Trojan HORSE

IT MAY LOOK SUBTLE, BUT THE UPDATED 997 INTRODUCES NEW TECHNOLOGIES THAT WILL SHAPE ALL FUTURE 911s

STORY BY JEFF GLENN PHOTOS BY IAN KUAH

At a glance, the latest 911 looks like a subtle facelift of the successful 997 series. The lights in the front bumper are now LED units, integrated into larger, reshaped outer inlets for the front radiators. Bi-xenon headlights are now standard on all 911s and the side mirrors have grown to comply with EU regulations. New LED taillights droop into a rear bumper with recessed detailing between the oval exhaust pipes of the Carrera and the four round tips of the Carrera S.

Don't let subtle fool you.

The development under these skin-deep alterations is impressive. We knew a number of new engine pieces would center around the addition of direct fuel injection to the 911 flat six, but we weren't clear on how many parts outside of the cylinder heads would actually change. Try *all* of 'em. Porsche says the Carrera's 3.6- and the Carrera S's 3.8-liter engines are totally new, starting with a two-piece crankcase with fully integrated crankshaft bearings instead of the previous four-piece block with its bolt-in bearing housing.

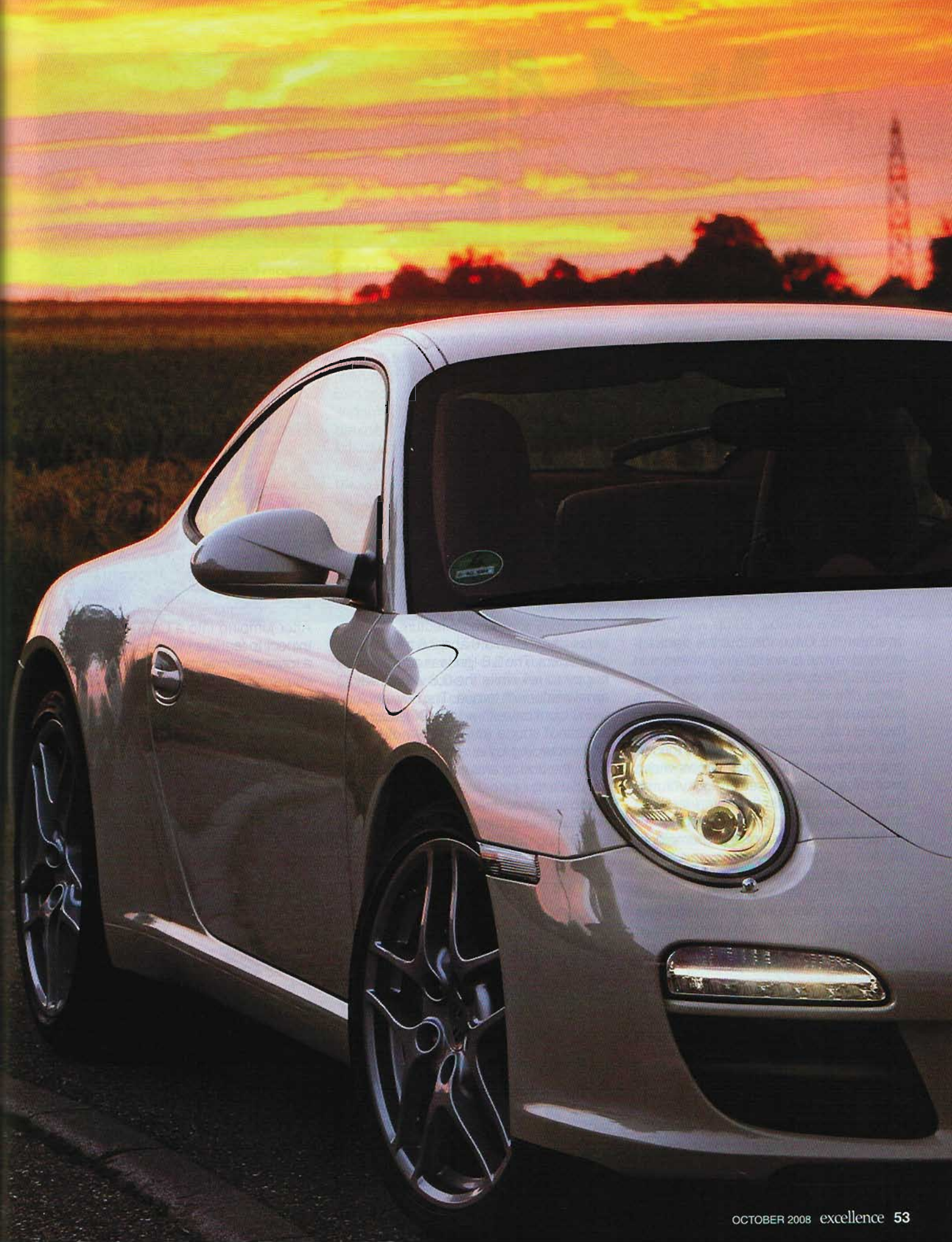
That may alarm those who think about engines in terms of rebuilding them, but it's hard to argue with the here and now. Porsche says the new engines make "more power on less gas with lower emissions." How much more? The 3.6 is up 20 bhp, to 345 with 287 lb-ft of torque. The 3.8 gets 30 more to reach a rather serious 385 bhp with 310 lb-ft of torque.

