vibration damper and cam drive gear are firmly secured to the front crankshaft stub with a square key and bolt.



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Carrera GT



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The pulley, as well as acting as the drive for ancillary units (alternator, air conditioning compressor, power steering and coolant pumps) using two poly rib belts, has the additional task of acting as a vibration damper.

The vibration damper in the pulley of the Carrera GT engine is not the usual vulcanized rubber/metal element, but is based on a new process incorporating a viscous damper within the pulley. Within the pulley body there is a steel ring with an exactly defined mass which acts as a counterbalance weight. This chamber is enclosed using a cover which is laser welded in place. Through the cover a mass of silicone-based gel is injected into the chamber alongside the counterbalance weight. The cover is then sealed with a point weld. This mass of gel forms a resilient mounting for the counterbalance weight and reliably smoothes out irregularities in the rotation of the crankshaft.

The advantages of this design are that it is small and compact, does not degrade with age, and is unaffected by aggressive materials and external influences.

Connecting Rods

The connecting rods are forged titanium (Pankl connecting rods). The connecting rod big end cap joint faces are machined (not fractured). The exact fitting of the bearing cap to connecting rod end is achieved by fixing with dowel pins. The caps are bolted using anti-fatigue bolts.



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To match the bearing caps to the connecting rods, both items have a matching number on the side of the connecting rod and cap.



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Pistons

The pistons of the Carrera GT are box pistons with 2 compression and one oil wiper ring. The pistons are of forged aluminium. The piston surface is phosphated for corrosion protection. This surface coating is evident as a matt black coloration of the piston.

The wrist pin is retained in the wrist pin bores by two circlips.



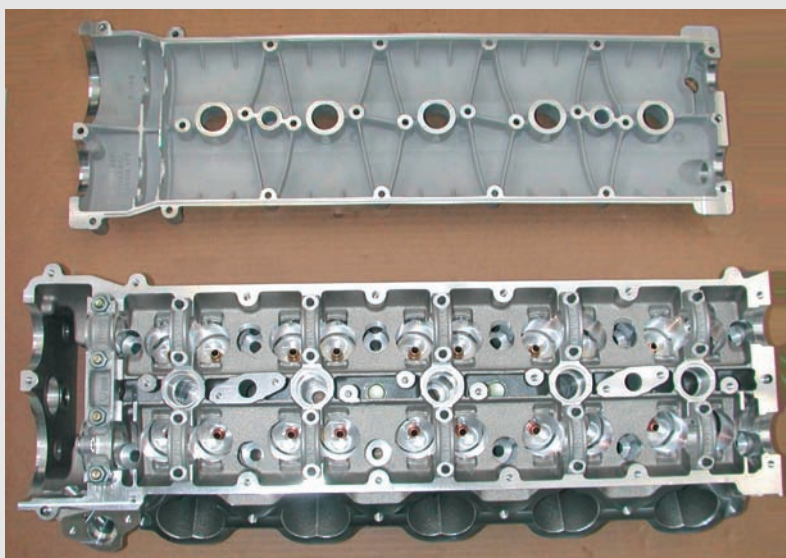
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Cylinder Head

The cylinder head of the Carrera GT is a single-piece gravity casting of aluminium alloy (G-AlCu5Ni1). The cup tappet guides and the camshaft bearings are cast into the cylinder head.

In the gear wheel chamber of the cylinder head are mounting bores for the intermediate gear wheel for the camshaft drive.

The bearing bridge of the first camshaft bearing forms a labyrinth with two cast-on ribs in the cylinder head cover. This ensures that the oil thrown off by the camshaft timing gears remains in the camshaft drive housing. The reason for this is to avoid aeration of the oil, while ensuring crankcase breathing through the camshaft housing.



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The scope of work for valve clearance adjustment can be found in the relevant sections of the Technical Manual.

Gas exchange is performed by two intake and two exhaust valves per cylinder. The valves are mounted in pairs in a pitch-roofed combustion chamber, at a total angle of 21.4° to each other.

Valve actuation is performed by cup tappets without hydraulic valve clearance adjusters. Within the upper spring retainer there is a ground valve adjustment shim. Every 30,000 miles (48,000 km) the valve clearances must be checked and adjusted as necessary.

For valve clearance adjustment the drive unit must be removed. For this reason valve clearance adjustment is included within the scope of work for Service Level 2.

The air passages for secondary air injection behind the exhaust valves in the exhaust ports are cast into the cylinder head. The air feed is provided from a central air channel in the cylinder head cover.

On the intake camshaft side, next to the camshaft drive chamber is mounted the solenoid hydraulic valve, which controls the camshaft adjustment.

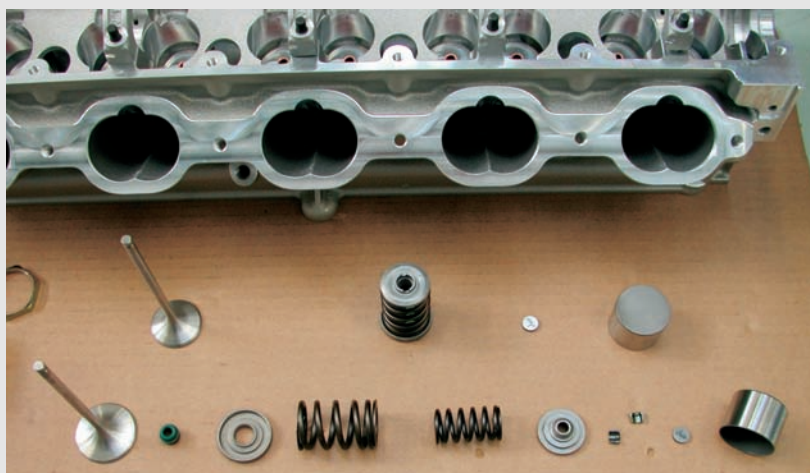
In the mounting bore before the solenoid hydraulic valve there is a fine screen, to protect the solenoid hydraulic valve from any foreign particles in the oil.

Valves; Valve Springs

The intake and exhaust valves of the Carrera GT have a stem diameter of 6 mm. The valve guides are pressed into the cylinder head.

The intake and exhaust valves are bimetallic, i.e. a different material is used for the valve heads and the lower part of the valve stem, compared to the upper part of the valve stem. In addition, the exhaust valves of the Carrera GT engine are sodium filled, for better heat transfer.

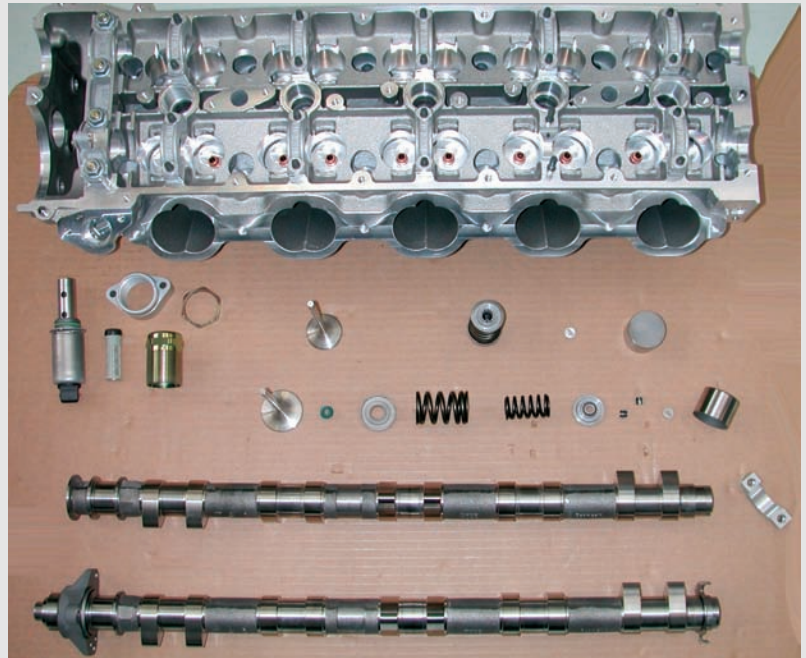
The diameter of the intake valve heads is 39.5 mm and of the exhaust valve heads is 34.0 mm. The intake and exhaust valve springs are helical double springs. That means that to ensure that the valve has sufficient closure force a second valve spring with an opposite wound coil is positioned within the main spring.



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Camshafts

The camshafts of the Carrera GT are clear chill steel castings. The intake valve stroke is 11.8 mm, and the exhaust valve stroke 10.5 mm. The base diameter of the cam is 35 mm. The camshafts run in six bearings without bearing shells, fed with pressurized oil, running directly in the cylinder head material. The bearing diameter is 31 mm.



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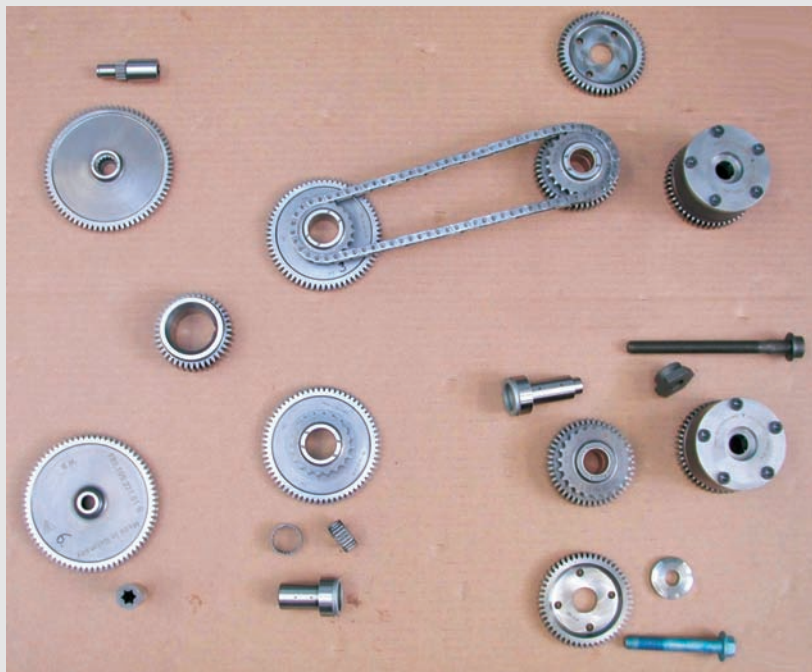
Camshaft Drive

The drive to the camshafts is taken from the crankshaft by means of a spur pinion on an intermediate gear which is mounted in the crankcase. The intermediate gear drives a roller chain, which in turn drives an intermediate gear mounted in the cylinder head.

This intermediate gear mounted in the cylinder head takes its drive power from a sprocket and transfers it to a spur pinion gear. This spur pinion gear is constructed as a tensioning gear for vibration damping.

A tensioning gear comprises two parallel halves which are tensioned against each other by one or more spring elements. This type of pairing of gears eliminates gear tooth flank play. Vibrations and drive noises are very effectively dampened.

The intermediate gears are mounted in the chain drive housing and run on stop pins with oil mist lubricated bearings.



1_81_04

Auxiliary Drive Belt

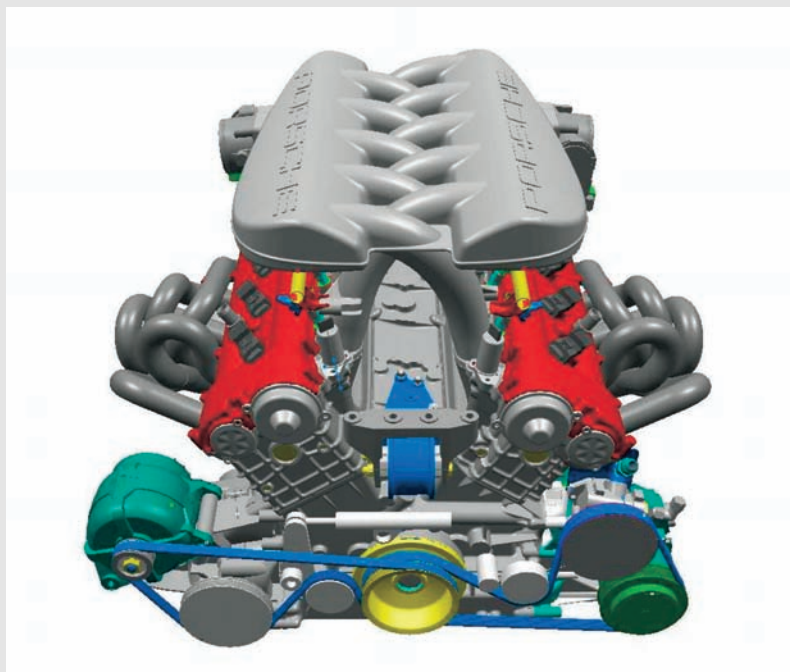
The drive belt for the auxiliary units comprises 2 polyrib belts driven from the crankshaft pulley. In the base version of the vehicle, without air conditioning, the polyrib belts fitted on the left hand side of the engine is correspondingly shorter.

Both polyrib belts are fitted with a tensioner roller, which exerts a defined force on the belt by means of a pre-loaded spring and a deflector arm, thus tensioning the belt.

If the belt requires changing, the spring must be moved to an assembly position, using the appropriate tool.



Refer to the respective section in the Technical Manual.



1_64_04

On the long pull span of the polyrib belt to the alternator and coolant pump drive, there is a steel pin mounted on the coolant pump body to limit the amount of oscillation of the drive belt. The steel pin is located above the polyrib belt in the center.

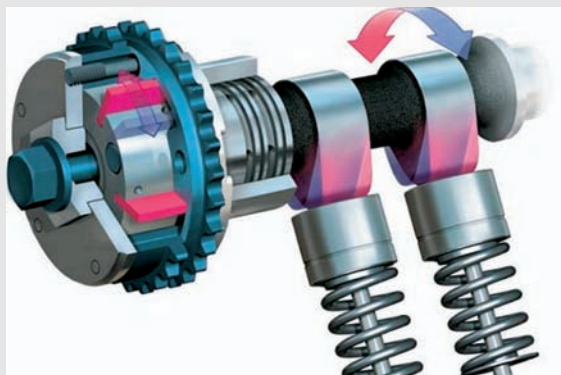
Variable Camshaft Timing

The Carrera GT comes with an intake side camshaft adjustment for achievement of its power and torque values. The adjuster for the Carrera GT is matched to the V10 engine and its designed control characteristics.

The drive of the camshafts and of the adjusters is performed by straight cut spur pinion gears. The variable camshaft timing on the intake camshaft is based on the well-known principle of a vane cell adjuster. Adjustment is achieved by means of oil pressure which is delivered to the respective working chambers by the solenoid hydraulic valve.



The illustration in this section shows the drive of the adjuster using a sprocket. In the Carrera GT a gear wheel is used instead of a sprocket. This arrangement does not affect the functionality of the variable camshaft timing.



1_65_04

The Motronic control unit determines, using the speed sensor and Hall sensor signals, the actual position of the camshaft relative to the crankshaft and calls for adjustments if this varies from the required position calculated by the Motronic. Using the programmed map values (speed, load, engine temperature) and input signals, the control unit determines the desired angle. If there is a difference between the desired and the actual angles a controller in the Motronic actuates the solenoid hydraulic valve for camshaft adjustment for a sufficient period until the desired and the actual angles match. The maximum adjustment angle is 40° crank angle (20° cam angle).

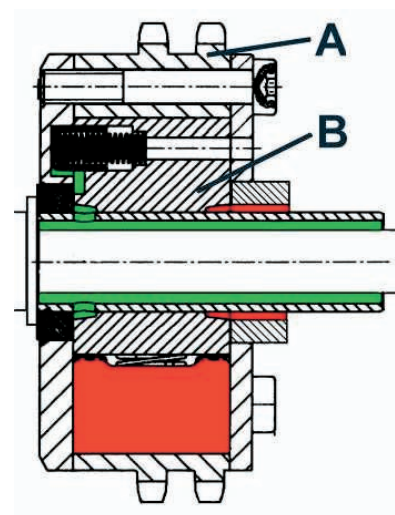
Vane Cell Adjuster

The vane cell adjuster is comprised of:

- the stator (A) locked to the crankshaft gear wheel
- the rotor (B) locked to the camshaft
- the vanes inserted to provide the seal between the working chambers, and two covers.

The gear is mounted on the outer diameter of the stator. It is positively linked to the crankshaft by the drive cascade. The rotor is securely bolted to the camshaft. Repositioning between rotor and stator is possible (inner bearing of adjuster). This rotation is limited by a vane that is inserted into the rotor and by stops on the stator. The vanes divide each recess in the stator into two chambers, which work in opposite senses.

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. On each side the chamber has a cover which provides a seal against the gear wheel. The adjuster is locked at the “retard” adjustment stop. This is achieved by a spring-loaded hardened pin which engages in a hole in the cover when the adjuster is at the “retard” adjustment stop and without oil pressure. When the engine is started, this gives a positive connection between stator and rotor. Noises during the period when there is no oil pressure are reliably avoided using this interlock.



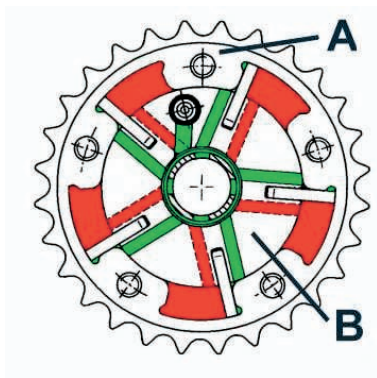
1_83_04

A - Stator

B - Rotor



1_31_04



1_84_04

A - Stator

B - Rotor

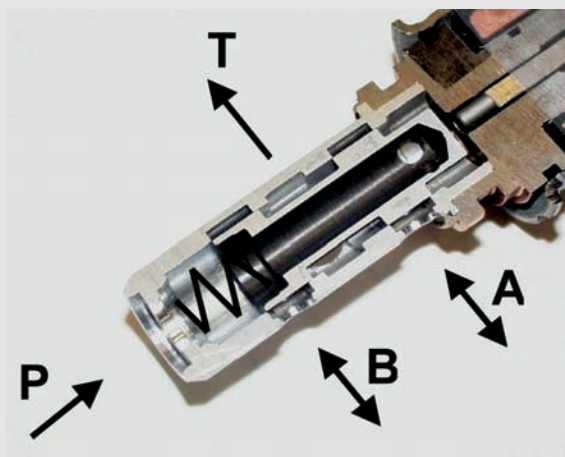
- A** - Control line, retard
- B** - Control line, advance
- T** - Return line
- P** - Pressure feed line

Function

In the adjuster there are two chambers, one for each different effective direction. Filling a chamber causes the rotor to rotate relative to the stator. Filling the other chamber allows the rotor and with it the camshaft to be returned to its initial position. The oil in the non-pressurised chamber returns via a solenoid hydraulic valve back to the crankcase. If during the filling of a chamber the oil supply and the oil return flow at the solenoid hydraulic valve is interrupted (valve is in central position), the adjuster remains in the position it has reached. The chambers lose oil through leakage so that the adjuster leaves its position. The solenoid hydraulic valve is activated accordingly via the control unit and the adjuster returns to the desired position.

Solenoid Hydraulic Valve

The solenoid hydraulic valve for controlling the camshaft adjuster oil pressure is the same as that used on the Cayenne. For each intake camshaft a valve is provided in the respective cylinder head.

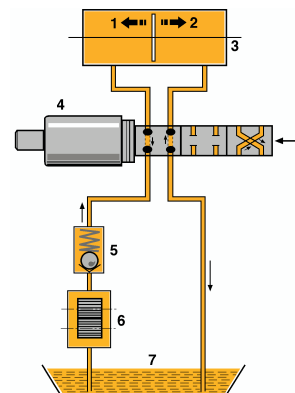


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The solenoid hydraulic valve is designed as a 4/3 way proportional valve. Depending on the control unit command it connects one of the two control lines (A/B) with the oil pressure feed line (P) and also opens the other line to allow the oil to flow out into the crankcase (T-line). If the A-line is pressurized with oil, the adjuster is turned in the advanced direction. If the B-line is pressurized with oil, the adjuster is turned in the direction for retarding the valve timing. In the center position, both control lines are closed. The camshaft is held in the desired position. Additionally, 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 center position. The solenoid hydraulic valve therefore determines the adjustment direction and the rate of adjustment.

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 fitted in the P-line and the solenoid hydraulic valve is energized (e.g. to adjust the valve timing towards advance), the adjuster, with the camshaft moving towards advance, independently draws oil via the feed line, the solenoid hydraulic valve and the non-return valve. If subsequently, due to the high drive torque, the camshaft moves towards retardation, the non-return valve closes and the oil cannot escape. During this period, the camshaft is taken over the oil cushion by the gear wheels, as when free-wheeling.

The camshaft advance and hold repeats itself, so that the camshaft left to itself progressively advances the 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 serves also to increase the speed of response to low oil pressures.



1_01_03

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

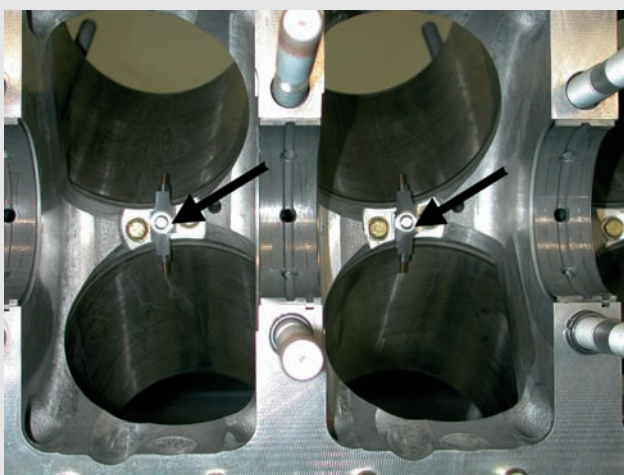
- Engine oil before the pressure pump
- Pressurized engine oil
- Pressurized oil engine/lubrication points
- Return oil
- Return oil after scavenging pumps
- Oil mist/crankcase breathing

1_85_04

- | | |
|---|----------------------------------|
| 1 - Swirlpot | 15 - Camshaft adjuster |
| 2 - Oil tank dry sump | 16 - Non-return valve |
| 3 - Pressure oil pump | 17 - Dry sump crankcase |
| 4 - Oil pressure control valve | 18 - Oil injection jets |
| 5 - Bypass valve oil filter | 19 - Oil level sensor |
| 6 - Oil filter cartridge | 20 - Chain tensioner |
| 7 - Pressure limiting valve | |
| 8 - Safety valve | A - Transmission casing |
| 9 - Suction connection at intake | C - Oil pumps/oil filter module |
| 10 - Crankcase breather equalizer tubes | D - Oil/water heat exchanger |
| 11 - Oil pressure sensor | E - Oil temperature sensor |
| 12 - Solenoid hydraulic valve | F - Oil scavenging pumps (5 off) |
| 13 - Tappet exhaust camshaft | G - Oil scavenging pumps (4 off) |
| 14 - Tappet intake camshaft | |

Oil Injection Jets

On the underside of the main oil channel between two cylinders mounted opposite each other is a bracket on which is mounted a piston spray jet for each piston. The piston spray jets spray the underside of the pistons with an oil jet, thus contributing to increased heat transfer from the piston and better piston cooling.



Function

1_66_04

On reaching the minimum oil pressure a spring-loaded valve (such as a non-return valve) in the valve body opens ($p > 2.7$ bar) and an oil jet is directed from below at the piston base to the piston.

Oil Pumps

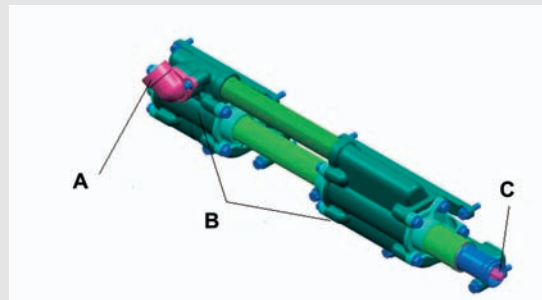
For oil scavenging the Carrera GT is fitted with a total of nine gear pumps of various sizes. The scavenging pumps are bolted to the crankcase lower part on the right hand side.

The pumps are 2 units with a common drive and a common combined return line. The drive is performed by an intermediate gear driven from the crankshaft. There is a torx female socket in the shaft of the intermediate gear into which the shaft of the oil pumps is engaged to drive the oil pumps.

Oil is extracted from all five crankcase chambers, the cylinder heads and the gear casing. The oil extraction also performs the crankcase breather function.

- A** - Return outlet to engine oil tank
- B** - Suction pump module
- C** - Drive

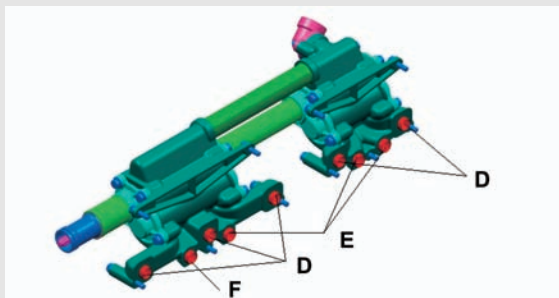
Scavenging Oil Pumps/Front View



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- D** - Extraction crankcase
- E** - Extraction cylinder heads
- F** - Extraction cylinder heads and timing drive casing

Scavenging Oil Pumps/Rear View



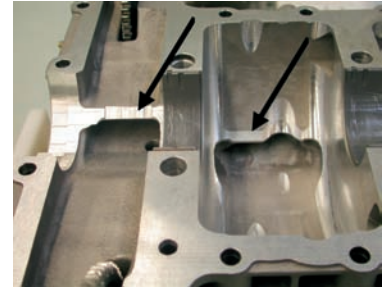
1_76_04

Extraction of the lubrication oil from each chamber of the crankcase is performed by scavenging pumps flanged directly to the crankcase lower part. Oil emerging from the lubrication points of the engine will be thrown tangentially from the crankshaft by centrifugal force directly on to a surface that acts as a scraper, channeling the oil to the inlets of the scavenging pumps. The same happens with the oil from the gear wheel drive.

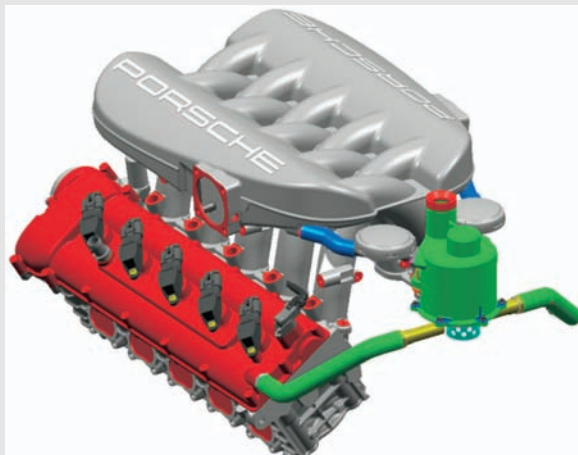
The oil scavenging pumps forward the oil to the return channel integral within the housing of the oil tank for defoaming in the oil separator (swirlpot), above the oil tank. In the oil separator the oil is separated from the air, and then pours downwards into the oil tank. The vapor from the oil separator is fed through two unheated pressure limiting valves into the two intake manifold plenums. From the oil tank upper part a further breather pipe is connected to the cylinder head cover.

An additional safety breather pipe runs from the oil separator through the crankcase upper part into the engine. At the oil separator the breather hose is attached to an overpressure valve, which opens when necessary and diverts excessive overpressure from the crankcase into the oil separator. This safety breather pipe with the overpressure valve is not used in normal operation. It only operates in the event of excessively high pressures in the crankcase, when it vents the pressure, preventing damage to the engine.

Oil extraction from the crankcase is so efficient and the pressure in the crankcase is always so low, that this simultaneously performs the crankcase breather function.



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1_77_04

Oil Pressure Pump/Oil Filter

The pressured oil supply of the V10 engine is provided by a single gear pump which is bolted to the crankcase lower part on the left hand side. The pump drive is the same as for the scavenging pump module.

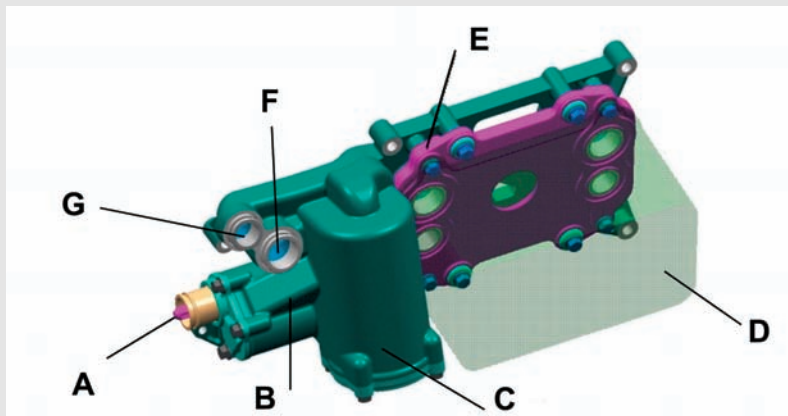
The pressurized oil for engine lubrication flows from the pump and oil pressure control valve to the oil filter and then to the oil-water heat exchanger, before the oil is fed through the engine internal oil distribution channels to the lubrication points and actuator elements.

The oil pressure control valve is set for a control pressure of 5.0 to 5.2 bar. The oil pressure sensor is mounted in the crankcase between cylinders 5 and 10. The oil pressure is displayed on the multi-function instrument cluster, where is the display at the furthest right.

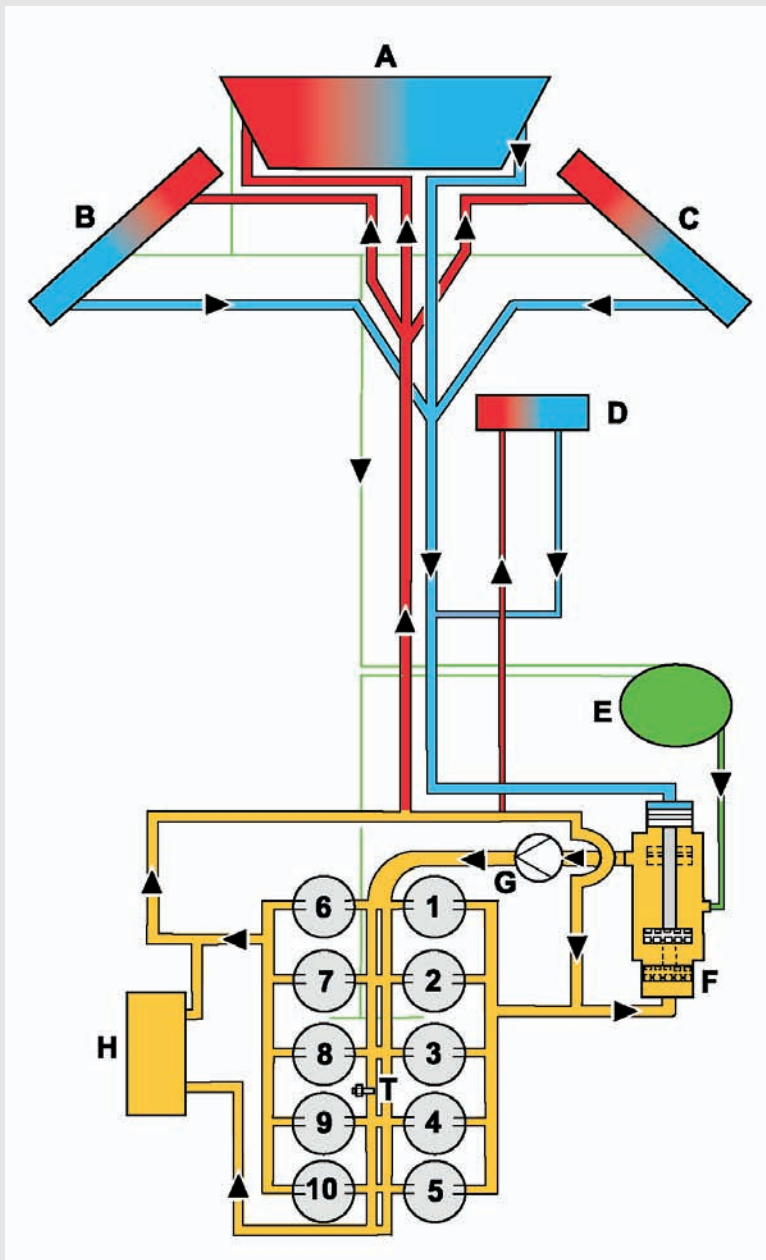
The oil temperature sensor is installed in the pressure oil channel after the heat exchanger within the oil pump bracket. Apart from the heat exchanger, which is mounted on a isolating plate to reduce vibrations, no further oil cooler is required.