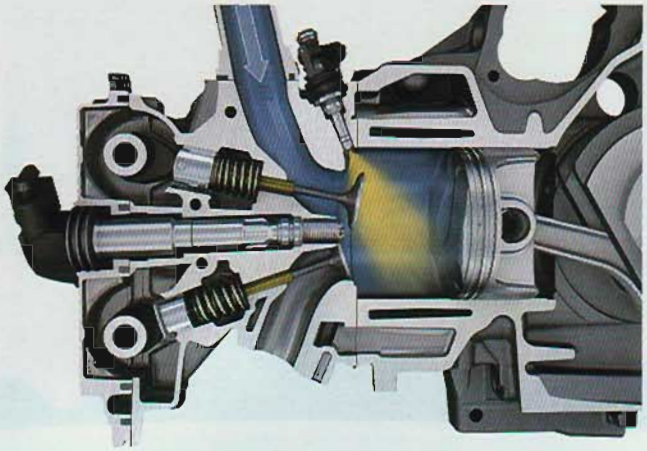
DFI varies fuel pressure based on load. Most of the time, it operates at an incredible 1,740 psi but drops operating pressure to as little as 1,015 psi at idle or under light loads. Magnetically-operated fuel injectors placed between the two intake valves spray precisely directed patterns into each combustion chamber without the usual fuel losses along the walls of an intake plenum and effectively deliver a cooler charge — allowing a higher compression ratio of 12.5:1. On cold starts, a second squirt of fuel late in the combustion event creates a greatly heated exhaust charge to bring the catalysts up to temperature quickly. This allowed Porsche to avoid using a secondary air-injection system — the root of many past ills.

A multiple-injection sequence is again used in high-load situations up to 3500 rpm. The spray is divided into successive squirts during the intake stroke to improve the air/fuel mixture and reduce fuel consumption. In all other situations, fuel comes in a single blast. The direct nature of DFI quickens throttle response, most notably when you tip off the throttle.

These flat sixes point to where Porsche sports cars are headed. The general theme seems to be "even more from even less." The flat six's overall height is 10 millimeters shorter from the crankshaft to the top of the engine, and 20 mm shorter from the crank to the sump. There are 40 percent fewer components in the engine thanks to things like integrated crankshaft and camshaft bearings as well as new one-piece cylinder heads. The new six is easier to assemble and 11 pounds lighter than the outgoing motor.

Bore and stroke have changed slightly on both versions, with the 3.6-liter stroke increasing by 1.3 mm to 81.5 mm and the bore enlarged from 96 to 97 mm. This adds 18 cc, yielding a capacity of 3614 cc. To increase the 3.8-liter's ability to rev, its stroke was reduced from 82.8 mm to 77.5 mm while bore was increased by 3 mm to 102 mm, for a true 3800 cc.





Location of direct fuel injector above the intake valve (left). Injections can be timed and phased to improve cold-start emissions, allowing for the elimination of troublesome secondary air-injection systems...

Previously, the timing chains utilized an intermediary shaft to lessen the load on the chains, but advances in materials let Porsche delete the shafts — saving weight and rotating mass. Further reductions were realized by reducing the diameter of the shift tappets on the intake valves by 2 mm to 31 mm, and by 5 to 28 on the exhaust valves. The reduced mass allows a 7500-rpm redline for both units. Even the water pump is new, pushing 20 percent more volume and now located outside the engine to ease service.

Lubrication is now adjustable to deliver just the right pressure and volume at the right time through a single pump. The theory behind a variable pump was developed for the Cayenne, but the packaging and layout is completely different in the 997. The pump itself looks like a multistage unit with four suction holes. The adjustability comes from a gear moved hydraulically on top of a pumping gear that acts like a paddle wheel. As the top gear is moved, the paddle grows wider, providing more pressure and volume while a new baffle in the sump reduces splash losses and combats foaming.

The electronically regulated pump contributes to a three-horse gain and a two-percent reduction in fuel consumption while improving the motor's ability to cope with extreme lateral forces. The latter was confirmed on a new tool developed at Weissach: a dynamic engine test rig similar to suspension test rigs that simulate *g*-loading. Picture a running engine on a mechanical bull and you're close. The rig simulates laps of the Nürburgring by running the engine through a program that replicates rpm while moving the motor up to 54° in any direction at a speed of 140° a second — enough to simulate 1.4 *g* of cornering, braking, or acceleration.

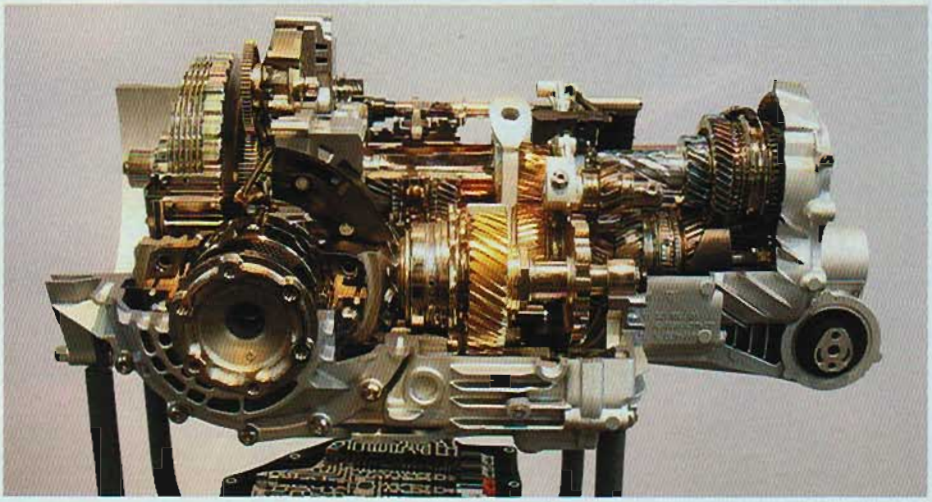
Both 997 engines are fitted with new, twin-filter intakes. Previous airboxes had a single filter element and intake funnel. Now, two round filters in the airbox are fed by separate hoses attached to the deck-lid. Flow resistance is lowered and, as a result, Porsche says the filters are good for 56,000 miles instead of 37,000. The 3.8-liter airbox uses a vacuum-controlled flap for induction noises and to adjust the oscillation of air in the induction system for a stronger charge. It remains closed under full-throttle conditions from 2600 rpm until 5100 rpm, when it reopens.

Despite shared architecture, the previous-generation 3.6 and 3.8 had distinct characters. The 3.6-liter was a sweetheart happy to rev while the 3.8 was ready to arm-wrestle with torque. The new engines aren't identical, either. With DFI, each has a distinct sound at idle only noticeable while standing by a rear wheel; interestingly, the ticking and air-rush noises from the clicking of the direct injectors are not heard inside or directly behind the cars. The Euro exhaust is more subdued than U.S. versions will be, so this may or may not be as noticeable Stateside.

Slip inside and you'll find the Porsche Communication Management system has a larger screen, a new touch-screen interface, and larger buttons — making it easier to use than the last version. Where there were 36 buttons and five levels of menus, 16 buttons and three levels do the job. The unit's six-disc changer plays audio CDs as well as video DVDs in a host of compressed formats. There's a universal interface to allow iPod or USB stick connectivity, too.

Driving a Carrera S coupe, we find the new 3.8 is very willing to reach for the redline. Torque is impressive, accompanied by a mechanical boxer grunt down low. After jumping into a Carrera Cabriolet, I expect to feel like I've stepped down into a more comfortable cruiser. I'm pleasantly surprised. The 3.6 sounds racier than the bigger powerplant for two reasons: intake howl and that smooth, familiar "I could be on the Mulsanne Straight" shriek from a properly set-up boxer six. Intake noise overtakes the mechanical song and exhaust note past 5000 rpm, then fades and comes back into the fold at 7000 rpm.