- A** - Drive
- B** - Pressure oil pump body
- C** - Filter body
- D** - Oil-water heat exchanger
- E** - Isolating plate
- F** - Coolant outlet
- G** - Pressure oil outlet

Oil Bracket/General Overview



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- Coolant after radiator
- Coolant before radiator
- Bleeding and filling circuit
- Cold coolant circuit

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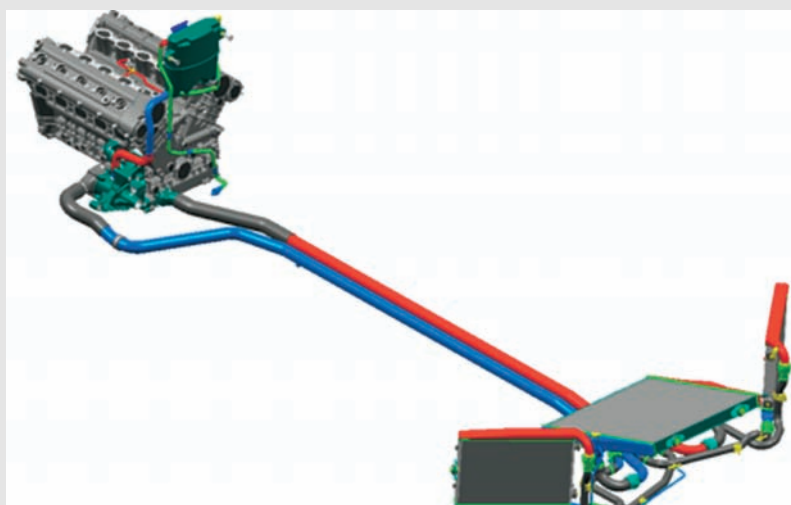
- A** - Nose radiator center
- B** - Nose radiator left
- C** - Nose radiator right
- D** - Heating heat exchanger
- E** - Coolant expansion tank
- F** - Thermostat
- G** - Coolant pump
- H** - Oil-water heat exchanger
- T** - Coolant temperature sensor

1-10 - Engine cylinders

The coolant is fed from the coolant pump located at the right side of the engine through a central distributor pipe, splits to the two cylinder banks, from where part of the coolant flow circulates around the cylinder liners and the main flow is directed through the cylinder heads.

The coolant flow is arranged on the cross-flow principle, so that the temperature distribution is as even as possible. Part of the coolant flows through the oil-water heat exchanger on the left hand side of the engine, before the coolant is again combined in a central manifold in the crankcase and fed through the coolant thermostat.

The thermostat is in the same body together with the coolant pump. It starts to open at 178 F° (81° C), and is fully open at 196 F° (91° C). The opening stroke of the thermostat is 10.5 mm. When the thermostat has not yet opened, the small cooling circuit is active, and the coolant is circulated directly in the engine cooling circuit without being fed through the radiators.



1_79_04

When the thermostat has opened, the large cooling circuit is active, circulating all or part of the coolant through the three radiators in the nose of the vehicle. The nose radiators are fed with coolant through a central water pipe. Before reaching the radiators the coolant is split by a three-way divider of aluminium in proportion to the cooling power (50 % for the central radiator, 25 % for each side radiator).

The coolant return is arranged in the same way as the feed by converging pipes and a central return pipe to the water pump body. The central water pipes are mounted in the central tunnel of the vehicle monocoque. The coolant expansion tank is mounted in front of the engine, centrally on the front wall of the equipment support beam.

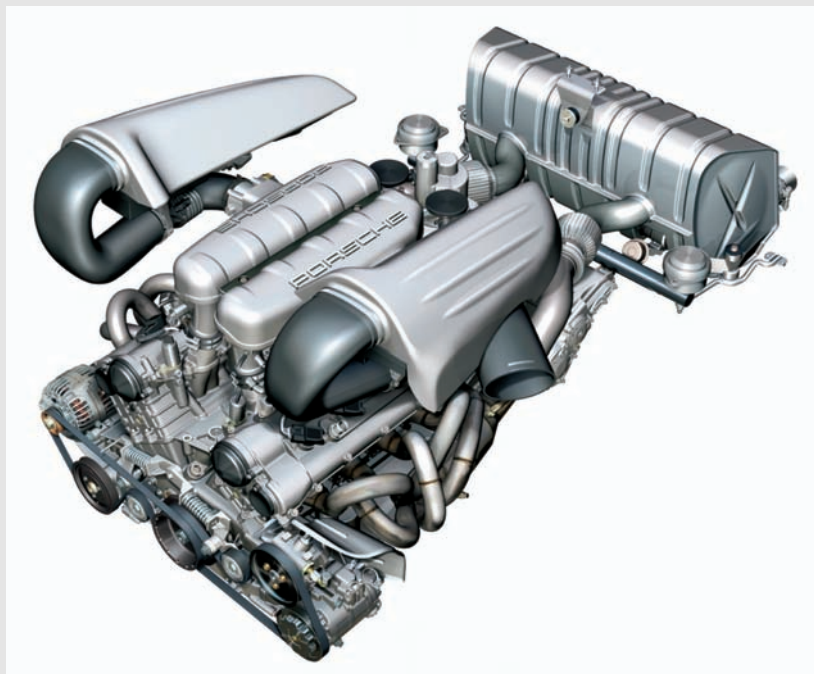
For bleeding the entire coolant circuit during operation there are bleed pipes from the radiators and cylinder heads to the central coolant expansion tank. The filler pipe from coolant expansion tank runs underneath to the suction side of the coolant pump body.

The flow for the heater core circuit is connected to the coolant return from the small cooling circuit before the pump suction side. The central flow for heating is permanently active, there is no control valve in the flow line. The return from the heating heat exchanger is connected to the return line of the central nose radiator.

The temperature sensor for the coolant is in the upper part of the crankcase, near the cylinder head gasket face of cylinder 9.

General

The 5.7l V10 engine for the Carrera GT is based on the Le Mans racing car engine developed for the requirements of the Carrera GT.



2_28_04

Development Goals

- High specific output and torque
- Compliance with all statutory requirements and emission standards in the target sales countries
- Service intervals that same as Porsche production sports cars
- Combination of suitability for race circuits and everyday use.

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Motronic ME 7.1.1	2
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Electrical power supply	6
Fuel supply	7
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Combustion air intake	14
Exhaust system	18
Exhaust gas cleaning	21
Engine cooling	24
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In the Carrera GT the following features are implemented:

- Motronic ME 7.1.1 as “Master-Slave” concept for multi-cylinder engines modern torque-based Motronic system
- Returnless fuel system
- VarioCam camshaft adjustment system for intake camshafts
- E-Gas; one throttle unit for each cylinder bank
- Engine drag torque control (EDC)
- Stereo lambda control:
 - LSU wide band lambda sensors as control sensors upstream to the catalytic converter
 - LSF lambda sensors for corrective control downstream from the catalytic converter
- Secondary air injection, one pump per cylinder bank
- OBD worldwide (OBDII or EOBD)
- CAN networking
- Safety fuel tank of aluminium, worldwide
- Tank leak test diagnostics by means of leak diagnostics (LDP) pump for US market
- Gear dependent engine speed control up to max. 8,400 rpm
- Platinum spark plugs with single ground electrode

Motronic ME 7.1.1

The electronic engine management system is undertaken by 2 Bosch ME 7.1.1 control units, one control unit managing each cylinder bank. Both control units are located under the seats. The 2-control unit concept is necessary to obtain a sufficient number of control unit driver stages for the computing power to control an engine with more than 8 cylinders.

Communications between the two control units is provided by a CAN bus running at a 500 kBaud transfer rate.



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The ME 7.1.1 controls the following areas

- Optimum combustion under all operating conditions by setting the optimum ignition point and injection point, together with the correct required injection quantity
- Load sensing and calculation of the intake air-mass by means of two hot film air mass flow meters
- Electronically controlled throttle valves for constant engine idling speed, optimum torque under all operating conditions, additional air intake for rapid catalytic converter heating functions, engine speed limitation and vehicle speed control
- Sequential fuel injection with returnless fuel system
- Active intake camshaft adjustment
- Spark distribution using distributor-less ignition
- Stereo lambda control (4 sensors)
- Secondary-air injection
- Evaporative emission control by canister purge valve
- Control of the radiator fan
- Vehicle diagnostics functions, monitoring all components and functions that affect exhaust gas, performing fault logging and visual indications using the check-engine light as required OBD II scope
- Cylinder-selective knock control, adapting to fuel quality for component protection
- Torque monitoring and control in conjunction with external demands such as MSR, ASR, TC, AC
- CAN bus to internal control unit communication and external diagnostics



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Check-engine Warning Light

The check-engine light provides a visual indication of a fault detected by the DME and registered in the fault memory. This covers obligatory reporting of incorrect functioning or defective/changed components. The monitoring includes components that affect exhaust emissions, such as catalytic converters, lambda sensors, together with misfiring, which in an extreme case can lead to damage to components.

In addition to the check-engine light, when the fault first occurs a message will appear in the instrument cluster. In the event of misfiring that could damage components the check-engine light will immediately start to flash. The check-engine light will continue to flash for as long as the misfiring that could damage components persists. At the same time a fault entry will be generated and saved in the Motronic control unit. The fault entry can be read using the PIWIS tester.

CAN Networking

The electronic networking allows data and information to be exchanged between the control units on the network.

Various CAN bus systems with different transfer rates are used in the vehicle.

The following systems communicate using the CAN drives bus

- Motronic master
- Motronic slave
- ABS 5.7
- Instrument cluster

The two control units for controlling the Motronic functions communicate with each other by means of their own CAN bus.

The following systems communicate using the CAN comfort bus

- Instrument cluster
- RDK
- Air conditioning

The instrument cluster contains the gateway control unit and is therefore a data interface responsible for the communication between the drive train CAN bus and comfort CAN bus.

Immobilizer

Information for enabling ignition and injection is sent to both Motronic control units by an analogue data cable (W lead) from the immobilizer part of the alarm control unit.

Crash shut-off

For safety reasons, in the event of an accident where the collision energy exerted on the vehicle exceeds a defined threshold, the fuel pump is switched off by the Motronic. The crash signal is triggered by the airbag control unit. The signal does not necessarily mean that the airbag will be triggered.



Further information regarding the immobilizer can be found in the Technical Manual.



Further information regarding the crash shut-off can be found in the Technical Manual.



Further information and illustrations can be found in section 9 “Electrics” of the Service Information Manual.



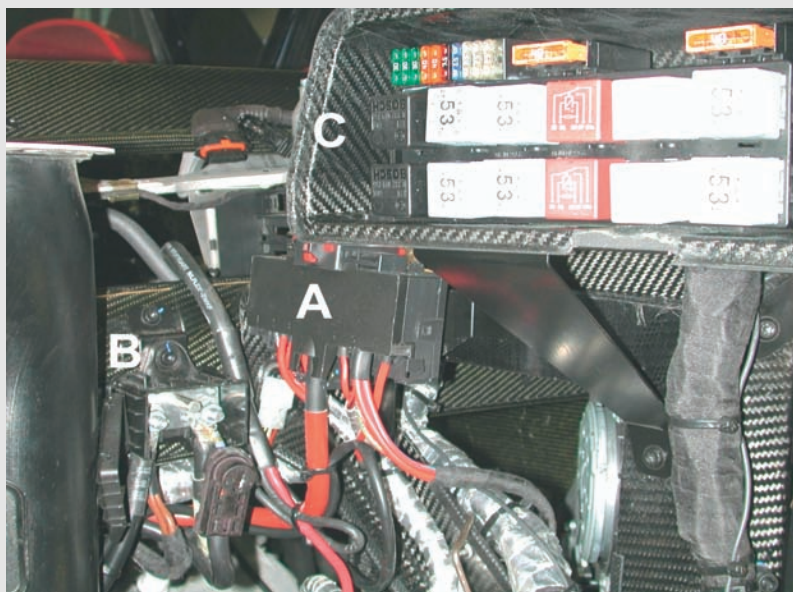
Further information regarding the electrical power supply, circuit diagrams, fuse and relay allocations can be found in the Technical Manual.

Electrical PowerSupply

Electrical power is generated by the alternator mounted on the right hand side of the engine. This is driven by a polyrib belt and has a maximum power output of 150 amps (2.1 kW). The alternator is supplied with cooling air through a tube connected to the electric fan on the gearbox oil cooler.

The flow of current from the alternator to the vehicle battery and into the vehicle electrical system is performed by electrical distribution elements within the engine compartment and the fuse box with relay board, also in the engine compartment.

A second fuse box is located in the interior of the vehicle, under the dashboard on the left hand side.



2_70_04

- A** - Positive distributor
- B** - Ground distributor (disconnected in photo)
- C** - Fuse carrier/relay carrier (in engine compartment on right hand side)

Starter Motor

The starter motor of the Carrera GT is located at the side of the gearbox under the right hand axle shaft flange. During the start procedure, the starter pinion engages directly into the teeth of a bevel starter drive gear. This bevel starter drive gear is mounted directly on the clutch housing. The starter motor is similar to that used in the Cayenne. The drive power is 1.7 kW.



2_21_04

Fuel Tank

The fuel tank is of aluminium and is located in a cavity behind the seats, between the monocoque rear wall and the front face of the engine. The tank cavity is covered at the rear by the front wall of the power unit carrier.

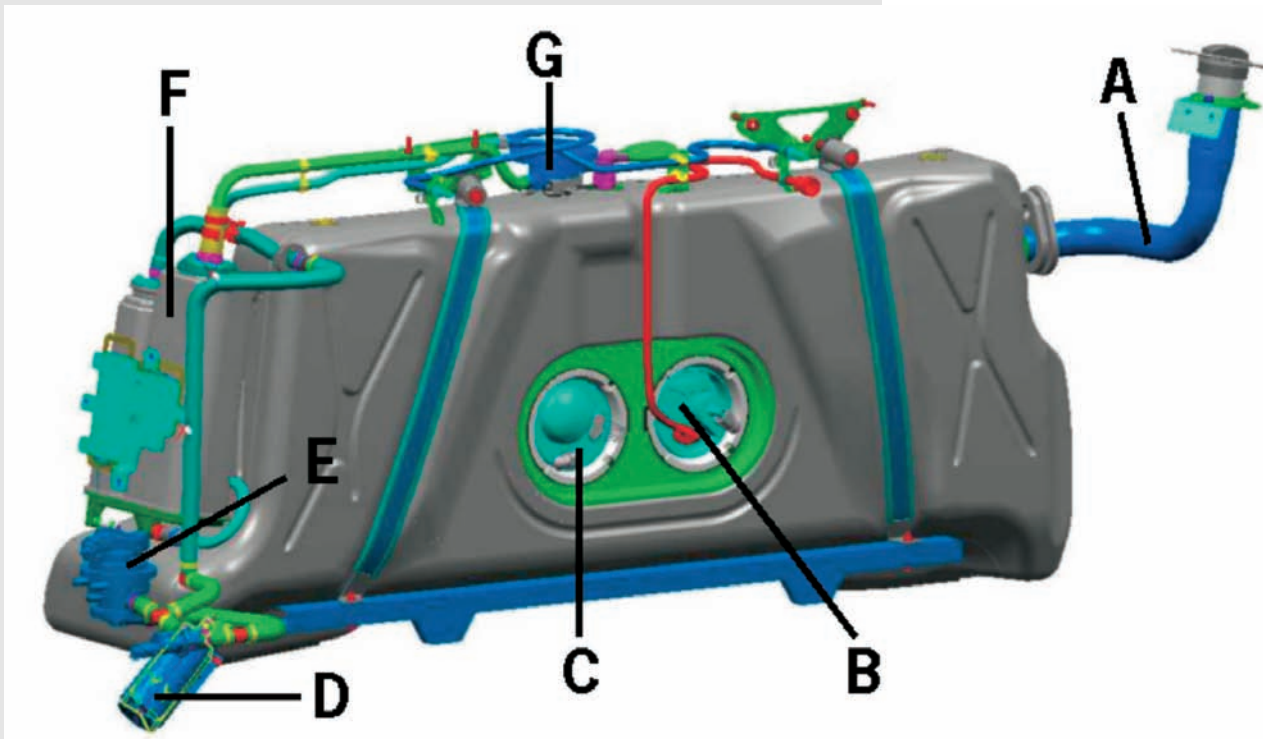
The tank is the same worldwide and is fitted with the ORVR tank filling system. For the USA a tank leak diagnostics unit (LDP) pump is installed. Due to the modular construction, simply disconnecting a hose connection on the left hand side of the tank allows this to be installed. The leak diagnosis pump (LDP) itself is located on the left hand side, under the air conditioning condenser.

The fuel tank is only accessible once the drive unit and power unit carrier has been removed.

The fuel filter is located within the tank itself and has no maintenance interval.



The fuel tank may not under any circumstances be opened by the workshop!



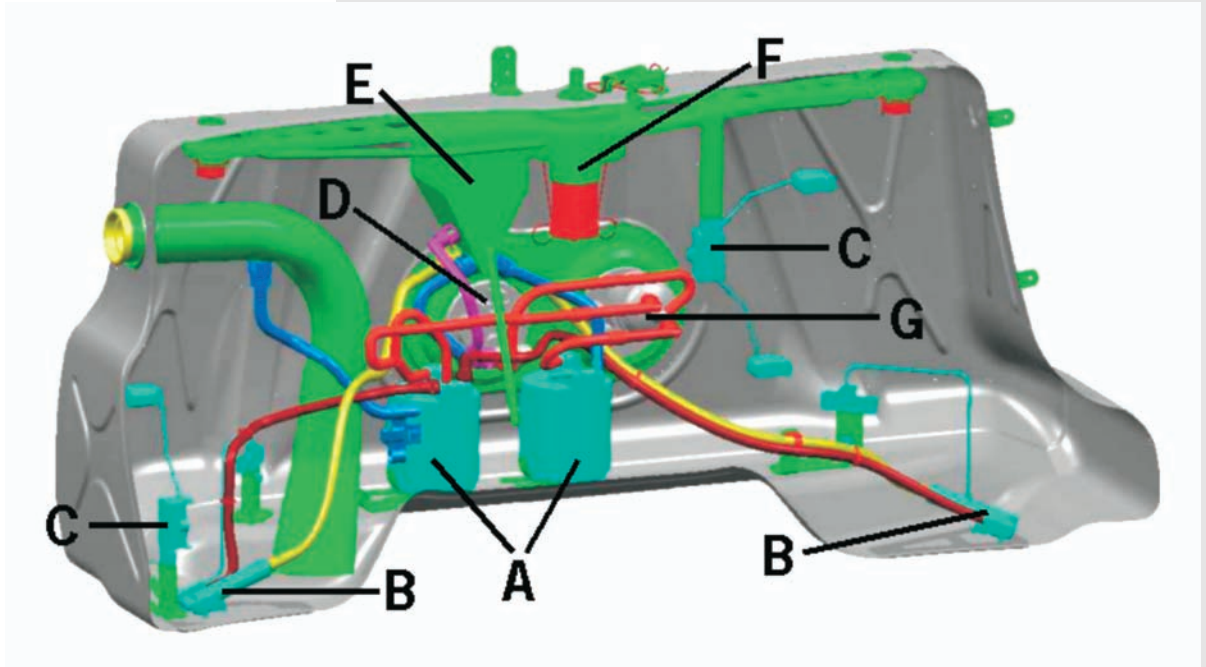
- A - Fuel filler neck
- B - Fuel-pressure regulator
- C - Fuel filter
- D - Air filter
- E - Leak diagnosis pump (LDP)
- F - Activated charcoal filter
- G - Pressure limitation valve

2_71_04

Returnless Fuel System

Under this system there is only a single fuel line from the tank to the engine. The fuel pressure regulator, like the filter, is located in the tank.

Fuel Tank Components



2_72_04

- A - Fuel pumps
- B - Sucking jet pumps
- C - Fuel gauge sender units
- D - Fuel-pressure regulator
- E - Catch tank
- F - Level limitation valve
- G - Fuel filter

The fuel delivery system has 2 fuel pumps within the tank; the second pump is activated only when a larger fuel delivery quantity is called for. To ensure sufficient flow of fuel even during sporty driving, the tank has 2 internal “catch tanks” in central position, each with 0.6 l volume, together with 2 suction pumps at the deepest points of the fuel tank on the outer left hand and right hand sides.

The 2 electrically driven fuel pumps are located in the center of the tank, behind a bolted oval cover. This cover is only accessible once the engine and power unit carrier has been removed.

The components inside the fuel tank are not serviceable and the cover is not to be removed.

Fuel Delivery Quantity Regulation

When the engine is started both fuel pumps are in operation; the second pump is shut down 2 seconds after completion of start is detected. For the most part during partial load operation only a single fuel pump operates.

If the injection signal in the Motronic calls for a large fuel flow volume, the second pump will be reactivated, to ensure the required fuel quantity is made available. When the fuel level has fallen to a minimum level the second fuel pump will be activated under all circumstances. This is to ensure that all of the fuel remaining in both catch tanks can be pumped.

Fuel Filter

The fuel filter is located in the right side cover and is not a serviceable item.

Fuel Pressure Regulator

The Carrera GT has a returnless fuel supply system. Neither vacuum nor differential pressure comparison is applied to the fuel pressure regulator. This is performed electronically using a calculation algorithm within the Motronic. The fuel pressure regulator is located within the tank and is set to a system pressure of 4 bar.



The diagnostics for both fuel pumps is purely an electrical test. Functional plausibility checking is not performed.

Fuel Level Sensor

The Carrera GT has a non-contact fuel level sensor system. The fuel level is sensed using 2 level sensors and is reported to the instrument cluster for display.

The level sensors have a magnet which switches the separate series connected resistance layers by moving to the respective tapping. The level is then reported based on the corresponding curve. The great advantage of this system is its freedom from susceptibility to error due to foreign particles and freedom from wear of micro-contacts.

There are two level sensors fitted to the tank of the Carrera GT. One sensor is for the level range > 50 % level and the other sensor registers the range below 50%.

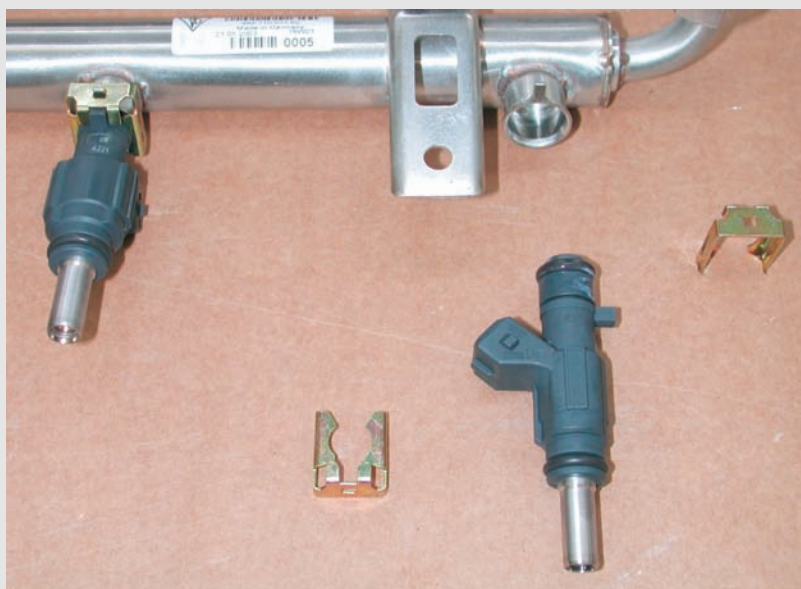
Tank Gauge

The values reported by the tank sensors are checked in the Motronic for plausibility and applied to conversion tables to generate a signal for the tank display instrument cluster.

When the quantity remaining is approx. 4 US Gallons (15 liters) the "Low Fuel" display will be activated and a warning light will come on in the instrument cluster. Accompanying the warning light a display will be presented on the vehicle computer matrix, which the driver can switch off.

Fuel Injectors

The Carrera GT comes equipped with Bosch EV12 fuel injectors. The EV12 fuel injector is very similar in its construction to the EV6. The most important differences in the EV12 is a longer injection tube for more precise positioning of the injection spray in the intake manifold and an optimized matching of injection jets for improved fuel atomization and determination of a more precise injection quantity.



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The EV12 fuel injector is held in place by a locking clip in an indexed retaining collar on the fuel manifold. This indexing is necessary for exact positioning of the injection jet on the intake valve. The retaining collar may not suffer any kind of damage. The injector and/or retaining clip may never be substituted with any other types.

Ignition System

Distributor-less ignition with individual laminate frame primary ignition coils and integral spark plug connectors.



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Ignition Coils

Each cylinder has its own ignition coil within which is the complete integral HT system for generating the ignition spark. The ignition coils are the same as those used on the Cayenne. The ignition coils are actuated directly by the ignition outputs from the control units, which also incorporate a diagnostics function for the ignition coils.

The ignition signals are sent individually in the ignition sequence. Cylinders 1-5 are actuated by the master control unit, cylinders 6-10 by the slave control unit.

Spark Plugs

The spark plugs have a platinum central electrode and a single ground electrode.

Speed Sensor

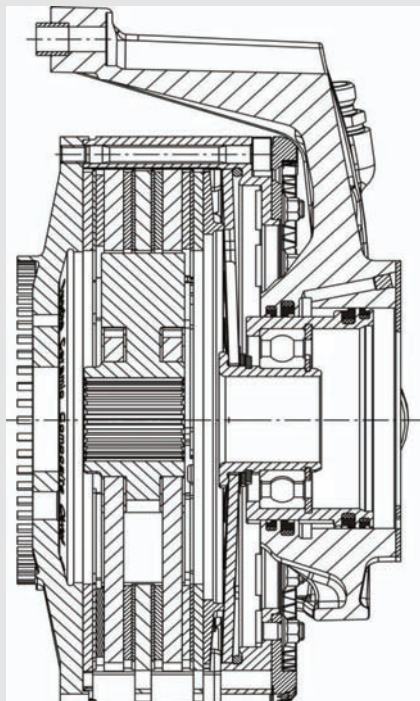


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Behind the flywheel of the Carrera GT engine there is a toothed segment ring from which is taken the engine speed and reference mark signal. The flywheel and the segment ring are made of steel. Non-magnetic material cannot be used since it would not permit the sensors to pick up the engine speed and reference mark signal.

The count of impulses from the square teeth is detected by active impulse sensors and passed to the control units as a square wave voltage signal for signal processing.

Each cylinder bank and therefore each Motronic control unit uses a separate impulse sensor. The impulse sensors spaced at the distance of the cylinder V angle from each other on the bearing cover of the rear crankshaft seal. The plug colors are different in the engine wiring harness to avoid assembly errors.



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Hall Sensor

At the back of each intake camshaft there is a Hall sensor plate to allow the camshaft position to be determined. The Hall sensor plates are made of sheet steel. The Hall sensor signal is picked up by the Hall sensor bolted to the respective cylinder head cover. The Hall signal is further processed in the Motronic.

Knock Sensors

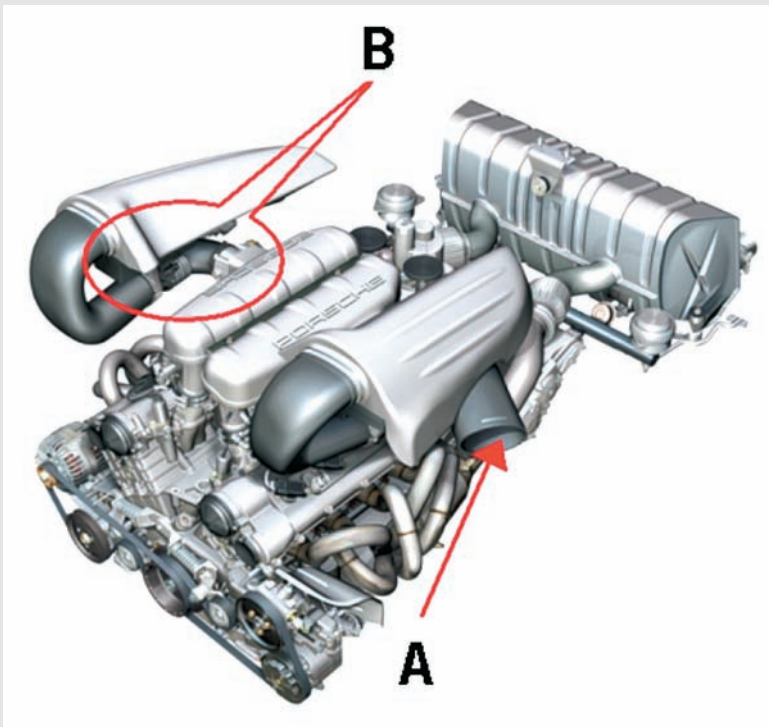
There are a total of four knock sensors installed on the crankcase valley near to the mating surface with the cylinder head. The knock sensors are secured to the crankcase with a single M8 bolt.

The prescribed tightening torque for these bolts must be exactly observed. If the tightening torque is insufficient or excessive, the output of the knock sensors in response to mechanical vibrations can be distorted and the signals indicate a knocking condition incorrectly and lead to a retarded ignition angle and loss of power.



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The left and right combustion air intakes are separate and are measured by means of two hot film air mass flow meters. Air intake is achieved by a scoop from the air stream in the air spaces in front of the rear wheel arches. It is fed through a water separator into the intake ports of the air filter housing, via paper air filter elements. From there it flows through the hot film air mass flow meters to the throttle valves and into the bank-specific intake manifolds.



A - Air intake (before air filter)

B - Positions of hot film air mass flow meter and throttle valve

2_65_04

Hot Film Air Mass Flow Meter

For exact determination of the combustion air mass the engine of the Carrera GT is equipped with two hot film air mass flow meters type HFM5SF. These are a further development of the HFM5CL. The HFM5SF is a raw air mass flow meter and is available only as a complete assembly.

Under no circumstances may the measuring element be removed from the measurement tube!

The measurement range with a measurement uncertainty of < 3% ranges from 30 kg/h to 850 kg/h, but volume flows as high as 1,200 kg/h or more can be measured.

Accelerator Pedal

The pedal arrangement of the Carrera GT includes a pedal position sensor directly behind the accelerator pedal. The pedal position sensor is operated by the accelerator pedal by a push rod and a pull cable by means of a cam plate. The pedal position sensor transmits the driver's desired torque to the Motronic control unit, where this signal is converted into an air mass throttle valve angle.



The throttle valves are monitored for defective functioning and in the event of a fault, they will default to a emergency run position and the Motronic will register a fault entry in the fault memory.

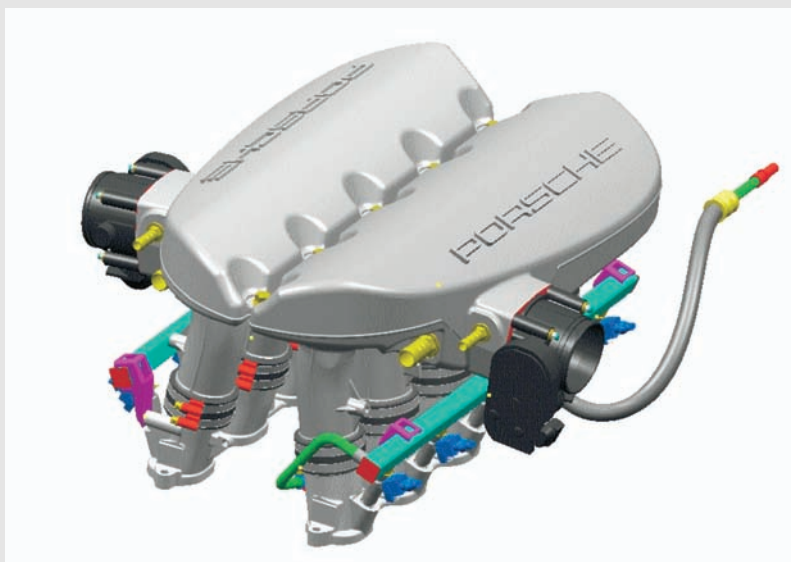


Crankcase breathing is described in detail in section 1 of the Technical Manual.

Throttle Valve Adjustment Unit

For each bank of cylinders there is a separate throttle valve, which is controlled by the respective bank-specific control unit. The throttle valves are controlled electrically by the Motronic. In the throttle valve adjustment unit there is a motor which implements the movement of the throttle valve in accordance with the signal output from the Motronic control units.