The mechanical sound from the 3.6 has a smoother frequency and does the job of moving this 997 down the road so well



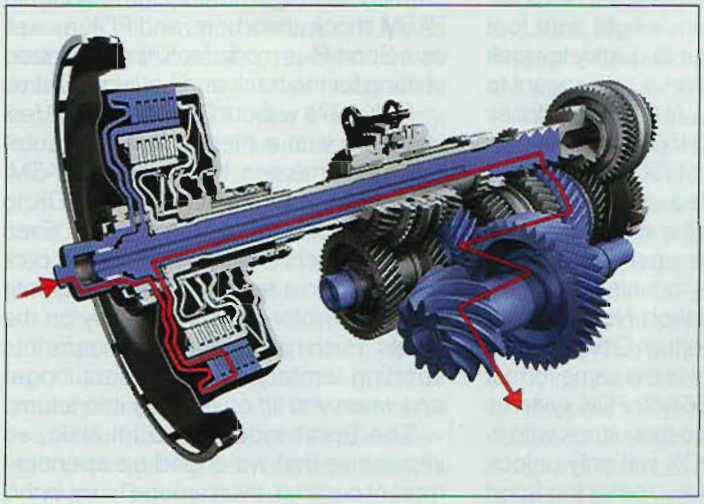
The PDK transmission (right) is compact but adds 66 pounds. Torque path through its twin wet-clutch setup (far right) and separate transmission layouts for gears 2, 4, and 6 as well as 1, 3, 5, 7, and reverse.

that it takes some thought to pinpoint where the 3.8 is quicker. Midrange torque is the obvious answer — the ramp-up to max torque is similar in both motors, but the 3.8 has more and offers a longer hit. To find out if the intake-howl volume is related to the soft top, I try a 3.6 coupe and, while the intake noise may have dropped a decibel or two, the sounds are pleasantly similar to the Cabriolet's.

Shifting the latest 997 manually is no different than before. The only change to the six-speed box is a three-percent taller third gear, though Carreras now share the wear-compensating clutch reserved for Ss last time around. Those who prefer just two pedals can choose Porsche's long-anticipated *Porsche Doppelkupplungs-getriebe* — or PDK for short. This dual-clutch manumatic is a replacement for the previous Tiptronic auto and, unlike the Tip, has better instincts than you do. Really. It may be just a piece of complex hardware with software to second-guess your next move, but it does so amazingly well.

Porsche came up with the twin-clutch concept in the 1980s, debuting the system in 1983 in a 956 and achieving success with a win at the World Championship round at Monza in 1986 with a 962. Aside from having two clutches, the PDK of today bears no relation to that first iteration. Porsche worked directly with ZF onsite at Weissach to develop the system. During the six-year project, Porsche tested the system in the hills of San Francisco and the traffic of Los Angeles.

The seven-speed layout features two wet clutches, one inside another, and two



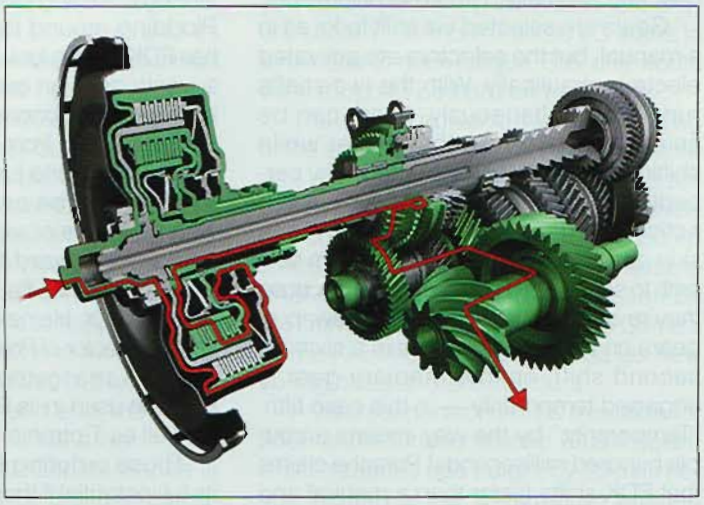


PHOTO PORSCHE

Superb 997 interior changes little for the 2009 MY, but boasts a new PCM system as well as iPod and USB connectivity. Cars with PDK get a new steering wheel (above).

separate transmission layouts for even — 2,4,6 — and odd — 1,3,5,7, and reverse — gears. The first clutch works with odd gears, the other works the even side. The wet clutches work independently and are closed by a piston and bathed in their own fluid, separate from the gear oil in the rear of the box. Porsche says PDK transmission gear oil is good for the life of the car, but that the twin-clutch fluid must be checked and refilled at 90,000 kilometers.