Intake System



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Crankcase Breather Valve

Crankcase breathing in the engine of the Carrera GT is undertaken by the oil extraction pumps. The crankcase breathes through two connection pipes from the cylinder heads to the oil tank. The blow-by gases are fed into the intake manifold by the swirlpot through two vacuum limitation valves located behind the throttle valve.

The canister shut-off valve for the fuel tank is installed within the carbon canister on the left hand side of the fuel tank. In this carbon canister the hydrocarbon components from evaporated fuel are captured.

While the engine is running the activated carbon canister is flushed through the fuel tank, the tank purge pipework and the canister purge valve which is activated as required, towards the intake manifold. The two canister purge valves are cycled depending on the engine operating conditions (air throughput) and the carbon canister load (fuel saturation) to the maximum air purge quantity that the engine can accept

This purge system returns evaporative emissions from the fuel system to the combustion cycle and prevents their release into the atmosphere. Each canister purge valve has a maximum volume flow of 3.8 kg/h.

Tank Leak Testing

The fuel tank of the Carrera GT is identical worldwide. For the US American market a leak test of the complete tank system is a statutory requirement. Leakage must not exceed that from a 0.5 mm diameter hole.

The tank leak testing diagnostics in the Carrera GT are the same as USA versions of the Cayenne.

The tank leak testing diagnostics are performed using an electro-pneumatic membrane pump which applies overpressure to the tank system and gauges the leak of the tank system by sensing the time between reclosure of two reed contact circuits. The pump controls, together with evaluation of the test results are performed within their own diagnostics path in the Motronic.

During the diagnostics the tank system is isolated from the engine by way of the canister purge valve and to the atmosphere by means of the activated carbon container shut-off valve, so that external systems do not affect the test. Because of the tank leak test, the Motronic dataset for USA vehicles differs in its functional scope from the versions for the EU, RoW, ...

Tank Leak Testing (cont'd)

The diagnostics pump is installed in the purge hose, downstream from the activated carbon container. The diagnostics pump and the activated carbon container isolation valve are installed on the left hand side of the tank, on the demountable connection between the activated carbon container and the air filter for the tank system.

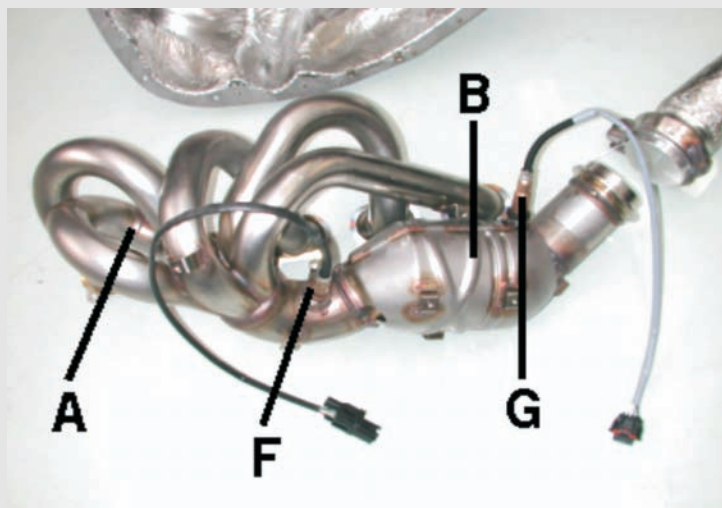
The wiring for the pump and the shut-off valve is included in the wiring harness for all engines. The vacuum supply for performing the membrane stroke against the pump spring is taken from a T-piece between the vacuum accumulator and the electric changeover valve for the left hand secondary air pump.

Exhaust System

The Carrera GT uses the same exhaust system worldwide. The exhaust system of the Carrera GT is doubled walled throughout and is made of corrosion-resistant stainless steel. The exhaust manifolds are made of steel tubing and are of exactly the same length. For better thermal insulation within the engine compartment, the manifolds are enclosed in an aluminium casing.

The pre-catalytic converter is attached directly to the exhaust manifold. Lambda sensors are located upstream and downstream of this pre-catalytic converter. The reason for the location immediately downstream from the manifold tube collector is to achieve better heating of the catalytic converter after a cold start and to promote a homogeneous exhaust gas flow.

- A** - Exhaust manifold primary pipes
- B** - Pre-catalytic converter
- F** - LSU wide-band Lambda sensor
- G** - LSF planar Lambda sensor after catalytic converter



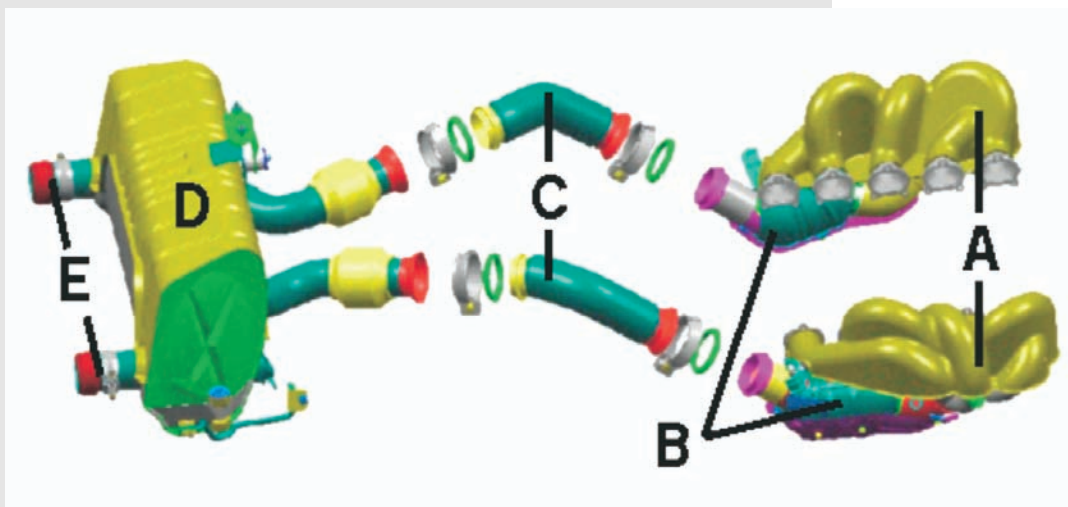
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After the pre-catalytic converter the exhaust gas flows in a tube (which is also insulated) above the left and right hand driveshafts along the transmission to the transversely mounted main muffler box with the 2 main catalytic converters at the inlet.

For reasons of weight there is no extensive use of absorption material in the final muffler; the muffler operates on the reflection principle, under which the sound waves are reflected within the chambers to reduce their intensity.

To reduce thermal radiation the final muffler has a jacket of external thermal insulation. The thermal insulation comprises of an aluminium shell installed around the muffler. This aluminium shell acts as a chimney to remove the heat. The air heated by the muffler escapes upwards through a vent grill under the rear spoiler, while cold air enters from below and travels across the muffler and out the grill.

Within the final muffler a mixer chamber for both sides of the exhaust system is installed. This is for sound optimization, to achieve the special acoustic signature of the Carrera GT.

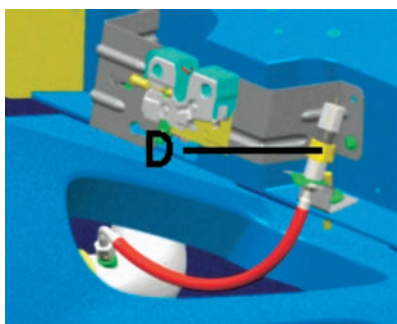


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- A** - Exhaust manifold primary pipes
- B** - Pre-catalytic converters
- C** - Connecting pipes
- D** - Exhaust muffler with main catalytic converters
- E** - Exhaust tailpipes



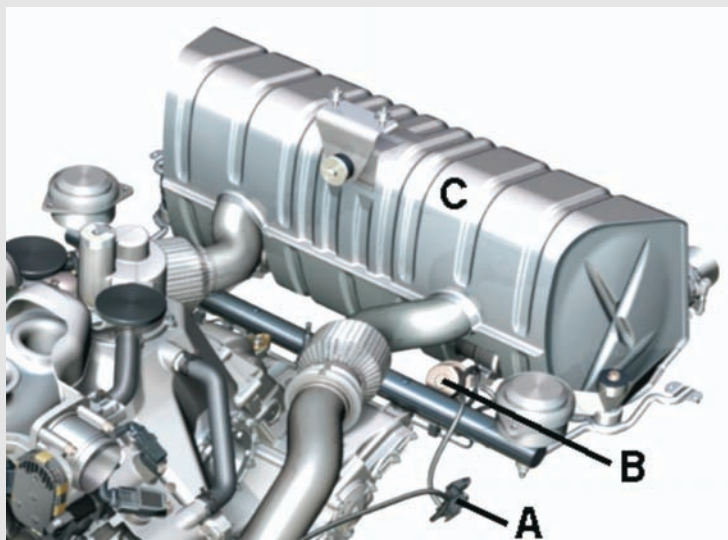
If the pressure in the exhaust system becomes excessive, a fault entry is generated in the Motronic and the “Check Engine” light in the dashboard gives a visual warning of a system fault. In addition a control function in the Motronic reduces the permitted torque by 50 %.



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Exhaust Emission Control

Within the final muffler box there is a additional flap-type muffler. This flap mechanism is controlled by two vacuum motors which are installed outside the box. The flap mechanism is used to reduce back pressure and associated increased demand for power from the engine. The control is performed under a mapped reference in the Motronic, via electro-pneumatic changeover valves.



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- A** - Electro-pneumatic changeover valve
- B** - Vacuum motors
- C** - Exhaust mufflers with main catalytic converters

The exhaust gas flaps are opened from second gear to sixth gear, at speeds in excess of 43 mph (70 km/h), and in the gears, 1st, 2nd and 3rd at engine speeds in excess of approx. 2,800 rpm, if the air mass flow exceeds a certain threshold. For each gear there is a specific performance curve for flap control stored in the Motronic control unit.

To check that this flap is functioning correctly there is an external pressure sensor installed on the final muffler. The external pressure sensor is located near the catch for the engine lid. The connection to the pressure measurement port is made with a flexible steel lead with Teflon core. The pressure in the exhaust gas system is sensed upstream of the main catalytic converter.

Catalytic Converters

The Carrera GT is equipped to reduce pollutant emissions and to conform to all statutory requirements. Four three-way catalytic converters are installed. Two pre-catalytic converter on the exhaust manifolds, one for each exhaust gas stream, and two main catalytic converters are positioned at the inlets to the final muffler box.

The catalytic converters have their matrix coated with a mixture of palladium and rhodium. The pre and main catalytic converters are of different sizes and also have different cell densities. Upstream of the pre-catalytic converter is the LSU wide-band sensor of the lambda control system; downstream from the pre-catalytic converter is the LSF sensor.

Both lambda sensors, as well as their control functions for the fuel/air mixture are also used for monitoring the effectiveness of the catalytic converter.

Secondary Air System

For an especially quick warm-up of the pre-catalytic converter and thus an rapid light-off of the main converter. When starting with an engine temperature less than approx. 86° F. (30° C), a powerful jet of secondary air is blown into the cylinder head, directly downstream from the exhaust valve. In circumstances of a rich mixture in a cold engine and a deliberately retarded ignition angle, under secondary air operation an afterburning effect is achieved in the exhaust passage, which quickly heats up the pre-catalytic converter and ensures exhaust gas conversion.

Secondary air injection is active in the Carrera GT for only as long as catalytic converter heating is required. The secondary air channels are integrated into the cylinder head. Control of the secondary air pumps is performed by a relay which is actuated as required by the Motronic. When secondary air is required, an electric changeover valve is opened, vacuum flows to the combination valve for secondary air and the air flows into the cylinder head and to the exhaust ports.

Exhaust Emission Standards

- Europe: EU4
- USA / Canada: LEV



If the pre-catalytic converter is found to be defective, the Motronic will generate a fault entry and when confirmed will illuminate the "Check Engine" light.



The secondary air system is an exhaust gas relevant system and as such is also monitored by the Motronic functions. The monitoring is performed using the lambda sensors upstream to the pre-catalytic converter. In the event of a defect an entry will be registered in the fault memory. If the defect is repeated a visual indication will be given by means of the "Check Engine" light.

Stereo Lambda Sensor Control

Both cylinder banks have a separate lambda control circuit, each with a LSU wide-band sensor before the catalytic converters that determines the optimum mixture composition and corrects it, and a LSF sensor between the pre-catalytic and main catalytic converters. This ensures the lowest pollutant emissions and fuel consumption under all operating conditions.

LSF Lambda Sensors After The Pre-Catalytic Converters

The planar LSF lambda sensor is a further development of the LSH heated Lambda sensor. Functionally it is equivalent to the LSH heated lambda sensor. Unlike the LSH, with the oxygen sensor LSF the solid-state electrolyte is made up of ceramic sheets. (LSF means: lambda sensor flat).

Special characteristics of the oxygen sensor LSF:

- Quickly operational
- Low heating power demand
- Stable regulating characteristics
- 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 functional layers (electrodes, protective layers, etc.) are manufactured by a screen printing process – Thick Film Technology. The laminating of various printed sheets on top of each other allows for a heater element to be integrated in the sensor element.

In the Carrera GT before the pre-catalytic converter for each cylinder bank there is a wide-band LSU lambda sensor (LSU means: lambda sensor universal). Vehicles with these wide-band lambda sensors operate under full lambda control from shortly after a cold start, over the whole range from idling to full power. The LSU wide-band lambda sensor is a further development of the LSF lambda sensor.

Advantages of the LSU wide-band lambda sensor:

- Precise measurements can be made from $\lambda > 0.7$ (rich mixture) to $\lambda < 4$ (pure air).
 - The LSU allows for instance controlled operation outside $\lambda 1$, e.g. in the enrichment range of component protection.
 - The LSU delivers a continuous signal which is evaluated in the Motronic control unit.
 - Controlled operation with lambda control can be performed under all conditions.
 - The wide-band lambda sensor is operationally ready in a very short period of time.
 - The lambda controls respond more quickly to a non-ideal mixture.
 - Better control behavior with increased dynamic response.
- Construction of the LSU wide-band lambda sensor

The LSU is arranged in different functional layer planes:

- The actual sensor element of the wide-band lambda sensors comprises a combination of a Nernst concentration cell (sensor cell) and an oxygen ion transporting pump cell.
- The wide-band lambda sensor requires special operational electronics for the evaluation circuit (AWS) in the DME control unit.
- The AWS contains the internal control electronics for the pump and the sensor cells to generate the sensor signal.
- The control current in the electronic pump cell causes $\lambda 1$ to be permanently generated by the measurement cell.
- This is continuously checked against the voltage from the sensor cell (450 mV).
- Variations in the current in the pump cell (0 mA to 1 mA) the AWS calculates the exact lambda value of the exhaust gas.
- The temperature control of the LSU is also integrated into the AWS.



Further description of the coolant circuit can be found in section 1 of the Technical Manual.

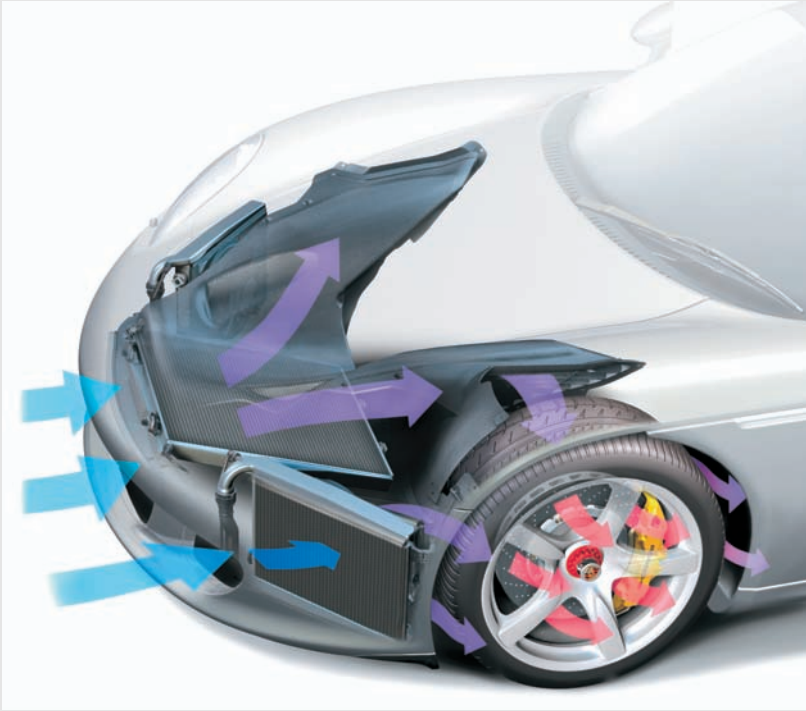
Engine Cooling

The engine cooling operates on the cross-flow principle, under which each cylinder receives the same quantity of coolant at the same temperature. This ensures positive and uniform cooling.

The coolant leaving the engine is cooled in radiators which are located in the vehicle nose. One radiator lies in the air flow towards the undertray and one radiator lies in the airflow towards the front area of each of the front wheel arches. Each of the outer radiator units is equipped with a variably controllable 300 watt electric fan. The control of the radiator fan is by a PWM signal which switches the fan on as required, depending on the coolant temperature. The signal is output from the Motronic based on the respective conversion curves.

The fan controls include an emergency operating mode, which if there is a relevant fault in the system, switches both fans to 100 % power. Both the front radiator fans are controlled by a common power driver stage, which is installed in the air stream behind the left hand radiator.

The use of an additional fan for the center radiator is not necessary. The air inflow and outflow are aerodynamically optimized and guide the air exiting the radiators into the front wheel arches.



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Electric Fans

There are four electric fans installed on the Carrera GT. Two fans for the side radiators located in the vehicle nose, two in the vehicle tail; one at the right rear for the transmission oil cooler, and one at the left rear for the air conditioning condenser. Both these fans have the additional function of ensuring sufficient ventilation of the engine compartment. Each 290 watt fan is controlled by the PWM.

The control unit for each fan is integrated within the fan body and can only be replaced as a complete assembly with the fan. The fan for the air conditioning condenser is installed even on vehicles without air conditioning.



If a defined permitted variation of actual from desired angle is exceeded, the Motronic generates a fault entry which can be read using the Porsche System Tester. For further fault-finding, appropriate actual values from the Motronic can be displayed on the system tester, to allow the causes of faults to be traced and the faults remedied.

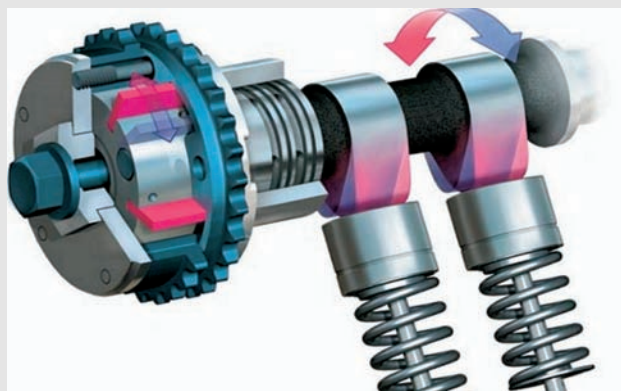


For a detailed description of the variable camshaft timing please see the section "Camshaft Adjustment" in section 1 of the Technical Manual.

Variable Camshaft Timing

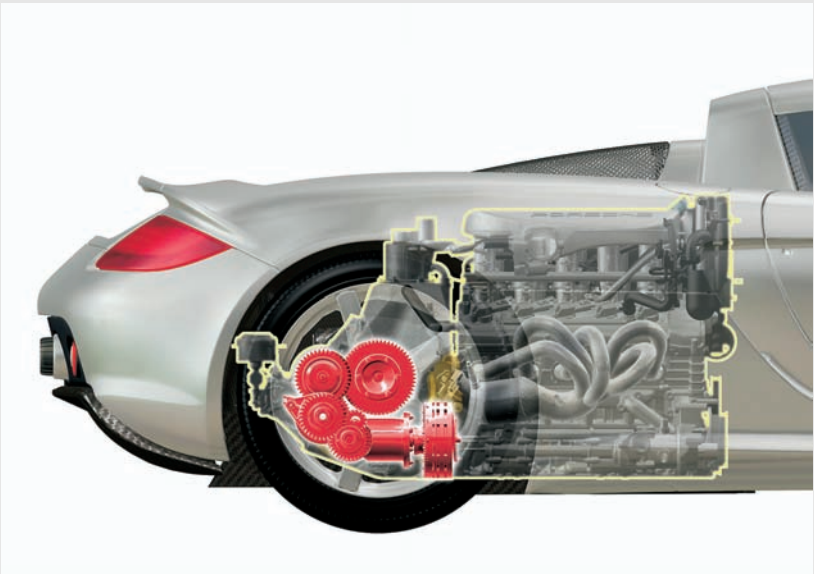
The Carrera GT has continuous adjustment of the intake camshaft. The adjustment angle is controlled, calculated and output by the Motronic using the map values. The maximum adjustment angle is 40° crank angle (20° cam angle).

Adjustment is performed hydraulically by means of a solenoid hydraulic valve in the respective cylinder head and the vane cell adjuster positioned on the camshaft. The camshaft position is determined by means of a Hall sensor plate on the end of the camshaft and an associated Hall sensor. The Motronic compares the actual angle with the desired angle and activates the solenoid hydraulic valve accordingly.



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Clutch



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General

The PCCC, **P**orsche **C**eramic **C**omposite **C**lutch is a proprietary Porsche development and is protected by patents. Its dimensions are very compact, not only regarding its diameter, but also its length. The weight of the clutch unit has been kept to an absolute minimum with extensive use of aluminium, titanium and ceramic materials.

The low pitch of the crankshaft, the limited space for installation and the high torque of the V10 engine required development of a new clutch concept. The clutch of the Carrera GT is a 2-plate ceramic clutch PCCC, with the small plate diameter of 169 mm, necessitated by the low pitch of the crankshaft.

The clutch linings are a combination of materials never previously used; fiber-reinforced ceramic materials produced by a process similar to sintering. In combination with the opposing friction plates (clutch plates) made from ceramic this innovative combination achieved a lighter multi-plate clutch with greater power transfer rating and full capability for day-to-day use.

The layout of the PCCC represents an optimum compromise between power transfer, comfort, service life and capability for day-to-day use. The PCCC combines positive characteristics from the widest variety of clutch types for racing and series production cars. Depending on how the Carrera GT is used (e.g. racing, aggressive shifting), the service life will be longer than clutches installed in other sports cars within this performance range.

Contents

Clutch	1
General	1
Manual transmission, G80	5
Limited-slip differential	8
Gearbox lubrication	9
Gear changing	10
Shift mechanism	11

Function

The clutch assembly is bolted to the flywheel. The clutch linings (pads) are finish baked on to steel carriers and are riveted to intermediate plates of titanium. The center one of the three lining carrier plates has linings on both sides. Within the PCCC there are a total of 24 pads. The intermediate plates have recesses in their outer edge, which retain their position within the clutch housing while allowing axial movement.

The driven plates between the lining plates are ceramic. The two driven plates are linked to each other by a titanium spider with a central hub. This hub transmits the drive to the gearbox input shaft. Within the bell-shaped clutch housing the diaphragm disc springs are also mounted. Between the disc springs and the pressure plate (behind the last intermediate plate) there is a dished pressure plate, which improves the clutch engagement behavior.

The clutch is ventilated by forced air on the principle of a centrifugal blower. This cooling procedure is a world first in a clutch and Porsche has applied to patent it. Flow and return channels for clutch cooling are incorporated within the clutch bell housing. The cooling air is fed into the inner parts of the clutch where the rotary movement draws cooling air outwards, in the process cooling the clutch components. This type of cooling operates only when the engine is running at a certain minimum speed.

The clutch is operated by a hydraulically actuated pull. The slave cylinder is located in a three-arm bearing housing, which is secured to the crankcase with three bolts. Two hydraulic lines are secured to the release bearing. One line is for bleeding, the other runs to the master cylinder.

The master cylinder for clutch operation is made of high quality plastic, and mounted directly on the mounting bracket for the pedals. Operation is with a push rod directly from the clutch pedal. A switch for detecting clutch operation is incorporated in the hydraulic circuit. This signal is required for further processing in the Motronic.

On the pressure spring side a starter gear ring is secured to the clutch housing with special high-tensile M6 bolts, forming a crown gear. The crown gear allows the starter motor to be located in a low position for optimum center of gravity.

All components of the clutch are identified with assembly location marks and may not be interchanged or reversed in position. The clutch engagement, release behavior and operating force are excellent for a vehicle in this power range.



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Clutch lining wear can be checked without disassembling the transmission. However it is necessary to remove the undertray around the rear axle. After removing a cover on the underside of the transmission housing a caliper can be used to measure the clearance between the first and third clutch intermediate plates.

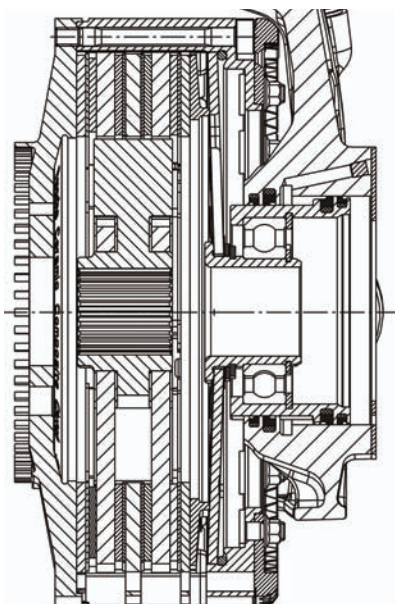
The nominal clearance is: 31 mm. The minimum clearance must not be less than 28 mm.



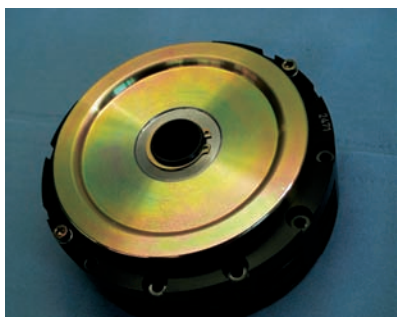
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Detailed information regarding wear measurement of the clutch can be found in the Technical Manual



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It is not possible to disassemble the clutch without first installing the mounting plate, Porsche Special Tool #9469.



The exact operations for working on the clutch can be found in the Technical Manual.

If service is required, there will be various repair kits for the clutch available through the parts department. These will offer an appropriate and economical repair.

The hydraulic actuation of the release bearing (slave cylinder) and the release bearing itself are installed in the 3-arm bearing block. There is no provision for repair of the release mechanism.

Disassembly

To disassemble the clutch it is first necessary to disassemble the clutch slave cylinder. Refer to the Technical Manual for procedure.

Before undoing the 12 M6 screws of the clutch housing, it is essential that the mounting plate (Porsche Special Tool #9469) with its associated securing ring be installed on the clutch while it is still assembled. This mounting plate takes up the pre-load of the disc springs, which is essential in order to reassemble the disc springs. Two M6 hexagon socket head screws must be screwed into the tapped holes provided in the first intermediate plate. For the 2 M6 screws there are 2 threaded holes provided on the first clutch friction plate. These two screws hold the clutch package together.

If the mounting plate is not used, then the clutch housing screws will have to be undone against the spring force exerted by the pressure plate.

Assembly

Before reassembly, the pressure plate must first be compressed in a press so that the mounting plate can be installed.

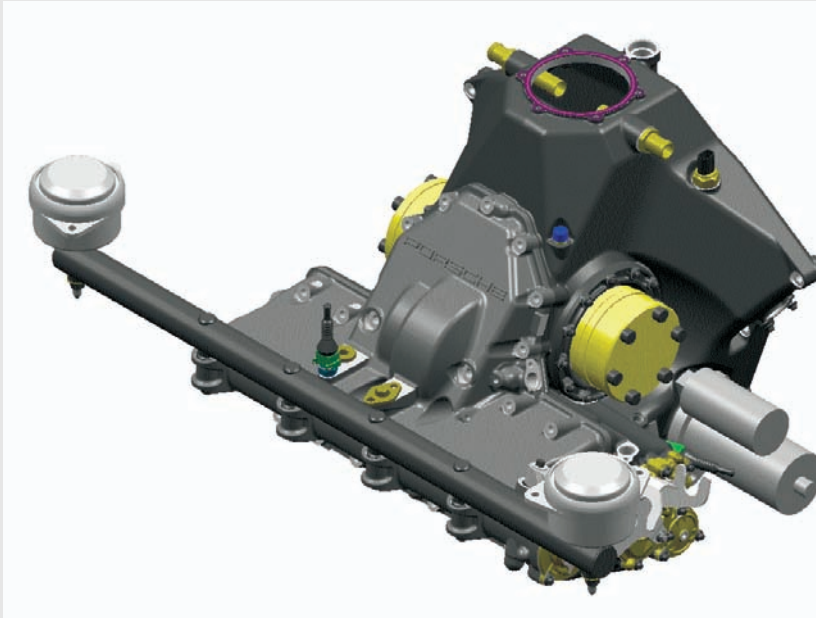
Assembly in a press carries a very high risk of damage to the ceramic plates. This damage may not be evident at the time. Damaged clutch components, especially if ceramic, must not be reused.

During assembly or exchanging clutch plates, care must be taken that the plates are installed in the correct sequence and that the assembly marks match. The circlip must be fully seated in the release sleeve groove of the disc springs.

Both hydraulic lines at the release bearing block must be tightened securely before attaching the transmission. **The clutch operating system must be carefully bled to assure all the air has been removed, since the slightest amount of air in the hydraulic line will cause the clutch to not sufficiently release, and lead to shifting synchronization problems.**

General

The only transmission installed in the Carrera GT is the G80 manual transmission. Developed especially for the Carrera GT and manufactured by the Hör company. This is a manual fully synchronized 6-speed gearbox arranged transversely with an H-form selector gate.



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Development Goals:

- Production line installed transmission suitable for race conditions
- Compact dimensions
- Extremely low center of gravity
- Easy and positive gear change
- High power throughput for the transmission

As well as the complete gear train, the engine oil tank is part of the transmission housing, and the oil separator swirlpot is installed on top of the transmission housing.

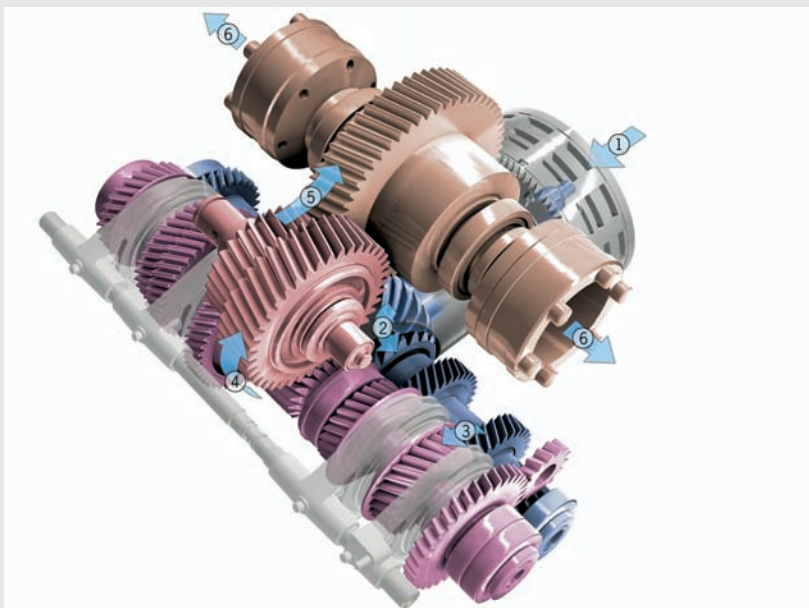


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The G80 transmission has what is called transverse drive, in which the torque from the engine is taken by way of a bevel gear drive to a drive shaft running transversely to the direction of driving.

The extremely low pitch position of the transmission input shaft resulted from the center of gravity demanding a flywheel design with the diameter of 192 mm. This small diameter prohibited the use of a dual mass flywheel.

The task of a dual mass flywheel was taken over by the transmission input shaft. The input shaft is designed to be torsionally elastic (capable of twisting), it acts as a torsion damper and in conjunction with the bevel gear drive acting as rotational mass, reduces crankshaft power pulsations and therefore the resulting transmission noise level.



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- 1** - Transmission input shaft (Power input)
- 2** - Bevel gear drive from layshaft
- 3** - Power transmission from layshaft to output shaft
- 4** - Intermediate final drive gear
- 5** - Drive differential
- 6** - Road wheel drive via axle shafts

All the fixed gears are mounted on the input shaft. These fixed gears drive the free gears which are mounted on the output shaft. First through fourth gears use triple synchronization. Fifth and sixth gears use double synchronization. Reverse gear has single synchronization.

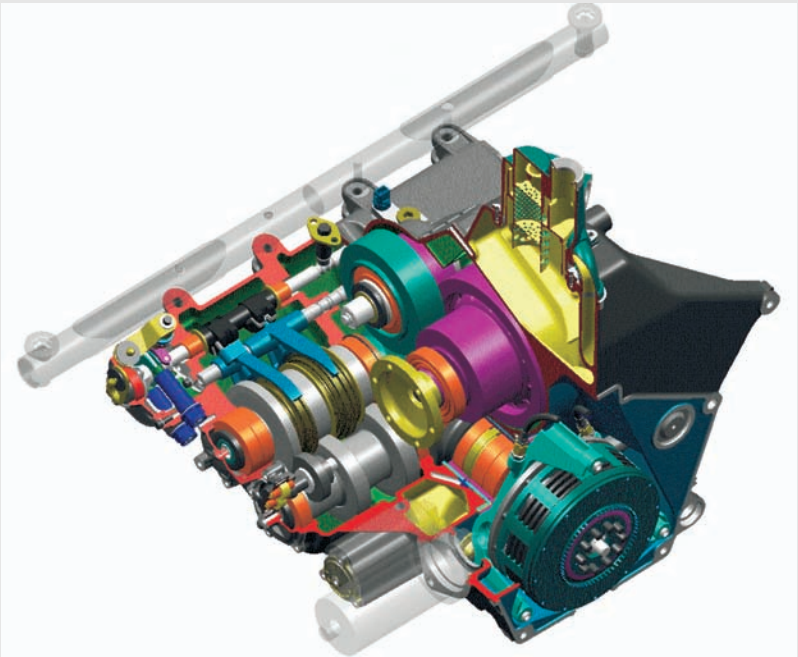
In the center of the output shaft there is a helical gear which provides the connection to the “final drive”. The “final drive” comprises of 2 helical gears mounted together and secured to each other by bolts, which form the connection from the output shaft to the differential.

The differential, like the final drive, is placed one level higher than the rest of the gears. From the differential the axle shafts form a direct connection to the rear wheels, keeping moderate drive shaft angles. The two-part aluminium housing is designed for the highest possible strength and rigidity. The rear transmission bearing is supported from four points on a transverse section and on hydraulic mountings on the equipment support beam.

1. Gear	3.200
2. Gear	1.870
3. Gear	1.360
4. Gear	1.071
5. Gear	0.900
6. Gear	0.750
R. Gear	2.140
Rear axle ratio	4.440

Limited-Slip Differential

The mechanical plates of the limited-slip differential have a limitation effect of 32 % in both acceleration and deceleration. For good weight distribution and low dynamic axle load transfer the symmetrical limitation in the Carrera GT is set at 32 %.



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The transmission oil pump is mounted to the right and above the transmission oil filter. The pump is externally accessible. The integral gear pump for the oil is driven by the intermediate reverse gear in the transmission. Before the oil drawn from the gearbox sump is fed back to the lubrication points via the integral oil channels it is filtered and cooled.

The transmission oil filter is mounted on the right hand side of the transmission housing, underneath the starter motor. It is accessible by removing a cover. In the oil passage after the oil pump there is a temperature sensor for controlling the speed of the fan for the transmission oil cooler. The transmission oil temperature can be read using the PIWIS tester.

The transmission oil cooler is located in front of the right rear wheel and has a speed-regulated electric fan. The air scoop for the alternator cooling air is bolted to the fan shroud. Transmission breathing is by means of a labyrinth within an open breather pipe.

The engine oil tank is located above the differential and incorporated into the transmission housing, together with the oil separator for the crankcase breather.

Transmission Oil

The transmission of the Carrera GT holds 4.2 qts (4 l) of Mobil SHC oil, which is circulated by the integral mechanical gear pump. The oil quantity is divided between 2.4 qts (2.3 l) for the gearbox and 1.8 qts (1.7 l) in the cooler circuit.

An exchangeable filter element is installed in the oil circuit downstream from the pump. It is located on the right hand side of the transmission, between the oil pump and the starter motor. In the oil circuit upstream to the transmission oil cooler there is a thermostat, mounted on the equipment support beam. The thermostat opens at 194 F° (90° C). On the underside of the transmission housing, on the right hand side, there is a transmission drain plug.

To measure the transmission oil level, use a oil dipstick, Porsche Special Tool #9456. **Note:** The oil cooler thermostat must be open, to ensure that all the transmission oil is in circulation.



The transmission drain plug is the same as the engine oil drain plug. Care should be taken not to switch them.

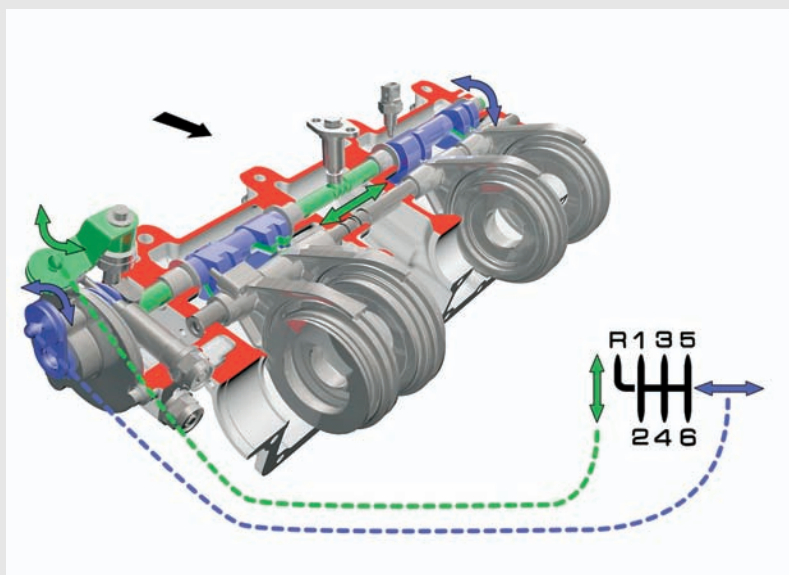
The exact procedure for checking the oil level and for topping off the transmission oil can be found in the Technical Manual, section 3.

Shifting Gears

The actual gear changing employs a newly developed system, in which the gear change rod for pre-selection rotates, and for the actual gear changing moves axially. The locking pieces on the gear change rod keep the gear change forks of the gears that are not selected in the neutral position. This prevents two gears being selected at the same time.

The gear change forks which are operated by the locking pieces are mounted separately on the guide rod. The advantages of this gear change mechanism are the compact arrangement of the components and the distribution of the operating elements and gear change forks all on a common rod or shaft.

The reverse gear selector is also engaged using the gear change rod. The gear change element is mounted on the transmission housing, in front of the cross member. On the right hand side, alongside the reverse gear selector, is located the spring element for the gear change rod stop. Both components are externally accessible and if necessary can easily be replaced.



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-  Pre-selector level
-  Gear change level

Gear changing in the Carrera GT is by manual driver operation of a shift lever in an H-pattern gate. First gear is at the front left, reverse gear is on the left behind first gear and can be engaged after overcoming the resistance of the reverse gear lock-out in the gearbox.

Gear selection and gear change forces are transmitted by steel tongues using flexball linkages to the manual transmission.

Shift Lever

The shift lever with its operating mechanism is mounted in the center console. Both flexball operating linkages are supported from the shift lever and locked to it.

For safety considerations the shift lever has an oval slot along its length. In the event of an accident which results in a person's head impacting the shift lever, the slotted cross-section ensures controlled deformation without exceeding the permitted limiting value for a head impact.

Shifter Mechanism

The external gear change mechanism is based on the well-proven gear change of the 911 models (GT3). It utilizes a matched gear change block and two pushpull plates. The gear change force is transmitted in a similar way to that of the 911, with 2 operating elements. In contrast to the 911 these are not Bowden cables but ball-mounted flexible steel plates, in the flexball system supplied by DURA.

The transfer of gear change selections results from movement of the shift lever located on the center console, which is connected to the pre-selection and gear change mechanism on the transmission housing by means of 2 gear change linkages. The gear change linkages supplied by DURA are constructed on the flexball principle, which permits high forces to be conveyed in push and pull senses. The system is almost 100 % efficient. The gear change linkages are color coded, and must not be interchanged.

Carrera GT

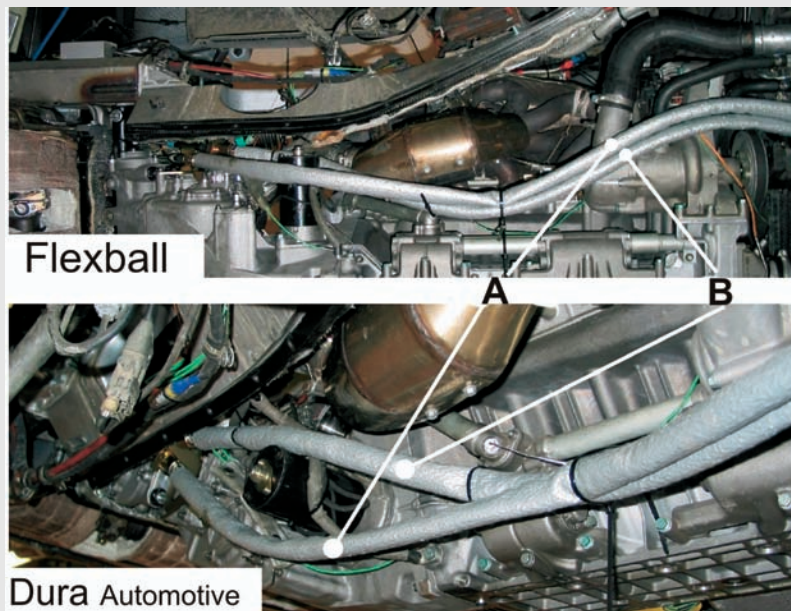
- A** - Gear change linkage
- B** - Preselector linkage



Details for R & R of flexball systems can be found in the Technical Manual.

The pre-selector linkage is to the left of the gear lever and is coded blue on the drop arm and gearbox-side sealing cap coded blue. The respective components for the gear change linkage are coded grey/black.

The linkages must be installed without kinks and in accordance with the manufacturer's specification. For trouble-free installation and removal, and to ensure optimum routing with no kink or crush points, the monocoque incorporates a separate guide channel for the flexball linkages.



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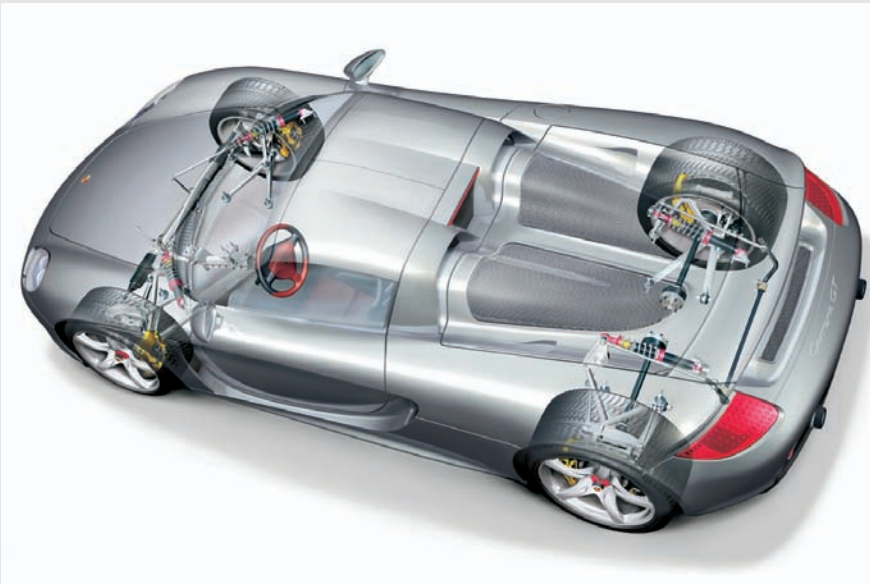
The use of cable ties must be avoided when routing the linkages within the vehicle. The linkages may not be clamped nor bundled. The manufacturer's instructions must be followed exactly

Flexball operating linkages, in contrast to Bowden cables, convey high operating forces in both push and pull environments. They require no maintenance or lubrication, are unaffected by changes in temperature, and are flexible enough to permit 3-dimensional installation routes.

The main components of a flexball system are two ballcage belts with steel balls, which run in two external semicircular rails with ball guides and a moveable central plate with ball guides on both sides. These components run on top of each other and are bound together and supported by an internally coated wound flexible steel hose (similar to a flexible shaft). The steel tongues are stainless steel.

For protection against external factors, such as moisture, the whole linkage bundle is sealed in a silicone plastic sheath. The silicone plastic sheath is stable at temperatures up to 400° F. (200 °C). For further thermal insulation within the engine compartment additional thermal insulation is applied in the form of a thermal sleeve over the bundle.

The maximum bending angle for the flexball system is 90° at a minimum bending radius of 100 mm.



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General

The chassis design of the Carrera GT is based on the GT1 Le Mans racing car. The speeds achievable with the Carrera GT demand special chassis provisions in respect of dynamic response, resilience, spring loading and damping.

For increased dynamic stability when driving at high speeds, measures to generate downforce are necessary. These in turn must be taken into account when arranging springs/shock absorbers, as downforce is increased, air resistance increases. In consideration of these aspects, the rear axle control arms, which are in the airstream, have been designed with an optimized aerodynamic profile.

Many detail measures in designing the chassis, the suspension, the tires and the aerodynamics have resulted in outstanding handling characteristics, steering precision and agility combined with high rear vehicle stability.

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Carrera GT

The Carrera GT chassis is set up without compromise for dynamic performance and tuned the same for all world markets.

This also includes the vehicle height, which may not be changed, due to the fact that the ground clearance directly affects the aerodynamics of the undertray and thus the downforce of the vehicle.

There are dimensions and measuring points for checking the vehicle height. The lower disc springs for the spring struts can be adjusted to allow the loads on each wheel to be set within the stated tolerances for balancing the vehicle.

Permissible variations in loads on each wheel are 22 lbs (10 kg) on an axle and 33 lbs (15 kg) diagonally. The front and rear axles operate on the "Pushrod" principle. Which means that suspension and spring movements are not transmitted directly to the spring struts, but indirectly via a push rod and a rocker arm.



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This has the advantage that the spring struts can be placed where they are not affected by aerodynamic influences and they can be more rigidly attached to the chassis structure. The rocker arm that is required can also be accorded leverage in translating the wheel spring movement to the spring strut, allowing sensitive response to the spring loading.

Driving Dynamics

Driving dynamics is one of the core competences of the Porsche company and has been applied thoroughly to the Carrera GT, achieving the following characteristics:

- Outstanding driveability and best possible dynamics with high reserves of safety in all situations.
- Smooth and safe driveability at all speeds, even when changing lanes.
- Best controlled load-reversal reactions in curves and exceptionally high lateral acceleration possible.
- Agile, direct and precise steering with noticeably good road feedback.
- Lowest roll, pitch and yawing movements, with lowest pitching due to the low center of gravity.
- Shortest possible braking distances, even during extremely heavy sustained braking, with high vehicle stability during the braking operation.
- Responsive traction control (TC).

Summary Of The Chassis Systems

Axle geometry fully adjustable	Optimum adjustment facilities for setting the tolerances, e.g for use on race tracks
Double control arms for front and rear axles	Precise wheel location with good force transfer to the bodyshell
Spring and shock absorber linkages on the "pushrod" principle	Spring struts indirectly actuated via a pushrod and rocker arm from the control arm/wheel carrier
Adjustable spring struts	Wheel loads adjustable to balance of the vehicle
Rear axle stabilizer adjustable	Vehicle dynamic properties adjustable from sporty oversteer to understeer
Traction control "TC"	Vehicle stability assistance during acceleration
ABS 5.7	4-channel anti-lock system for brakes. Each wheel is controlled separately
Engine drag torque control	Prevents loss of grip by the drive wheels during heavy deceleration



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The Carrera GT is equipped with double control arms with forged aluminium links. In this type of axle construction, the spring loading and wheel guidance functions are clearly separated.

The stainless steel pushrod is connected not to the aluminium hollow-cast wheel carrier but to the control arm. This reduces the steering-induced changes in height and wheel loading to a minimum. The pushrod is dimensioned to handle the forces that arise, i.e. the wall thickness is optimized between resistance to bending and achieving low component weight.

The wheel forces on the control arms are optimally transferred to the rigid carbon fiber monocoque through wide mounting base points. At the mounting base points for the lower front axle wishbones there are additional reinforcing plates to spread the forces over a large area.

The mounting of the control arms, unavoidably in vehicles with a race sport layout, is rigid. Metal balls are fitted in a plastic bearing race with a steel shell pressed on. These mounting parts have absolutely no play.

All control arms are mounted using these sealed stainless steel mountings, called uniball mountings.

The wheel carriers, to which the steering and control arms are attached, and to which the wheel bearings and axle stubs are bolted, are aluminium castings.

The scrub radius is set to a slightly negative geometry, so as to minimize the effects of forces that arise during braking and acceleration and which are perceptible as jerks at the steering wheel. In connection with the dynamic tire pressure distribution over the wheel contact area, effectively a negative scrub radius is achieved with a short retarder lever arm.

The caster offset is 25 mm which together with the stiffly geared steering system gives typical Porsche dynamic but smooth steering behavior. The materials selection and sizing of the front axle components was performed with a view to best stiffness values with lowest sprung and unsprung masses.

Front Axle Technical Data

Spring rate	70 N/mm
Spring wire diameter	10.5 mm
Number of turns	9.5
Auxiliary spring: spring response rate	33 N/mm
Auxiliary spring: spring wire profile	Rectangular 4x10 mm
Auxiliary spring: number of turns	4.5
Ground clearance to DIN, empty	86 mm
Stabilizer diameter	18.7 mm
Total toe	+4'
Camber	-1° 40'
Caster	+11.5° (25 mm)

Control Arms

The front axle suspension consists of 2 forged aluminium triangular control arms with maintenance-free uniball joints to transfer forces to the chassis. The mounting points of the control arms to the chassis are designed with a broad mounting base, so as to provide the optimum spread of forces into the chassis.

The ball bearing joints are absolutely maintenance-free and have no play. For protection against water and dirt each joint is sealed with 2 protective rubber caps. If a joint is damaged or displays increased play the entire control arm must be replaced.

On the upper control arms the rear strut is provided with a thin section, which is for protection of the chassis in the event of an accident. In an accident there will be corresponding forces on the wheel suspension, and the control arm is designed to deform at this point so as to protect the chassis from damage by overstressing.

The control arm will only deform in the event of an accident. The reduction in control arm cross-section area does not affect its strength.



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The wheel carriers are aluminium castings. The front wheel carrier has both the forged control arms attached to it by ball joints. The force transfer of wheel spring movements is performed by the front push rods, which transfer the forces to rocker arms and then to the spring struts bolted to the monocoque.

The front push rods are connected to the lower control arms, which keeps to a minimum the possible changes to wheel load and vehicle height level that can arise from steering actions. The upper control arms and the track rods form together with the wheel carrier an L-shaped profile, to which the steering arm is bolted, and connected to the compensating washers for camber adjustment with the wheel carrier.

A two-row angular ball bearing is pressed on to each wheel carrier, which must be replaced together with the complete wheel carrier.



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Spring Struts

The spring struts consist of a non-adjustable damper unit. The damper housing has a universal external thread for the lock nut for wheel load adjustment and for the actual chassis spring which presses against the damper. The spring is tensioned by means of the spring perch which is attached to the damper piston rod and the nuts located on the damper body. The spring layout is linear.

To ensure that even under maximum spring travel in the front wheel suspension the main spring at all times rests on its perch, an auxiliary spring is placed beneath the main spring on the front spring struts. This auxiliary spring is designed so that its coils remain in contact at all times, even at extreme spring travel. The working travel of the auxiliary spring is a maximum of only a few millimetres.

Stabilizers

The front stabilizer is solid steel with a 18.7mm diameter and has an arm on each side with a connecting rod that is connected to the spring strut. The positive connection of both flexional arms with the stabilizer is formed by a polygon connection. Due to space considerations the stabilizer is in 3 parts.

The actual torsion bar is mounted on two Silentblock rubber mountings which are provided with Teflon coated slide sleeves and are bolted to the splashboard of the monocoque. The flexional arms are screwed on, one at each end of the torsion bar and provides the stabilizer effect.

The components are of highly heat-treated steel and are coated with anti-rust agent. The front stabilizer is non-adjustable.



The steering column is the same as that in the 986/996 sports cars and is coupled to the Carrera GT suspension and steering shaft with two cardan shaft joints.

The hydraulic lower support for the rack and pinion steering is bolted rigidly to the monocoque front wall (in front of the front axle) on the left hand side in the direction of travel. This design significantly increases the safety of the occupants of the vehicle, as well as meets FIA motor sport standards.

On the right hand side of the vehicle the steering rack is semi-floating, to permit thermal expansion resulting from changes in temperature of the material. The steering rack is a further development by ZF to include significant optimization of friction levels and a special hydraulic power assistance profile tuned to the requirements of the Carrera GT. The overall steering assembly is designed for direct, yet sensitive response, for good handling characteristics and agility.

The moderate steering wheel ratio of 15.7:1 and the resulting 2.59 steering wheel turns, lock to lock, allow direct feedback from the road surface. The steering wheel diameter of the vehicle is based on the 911 range is 14.7" (375 mm) and also is equipped with an airbag.

Steering Data

Steering wheel diameter	14.7"
Steering wheel ratio	1 = 15.7:1
Turning circle diameter	42.3 ft
Turning track diameter	40.3 ft
Steering wheel turns lock to lock	2.59

Hydraulic Power Steering

The hydraulically assisted rack and pinion steering draws its pressurized oil from an engine-driven vane pump. The pressure supply lines to the steering rack are steel hydraulic lines. For acoustic insulation the final connection of the feed line to the steering rack is a fiber reinforced hose of polymer materials. The return is a steel tube, and to accommodate longitudinal movements of the steering rack, has several coiled turns for length compensation.

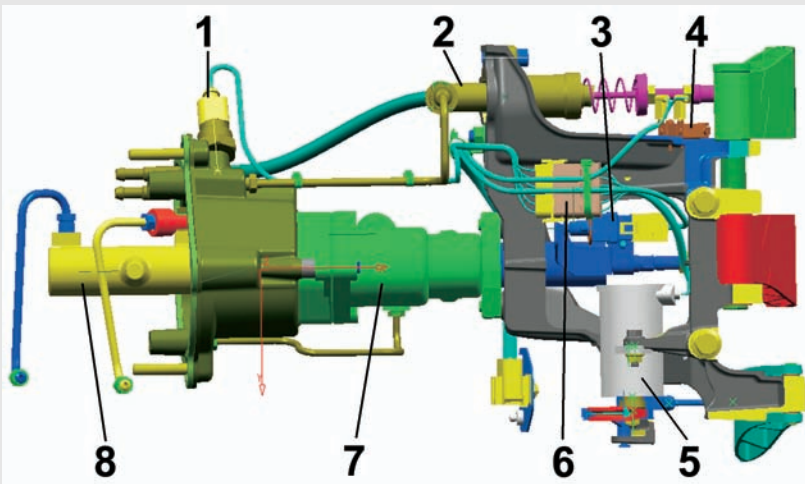
The pump is bolted to the engine on the left hand side in the direction of travel and is driven by a poly rib belt. The expansion tank is in the engine compartment above the servo pump on the left hand side alongside the cooling water header tank. The system is filled with approx. 1.2 qts (1.1 l) Pentosin CHF 11S. The power-assisted steering operates in the same way as the 996/986 sports cars.

Steering Column

The Carrera GT is equipped with a steering column mechanically adjustable for length, which is rigidly fixed to the monocoque bodyshell. The length adjustment range of the steering column is 40 mm. The clamping lever for the column length adjustment is underneath the steering column, similar to the 911 Carrera (996).

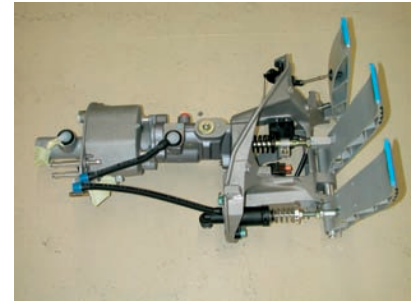
The pedal box module includes a cast aluminium carrier, pedals, hydraulic brake servo, clutch master cylinder, pedal position sensor, clutch switch and brake light switch. The pedal box module is bolted directly to the monocoque on the front of the scuttle. The pedal box module is hidden from sight up to the pedals with a removable carbon fiber cover. This cover incorporates the air outlet for the footwell air vent.

When adjustments and/or component replacement is required it is recommended that the complete module be removed and work performed on a work bench.



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- 1 - Clutch pressure sensor
- 2 - Clutch master cylinder
- 3 - Brake light switch
- 4 - Mechanical clutch switch
- 5 - Pedal position sensor
- 6 - Connection plug
- 7 - Hydraulic brake servo
- 8 - Master brake cylinder



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The exact operations for repair and adjustment work on the pedals and the parts connected to them can be found in the relevant sections of the Technical Manual.

Rear Axle

The rear axle of the Carrera GT is, like the front axle, built around a double control arm pushrod axle. The rear axle design is attached to mounting points on the equipment carrier within the load-bearing vehicle structure. In contrast to the front axle pushrod connections, on the rear these are on the wheel carriers. This permits the lower control arms to have a lightweight aerodynamically form since they carry “only” the wheel guidance forces, and this leads to significantly lower air resistance for the rear wheel suspension that lie in the diffuser airstream of the lower undertray.

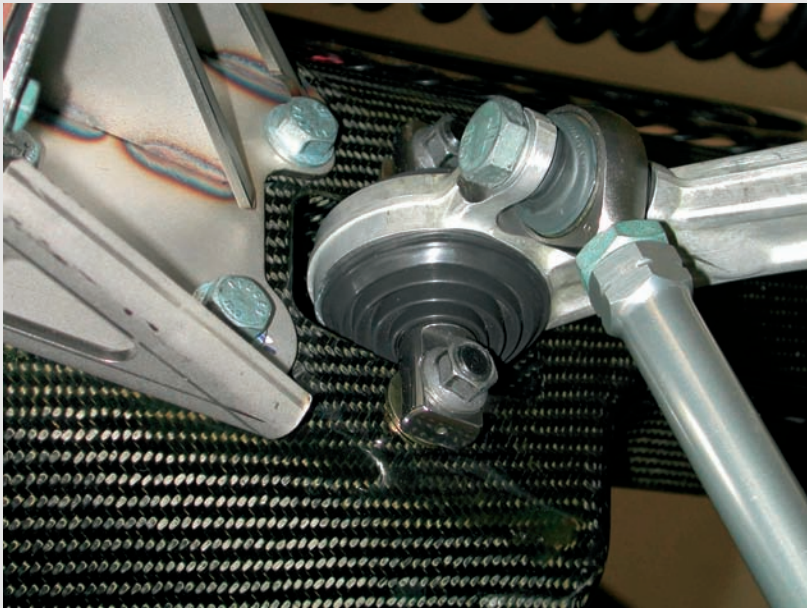


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Rear Axle Technical Data

Spring rate	80 N/mm
Spring wire diameter	11.75 mm
Number of turns	11.9
Ground clearance to DIN, empty	86 mm
Toe-in per wheel	+10'
Camber –	1° 30'
Stabilizer	tube ø 17.2 x 2.5 mm

The rear axle suspension also has 2 triangular control arms with maintenance-free uniball joints to transfer forces to the chassis. The mounting points of the control arms to the chassis are also designed with a broad mounting base to provide the optimum spread of forces into the chassis.

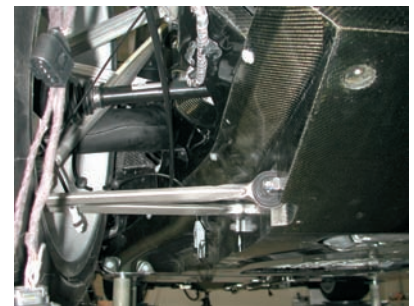


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The upper control arm is similar to the front axle – made of forged aluminium and secured with two bolts to an L-shaped aluminium forged part; the steering arm on the wheel carrier. These connections take up the camber adjustment through inserted shims.

At the rear of this forged part the adjustable track rod for the rear wheels is attached. The lower control arm, in contrast to all the other steering arms, is of corrosion resistant stainless steel welded design. The profile of the lower control arms is aerodynamically optimized in the form of an inverted wing of an aircraft.

The ball joints are maintenance-free and have no play. For protection against water and dirt each joint is sealed with 2 protective rubber caps. If a joint is damaged or worn the complete control arm must be replaced.

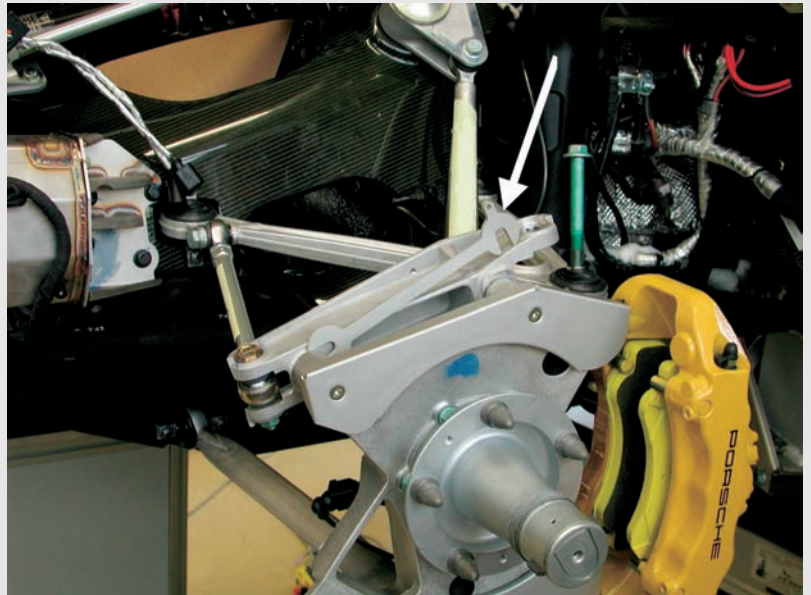


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Wheel Carriers

The rear wheel carriers are aluminium castings, similar to the front wheel carriers. The rear wheel carriers have connections not only to both control arms but also to the pushrod which connects to the rocker arm of the spring strut and via the forged steering arm to the rear track rods, to adjust the rear axle toe-in.

The upper control arms and the track rods are bolted together to form with the wheel carrier, an L-shaped profile. A two row angular ball bearing is pressed into each wheel carrier, if bearing replacement becomes necessary, the complete wheel carrier must be replaced.



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Spring Struts

The spring struts, similar to those on the front axle, comprise a non-adjustable damper unit, which on the damper casing has a universal external thread for the wheel load adjustment lock nut and for the actual chassis spring which presses against the damper.

The rear axle chassis spring is a linear arrangement. The spring is tensioned by means of the upper spring perch which is screwed to the damper piston rod and the lock nuts and lower spring perch on the damper body.

Stabilizers

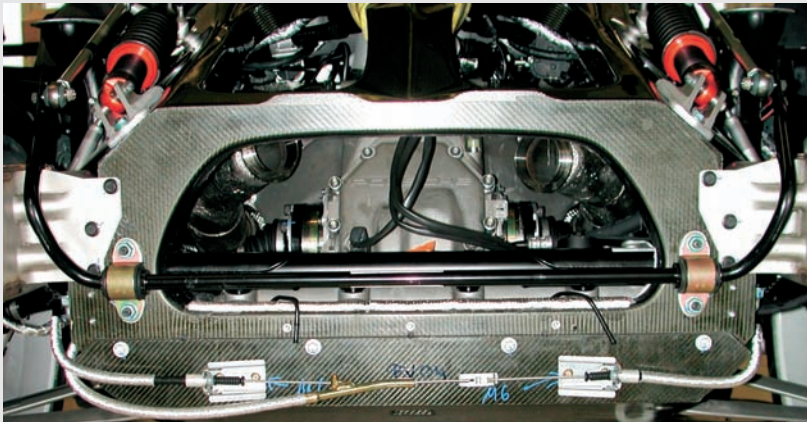
The rear axle stabilizer is similar to that on the front axle with two connecting rods adjustable for length, connected via the rear rocker arms with the spring strut. The stabilizer itself is a single piece design secured to the rear axle and bolted to the bodysell with 2 rubber mountings (like the front axle) between the rear wall of the equipment carrier and the final exhaust muffler.

The rear stabilizer is highly heat-treated steel in the form of a tube (D: 17.2 x 2.5).

Carrera GT



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The rear stabilizer, in contrast to that at the front is adjustable for firmness of response in three stages. When the Carrera GT is delivered it is set to the firmest ride, which tends towards oversteer in a sporty dynamic style of driving. The two other settings change the driving dynamics successively towards understeer.

Wheels

The newly developed wheels of the Carrera GT are manufactured of magnesium using a special forging process. The 5-spoke design is retained. On the front axle, 19" wheels are installed and 20" wheels on the rear drive axle.

The manufacturing process for the wheels is the same as that used for manufacturing the wheels of Formula 1 racing cars. This technique gives optimum strength with very light weight. The weight savings compared to aluminium wheels is approx. 25 %. Low unsprung masses in the wheel assembly are indispensable for responsive design of spring loading and damping characteristics.

To protect the magnesium against its susceptibility to oxidize, the entire wheel is protected with a special surface coating of magnesium oxide and clear varnish. At the annual inspection, all wheels must be checked for damage and either repaired or replaced according to the guideline in the Technical Manual.



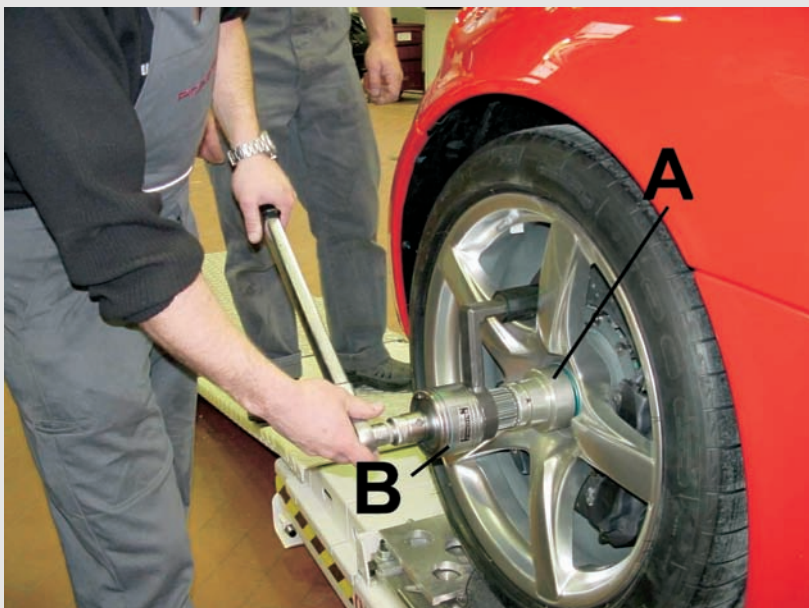
It is very important that this coating is not damaged during tire mounting, any damage to this coating could cause the wheel to fail due to corrosion.

Use of the motor racing style of central wheel fastening for mounting the wheels means that only a single central securing nut of aluminium is used. This nut has a wave-shaped multi-tooth external profile and can be removed and tightened only with the corresponding nut socket driver. This solution is at the same time effective theft protection.

On the left hand side of the vehicle the threads are right handed, and on the right hand side of the vehicle the threads are left handed. This arrangement eliminates the chance of nuts loosening and as an additional safety feature, the wheel has two spring-loaded safety wedges which engage positively in the castellated leading part of the wheel nut.

The color coding of the wheel nuts also stems from motor racing. This assists in identification of the wheel nuts for thread direction and eliminate the possibility of cross-threading.

These color codings are exactly like those used in motor racing. On the left hand side the right hand threaded nuts are anodized red, on the right hand side the left hand threaded nuts are anodized blue.



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To loosen and tighten the wheel nuts a special nut socket driver (Porsche Special Tool #9451) which matches the nuts is necessary. This matching socket driver is located in the trunk of the Carrera GT and made of high tensile aluminium. When used with a suitable wrench, the nuts can be loosened and tightened. **Under no circumstances should the socket be used with an impact wrench!**

Carrera GT



The torque multiplier is not supplied with the vehicle. This Porsche Special Tool #9450 was supplied as a minimum requirement tool.



Under no circumstances should parts being assembled have large variations in temperature, once the temperatures have equalized the tightening torque will not longer be as specified.



The tire inflation pressures can be found in the Owner's Manual or in the Technical Manual.



For safety reasons the tires may not be used when they are more than four years old.



When tire sealant has been used, the tire pressure unit in the wheel must be replaced.

If no wrenches with the corresponding leverage are available, the nut can be loosened and tightened using a torque multiplier (Porsche Special Tool #9450) with an integral reaction element. The torque multiplier has a multiplication ratio of 3:1.

Everytime the nuts are installed they must be checked for dirt in the thread or on the cone, and if necessary they must be cleaned. The nuts must be lubricated on the thread and on the cone with a special grease.

Every time a wheel is installed, a check must be made that the circular groove in the wheel's conical seating area for the central securing nut is still present. This small groove is an indication of the necessary presence of a defined mounting surface for the central nut.

If the groove can no longer be felt, the wheel must be replaced.

Tires

Due to the unique demands of drive power, traction, driving dynamics and safety, new tires were developed specially for the Carrera GT, with very large road contact area. The tires to match the rims are made by Michelin, Pilot Sport range sizes 265/35 ZR 19 on the front axle and 335/30 ZR 20 on the rear axle. Since the Carrera GT vehicle has been designed with driving dynamics as the main priority, **no winter tread tires have been approved by Porsche.**

Punctures/Tire Sealant

The Carrera GT is equipped with a tire repair system "Tire Fit" as standard equipment in the event of a tire puncture. Provided the tire is not seriously damaged, the puncture can be sealed without removing the wheel. Once the puncture is sealed the vehicle can be driven at a reduced speed of max. 50 mph (80 km/h).

The tire sealant is a quick and easy technique for recovering mobility in the event of a puncture. It is capable of sealing punctures that arise from the usual causes, such as nails and screws, and allow the driver to proceed to an authorized Porsche dealer and/or tire dealer.

The tire sealant bottle and electric air compressor are stored in a special area of the engine compartment.

In the event of a puncture the valve of the damaged tire must be removed using the valve extractor supplied with the vehicle tool kit, before the tire sealant can be pumped into the tire. After the special injection valve has been fitted, the tire must be inflated using the compressor to a pressure of at least 36 psi (2.5 bar).

After driving for a period of approx. 10 minutes the sealing process has finished. The tire pressure must be checked again and inflated as necessary to bring it to the correct set value.

The 12 volts outlet receptacle for powering the compressor is located in the glove compartment.

Tire Pressure Monitoring (RDK)

The Carrera GT is equipped as standard with a new digital tire pressure monitoring system (RDK). The system allows continuous monitoring of the tire pressures of all four wheels during a trip, including when the vehicle is stopped. Signal processing is performed by an evaluation logic in the digital antennas.

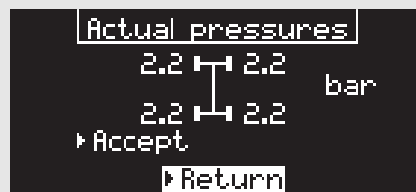
Conventional copper wires carry the information from the antennas to the RDK control unit. The RDK control unit performs the signal processing and passes the information to the instrument cluster. No coaxial cables are used. This means that the system is more secure than other systems against interference.

The tire pressure checking system with digital antennas used by Porsche is a 4-wheel system. The data transmission from the wheel sensors to the control unit is performed by radio transmission in the high frequency range (HF range, 315 MHz). Information exchange within the vehicle periphery is performed by the CAN comfort bus.

From each of the measurement and sender units installed at the tire valve a radio signal is sent at regular intervals to the antenna that is mounted in the wheel arch. The antenna passes the signal to the RDK control unit. The RDK control unit evaluates the tire inflation pressure and the rate of change of pressure and sends these to the instrument cluster. When a warning is given, the pressure difference from the set pressure will be displayed (e.g. set 32 psi (2.2 bar), actual 27 psi (1.9 bar), display = - 4 psi (- 0.3 bar). The driver can then reinflate the tire irrespective of the tire temperature by the pressure difference of 4 psi (0.3 bar).

For driving on a race track, or driver's individual preferred air pressure values, can be input separately through the instrument cluster into the RDK. The RDK then monitors these individual values.

For safety considerations the tire pressure menu can only be called up when the vehicle is stationary.



The tire pressure monitoring system offers the following advantages:

- Increased safety through 2-stage warning:
 1. Early information ("soft warning", yellow) between 3 & 6 psi (0.2 & 0.4 bar) less than set pressure
 2. Immediate warning ("hard warning", red) if >6 psi (0.4 bar) less than set pressure or if sudden loss of pressure
- More convenience since the usual tire pressure check every 14 days is no longer required. Tire pressures need only be corrected when the corresponding display shows it is necessary
- Longer tire life (an underpressure of 4 psi (0.3 bar) can reduce the life of a tire by up to 25 %)
- Lower fuel consumption since rolling resistance is less when tire pressures are correct
- Optimum vehicle handling
- Individual input of tire set pressures for use on race tracks
- Convenient to use:

No need to look up the correct tire pressures on the tire pressure sticker. The applicable pressure values are automatically communicated to the RDK control unit (table calibration)
- This table calibration eliminates variations in accuracy of readings of tire gauges applied to the wheel. The display using the values determined by the pressure sensors in the vehicle is significantly more precise
- In the event of a warning, the tires can be inflated to the correct pressure even in the warm state, since the pressure shortfall against the set value is displayed on a temperature-compensated basis (inflation info)
- During the trip the absolute pressures of the tires can be displayed and can be seen how the tire pressures rise and fall according to how the driving style and the ambient conditions affect the temperature.
- All warnings are specific to the wheel position concerned.

Minor Loss of Tire Pressure

A minor loss of tire pressure 3 psi (0.2 bar) less than the set pressure, such as that due to diffusion, is indicated to the driver as an early warning, visually and acoustically (“soft warning”), that the tires should be checked and inflated to correct pressure at the next suitable opportunity.



Major Loss of Tire Pressure

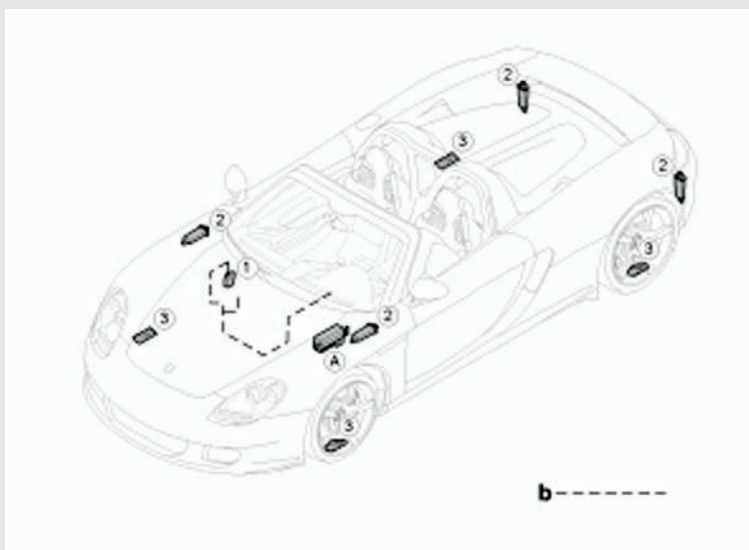
In the event of a major loss of tire pressure 6 psi (0.4 bar) less than the set pressure the driver is immediately given a visual warning. At the same time a warning buzzer sounds and the warning signal is activated (“hard warning”). This display is maintained as long as the ignition is switched on, including when the vehicle is stopped at a in traffic.



Design

The tire pressure monitoring system includes the following components:

- 4 wheel senders
- 4 antennas in the wheel arches
- RDK control unit in the passenger footwell
- Display on the matrix display in the instrument cluster



- 1 - RDK control unit
- 2 - Digital antenna
- 3 - Wheel sender
- A - Diagnostics socket/fusebox
- b - CAN connection

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Wheel Senders

The wheel senders are fastened to the metal valves on the wheel rims. They are secured to the wheel rims using a hollow Torx screwdriver to tighten a screw fitted with a tamperproof pin. The additional weight is approx. 1 oz (30 grams) which can be balanced out and eliminates the need for special wheels. When a wheel is changed, the wheel sender can be reused.

The following components are incorporated in the wheel sender:

- Sender antenna
- Pressure sensor
- Temperature sensor
- Measurement and control electronics
- Battery

Pressure sensor, temperature sensor and measurement/control electronics are combined within a sensor unit. Depending on the country standards, one of two different carrier frequencies is used for radio transmissions. For North America a carrier frequency of 315 MHz is used. The respective carrier frequency is hard wired into the sensors, antennas and control units.

Additionally the sensors are color coded:

315 MHz pale grey

The tire pressure monitoring system will only function correctly when all system components are set to the same carrier frequency.

The wheel sender transmits the following information:

- Individual Identity Number (ID)
- Current tire pressure (absolute pressure)
- Current tire air temperature
- Status of the integral battery
- Plus status, synchronization and control information necessary for security of data transmission

Each wheel sender has an individual Identity number (ID) in the form of a maximum 10-position number (which is stamped into the wheel sender itself). The ID is contained in the data signals sent by the wheel sender and is passed through to the control unit. The RDK control unit learns the IDs that belong to the wheel senders on the vehicle, and their wheel position, using a complex process, and saves them.

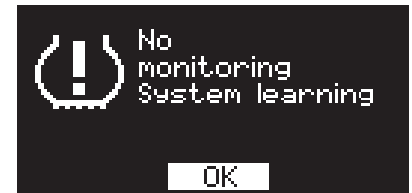
Learning takes place only when the vehicle is moving. This prevents inadvertent changes to the learned information originating from wheel senders in other vehicles, e.g. when stopped at traffic lights or in a parking lot.

Learning Process

The learning process is divided into 3 phases:

1. Recognition of the respective wheel

When a new set of tires is mounted, the system starts the process of learning the ID of the wheel senders in the vehicle's wheels. During this learning phase the message "No monitoring, system learning" appears in the display and the RDK warning light is on. On completion of learning the ID of the wheel senders in the vehicle's wheels, the RDK warning light will go out. The system can now recognize loss of tire pressure and if necessary give a warning.



2. Wheel position allocation

Once the wheel senders have been recognized, the learning of the respective wheel positions on the vehicle begins. After all wheel positions have been recognized and "learned" the system can immediately display the pressure of each wheel position in the main menu, and the pressure levels variations in the RDK menu.

3. Confirmation phase.

This learning process is required mainly for checking whether one or more wheels has been changed, without the new wheel being registered in the system using the RDK menu. This phase is restarted every time the ignition is switched on. When this last learning phase has been completed, the system ignores signals from other vehicles.

Activation of the system by inputting the wheel sender ID can be performed using the system tester or by driving the vehicle approx. 20 minutes.

Tire Pressures

The wheel sender captures the current tire pressure (absolute pressure measurement) which is sent to the RDK control unit for evaluation.

Temperature

The temperature signal enables temperature-dependent pressure compensation. Temperature compensation is performed in the RDK control unit. This allows the measured tire pressures to be standardized to a temperature of 68° F (20° C).

At tire temperatures greater than 248° F (120° C) the RDK may for a brief time report a system fault, and cease functioning. When the temperature falls below this level the system will again operate normally.

Connection Between Tire Pressure and Temperature

As the tires heat up while driving, the pressure in the tires increases. This pressure can be significantly higher than the stated pressure setting for the cold state (approx. 68° F (20° C). Recognition of this pressure-temperature dependency allows warning messages of loss of tire pressure to be displayed even though the absolute pressure of air in the tire displayed in the instrument cluster is greater than the set pressure for the tire. **Such warning messages are correct!**

The air pressure in a closed system changes in proportion to temperature. In the relevant temperature range, a temperature change of 18° F (10° C) caused a pressure change of approx. 1.5 psi (0.1 bar).

For this reason the wheel sender, in addition to the pressure sensor also has a temperature sensor. This allows calculation of compensation for temperature-dependent pressure changes in the tires. Temperature compensation is performed in the RDK control unit. This allows the measured tire pressures to be standardized to a temperature of 68° F (20° C).

When a warning is given and the tire pressures are reported in the RDK menu, the amount of pressure shortfall from the set pressure is also temperature-corrected to 68° F (20° C). This avoids the risk that large changes in temperature may result in false alarms or missed warnings.

When tires are being inflated, this system gives pressure readings that are independent of the temperature of the tires, this assures correctly set pressures, even with hot tires.

The energy required for electronics is provided by an integral lithium battery. To ensure long operating life for the tire pressure sensors, the control electronics incorporates an ingenious energy management system.

The battery life on the Carrera GT can be read using the Porsche system tester. The battery life is dependent on the operating conditions, but is designed for approx. 7 years. In principle the battery should be changed if the operating life is expected to be less than the life of the tires.

Energy Management

Relatively infrequent sendings of data (approx. 1x/min) are sufficient for measuring tire pressures. Any loss of pressure must however be detected immediately and sent to the control unit. The energy management differentiates between normal send mode and high speed send mode by using different measurement and sending intervals. As long as the sensor finds tire pressure to be constant the tire pressure sensor operates in normal send mode.

Normal Send Mode – It measures the pressure and temperature every 3 seconds, as long as the values remain constant, it sends the values every 54 seconds.

High-Speed Send Mode – If it detects a loss of pressure at a rate greater than 3 psi (0.2 bar) per minute, the sensor changes immediately into high-speed send mode, in which it measures and sends every 0.8 seconds.

After the vehicle has been switched off and a certain time has elapsed the system switches into power-saving mode (sleep mode). This energy management means that the drain on the sensors battery is as low as possible, while providing a high level of security in the monitoring.

Energy saving feature make a battery life of 5 to 10 years possible. The battery is a component of the tire pressure sensor and cannot be replaced separately.

This new RDK system offers the facility of triggering a request data signal from the wheel senders and using the reply for communications path diagnostics. This trigger facility allows the possibility of further reducing the frequency of data signals, further prolonging the battery life.

RDK Antennas

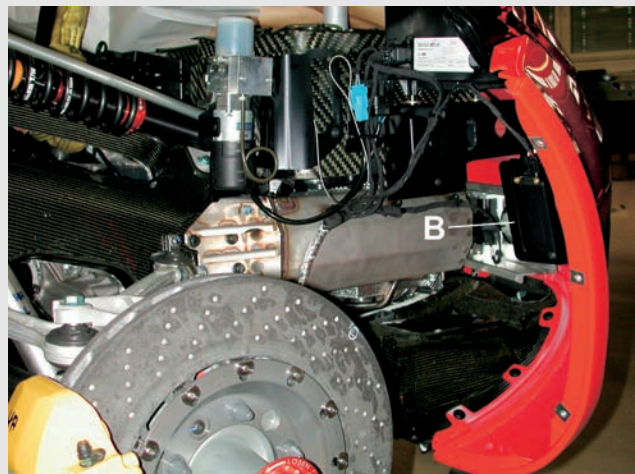
The antennas receive the radio signals from the wheel senders, transduce these into LIN bus-compatible signals and sends them for further processing to the RDK control unit.

The tire pressure monitoring system possesses 4 antennas, which are mounted in the wheel wells behind the wheel well liners.



A - Antenna front axle

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B - Antenna rear axle

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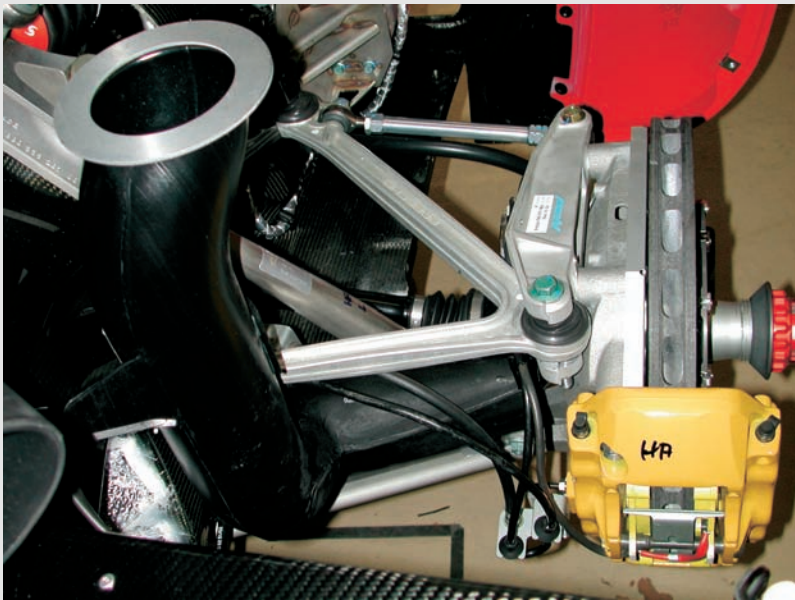
RDK Control Unit

The RDK control unit evaluates the radio signals that come from the antennas, prioritizes them, and sends corresponding information to the instrument cluster. The RDK control unit is located in the passenger footwell, front right.

The Carrera GT is equipped with Porsche Ceramic Composite brakes (PCCB) as standard equipment. The PCCB offers high performance braking characteristics, consistently short brake piston travel with minimal brake fade tendency, and constant coefficient of friction.

A additional advantage of the PCCB system is longer brake pad and rotor service life when compared to steel brake rotors.

Since the Carrera GT is designed with well balanced weight distribution, the front and rear rotors have the same diameter.



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Wear in the components of the brake system is dependent on individual driving styles, including; racing circuit use, frequent aggressive stops.

Brake System Data	Front axle	Rear axle
Brake disc diameter	380 mm	380 mm
Brake disc thickness	34 mm	34 mm
Brake caliper type	Brembo 6 piston fixed caliper	Brembo 6 piston fixed caliper
Number of pistons	6	6
Piston diameter (in pairs)	28/32/36 mm	28/30/32 mm
Pad area per pad	112 cm ²	112 cm ²
Brake servo	hydraulic	
Amplification factor	3.6	
Master brake cylinder dia.	26.99 mm	
Handbrake		Bowden cable on floating calipers
Pad area per pad		19,5 cm ²

Brakes

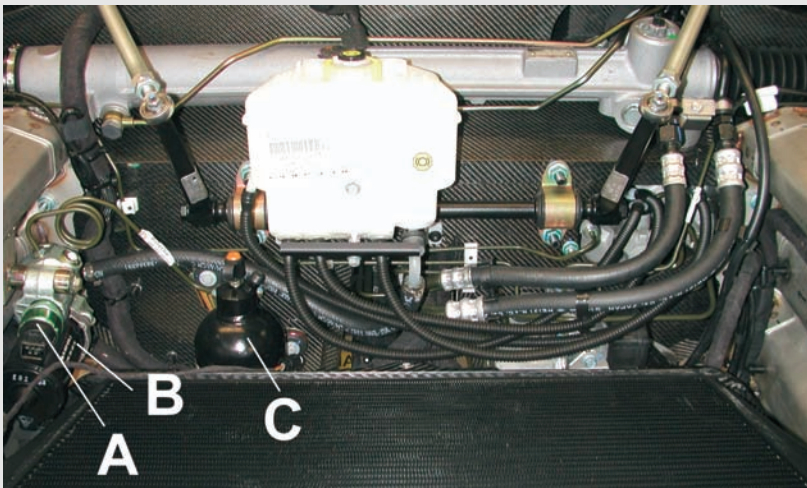
The tandem brake master cylinder is placed in front of the brake pedal and at the same height. The brake fluid reservoir is located in front of the steering rack on the front side of the monocoque and is accessible by a flap in the trunk for maintenance and checking.

The hydraulic brake servo is integral with the brake master brake cylinder and located behind it.

Brake Servo

The brake servo operates hydraulically and is charged with servo pressure by an electric pump through a pressure accumulator. The electric pump runs as needed when the ignition is switched on. The pump runs until the brake servo pressure circuit and the pressure accumulator have attained their working pressure and the pressure switch has detected maximum pressure.

If the vehicle has been standing a long time, the pump may have to run for a longer period to build up to operating pressure. During this time the instrument cluster can display the warning “Low brake pressure”. This warning is cleared as soon as the working pressure is attained.



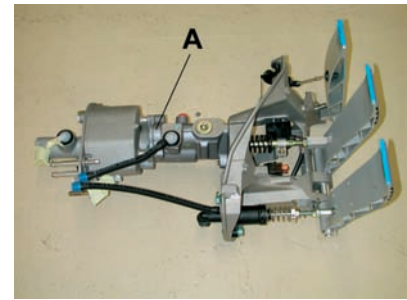
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- A - Pressure switch
- B - Pressure pump
- C - Pressure accumulator

Brake Fluid

The brake system of the Carrera GT is filled with “Super DOT 4” brake fluid. The change interval is 2 years.

Carrera GT



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While the warning is displayed, the brake system is in full working order, but without brake servo assistance. The brake force assistance that the servo would provide must be physically applied as additional force by the driver.



The brake servo system is functionally the same as in the 911 Carrera (993) and 911 Turbo (964).



Silicone brake fluid must not be used!

Carrera GT



The brake calipers for the front and rear axle are not identical and can not be interchanged.



For race track operation, special pads (P 50) are recommended. These pads are for competitive racing environments and only attain their maximum braking power at high working temperatures.

These pads are not approved for driving on public roadways!

Front and Rear Brakes

The perforated fiber reinforced ceramic brake discs have a diameter of 380 mm and width of 34 mm and are internally cooled by way of involute-form cooling channels.

The ram pressure forced brake cooling air comes from the air openings in the front apron and is directed to the brakes by air guides on the lower control arms. Ventilation slots on the outside between the brake rotor hub and rotor additionally assists cooling.

The monobloc aluminium fixed calipers are each provided with 6 pistons. The seating area on which the brake calipers are bolted is exceptionally large and provides a strong attachment to the wheel carrier. This allows the proportioning and pedal response to be optimized.

The brake calipers are painted in typical PCCB yellow.



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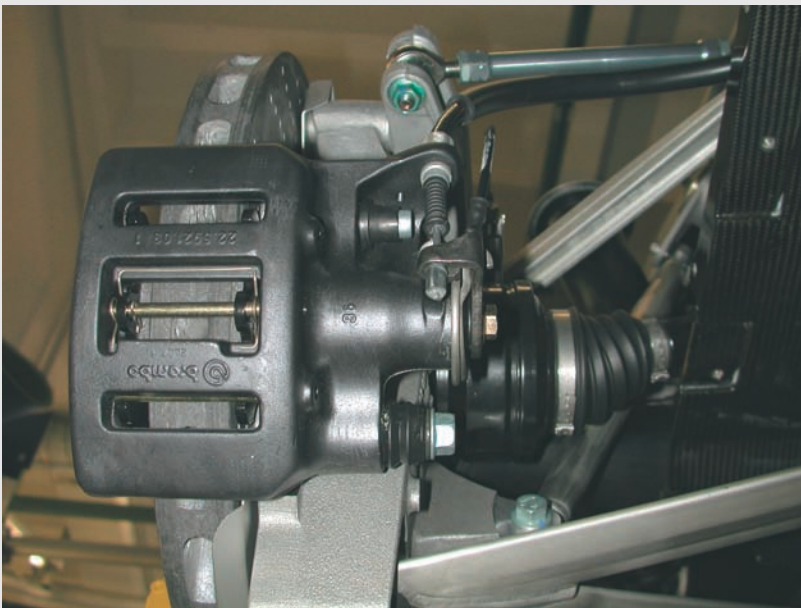
Brake Pads

The brake pads are specially configured for the brake discs of the PCCB brake system. When replacing brake pads, only install pads that are approved for use in the PCCB brake system. Applicable part numbers are available through the Porsche parts department.

The handbrake of the Carrera GT acts through two separate floating calipers on the rear axle brake rotors, operated by mechanical Bowden cables. The brake pads for the handbrake are almost the identical material as those of the main brakes.

The handbrake is applied by a manual handbrake lever, which is located to the left of the driver's seat. From the handbrake lever a long Bowden cable leads directly to the right handbrake caliper. The cable runs behind the cross member of the power unit carrier, where it is attached to a divider piece to which is connected the short brake cable for the left handbrake caliper.

When the handbrake is applied, this short cable is tightened by the divider piece and the support against the sheath and thus transfers the operating force equally to both handbrake calipers.



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ABS 5.7

The Carrera GT is equipped with a 4-channel anti-lock system of the generation ABS 5.7 from Bosch. The advantage of 4-channel ABS compared to a 3-channel system is that in ABD operation, both rear wheels have independent brake control, through two independent hydraulic valves.

This ABS control at the rear axle is however in conflict with the criteria for vehicle stability and lateral control. This means that the principle of “Select Low” must be applied to the rear axle, and maximum brake power is governed by the rear wheel with the least adhesive grip.

Traction Control (TC)

The Carrera GT is equipped with a “Traction Control” system as standard equipment. The “TC” system includes the components; automatic brake differential (ABD 5.7), traction control (TC 5.7) and engine drag torque control (MSR).

ABD 5.7

During acceleration, in the event of the one wheel slipping, that wheel is braked by the ABD until stable driving conditions are reattained. The application of brake pressure is achieved by the individual hydraulic valves for each drive wheel, located in the ABS hydraulic unit.

The component functions of the ABD 5.7 are implemented in the overall TC 5.7 system.

TC 5.7

The traction control system has the responsibility of preventing excessive wheel slip at the drive axle, which, prevents lateral drift of the rear axle during acceleration. The TC function is active at all speeds when acceleration is applied. If one (or both) wheels slip, the wheel is braked until the speed of the wheel falls to one at which the wheel does not slip, or both wheels are braked down to a wheel speed level where slipping does not occur.

If prolonged TC applications causes the brakes to overheat, then the electronic engine management system will reduce the engine torque until the drive wheels regain forward grip within the adhesive limit.

When traction control is active, these interventions will be indicated by a flashing yellow warning light in the instrument cluster.

Engine torque reduction means the throttling back (reduction) of the engine torque currently demanded by the gas pedal by a reduction in the mass of combustion air admitted, which is achieved by closing the electronic throttle valve. A additional possibility for torque reduction is to reduce the efficiency of the engine combustion, by retarding the ignition angle. From a thermal point of view there are strict limits to retarding the ignition angle, so its use is only for minor control interventions.

Engine Drag Torque Control (MSR)

Within the TC function there exists engine drag torque control. This may be required for instance after shifting to a lower gear on slippery surfaces. When shifting down to a lower gear the resulting engine braking effect could be so severe that the rear wheels break loose. MSR prevents this by opening the throttle and there by reducing the engine braking effect.

There is always the possibility that the Carrera GT driver may switch off the traction control functions by pressing the button labeled "TC". The driver is then reminded of this by the display "TC off" in the instrument cluster.

It is however inadvisable to switch off the TC functions. Doing so will in any case not lead to better lap times on the race track.

Diagnostics

The ABS and TC systems are connected via the CAN drive bus system to the two Motronic control units and to the instrument cluster for data exchange. The drive bus has a data frequency of 500 kBaud. The RDK control unit is connected to the significantly slower CAN comfort bus (100 kBaud) in the instrument cluster.

The instrument cluster acts as gateway control unit for control of the data traffic between the bus systems. The instrument cluster also incorporates the connection port for the Porsche system diagnostics tester for the control units. Diagnostics of the control units is performed using the K line between the instrument cluster and the system tester.



It is the position of Porsche AG, that drivers should for safety considerations not switch off the TC function.



The description, fault indications and repair of these components can be found in the Technical Manual.

Diagnostics (cont'd)

All system components are continuously monitored by diagnostics routines for their functional capability and in the event of a fault in the respective control unit the corresponding fault description is registered. Additionally, faults in safety-relevant systems are visually indicated by way of indicator lights in the instrument display and a text message on the matrix display of the instrument cluster.

The fault will remain permanently logged until the fault memory is cleared, the fault is corrected, or the control unit is disconnected from the vehicle electrical supply.

The fault memory can be cleared using the Porsche system tester, within which are also additional functions, such as those to allow activation of particular actuators, switching of inputs and testing of systems.

General

The body of the Carrera GT employs the highly innovative and expensive technique of body construction using carbon fiber reinforced composite (CFRP). This type of body with a monocoque as the core of the vehicle and connection for attachment of important components originates from racing car construction.

A further innovation is the equipment support beam bolted directly to the monocoque, which also is made entirely of CFRP, and carries the entire drive train (engine, transmission and rear axle).

Carbon Fiber Reinforced Composite (CFRP)

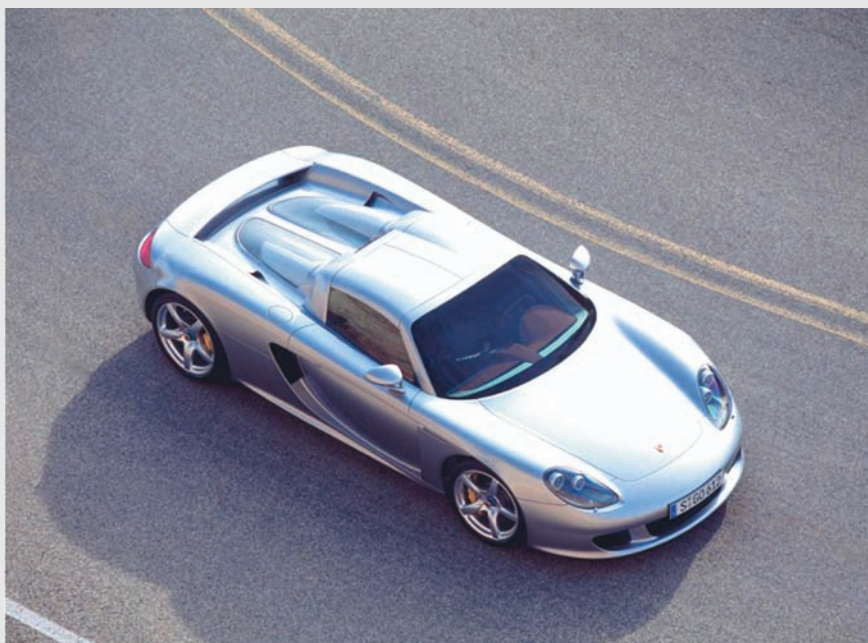
The central unit formed in this method of vehicle construction is called the “Rolling Chassis”. “Rolling Chassis” means the bare vehicle comprising of components such as; running gear, hydraulic, mechanical and electrical components.

The external CFRP skin of the body in this method of construction has no load-bearing function, it is primarily for styling and aerodynamic form.

The Carrera GT satisfies all statutory requirements worldwide regarding crash behavior and occupant protection. Tests were performed for head-on, offset, oblique, side, rear-end and other collisions.

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The vehicle concept of a powerful and dynamic sports car, which has no trouble in achieving speeds significantly in excess of 186 mph (300 km/h) demands a sophisticated aerodynamic shape for low air resistance while still achieving sufficient downforce for good road holding under all conditions.

Special Demands

- Small frontal area contributes to low air resistance to achieve high performance
- Low ground clearance to support the aerodynamic functionality
- Achievement of high downforce at the front and rear axles by special measures at the external skin and on the undertray
- Efficient design of air entry openings and their guide channels

These requirements were rigorously implemented, using the knowledge and experience of decades of successful sports and racing activities. Cooling air and ventilation openings were located (where possible) in areas where they could collect and discharge sufficiently large quantities of air for the respective heat exchangers and consumers, while at the same time not impacting the aerodynamics qualities.

The transitions at the entry openings to the cooling air guides were designed for optimum smoothness of airflow and optimum aesthetic effect.

At the rear between the rear fairings of the fenders is an adjustable rear spoiler with an aerofoil section profile that can be raised and lower. At higher speeds this rear spoiler ensures additional downforce on the rear axle and provides additional stabilization for the vehicle.

The two structural components, chassis and equipment support beam together form a structural and functional unit and are the backbone of the Carrera GT.

On these components go the complete axles assemblies, the engine /transmission drive unit, and all components of the exterior body. With this form of construction, the chassis can theoretically be driven without the body skin, which is where the phrase “Rolling Chassis” comes from.



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Due to the construction, the structural components are in the position to; absorb all the service loads and the forces arising at the axles, absorb the forces of an accident, and provide support functions for all attached components.

Porsche has applied for a patent for this chassis and equipment support beam as a functional unit concept. For the first, an open-top “standard production” vehicle has attained outstanding overall chassis/body stiffness sufficient for competitive racing.

Manufacture

The components are manufactured by placing several layers of precisely cut resin-impregnated carbon fiber mats, called “Prepregs”, into a negative form. According to the application and loading, several layers of CFRP are placed over one another with precisely determined fiber orientation. For particularly heavily loaded areas, such as the structural components, additional stiffening elements, called “Honeycomb” structures, are laid with additional CFRP mats forming a laminated structure.

Depending on the application, honeycomb reinforcement is either aluminium or plastic. When the component has sufficient thickness of lamination according to the “Plybook” (planned operation) the form is closed with an airtight plastic film, the remaining air extracted from the CFRP/resin mixture under vacuum and the component placed in an autoclave at the applicable temperature for curing the resin. During the entire procedure in the autoclave, the component is continuously under vacuum.

In the autoclave itself a pressure of approximately 87 psi (6 bar) is maintained during the entire procedure. During the polymerization procedure the resin prepregs bind to each other and to the honeycombs, forming an exceptionally strong and stress-resistant structure.



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The chassis comprises the monocoque, the windshield frame and the roll bar at the rear of the monocoque. The components are primarily made of highly integrated fiber composite materials with honeycomb structures.

The windshield frame is made of monolithic carbon fiber. This means that the frame comprises externally of several layers of CFRP fabric without honeycomb reinforcement. For stiffening and to ensure roll-over safety the frame is reinforced with high-tensile steel tubes, which are structurally bonded and bolted.

To satisfy the required safety standards, exposed areas, such as around the B-pillar, are selectively reinforced. The roll bar in the area of the monocoque tail is designed to meet all possible loadings and is bonded to the monocoque.

The materials characteristics of the CFRP and the design arrangement of the monocoque as a load-bearing structural component means that this arrangement offers where required, the highest degree of safety for the occupants, and can be considered a safety cell.

For attaching cables, pipework and components, the chassis is provided with many stainless steel rivet sockets, which were attached with resin to prevent moisture penetration into the CFRP.

For attachment of load-bearing or safety-relevant components such as; control arms, side frame members, seats and doors, attachment points called "Inserts" were incorporated during the lamination process. This ensures a secure bolted attachment for suspension components and an optimum large area for force transfer to the load-bearing structure. The "Inserts" are made of aluminium plates and are provided with threads or holes.



In the event of repair to a damaged thread insert, the thread repair kit "Nutsert" should be used. The handling and procedure for this can be found in the Technical Manual.



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Equipment Support Beam

For the first time in a production vehicle an equipment support beam of carbon fiber composite material has been used. The design principles and manufacturing process is essentially comparable to that for the monocoque, however due to the higher thermal stresses in the engine compartment a higher temperature resin was used.

To ensure the necessary strength and stiffness of the equipment support beam, it is constructed as a fiber composite CFRP/honeycomb. For attaching cables, pipework and components, this support beam is provided with many stainless steel rivet sockets, which were attached with resin to prevent moisture penetration.

Similar to the chassis, attachment points called “Inserts” were incorporated for attachment of rear axle components. The equipment support beam is bolted directly to the monocoque rear wall using bolted connections. The attachment points are reinforced by the use of “Inserts”. The transmission transverse support with the two hydraulic mountings from which the drive unit is suspended is also located in the tail area and is bolted to the rear corners of the equipment support beam.

To allow for the high temperatures and to prevent damage to the CFRP due to high temperatures, the inner areas of the equipment support beam were covered with an adhesively attached aluminium-covered thermal insulation barrier. This is the case around exhaust components, and in addition, the exhaust system has added insulation.

CFRP components exposed unprotected to open flames must always be replaced. Heat-damaged components cannot be repaired.

The side frame members made of high-tensile stainless steel are bolted at the front to the chassis and at the rear to the equipment support beam. Their primary function is to transmit the impact energy from the bumpers to the CFRP load-bearing structure and in the event that a defined deformation energy is exceeded, absorb this energy by deformation at defined crumple zones.

The side frame members are polygon hollow sections. This promotes the selective deformation, at particular points, holes are drilled into the section in a transverse direction.

The front side frame members at the monocoque comprises three hollow sections on top of one another, and have different shapes and lengths. The three frame horns are then welded together. The front bumper is bolted to the frame horns.



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To the rear of the equipment support beam deformable crash structures made of stainless steel, similar to those for the monocoque, are bolted on to carry the rear bumper, the drive components of the rear spoiler and the final exhaust muffler. These structures in the tail area are single pieces.

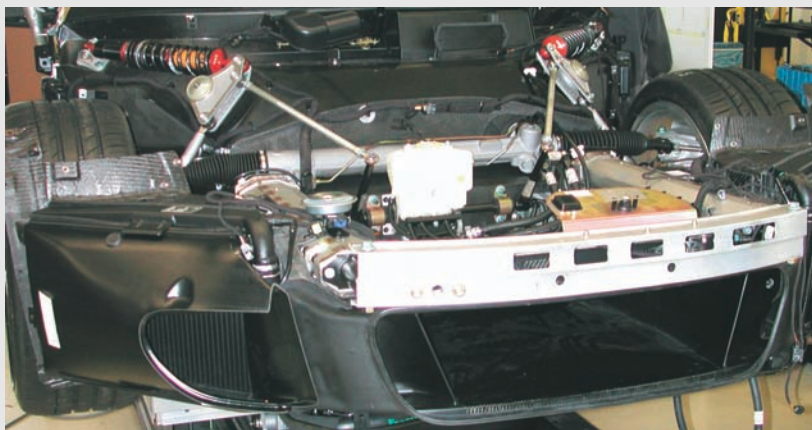
To provide lateral stabilization for the side frame members and to prevent kinking, the front undertray, in addition to its aerodynamic functions, is designed as a load-bearing structure to which both front side frame members are connected. The side frame members undertake additional functions as mounting points for components such as; the brake servo pump, pressure accumulator, electrical components and ground connections.



5_09_04

Bumpers

Similar to Porsche sports cars, the front and rear bumper systems of the Carrera GT include high-tensile extruded profile aluminium horizontal bars, and impact absorbers. They are attached to the side frame members. In the front bumper beam, offset to the right there is a threaded socket into which the towing lug is screwed.



5_10_04

Luggage Compartment

The luggage compartment in the front of the vehicle has a usable capacity of 2.7 cu ft (76 liters). As well as accommodating the necessary safety equipment, it can store the two removable roof panels, or a suitcase (from the luggage set included with the car).

When storing the roof panels in the luggage compartment, they rest on form-fitting moldings and are tied down with supplied belts and Velcor closures. To protect the roof halves, they can first be inserted in fabric protective sleeves.



6_04_04

Front Hood

The luggage compartment hood is made of CFRP components with honeycomb reinforcement, optimized for weight and stiffness. The attachment points are incorporated in the CFRP structure. To open the hood and maintain it in position, two gas pressure springs are provided. The hood's shape and design serve as frame support structure and has a high inherent stiffness and a selective deformation behavior in the event of an accident.

The front hood is released electrically. The button is to the left of the driver's seat, in the handbrake console. Before the hood can be opened completely, the safety catch lever in the center must be pulled to the right. For emergency release of the front hood there is a Bowden cable behind the right front wheel arch, which emerges at the headlight housing in a cable loop.



Rear Hood

The rear hood also comprises CFRP components with honeycomb reinforcement, optimized for weight and stiffness. The attachment points are incorporated in the CFRP structure. To open the hood and maintain it in position, two gas pressure springs are provided. Release is performed electrically using a button in the handbrake console.

Even with two large air ventilation openings above the 2 engine cylinder banks, the engine compartment cover has high inherent stiffness. To discharge engine heat into the recesses in the hood, integral air discharge grills were added. These grills are made of very high quality stainless steel plate, specially produced for the Carrera GT, with honeycomb (hexagonal) holes.

For emergency release of the rear hood, there is a Bowden cable behind the left rear wheel arch, which emerges at the tail light housing in a cable loop.

The doors of the Carrera GT are also components made of CFRP, optimized for weight and stiffness. The side impact protection in the body of the doors includes a high-tensile steel tube and connects the hinge attachment point to the reinforcements around the door catch.

The outside door handle is recessed into the outer door panel, under the mid-line. The connection between outer door handle and lock assembly is by a pull cable.

The lock cylinder is in the door panel and separate from the door handle. The internal door handle is made of diecast magnesium and the lock plate is secured to a chassis bracket with provisions for adjustment.

The electric window lifters are from the 911 Carrera (996) and have been adapted to fit the Carrera GT doors.

The airbag unit of the side impact system is also incorporated in the door body.



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Rear Spoiler

The electro-hydraulic extendable rear spoiler, like other attached parts, is made of CFRP/honeycomb. The rear spoiler plays a significant role in aerodynamics of the Carrera GT, by increasing the downforce on the rear axle and thus substantially improving the roadholding capability at higher speeds.

The rear spoiler when retracted harmonizes integrally with the contours of the vehicle. The third brake light, using LED technology, is incorporated in the spoiler.

When the Carrera GT is used on racing circuits, the spoiler wing angle can be tilted up to 6° . For street use that angle is set at 1° , so that when the spoiler wing is retracted, it blends in perfectly with the rear fender contours.

The lift stroke of the rear spoiler is 6.6" (160 mm) and requires only approx. 5 sec for complete extension.



Spoiler control is by way of an electro-hydraulic pump which is actuated by the Motronic. The hydraulic operating circuit is fitted with two actuator cylinders, balanced by an upstream hydraulic compensator to ensure that the spoiler movement is parallel during extension and retraction cycles.



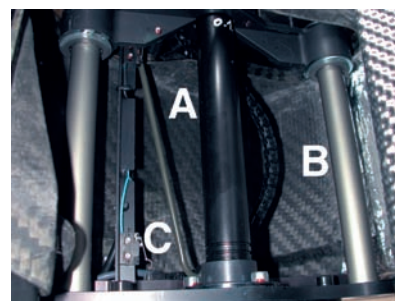
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Rear Spoiler Drive

Extension and retraction of the rear spoiler is performed by two powerful hydraulic drive units, which are connected to the left hand and right hand ends of the rear spoiler.

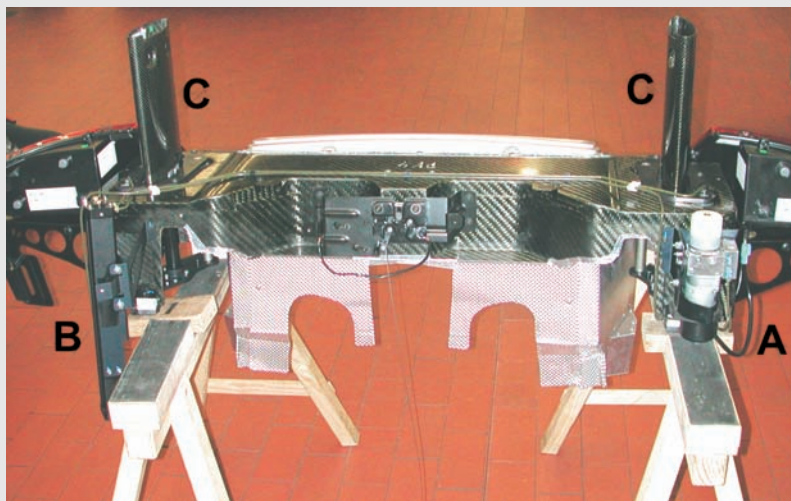
Connection of the drive units to the spoiler is by two vertically mounted hydraulic cylinders with aerofoil cladding of CFRP, optimized for minimum air resistance. The hydraulic cylinders act both as steadying guides for the spoiler during the extension operation, and to retain it in the final travel position. Within the body the drive mechanism is mounted on two sturdy aluminium pillars, which also act as guides for the rear spoiler.

The actual drive cylinders which power the extension of the spoiler are located centrally between the two lifter tubes.



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- A** - Hydraulic cylinder
- B** - Guide tube
- C** - Limit switch



5_13_04

- A** - Hydraulic pump
- B** - Hydraulic distributor
- C** - Enclosed lifter mechanism

Spoiler Control

The control of the rear spoiler is performed based on road speed and engine power. At 74 mph (120 km/h) the spoiler is extended under electronic control. At speeds less than 50 mph (80 km/h) the rear spoiler is retracted again.

The rear spoiler control can also be influenced by driving style. The power output of the engine is measured, averaged and evaluated. The aim is to suppress unnecessary retraction when the vehicle is driven at consistently high speeds, such as, during competitive events on race circuits.

If the driving style demanded high power output, the spoiler will remain extended after the engine has been switched off, this assures that the built up hot air within the engine compartment can escape through the air outlet channel above the final exhaust muffler.

Once the speeds have slowed and the power/speed has been averaged and evaluated, the spoiler wing will again be retracted.

There is no provision in the controls for an intermediate position of the rear spoiler. Manual activation of the spoiler is by a button in the center console. At speeds greater than 74 mph (120 km/h) the manual override function is deactivated.

Engine Intake Air/Engine Hot Air Escape

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The combustion air for the engine is taken in via openings in the rear wing supports (left and right sides), behind the doors, above the air guides for the transmission oil cooler, and the air conditioning condenser. This air is fed by channels to the engine.

The position and shape of the combustion air intakes have been designed for the special requirements of the Carrera GT. The arrangement among other things results in a certain ram force effect at higher speeds and thus improves the air throughput of the engine, which in turn benefits the engine power and responsiveness.

To allow the heat from the engine and especially from the final exhaust muffler to escape without any restriction, an additional opening has been provided in the rear upper area of the tail panel (above the final exhaust muffler). The position and size have been chosen so that the aerodynamic demands, such as the chopped edge effect and downforce on the rear axle was not adversely affected.

This outlet opening is a honeycomb grill, similar to that for the engine compartment cover.

Carrera GT



The car cover is supplied in a nylon sports bag for safe keeping.

Body Protection

To protect the body against damage and dust, the Carrera GT comes with a car cover and two roof panel covers as standard equipment.

The covers for the roof modules are intended for use when transporting the roof in the luggage compartment or storing them in a garage. The covers are of nylon/polyester mixed fabric.



5_16_04

General

In spite of its dimensions, which are more what would be expected in a racing car, the Carrera GT offers features on its exterior that are clearly typical of Porsche. The front part is unmistakably inspired by the legendary Porsche 718 RSK of the fifties, recognizable for instance in the arrow shape of the front of the vehicle.

Under their flat headlight glass the V form arrangement of the Xenon headlamps were previously seen in the 917 racing car. The arrowed luggage compartment hood is unmistakably Porsche; the origin of the form and the angle cannot be denied. The performance pretensions of the vehicle are clearly underlined by the broad, powerful three-dimensional air intakes.

The proportions of the Carrera GT in a side view make it immediately clear that this is a vehicle which employs the mid-engine concept. A another example of this successful combination of aesthetics and high performance technology is the dynamic shape of the side air intakes.

Also new and unique in the design are the external rear view mirrors with V-shaped double mounting. In their lines they pick up the angle of the A-pillar, and thus underscore the dynamics of the chassis.

Since the Carrera GT has a removable roof, the roll bars must be significantly stronger than for an enclosed vehicle. The roof contour has a dip in the middle between the occupants, to reduce the aerodynamic front area and to act as a styling element.

These design elements can be traced back to earlier Porsche racing cars.

On the underside, the tail is completed with a diffuser in the undertray which has an aero foil section, and, at the same time forms the visual balance to the upper part. At the rear of the vehicle, above the diffuser, there is a cover made of carbon fiber, through which to the left and right of the license plate the two exhaust tailpipes emerge. The shape of the tailpipes was strongly influenced by the design of jet engines, which in turn underlines the Carrera GT's dynamics and power capabilities.

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For the Carrera GT no special colors for exterior and interior are offered as standard.

Colors

There are a total of 6 external color schemes offered for the Carrera GT, some of which are identical to the sports car, and some are special to the Carrera GT.

Colors	
Black (A1)	non-metallic
Guards Red (G1)	non-metallic
Fayence Yellow * (Q2)	non-metallic
GT Silver Metallic * (U2)	metallic
Basalt Black Metallic (Z4)	metallic
Seal Grey Metallic (Y1)	metallic

* Carrera GT-specific

Exterior Paint (non-metallic)



Black



Guards Red



Fayence Yellow

Exterior Paint (metallic).



GT Silver Metallic

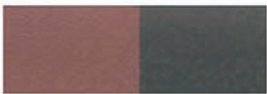


Basalt Black Metallic



Seal Grey Metallic

Interior Color



Ascot Brown/Natural Black



Natural Dark Grey



Terracotta

Under certain external conditions, high surface temperatures and UV radiation (sunlight), may cause the components of CFRP, the woven structure to show through the painted surface (top coat).

This behavior is accentuated if in addition to the above parameters the ambient relative humidity is high.

This behavior is not a defect, it is a material-specific feature!

It can appear different from different angles of view and for different exterior paint finishes. In a very wide range of temperatures this behavior will not show itself in the materials used for the Carrera GT. Beyond that there is a range where the woven structure emerges as visible; but when the ambient conditions change it is lost to view again.

This range itself extends to unusually high temperatures; however if these temperatures are exceeded then to an extent the changes become irreversible.

Those parts that are made of visible carbon fiber are given a special UV resistant clear varnish to prevent UV-related ageing and associated yellowing of the surface.

Roof Panels

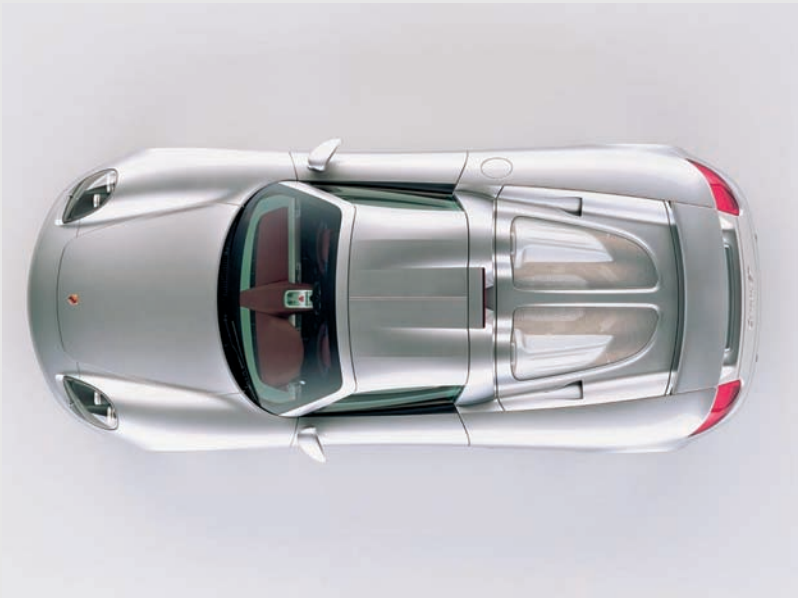
The Carrera GT is equipped with two detachable roof panels, which are made of high tensile lightweight shell mouldings of CFRP. For safe storage the roof panels can be stored in the front luggage compartment and secured using the retaining straps. In addition the roof panels can be placed in protective covers prior to being secured in place.



The exact operations for removing the roof panels and placing them in the luggage compartment can be found in the Owner's Manual.



For reasons of safety, it is not permitted to drive the vehicle with only one of the roof panel in position.



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Removing The Roof Panels

For removing the two roof panels a locking clip with an additional catch must be undone. The clip is in the roof panel above the head restraints. The locking mechanism is by means of a clip which is secured to the locking roller which engages in a locking strip attached to the roll bars and moves it to the required position (open or closed).

The roof panel on the passenger side must be removed first.



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When the roof of the Carrera GT is in use, it can experience high aerodynamic forces due to the high speeds of the vehicle. To take account of these forces there are in the windshield frame four holes for roof panel fixing pins. The fixing pins are on the front edge of the roof panel and the locking mechanism is at the rear of the roof modules in the form of two curved strips on the roll bars behind the head restraints.

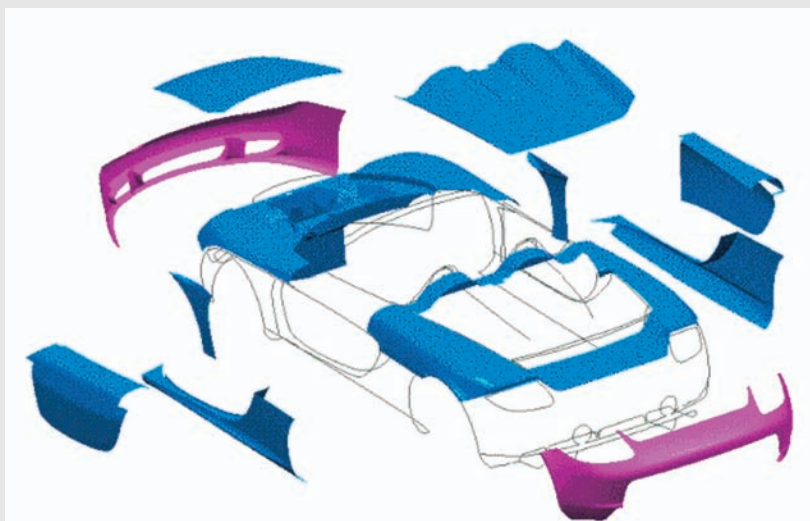
Bolt-on Body Parts

On the Carrera GT all bodywork parts are of plastic, primarily of carbon fiber reinforced composite CFRP. The front and rear panels use well-proven material, polyurethane, abbreviation PU. PU is light, easy to manufacture and offers a high capability for elastic deformation.

This elasticity is specially useful for minor bumps, and is the main reason for choosing not to manufacture these parts of CFRP.



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- Carbon Fiber Composite Parts
- PU Parts

Undertray

The complete undertray of the Carrera GT is made of CFRP and is secured with a total of 128 screws to the chassis. The undertray comprises three large pieces, covering the front axle, the rear axles with the complete drive unit, and the lower part of the monocoque. The main purpose of the undertray is for vehicle aerodynamics.

The undertray in the rear area has additional vertical air guides, called "Fences", attached to it. The center undertray, by the sills, under 4 removable plastic covers has four recesses for the vehicle hoist plates.

In addition, by selecting a particular undertray form, the downforce behavior in the respective area is improved. This is particularly clear in the rear part of the undertray. This area is structured as a diffuser (air channel) and makes a significant contribution to the downforce on the rear axle.

The term diffuser means an air channel within which the cross-section broadens. The effect of this cross-section broadening is to reduce the pressure of the air as it passes underneath the undertray. The result is that the air above the bodywork has a positive differential pressure. This creates an increased downforce.



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The diffuser and other aerodynamic components require a certain amount of airflow in order to achieve these effects. The design of the vehicle is such that the aerodynamic effects are obtained even at highway speeds. The higher the speed, the better use can be made of the aerodynamic assistance.

The front panel is one of the most important aerodynamic body components, and is partly responsible for the good aerodynamic characteristics of the Carrera GT.

This was achieved designing the component together, while allowing sufficient throughput of cooling air for the vehicle radiators and brakes. The front panel splits the cooling air stream into three air ducts for the three engine radiators, each side ducts also has a branch before the radiator for brake cooling.

A rubber lip around the lower part of the apron creates improved downforce on the front axle. The front panel is made of polyurethane (PU), and painted in the vehicle color.

The front turn signal lights are mounted on the side, along the wheel arches.



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Rear Panel

The rear body trim, like the front trim, is also made of PU and painted to match the vehicle color. In the center of the rear panel, is a panel made of CFRP, This CFRP panel holds the license plate, back-up lights, rear fog lamps (not for USA) and exhaust tailpipe.



6_09_04

Bumper System

The bumpers, similar to the sports car, are comprised of front and rear aluminium extrusions. At each end they are bolted to a crash bar with deformation elements of the crumple zone.

The mounting nut for the towing lug is riveted to the right hand side of the front aluminium bumper carrier.



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Front Windshield

The windshield of the Carrera GT is made of laminated safety glass with integral radio antenna. The windshield is tinted and at the top edge has a grey strip, called the grey wedge. The windshield has an open edge to the glass and is bonded directly to the windshield frame.

This jointing technique adds to the visual and aerodynamic front aspect of the vehicle structure. On the left hand edge of the windshield there is a setting mark in the form of a dash, used for setting the wiper arm position.



6_11_04

Side Windows

The 2 side windows are of tinted single pane safety glass. They can be electrically lowered within the doors. The window thickness is 4 mm, the same as other Porsche sports cars. The outside of the windows is treated with a non-wetting coating, which causes drops of water to run off more quickly and thus allows a better view in the external mirrors in inclement weather.

Rear Window

The rear window is in 3 parts. For weight considerations, the side windows are of 6 mm thick polycarbonate. The center window is of non-reflective glass.

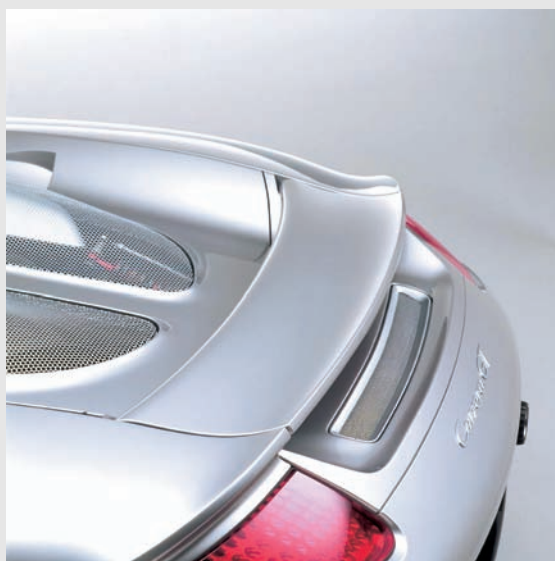
The geometric form of the roll-over structure with 2 roll bars and respective center part allows the three-piece rear window to be installed. The windows are bonded directly to the chassis without additional seals.



6_12_04

Rear Spoiler

The rear spoiler is located between the fenders, and is electrohydraulically actuated for extension and retraction. It contributes significantly to the balanced contour, and also contributes to the aerodynamic optimization by significantly increasing downforce on the rear axle. The rear spoiler itself and the lifter tube trim are aerofoil sections and made of painted CFRP. The third brake light is incorporated in the center of the spoiler.



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The aerodynamically optimized driver and passenger side rear view mirrors are secured to the door body with a 2-pillar base. Mirror adjustment is performed electrically by way of the 4-position knob located in the driver's door.

The rear view mirror glass has integral heating. The mirror heating is automatically switched on at temperatures less than 37° F (3° C). It is also activated when the heating is set to defrost.



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See also section 7, luggage system.



The exact locations of the emergency equipment, the vehicle tool kit and the towing lugs can be found in the Owner's Manual.



6_15_04

Storage Compartments

Despite available space limitations, some storage space is available in the Carrera GT. A lockable glove compartment, in the dashboard in front of the passenger seat.

In each door trim panel there is also a storage pocket. Additional storage is provided in the form of a storage compartment within each door body. These storage compartments are accessible only when the door is open.

The warning triangle, first aid kit and vehicle tool kit are kept in two storage compartments on the left and right hand sides of the engine compartment.

The Carrera GT with its CFRP monocoque body already possesses an enormously strong occupant protection cell, which with energy-absorbing honeycomb elements provides an outstanding basis for occupant protection. In this system the vehicle interior is designated as a survival cell. Together with the reinforcement of the doors and a restraint system for the occupants, comprising of 3-point seat belts with belt tensioners and belt force limitation, plus front and side airbags, provides excellent protection for driver and passenger (all demanded by today's safety minded consumers).



6_15_04

Seatbelts

Both seats are fitted with 3-point seat belt with pyrotechnic belt tensioners and belt force limiters. The retraction mechanism for the seat belts is bolted to the monocoque behind the shell seats, in front of the rear window. The belt force limiter mechanism and the belt tensioner propellant charge are incorporated in the belt retractor.

The belt retractors are concealed beneath a plastic cover painted the same color as the vehicle. The shell seats are installed as standard with belt anchorages for conversion to 6-point braces belts.

The necessary attachment points on the monocoque for conversion to 6-point seat belts are already provided.



The active safety system does not guarantee that no injuries will occur. The systems do however, significantly reduce the risk of injury, and reduce the severity of any injuries that do occur.

The airbag system must not be regarded as a substitute or alternative to the use of seat belts. Airbags can develop their optimum protective effect only when restraint systems are in use.

Airbag System

The Carrera GT is equipped with one full size airbag on the driver's and one on the passenger's side. These are inflated by a gas generator system. In accordance with general practice, the driver's airbag is installed within the steering wheel center, and for the passenger, it is in the dashboard above the glove compartment.



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The airbags and the components of their triggering system are the same as for the Porsche sports cars. The trigger thresholds for the airbags and the vehicle-specific tuning is arranged to suit the values of the Carrera GT.

The airbag control unit with the front crash sensors is located under the footrest in the passenger footwell.

Side Airbags

The side airbags of the Carrera GT are located in the recesses in the left and right doors. The side airbags are the same as those in the Porsche sports cars. The sensors for the side airbags are located under the seats beside the Motronic control units. No curtain airbags are provided for the roof supports.



7_02_04

General

A great challenge in designing the Carrera GT was to combine functionality with the comfort one expects of a Porsche road-going vehicle. Typical Porsche features, such as placing the ignition switch to the left of the steering wheel with the integral Porsche crest have not been forgotten.

In keeping with the vehicle concept, many components of the interior are made of visible carbon fiber, forming a significant part of the interior design. This includes the leather upholstered shell seats; the outsides of the seat shells are of high quality visible carbon fiber which compliments CFRP monocoque surfaces. The carbon fiber components and visible surfaces are sealed with a 2-part clear epoxy varnish, which highlight the surfaces exceptionally well.

The backbone of the interior is formed by the self-supporting center console, which runs diagonally upwards from the unseen center tunnel to the dashboard. A additional design feature is the placement of the shift lever in the center console alongside the steering wheel. This arrangement was chosen so that when shifting gears, the right hand reaches the shifter from its position on the steering faster.

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Carrera GT

This is reminiscent of the famous Porsche 917 and offers a further instance of pursuit of the weight-saving philosophy. Another exclusive and light material used in the Carrera GT is magnesium, not usually found to this extent in a vehicle interior, but very innovative. Magnesium special alloys are used for door handles, various panels and switch mountings as injection moulded parts, and for the fascia of the center console, which is made of deep-drawn sheet magnesium.

The choice of the outstanding interior materials CFRP, leather and magnesium creates a balance between hard high-tech materials and soft natural materials, in a concept of motor racing technology with comfort.

Material	Component
Carbon fiber, visible *	Monocoque floor, side sills, footwells, parts of the door panel, seat shells, monocoque, rear wall
Leather	Dashboard, dashboard trim, driver and passenger airbags, A-pillar trim and front window frame, sunshades, center console, door panel, steering wheel, seat upholstery on the shell seats, luggage set
Magnesium (alloy)	Door handles, panels, switch mountings, center console cover, seat console
Wood	Upper part of shift lever
Glass fiber/aramid composite	Dashboard fascia, passenger airbag cover
Aluminium	Pedals, passenger footrest, parts of the dashboard fascia and door trim, instrument mountings, dashboard carrier, seat supports
Polycarbonate	3-part rear window (middle piece is glass)
Fabric	Chequered lining of the roof panels

* Protected against yellowing by UV-resistant clear varnish

Front Seats

The shell seats in the Carrera GT are based on aramid fiber-reinforced carbon fiber shells (Kevlar). This construction achieves the best combination of low weight and occupant protection by using a CFRP component that will not splinter in the event of an accident.

The seat shell is bolted to the seat rails by 2 side mounting plates made of sheet aluminium. The seat shells are upholstered with foam, and covered with leather in the interior color.

The upper parts of the seat, seat bottom and side shells are provided with seatbelt slots of silver-painted plastic. The seatbelt slots are required for conversion to 6-point safety belts. The outer sides of the seat are of visible carbon fiber.



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The seat faces are provided with adjustable lumbar and thigh supports for driver and passenger comfort. These seat pads are secured to the seat shell with Velcro and can be adjusted to suit the individual.



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Carrera GT

This modification of safety-relevant components may be performed only by trained specialists, e.g. when the vehicle is delivered over by the Porsche dealer.



The operations for removing seats can be found in the Technical Manual.

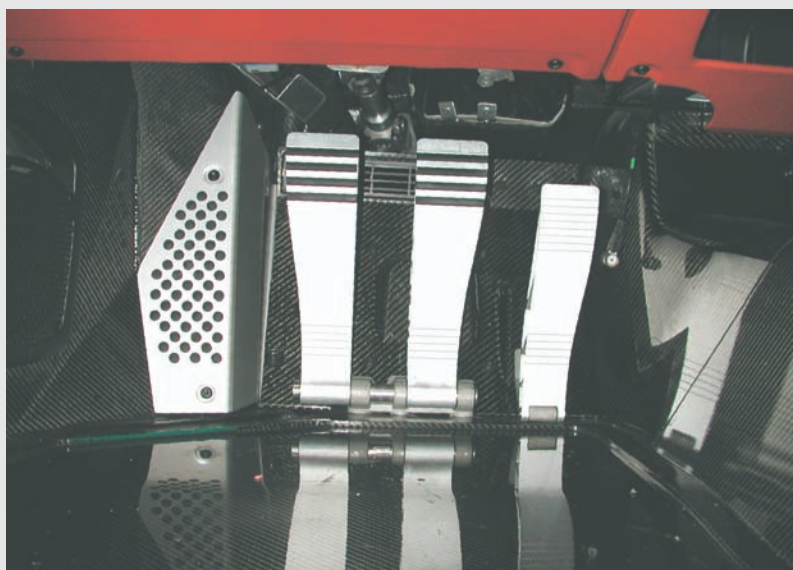
Seat forwards/backwards adjustment is performed mechanically, using the seat rails, which incorporate a ratchet to hold the seat in position. The ratchet is released by pulling on a lever underneath the seat.

Seat height adjustment is performed using the seat holder that is bolted to the monocoque floor. A seat holder kit which raises the seat an additional 10 mm can be ordered through the parts department. This kit contains all the necessary parts; screws, mountings and covers.

Another available modification is the option of installing a seat shell with 15 mm wider seat base (at the hips) (shell seat XT) at no additional cost if ordered at the same time as the vehicle. This option is available for both driver and passenger side seats.

Pedals

For the Carrera GT with its low seat position and flat floor the upright pedals of aluminium extrusion profile are ideal in form and position for sporty driving. To improve the grip on the pedals, their surfaces bonded rubber profiles.



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To the left of the clutch pedal is a foot rest of perforated anodized aluminium angle mounted on a CFRP base. The pedal box module (pedals, pedal carrier, brake master cylinder, hydraulic brake servo) is bolted directly to the monocoque on the front of the scuttle.

The pedal box module is hidden from sight up to the pedals with a removable cover of carbon fiber. This cover incorporates the air outlet for the footwell air vent.

The Carrera GT with its characteristic design elements in connection with classic Porsche styling elements gives an unmistakable sporty elegance to the interior of this super sports car.

Light CFRP trim, painted silver, and refined metal surfaces contrast stylishly with the satin finish of clear varnish protecting the visible carbon fiber.

The rotary switch for the headlights is higher up on the left, above the ignition switch.



7_07_04

Carrera GT

The “most important” instrument of the analogue displays is the tachometer, prominently located in the center of the dashboard. The tachometer dial field also includes the digital display for text messages from the vehicle computer functions, such as tire pressure monitoring.

A recurrent style element is presented by the circular dials with silver painted decorative bezels. The vehicle philosophy in the Carrera GT of rigorous pursuit of weight saving in construction while attaining the highest functionality, has led to the dashboard and center console being built of carbon fiber.

The rear of the center console forms a leather-covered armrest. The console sweeps forward, up towards the dashboard and the lower edge of the windshield. The side surfaces are leather covered, the center cover is formed of a silver painted sheet of magnesium.

In addition, the three rotary controls for the heating and air conditioning, together with the window lifter control buttons and an ashtray are located in the center console.

Storage Compartments

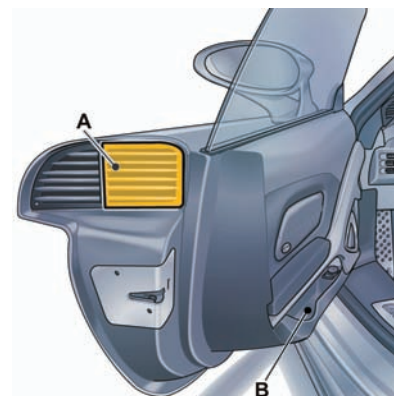
The Carrera GT has a lockable glove compartment in front of the passenger seat and includes a 12 Volt outlet. Additional storage can be found in the door trim of the driver and passenger doors and under the interior air vents.



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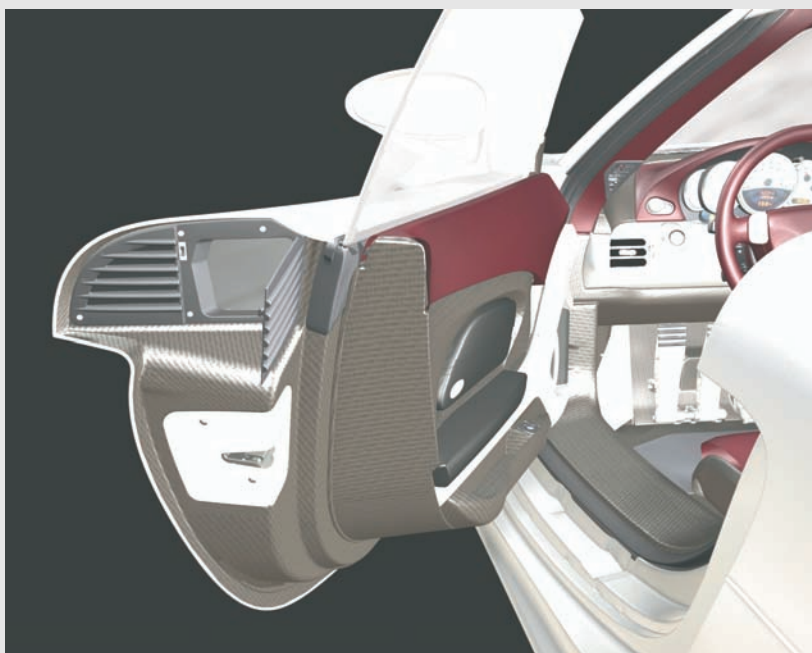
A additional storage compartment is within the door body hidden behind a flap in the rear face. This compartment is located beside the interior air vent and is accessible only when the door is open. Simply pressing on the cover flap opens it; it is closed the same way.

These compartments are provided with leather bags that can be closed, for storage of small tools. See also luggage system Carrera GT.



7_15_04

- A** - Door body compartment
- B** - Interior door trim pocket



7_16_04

Carrera GT

Luggage Set

Standard equipment for Carrera GT includes a multi-piece luggage set, made of high quality leather in a color matching that of the vehicle interior.

In cooperation with a well-known manufacturer of high quality accessories and the Weissach styling studio, a custom tailored luggage set specially matched to the Carrera GT was created.



7_10_04

	Pieces of Luggage	Placement
A	Travel case	Stowage space under front hood
B	Suit bag	Rear passenger seat incl. fastening
C	Briefcase	Passenger footwell
D	Jacket hanger	Between passenger seat and door
E	Center console bag	Underneath the center console incl. fastening
F	Leather bag	Door storage compartment



Further details of the luggage set and its stowage can be found in the respective section of the Owner's Manual.

7_11_04

Door Trim

The door trim mounting is made of CFRP. The door trim on its inner side forms part of the door latch. Both doors have a storage compartment with lid, and a side airbag.

The upper part of the door trim is covered with leather, the lower part carbon fiber and the storage compartment with the fairing of the dashboard are of silver painted fiberglass.

Above the open storage bin there is a leather-covered armrest. The covers for the mid-range speakers are installed in the door trim in front of the door handles.



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The shell-form trim of the interior of the windshield frames and the A-pillars are provided with integral head impact protection made of PU (polyurethane) with internal energy-absorbing aluminium honeycomb.

All trim around the windshield frame is covered with leather in the interior color. The trim, the center console and the dashboard are also covered with leather.



7_03_04

General

The Carrera GT is equipped with a manually-controlled heating and air-conditioning system as standard. The customer can choose to order the vehicle without the air-conditioning equipment at no extra charge.

In the following chapter, the structure, function and special features of the heating, ventilation and air-conditioning systems in the Carrera GT are described.



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Ventilation

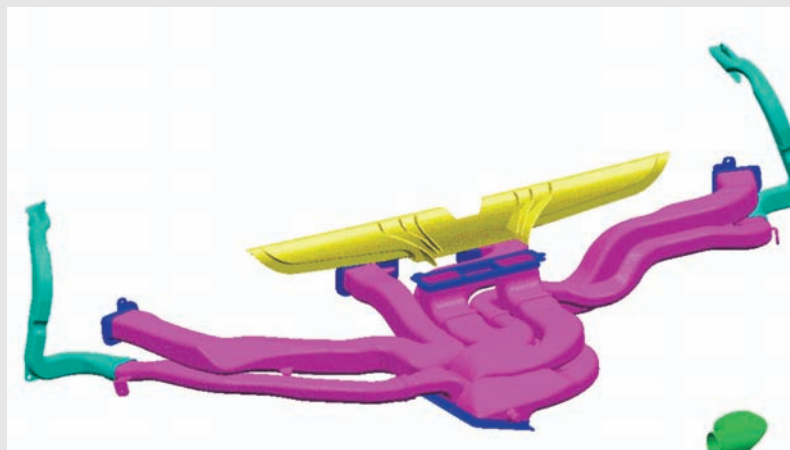
Fresh air enters the vehicle via an activated charcoal filter. This filter removes the dust, pollen and other impurities contained in the outside air. The outside air enters the vehicle via the heater unit plenum chamber beneath the windshield in front of the driver's seat. The filter is accessible from outside once a cover has been removed.

The heater is where the air is heated and cooled. From the heater unit the air is delivered through vents controlled by the occupants to the vehicle interior. In addition to the footwell vents and the defroster outlets at the bottom of the windshield, there are four air vents in the dashboard.

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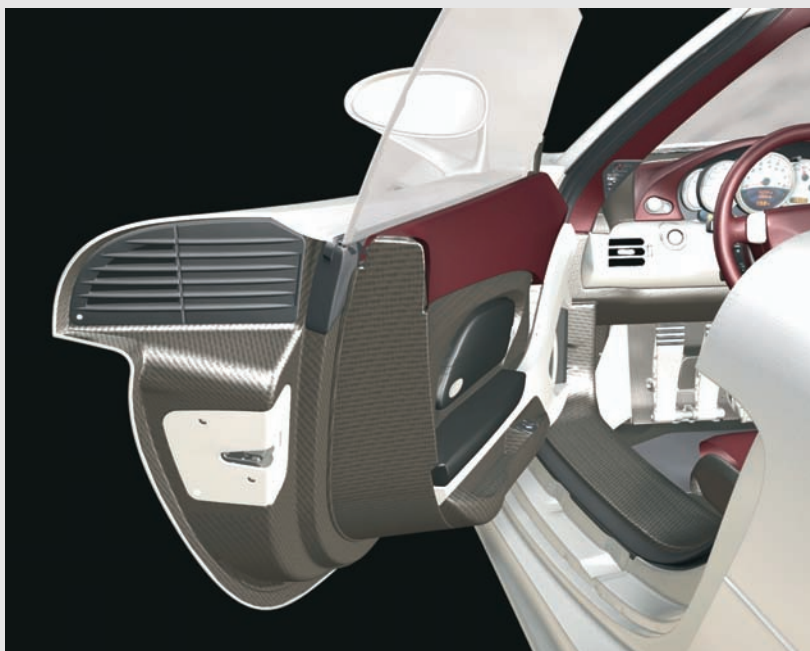
The vents illustrated above are at the left and right edges of the dashboard (near the doors) and to the left and right of the center console. All four vents on the dashboard can be swivelled on two axis to direct the air from the vents in the required direction. In addition, the air volume can be regulated at the vent itself by way of a flap that can be closed.



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To cool the vehicle interior more quickly or if the outside air is unpleasant, air recirculation mode is available. In this mode, the heater unit recirculates the air already inside the vehicle.

Air recirculation mode is selected via the air distribution rotary selector. Air is discharged from the passenger compartment through special openings in the bodies of the doors. There is a molded rubber component with a lever lock at the rear of the door storage compartment. It is located in front of the ventilation duct which leads upwards. The ventilation outlet to the surrounding air is located behind a grille at the end of the ventilation duct. The ventilation duct can be found at the top of the door body above the door catch.



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Heating

The Carrera GT uses surplus heat from engine cooling to heat the passenger compartment. The maximum heating power is 8 kW at a coolant flow rate of 132 g/h (500 l/h).

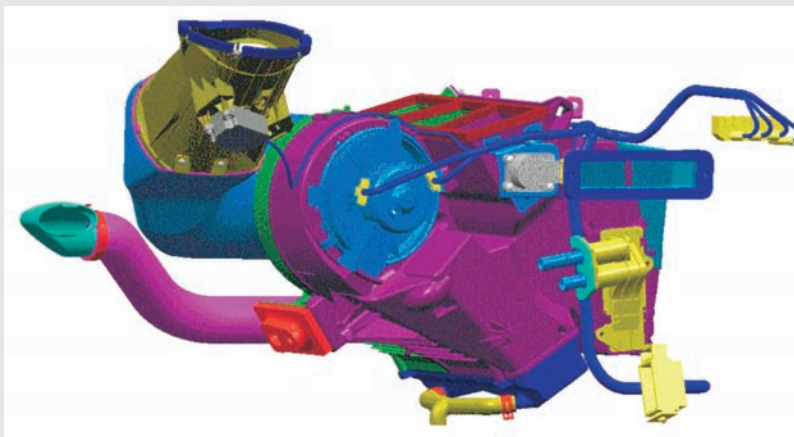
The coolant water flows continuously through the heat exchanger in the heater unit. The heat delivered is regulated by the air volume which flows through the heat exchanger and is controlled by air flaps.

Air and Flap Control (heater unit)

The outside air must flow through the heater unit on its way into the inside of the vehicle. In the heater unit, the outside air is sucked in by a continuously-variable blower. It first flows through the air-conditioning evaporator. If the air-conditioning is switched on, the evaporator cools the air and dehumidifies it. The condensate drains through the base of the heater unit.

Depending on the required temperature and the corresponding controller setting, a greater or lesser proportion of the air is then directed through the heat exchanger in the heater unit – through which, as stated above, engine coolant water is flowing. The air streams then are blended in the mixing unit, to create a single air flow at the required temperature. This air flow is directed towards the selected vents via ventilation ducts.

This mixing and directing procedure is performed in an appropriate part of the heater unit by means of electric stepper motors. The stepper motors are connected to reducing cross-section flaps by means of rods. The stepper motors are controlled by the heating/air-conditioning control unit. All information and messages such as temperatures, flap positions, individual settings, etc., converges in this control unit where it is processed as required. This results in the output of control signals. The control unit for the heater is located in the passenger footwell beside the heater unit.



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Special Functions

In addition to controlling the heating and air-conditioning functions, the control unit also switches the mirror heating function on and off. If the outside temperature is $< 37^{\circ}\text{F}$ (3°C), the mirror heater is activated; if the temperature is $> 38^{\circ}\text{F}$ (3.5°C), the heater is switched off.

In defrost mode, the mirror heater is switched on regardless of the outside temperature. The rear fog lamp relay (not applicable for the USA) is activated by the heater control unit when the rear fog lamp button has been pressed, the ignition is on and low beam headlights selected.

The Carrera GT air conditioner refrigerant is R134a, which is CFC-free and environmentally friendly. The air conditioning system can be serviced using normal Porsche servicing equipment.

Operation and Function

The heater and air conditioner are operated by way of three rotary knobs in the center console. These knobs are arranged one beneath the other and also have button functions.

Rotary Function	Button Function	Position
Temperature	Air conditioning	Top
Blower output	Defroster setting	Center
Air distribution	Air recirculation	Bottom



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In defroster mode, the exterior-mirror heating function is activated and the heater and blower operate at full power.

Carrera GT



Detailed information on operating and setting the heater and air conditioner can be found in the Owner's Manual.

- 1 - Air-conditioning compressor
- 2 - Electronically controlled fan for air-conditioning condenser
- 3 - Heater water hoses
- 4 - Air-conditioning refrigerant lines (high pressure and low pressure)
- 5 - Heater box with air flaps and heat exchanger for heater and air conditioning
- 6 - Air ducts
- 7 - Fresh air intake and filter
- 8 - Interior ventilation (door)

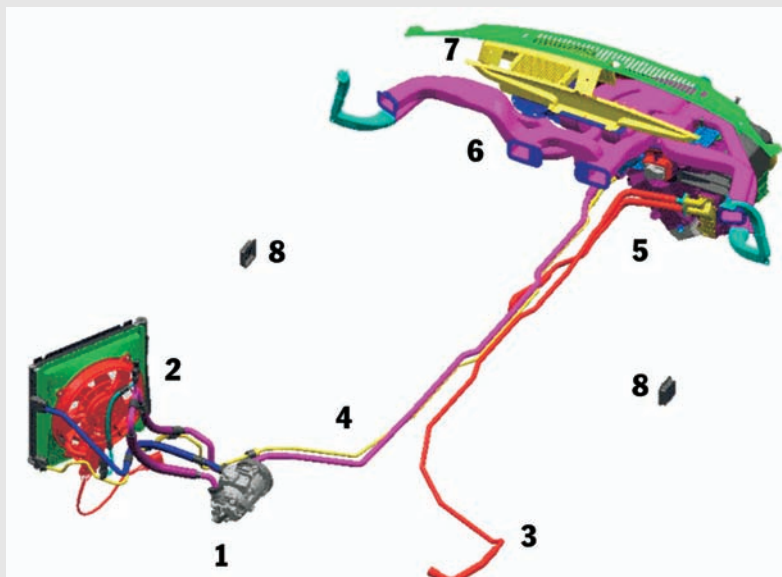
-  Air-conditioning suction line
-  Air-conditioning pressure line to the condenser
-  Air-conditioning pressure line to the evaporator
-  Hot water circuit

The Carrera GT heater and air-conditioner has no interior temperature sensor. This must be taken into consideration when individual settings are made for the current comfort temperature.

The following considerations can affect the temperature setting:

- Outside temperature
- Coolant flow rate in heat exchanger
- 1 or 2 persons inside the vehicle
- Air humidity
- Air vent exit speed

Refrigeration Circuit

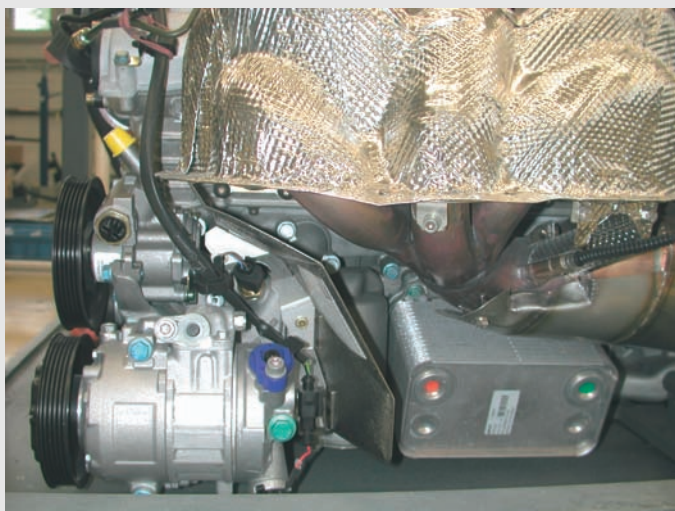


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The service connections are located in the engine compartment, to the left and above the air-ducting housing for the condenser. They can be accessed once the hood is open.

The Carrera GT is equipped with an electronically controlled swash-plate compressor. This device has a function and design similar to the Cayenne compressors. However, unlike the Cayenne, the Carrera GT compressor has a lower displacement of 7.3 cu.in. (120 ccm). After leaving the compressor, the gas-phase refrigerant has a pressure of 145-435 psi (10 – 30 bar) and a temperature of approx. 212° F (100° C).

The air-conditioning compressor is mounted to the front bottom left of the engine (in direction of travel). It is driven by a poly rib belt, by way of the vibration-damping pulley. The air conditioning compressor runs continuously and does not feature an electromechanical clutch. The advantages of regulating the compressor by demand, are lower fuel consumption and pleasant, not desiccated air. This air can be tempered as required to suit the exterior conditions.



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The compressor incorporates an electronic control valve. This causes the intake pressure (low pressure side approx. 14 - 43 psi/1 – 3 bar) to be applied to the swash-plate of the compressor body. The control valve is controlled by a switched PWM signal from the air-conditioning control unit. The control unit uses the signal from the evaporator temperature sensor as the basis for controlling the control valve. The basic frequency for the valve is 400 Hz.



If a critical system pressure of 580 ± 58 psi (40 ± 4 bar) is reached, the pressure relief valve opens in order to protect the system from damage. When the pressure has reduced, the valve will close again. The valve is located to the left of the compressor beside the high-pressure outlet.



If the outside temperature falls below approx. 35° F (2° C), the air conditioning compressor is switched off and cannot be manually overridden by pressing the A/C button.

Switched PWM Signal (400 Hz)

Current [Amperes]	Compressor Status
0.0 – 0.3	Off (no-load)
0.3 – 0.8	Variable adjustment
> 0.8	Limited

The piston stroke can be varied infinitely by changing the PWM signal current. A large stroke means a large (refrigerant) delivery volume; a small stroke a smaller compressor delivery volume. The higher the pressure is set, the more the swash-plate can tilt towards the no-supply, thereby reducing the compressor delivery rate. As the compressor has variable output, there is no need for a switched compressor clutch relay to control the refrigeration power of the airconditioner.

This means that, while the compressor will continue to turn if no refrigerating power is required, it will not be pumping refrigerant. In this case, the compressor runs in no-load mode.

Condenser

The air-conditioning condenser is mounted in the cooling air duct in front of the left rear wheel and at an angle to the direction of travel. In order to ensure a sufficient air flow through the condenser under all operating conditions. An electronically controlled blower with a power output of .4 hp (300 watts) is coupled to it. The control value for the blower speed is the same as the refrigerant pressure in the high pressure circuit.



The dehydrator cartridge is replaceable and, like in the Cayenne, it is located in a pipe to the right of the condenser. The cartridge can be accessed from above. The dehydrator cartridge can only be replaced if the refrigerant system has been drained using an air conditioning service tool.

First remove the rubber cover, then take out the safety ring using suitable pliers. With a special tool from the impact extractor set recommended by Porsche, the sealing cover can then be unscrewed and removed.



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After the cover has been removed, the dehydrator cartridge can be pulled out, using the spacer rod. The cartridge unit has a total length of approx. 15" (380 mm). It consists of a spacer rod, and a sleeve with a net insert containing a hygroscopic material. Until such time as it is saturated, the dehydrator cartridge can bind .2 - .4 oz (6 – 12 g) of water chemically.



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The replacement intervals and precise instructions on replacing the cartridge can be found in the Technical Manual.

- 1** - Sleeve with net insert
- 2** - Spacer rod

Expansion Valve

The expansion valve is located inside the car on the heating box in front of the evaporator. Its main purpose is to reduce the liquid refrigerant to a pressure of 14 - 43 psi (1 – 3 bar). The valve is assembled on the top in the form of a H-valve with an open diaphragm unit. It sets the permissible pressure by changing the flow rate of the gas-like refrigerant fed back to the compressor.

Evaporator

The evaporator is located in the heater unit. It acts like a heat exchanger in that it extracts heat from the heated air. This causes the refrigerant to revert to a gaseous state. When the heated air is cooled down, water vapor precipitates out in liquid form and is discharged as water through the drain port in the base of the heater unit, then further out of the vehicle through a drain in the monocoque floor.



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The actuators and sensors described in this section are used in the Carrera GT to control the heater fan and air flaps. Since the heater unit is less complex, the vehicle interior smaller, the heater and a/c unit not regulated, the heating system requires considerably fewer components.

Evaporator Temperature Sensor

The evaporator temperature sensor is located on the front of the heater unit. To replace it, the heater unit must first be removed. The primary function of the evaporator temperature sensor is to prevent the air conditioner from icing. The sensor is located approx. .8" (20 mm) behind the evaporator. At this distance from the evaporator, a consistent air flow temperature can be measured for all temperatures. The temperature behind the evaporator is used as a basis for the electronic control valve.

This means that the refrigerating capacity of the compressor is influenced by "Target value specification" given by the evaporator temperature sensor.

This target value is between 37° F (3° C) and a maximum of 53° F (12° C) and is calculated on the basis of the following variables:

- lowest outlet temperature required, and
- the outside temperature

Pressure Sensor for Refrigerant Circuit

The pressure sensor is an essential measurement input for assessing the refrigeration system. It measures the current system pressure and transmits a PWM signal to the air-conditioning control unit. This signal is primarily used to shut down the compressor for safety reasons when critical pressures are reached.

Outside Temperature	Low-pressure Shutdown	High-pressure Shutdown
T > 41° F (5 °C)	p < 20 psi (1.4 bar)	p > 464 psi (32 bar)
T > 41° F (5 °C)	p < 7 psi (0.5 bar)	p > 464 psi (32 bar)

The signal is also used to control the condenser fan through the DME. The need to activate the condenser blower, and the condenser cooling capacity associated it, has a linear relationship with the value registered by the pressure sensor. For more information, see the “Condenser” section.

Refrigerant Pressure	Blower Status	Blower Power
p = > 116 psi (8 bar)	On	approx. 20 %
p = > 217 psi (15 bar)	On	approx. 60 %
p > 319 psi (22 bar)	On	approx. 100 %

Actuator Motors

There are three actuator motors in the Carrera GT heater unit. They are used to set the required temperature. The actuator motors are designed as stepper motors, i.e. the adjustments cannot be made variably, but in adjustment steps specified to the motors. Each motor is used to move air flaps. These flaps are attached to rods moved by the actuator motors. The air conditioning delivered within the vehicle is controlled by changing the cross-sections of the relevant air ducts.

Terminology	Location	Function
Air recirculation flap	Driver’s footwell	Fresh air/internal air recirculation
Heater flap (temperature blender flap)	Between heater unit air conditioner and front monocoque wall	Air temperature
Air distribution flap	Top of passenger footwell	Air distribution



These calibration values are checked for any changes and saved again as necessary each time the actuator motors going to end position are adjusted. The passengers will not notice this plausibility check.

The first time the ignition is switched on after the battery has been connected, the actuator motors perform a calibration run to register their end positions (min./max.). These positions are recorded in the heater control unit so that the heating functions can be controlled accurately.

This process takes approx. 1 – 2 minutes and should be performed when starting the engine after maintenance work where the battery was disconnected. Otherwise, deviations in the heating control function will arise.

The blower motor in the heater unit is directly controlled by the control potentiometer in the center console via the heater control unit. It changes the settings for the air flow through the heater unit. The Carrera GT blower motor does not give any position feedback signals.

Auxiliary Heating

Will not be available.

Diagnostics

The heater and air-conditioner are diagnosed by way of a virtual K-line in the low-speed CAN comfort bus. The fault memory can be read out and an actuator test performed. Actual values are also available for more detailed diagnostics.

The air-conditioner control units supports the Keyword 2000 Protocol for diagnostics purposes, and can therefore communicate with Porsche system testers. The Gateway control unit in the instrument cluster acts as an interface between the tester and the heater/air-conditioning control unit. The Gateway control unit can be connected to the system tester via the K-line and the diagnosis socket.



Additional information on troubleshooting and diagnostics using the Piwis tester can be found in the relevant section of the Technical Manual, Group 0.

Signal	Default	from a/c	to a/c
Terminal 15			X
Light switch			X
Wheel speed front left	43 mph		X
Engine speed	8,000 rpm		X
Shut-down request			X
Battery voltage, terminal 30			X
Engine temperature	176° F		X
Outside temperature	50° F		X
Status of air-conditioner control unit		X	
Status of air-conditioner compressor		X	
Defrost		X	
Recirculated air		X	
Desired blower value (14 steps)		X	
Compressor request		X	
Request to raise idle speed		X	
Compressor load		X	
Refrigerant pressure		X	

General

It goes without saying that the electrical and electronic functions in the Carrera GT are expected to fulfil the same requirements as regards to safety and functional efficiency as all other products which bear the Porsche name.

A vehicle constructed with a carbon fiber body shell, meant additional wiring would be required. The carbon fiber monocoque could not be used as a current-conducting component, so an wiring harness with built-in ground wiring for each consumer was required. The only exceptions to this was the crash elements in the front and rear. Made from stainless steel, they are equipped with central grounding points for the surrounding electrical components.

In the Carrera GT, it was also essential to use CAN bus systems for data exchange between certain control units which process control, regulation or comfort functions. There is no optical bus (MOST) built into the Carrera GT. Instead the comfort functions are handled by the CAN comfort bus. The energy supply and its monitoring play a major role in these systems.

Voltage Supply

Battery

The Carrera GT's energy supply comes from a 12 volt battery. In models with air conditioning, the battery has a capacity of 80 Ah; in the model with no air conditioning, the capacity is 60 Ah.

The Carrera GT battery is maintenance-free and generally does not need to be inspected. The battery is located at the rear right-hand side of the vehicle, beneath the transmission oil cooler. Its location saves space elsewhere in the vehicle and ensures a low center of gravity. The battery is installed in a battery holder which in turn is bolted to the power unit carrier.

With the battery location, the battery terminals are not directly accessible. A separate ground disconnect has been provided in the Carrera GT engine compartment so that the battery can be separated from the on-board electrical system easily.

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Carrera GT



The battery maintainer (Charge-O-Mat) is not designed for charging discharged batteries. A standard workshop battery charger is required for this purpose.



The electric current should never be allowed to flow through the carbon fiber components when this or any other electrical work is being performed!

The electric circuit is disconnected from the battery at the ground end by simply detaching the ground cable connector from the ground pin. The battery is charged by an alternator with a maximum capacity of 150 amps (2.1 kW).

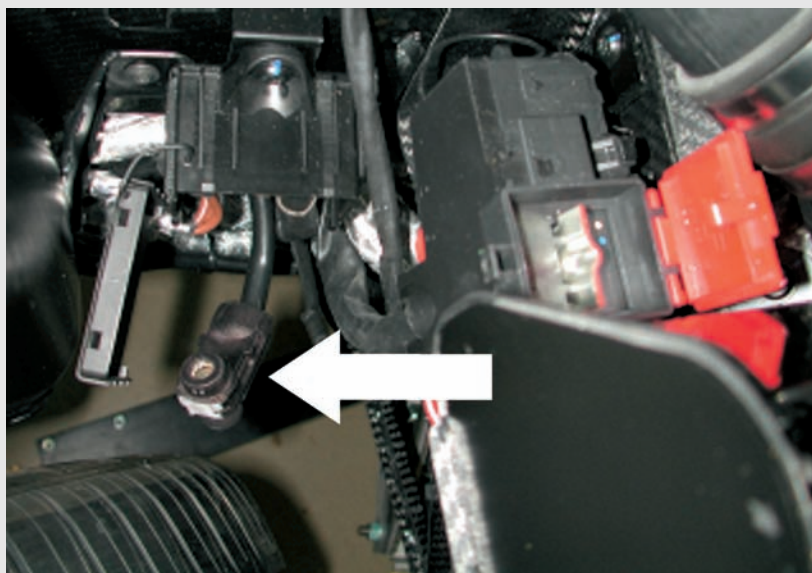
This alternator is driven by the engine by means of a poly rib belt. The battery may discharge if the vehicle is not used for a long period of time. To prevent this, each Carrera GT comes with a battery maintainer (Charge-O-Mat). When connected to the 12 volts socket in the glove compartment, the battery maintainer supplies the vehicle battery with a maximum charging current of 500 mA.

Power Distributors

Since the battery can only be accessed if a number of wheel-arch and underbody trim panels are removed, two service boxes (one for the positive terminal and one for the negative terminal) are provided at the rear of the engine compartment on the right-hand side. These service boxes also act as power distributors.

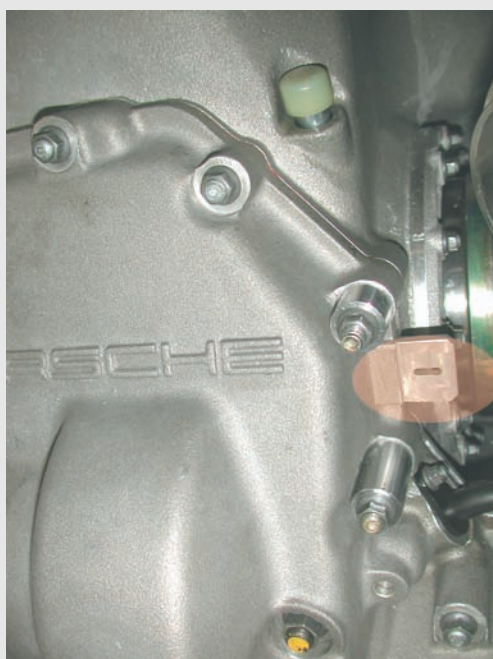
The main function of the power distributors is to separate the sections of the on-board electrical system which are divided into various electric circuits. This provides efficient protection against mutual interference in the main circuits. The service boxes can be accessed when the engine compartment lid is open – no trim panels have to be removed. The terminal covers can be removed after a number of catches have been unlocked.

The direct power supply from the battery terminals can be disconnected from the on-board electrical system without tools by unplugging special plug connectors in the service boxes. There is a metal contact on the positive terminal distributor. It is located beneath a red cover and can be accessed from above. It is used to connect a workshop charger or the positive jump lead when jump-starting the vehicle.



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There is a tab on the rear differential cover of the transmission. This is to be used for making an ground connection for charging, jump-starting and assembly work. It must not be used for any other purpose.



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Engine Compartment Relay Mounts

The electrical system has been fuse-protected as best suits the design of the wiring, components and space available in the Carrera GT.



No tools are required to disconnect the battery ground lead.



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The assignment of the fuse and relay slots is can be found in the Technical Manual.

There is a plastic relay mount in the direct vicinity of the two power distributors in the engine compartment. This mount also contains fuses for specific circuits.



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This relay mount is accessible once its cover is removed.

Passenger Compartment Relay Mount

The passenger compartment relay mount is located beneath the dashboard behind the knee bolster to the left of the steering column.



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The Carrera GT features a CAN-networked data communication system, consisting of a fast bus system for the drivetrain (500 kBaud) and a comfort bus (100 kBaud). The drivetrain bus connects the two Motronic control units and the control unit for the ABS/TC.

The two Motronic control units are connected to the CAN network as well as to each other by means of an internal proprietary CAN. The comfort bus connects the control units for the tire pressure monitoring system and the heating and air-conditioning control.

Both CAN bus systems (drivetrain and comfort) are connected to the instrument cluster. The instrument cluster acts as a gateway and regulates data traffic between the two bus systems and the virtual K-line (communication line).

In addition to the bus systems, there is an additional communication line (K) between the tester interface, the instrument cluster and the airbag and ABS/TC control unit. Another diagnostic line (K) connects the alarm and immobilizer control unit with the diagnostic interface. The immobilizer control unit communicates with the two Motronic control units (for start enable, etc.) via an analogue line (W).



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Detailed information on using the keys can be found in the Owner's Manual.

Immobilizer and Central Locking

Ignition Lock with One-Key System

Located to the left of the steering column, the ignition and steering lock is a typical Porsche attribute. A familiar feature in the classic Porsche sports cars.

Just like the sports cars, the Carrera GT also features central locking and immobilizer with a transponder system. The immobilizer transponder is located in the car key head, along with the remote control buttons for central locking. These buttons can unlock the doors and the luggage compartment lid by way of 2 separate buttons.

The key head has its own unique and distinctive design. The tank flap is also locked by means of the central locking function. The driver's door can also be locked and unlocked with the ignition key, and also the glove compartment door. There is a button for locking and unlocking the passenger compartment on the center console.

The immobilizer is automatically unlocked immediately after the ignition is switched on. Data comparison takes place in the background between the transponder in the key head and the receiver in the vehicle electronics (immobilizer control unit). If the data components are identical, the immobilizer is disabled and an electric signal informs the Motronic that the engine can be started. The immobilizer is activated when the key is removed from the ignition lock. This also enables mechanical locking of the steering column.

If lost keys are replaced, the new keys must be programmed with the Porsche System Tester 2 so that they can be used in the installed safety system.

Lost keys can be disabled to ensure that only authorized persons can open the vehicle with the correctly coded keys.

The Carrera GT is equipped as standard with an anti-theft alarm system with an infrared passenger-compartment movement detector. Aside from the passenger compartment and doors, the front and rear lids and the ignition are also monitored.

A tilt sensor is additionally provided to trigger the alarm if the vehicle is lifted.

Locking System

The anti-theft alarm system is automatically activated when the central locking function is activated by remote control or when the vehicle is locked automatically or manually. **If there are still people inside the vehicle when the vehicle is locked, the locking button on the remote control should be pressed twice.** This deactivates the passenger compartment movement detector and the car can be unlocked from inside.

Alarm System Readiness Display

Alarm system readiness is indicated by an LED in the central locking button (key symbol).



The automatic door locking function offers various options which can be programmed with the Porsche System Tester. The remote control shuts down after five days and is then no longer operational. This helps preserve the battery. When this occurs, the door must be unlocked manually and the remote control actuated once.

Detailed description of the locking system can be found in the Owner's Manual.

Lighting Component		Type and Wattage
Headlights	Driving lights	Bi_Xenon: D2S, 35 W ! 85V !
	High beam	HB3 60 W
Parking lights		High Performance 9,5 W
Turn signal lights	Front	High Performance 16 W
	Side	LED 2,0 W 12 LED
	Rear	LED 25 W 24 LED
Taillights		LED 1,3 W 22 LED
Side marker lights, rear		LED 1,2 W 4 LED
Side marker light, front (US market only)		LED 1,0 W 6 LED
Brake light		LED 6,4 W 12 LED
Brake light, rear wing		LED 3,0 W 20 LED
Reverse light		P21 21 W
Fog light (not for USA)		P21 21 W

LED: **L**ight **E**mitting Diode

Headlights

The Carrera GT headlight unit contains a bi-xenon projection module for the low and high-beam functions, and an additional high-beam light with halogen units. This additional high-beam light is designed using projection light technology.

A total of 3 service flaps are provided for performing service work and light replacement. A separate access point for each light is provided behind the light units so that the lights can be changed. The high-beam headlight are accessible once a rubber cover has been removed. The xenon module has a plastic cover which must be unscrewed.

There is a larger service flap at the bottom of the headlight which can also be unscrewed to facilitate more intricate jobs and the replacement of other components. There are two adjustment screws on the outboard side of the headlight housing. They can be used to adjust the light beam. These screws can be accessed by raising the top of the wheel-house liner slightly. No components need to be disassembled.

The low beam must then be adjusted – the additional high beam is automatically aligned as it is assembled on the same base plate as the bi-xenon module, and these have been factory-aligned with each other.

The lighting unit on the light mount must also be adjusted in such a way that the gap between the lighting unit and edge of the car body is the same all round. To allow the gap to be adjusted, threaded bars which are held in position using adjusting and locking nuts are provided at the bottom of the headlight.

Like all other lights on the vehicle exterior, the rear panel of the headlamp housing has valves with Gore-Tex membranes for ventilation.



The Carrera GT will not be equipped with front fog lamps.



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When working on the bi-xenon module and components, it is absolutely essential to follow the safety instructions in the Technical Manual! The operating voltage is 85 volts, the necessary ignition voltage is 22 kvolts.



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Bi-xenon Module

The bi-xenon module is installed as close to the outer edge of the vehicle as possible to ensure optimum road surface illumination. The light in this gas-discharge light system comes from a xenon bulb, powered by a high-voltage power supply unit.

Similar to an illuminated bar in appearance, the xenon bulb is replaceable and is aligned precisely with the projection lens at a distance of 2.7" (70 mm). It was possible to integrate the power supply unit in the headlight housing where it is safe from external influences. The power supply unit can be accessed once the bottom service flap has been removed. If necessary, it can be replaced.

Caution – High Voltage!

When the low beam is switched on, the beam of light directed towards the bottom part of the reflector is covered by a beam mask. This mask is connected to an electric motor by way of a lever. If the driver switches over to high beam, the electric motor is energized, thus causing the mask to be moved downwards. This increases the height as well as the width of the light beam and road surface illumination considerably. The mask makes a "clicking" sound when it opens. This sound is normal.

Halogen High-beam Light

The additional high-beam headlight is also designed using projection light technology and generates outstanding illumination over a long distance with its halogen HB-3 lamp.

Headlight Cleaning System

For safety reasons, a headlight cleaning system is a mandatory component for xenon headlights. It prevents light scatter, a danger and nuisance to on-coming traffic.

In order to activate the cleaning system, the driving lights must be switched on and the lever which activates the windshield wipers pushed forward. The Carrera GT headlamp cleaning system operates with a carefully-aimed high-pressure water jet directed at the headlight cover.

This efficient cleaning system does not require an additional wiper. Since the pressure necessary for this system is higher than for the windshield washer system, a separate high-pressure pump is required. This is installed immediately next to the windshield washer pump in the washer fluid tank.

The two extending cleaning jets are accommodated in recesses in the front bumper in front of the headlights. When the cleaning system is not in operation, only a tiny part of it protrudes above the panelling. When the cleaning system is activated and the pressure on the washer nozzles rises, the telescopic pipe with the emission nozzle is extended as far as the center of the headlight and the cleaning fluid is spread across the headlight.

Turn Signal Lights/Parking Lights

The front turn signal lights and the parking lights are both located in the headlight housing. Both lights are combined to form a single unit in a shared housing. The color of the light emitted by the parking light has been changed to match the blue light of the xenon lights. The light emitted by the turn signal lights and the parking lights are both located in the is yellow in color.

The lights have “high-performance” bulbs which are designed for a longer service life than that of the vehicle. However, if it is necessary to remove the bulbs, this can be done through the large service flap on the bottom of the headlight.

High-performance bulbs are a further development of the bulbs with P21 base which have been used for many decades. The high-performance bulbs consist of a filament which is embedded in an airless glass bulb. However, the procedure for evacuating the glass bulb and sealing it airtight is new. The new procedure lengthens the service life of the bulb considerably, and reduces the risk of failure caused by air entering the glass bulb. This new technique has been developed by Phillips and we have not been given more detailed information on it to date.

Another innovation in the high-performance bulbs is the use of an integrated reflector which allows light to be reflected in a specific direction. This means that the wattage of the bulbs can be significantly reduced while maintaining or increasing the level of light output. In the turn signal light of the Carrera GT, this amounts to 24 % of the original wattage. Additional advantages include lower heat generation and a reduction in the load placed on the on-board electrical system.

Side Turn Signal Lights

The side turn signal lights are LED units and located between the front wheel arch and the door on the top of the wing section of the exhaust air duct for the front wheelhouses.



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Front Side Corner Marker Lights

The front side corner marker light, designed as an LED unit (6 LEDs), is only installed in vehicles destined for the North American market. It is located on the nose section at the transition to the wheelhouse.

Tail Lights

The Carrera GT tail lights were also produced using LED technology. There is a total of 62 powered LEDs for each tail light built into the vehicle, most of which are series-connected in groups of 3 LEDs plus a series resistor. Every single LED is seated at the end of a facet-like channel which acts both as reflector and as light conductor. This keeps the illumination power of the LEDs at an optimal level and prevents light from scattering.

The tail light consist of four parts:

- Rear, bottom: 2 rows of LEDs (22 in total) form the tail light.
- Bottom, top, inside: 24 LEDs for the turn signal light
- Rear, top, outside: 12 LEDs for the brake light – this lights up together with the tail lights.
- Side, outside: A reflector with a further 4 LEDs which acts as a side corner marker light.

During braking, the luminous intensity of the tail light is increased to brake light level so that the tail light clearly and uniformly indicate that the car is braking. The brake light power is increased by an electronic circuit. The board for this circuit is located in the tail light.

The LED power rating for the rear side turn signal is increased to 25 watts by an electronic resistance circuit. This changes the flashing frequency to indicate when a turn signal light has failed. This circuit is also situated in the tail light housing.

From the outside, the tail lights appear red in color. The LEDs also light up in red, except for vehicles for Europe and the rest of the world where the turn signal lights must be yellow to comply with statutory regulations.



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LED – Light Emitting Diode

LEDs are compact in design and have a significantly longer service life and better operational reliability than conventional filament bulbs. With a service life of 10,000 hours as indicated by the manufacturers, it is highly unlikely that the LED bulb will ever have to be changed.

The LED also operates more efficiently which ultimately means that the light sources generate less heat. The more efficient energy conversion means that the lights need much less electric power to generate the same light power. This is of considerable benefit to the energy reserves of the on-board electrical system and the electrical charging resources.

Another advantage of LEDs is their shorter response time. They light up much more quickly when energized. This translates into enhanced safety for all road users, especially during braking.

Third Brake Light

The third brake light is also equipped with LEDs and is located in the center of the extending rear wing. The third brake light is connected to the power supply by a cable which is protected by a plastic link chain in the right-hand rear wing mechanics and is routed into the rear wing itself. In order to guide the cable into the rear wing, the plastic connector must be disassembled as the opening is very small.

Back-up Lights (USA Vehicles)

The back-up lights are located to the left and right of the rear tail pipes. Designed as a point-shaped light emitter, it is surrounded by a circular reflector. The bulb holder in the back-up light is located directly beneath the back-up light. It can be accessed by removing a service flap on the diffuser if the light has to be changed.

Rear Fog Lights (Not on USA Vehicles)

Rear fog lights are not available on vehicles for the North American market. Vehicles are equipped with a second back-up light next to the left tail pipe. The switch that was used for the rear fog lights is replaced by the driving light indicator.



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License Plate Lights

There are two license plate lights in the rear panels in the overhang above the license plates.

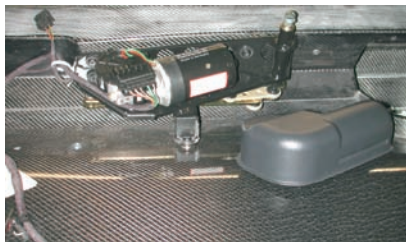
Luggage Compartment and Glove Compartment Lighting

The luggage compartment and glove compartment lighting is the same as that used in the 911 Carrera (996) and Boxster.

Passenger Compartment Lighting

The passenger compartment lighting and operation are the same as in the Boxster.

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There is a 1.1" (3 cm) black bar at the bottom left of the windshield. This serves as a position mark so that the wiper arm can be aligned accurately when being re-attached. See Technical Manual.

Wiper System

The Carrera GT features a powerful single-arm windshield wiper system. With its large spoiler, it can generate sufficient contact pressure on the wiper, even at high speeds. The wiper electrical system and mechanics are conventional in design.

The electric wiper motor with gearbox and lever transmission including the wiper shaft are installed with minimum space requirements on a shared base plate directly beneath the windshield at the center of the vehicle. A plastic cover is used for concealment and to provide protection against splashed water.

The electric wiper motor is the same as that used in the 911 Carrera (996). The end position of the wiper is clearly defined – there is no retraction position. Unlike the Cayenne, the operating conditions of the Carrera GT mean that an overload monitor for the wiper is not required. The wiper can be operated at two speeds and in a predefined intermittent setting.

The wiper arm has an articulated joint at the point where it is attached to the wiper shaft. This joint is not fully retractable. Its function is to compensate the curvature of the windshield. This means that it cannot be raised and locked when the wiper has to be changed, and must be unscrewed and removed.

Windshield Washer System

The windshield washer system uses the same fluid reservoir as the headlight cleaning system. This reservoir is located to the left of the B-column on the outer part of the monocoque. The reservoir has a refill capacity of 4.7 qts (4.5 liter).

There are two pumps in the fluid reservoir for washer fluid: one for the headlight cleaning system and one for the windshield cleaning system. The reservoir has a fluid level sensor. If there is less than 1.1 qts (1 liter) of liquid in the reservoir, a warning light in the instrument cluster lights up and information is displayed in the on-board computer info field prompting the driver to refill the reservoir.

When the wiper lever is pulled towards the steering wheel, the electric washer fluid pump in the tank pumps the cleaning agent through a plastic hose to the two electrically-heated wiper nozzles in the plenum chamber grille.

The filler pipe for the washer fluid is in the front left of the engine compartment. It can be accessed after opening the engine compartment lid and unscrewing the blue cap from the filler pipe cover.



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Instrument Cluster

The basic design of the Carrera GT instrument cluster is similar to that of the 911 Turbo (996) and was revised to meet the special requirements of the Carrera GT.

Tachometer with display area adjusted to suit the Carrera GT requirements:

- 10 x 1,000 rpm, redline from 8,400 rpm onwards
- Oil temperature gauge (analog) instead of battery voltage
- Speedometer with display up to 236 mph (380 km/h)
- Display for tire pressure monitoring system (RDK) in matrix display
- Monitoring and display if pressure in hydraulic booster circuit of braking system is insufficient. **(If the Carrera GT has been immobile for an extended period, it might take a few seconds until the system pressure is reached. The display light goes out when the operating pressure is reached.)**

The instrument cluster is configured as a gateway for the drive and comfort bus. The instrument cluster also controls communication between the tester and the control units (air-conditioning and RDK) with diagnosis capability.

A number of modifications have been made to the appearance of the instruments:

- Tachometer accentuated by painted trim and metallic titanium-effect dial
- All instrument rings painted in aluminium look
- Yellow scale bars and pointers
- Yellow background lighting

Matrix Display

The RDK has been added to the main menu points in the matrix display. The RDK functions have been added to the on-board computer.

On-board Computer

- Average speed, average fuel consumption, range on remaining fuel, outside temperature, transmission oil temperature and RDK displays

Limit

- Speed warning (adjustable)

Check

- Text of stored warnings

Oil

- Oil level measurement and display

RDK

- Displays for tire pressure monitoring system

Set

- Driver-specific settings and resetting of on-board computer

Off

- Switches off matrix display

Window Lifters

The Carrera GT is delivered with electric window lifters as standard. There are no manual window lifters offered. The window lifter motors are situated in the front section of the doors. They open and close the windows by means of 2 cables and sliding blocks. These are connected to the windows and run along guide rails. This mechanism is similar to that in our sports cars.

The buttons which activate the window lifters are located in the center console. Both windows can be opened by briefly pressing the window lifter switch on the center console (one-touch opening); however, one-touch closing is only possible for the driver's window.

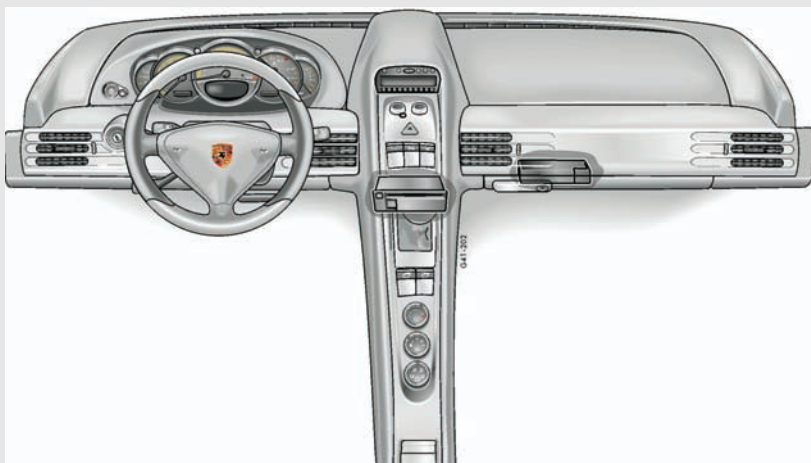


The door windows must be calibrated if the battery has been disconnected from the on-board electrical system. Refer to the Technical Manual for details.

The Carrera GT can be equipped with the Porsche Online Pro audio system at no extra charge. This system is complemented by a BOSE sound system. For reasons of space, the entire audio and communication system is divided up into different parts and installed inside the vehicle.

Component	Function	Location
Radio display	Matrix display for radio and navigation functions	Top end of center console
Radio control panel	On/Off switch, volume and channel selection, navigation functions	In front of radio display in center console
Radio antenna	Radio reception	Integrated in windshield
Radio receiver with navigation and CD slot, MMC	Control and output of audio and navigation functions	Under radio display in dashboard; under center console
Navigation reception	GPS satellite reception	Front of car in center of bumper
BOSE sound system and 2-channel TSM amplifier	Audio reproduction Switching amplifier 2 x 100 watts	Above radio/CD unit
Loudspeaker system	Mid-range speaker 2 x 3" Tweeter 2 x 1.5" Woofer 2 x 5"	Door trim panel, by door opener A-pillar/window frame A-pillar base/door sill

The Porsche Online Pro system is not connected to the vehicle network and therefore cannot be read out or diagnosed by the Porsche System Tester.



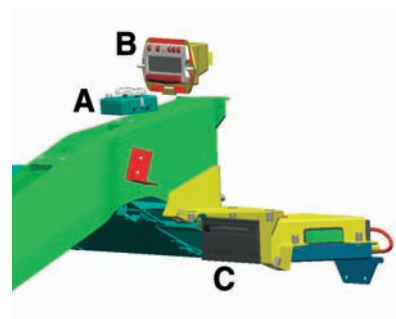
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Radio

The Porsche Online Pro system is a further development of the well-known Porsche Traffic Pro radio. The Porsche Online Pro uses a processor which is five times quicker than its predecessor. This enhances the power and user convenience of the infotainment equipment.

The radio system is equipped with a double-tuner for RDS Diversity and RDSEON in the VHF (FM) reception range. Naturally, the Porsche Online Pro also features very good reception quality in the medium-wave reception range (AM). Its central location makes the Porsche Online Pro display very easy to read. When necessary, the display informs the passengers about the current and available stations and about stored radio settings and options.

The radio is operated by means of a rotary button/pushbutton in a separate control panel directly in front of the display. This multi-function control panel consists of two adjustment buttons and a button to switch the radio on and off. The basic function of the rotary button/pushbutton is similar to other infotainment systems: the button is rotated to make a selection and pressed to activate the required function. The system functions are each subdivided into up to three levels according to meaning and their frequency of use.



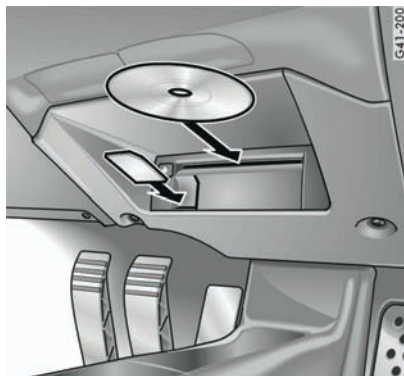
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- A** - Control unit
- B** - Display
- C** - CD drive



You are strongly urged to read the relevant chapters in the Operating Manual for detailed information on setting and configuring the Porsche Online Pro.

Carrera GT



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CD Player; MP3; MMC

The CD player with its CD slot is located in the radio housing and can be accessed via the opening beneath the center console. The CD player has excellent playback quality and can hold one CD at a time. The CD player control functions are actuated via the radio control panel and shown in the display.

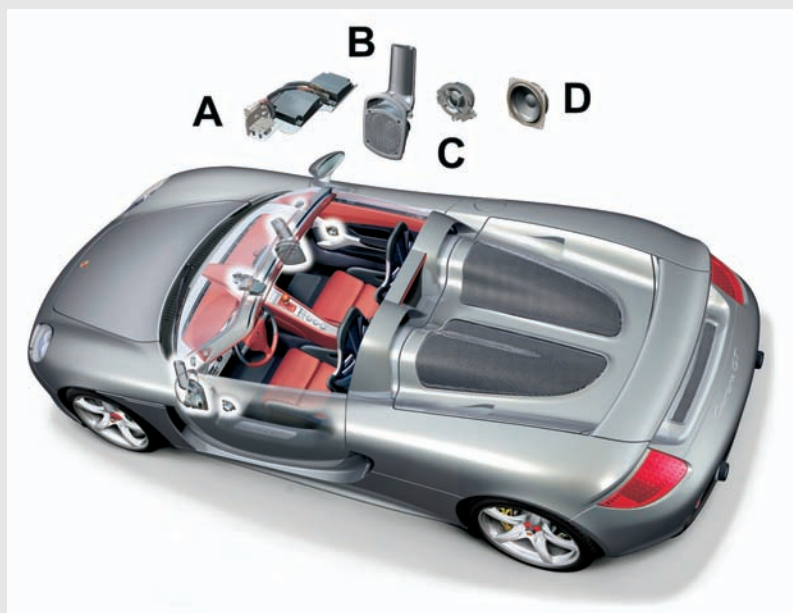
It is also possible to play compressed music files in the compartment for multimedia card (MMC) beneath the CD slot. Featuring no audible loss in quality, MP3 is one possible compression procedure.

BOSE Sound System

The sound system used in the Carrera GT and adapted for this vehicle is manufactured by BOSE, a company with a very good reputation in high-end audio components. Its outstanding features are the high-quality music and voice reproduction, and its low weight but comparatively high power.

The integrated sound system includes an amplifier and a total of six high-quality loudspeakers in the Carrera GT.

- A** - TSM amplifier
- B** - Woofer
- C** - Tweeter
- D** - Mid-range loudspeaker



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The two woofers are located at the base of each A-pillar where they share a common cavity with the door sill of the monocoque. With a resonance volume of 6.6 gals (25 liters) per loudspeaker, these cavities are used as active acoustic bodies in order to generate high sound levels in the bass range. This bass reflex technology generates a powerful bass with a relatively small loudspeaker membrane without generating any annoying vibrations.

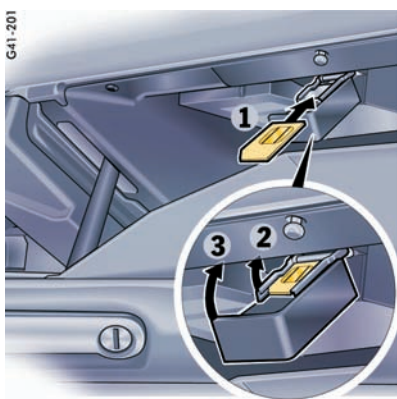
The **Two-State Modulation** is an amplifier system patented by BOSE.

The digital BOSE TSM switching amplifier operates with two 100 watts output stages in switching technology. These generate less heat than conventional linear amplifiers and this makes them 50 % more efficient, lighter and more durable.

The following are some more outstanding features of this sound system:

BOSE Loudness Control	Automatically boosts the bass. This function is implemented in the radio menu.
Active Equalization	BOSE technology to adjust the music reproduction to the acoustics inside the vehicle across the entire frequency range. The listener is given true-to-life music reproduction without having to constantly readjust the settings.
Active Compressor Circuit	Fine tuning in the dynamic range to suppress audible distortions, even in loud music passages.
BOSE Neodymium Loudspeaker System	Special neodymium magnet made from iron boron. Generates a magnetic field ten times more powerful than conventional loudspeaker magnets. This makes it possible to build much smaller and lighter loudspeakers.

Carrera GT



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See specific telephone system's operations manual for complete information.

Telephone

The Carrera GT features a triple band telephone system which covers most of the telephone networks used worldwide. These are for 900 MHz (D-networks), 1,800 MHz (E-networks) and 1,900 MHz (USA GSM networks). The telephone system is connected to the Porsche Online Pro via an external analog interface.

It is possible to make hands-free telephone calls with the radio in mute mode using a microphone in the instrument cluster panel and vehicle speaker. The telephone module with the slot for the plug-in card is located above the glove compartment. It can be accessed by opening the glove-compartment lid.

WWW-Capability

WAP/E-mail/Text Messages

The Porsche Online Pro also features in Internet option. Internet access is possible via WAP (Wireless Application Protocol). WAP is used to call up Internet sites with the appropriate portals.

It is possible to send and receive e-mails and (depending on the country) text messages. Each Porsche Online Pro system has its own e-mail address. The e-mail address consists of the vehicle ID number, the provider (WEB) and the country abbreviation, e.g. WP099.....@WEB.DE

For security reasons, the entire system is protected by a firewall (protection against unauthorized online access from outside).

Navigation

The navigation system in the Porsche Online Pro has a fast route calculation function. This operates using the route options entered and up-to-date traffic messages (TMC).

Voice output of the navigation system can be activated in the menu. The optical travel directions are given as pictograms in the radio display.

A navigation CD in the audio system CD drive is required for route calculation. When the route has been calculated, this CD can be taken out and replaced with a music CD.

Navigation CD	Number of CDs	Countries
North America	2	USA, Canada, Mexico
Europe/Rest of World	2	Europe and Rest of World

Antenna System

FM/AM

The radio reception antenna is a window antenna comprising wire loops integrated into the windshield. An antenna amplifier which conditions the received signal for the radio receiver is connected downstream of the windshield antenna.

Unlike a metal car body, the Carrera GT with its carbon-fiber body required the counter pole (vehicle ground) of the antenna to be integrated in the windshield. The wire conductor of the antenna is located at the top of the windshield and completely covered by the black border around the windshield.

The Carrera GT antenna system does not have any Diversity functions.

GPS/GSM

The antennas for receiving telephone and navigation signals are at the front of the vehicle in the center in front of the front lid lock. This location is particularly suitable for receiving such signals. Both receiver and transmitter modules are bolted onto a shared ground plate and connected to the front bumper in order to form the largest possible grounding surface.

For technical reasons, the GPS receiver (navigation) is attached to the center of the ground plate. The GSM transmitter and receiver unit (telephone) is attached off-center to the left of the GPS receiver. The GPS/GSM receivers are located beneath the PU front panel.





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