Gears are selected via shift forks as in a manual, but the selectors are activated electrohydraulically. With the two shafts running simultaneously, gears can be selected on both so that power while shifting is virtually uninterrupted. Any perception of shifting is conveyed by clutch action, not gear engagement. PDK can skip gears on downshifts, going from seventh to second in a single change because they're on different shafts. For a swap of gears on the same shaft, as in a sixth-to-second shift, an intermediary gear is engaged temporarily — in this case fifth. "Temporarily," by the way, means a couple hundred milliseconds! Porsche claims that PDK shifts faster than a manual and has consumption figures 12 percent better than the outgoing Tiptronic. It weighs 22 pounds less than the 2008's Tip, but 66 pounds more than 2009's manual.

In the Comfort mode, PDK is buttery smooth off the line, without the second-guessing or ratcheting of other manumatics. PDK only gets aggressive if you do. Along with throttle position, it reviews road speed and yaw sensors to adapt shifting strategy, holding gears longer if need be. Plodding around town, a light right foot has PDK saving fuel. It rolls quickly towards seventh gear, an overdrive ratio meant to improve fuel economy. At 0.617, it reduces rpm at 62 mph from 2450 rpm in the previous Tiptronic to just 1750 rpm.

Shifts can be called up via steering-wheel buttons or via the console shifter. You push forward for upshifts and pull back for downshifts — counter-intuitive in our view. Dr. Heinz-Jakob Neusser, Porsche's Director of Powertrain Development, says this arrangement is the same format Porsche used in its 956/962 PDK systems as well as Tiptronic, so they stuck with it.

Those ordering PDK will only unlock its full potential if they also order the Sport Chrono Plus package. Though we remain less than impressed with the dashtop timer, SCP's optimization of other electronic systems makes it worthwhile. SCP offers more sporting modes for the PSM stability management system, variable PASM shock absorbers, and PDK as well as a Sport Plus mode featuring optimized shifting for the track and Launch Control.

PDK 997s without PASM and SCP feel like 911s with a merely fantastic automatic transmission. With SCP and PASM, pressing the Sport button gets PDK to adopt a more aggressive strategy. Even so, it still reacts to inputs and sensed conditions within a range that dips back into Comfort territory if you are easy on the inputs. Push harder and PDK heads into sporting territory, holding gears longer and when you lift on the way into a turn.

The Sport mode is so intuitive, so impressive that we ended up spending most of our time, even around town, in this

setting. I was amazed by the Sport mode's shifts and their timing while hurtling the new 997 through the twisties. It stayed in gear and slowed the car approaching corners with uncanny consistency, then executed lightning-fast upshifts mid-corner without upsetting the chassis. More than once, my driving partner and I exclaimed, "Did you see *that?* That was ridiculous!"

The Sport Plus mode isn't adaptive at all. It locks out the overdrive seventh and assumes you want to shift as quickly as possible. In this setting, an even throttle while rolling through town will hold the car in gear, even at 6500 rpm. Interestingly, Porsche's own test drivers don't bother with Sport Plus at Weissach. After demo laps with two factory drivers in Normal, Sport, and Sport Plus, we asked and both said the shifting when left up to the car was what they'd do on their own — and smoother and quicker in most cases.

"I don't use the paddles, there's just no need," said one. It's a conclusion I reached, too, surprised by how well PDK thinks for you. This makes some sense considering the computing power present in this Porsche. Thanks to PDK, variable oil-pump sensing, PASM, and all of the other electronic gadgets, 2009 997s have 65 percent more memory capacity than the 2008 models and run at 120 mhz...

It hasn't been put to waste. Compared to the twin-clutch system in Nissan's high-tech GTR, PDK is far smoother in Comfort and deals with low-speed situations and reverse much more gracefully than the GTR's clunky, jarring shifts. On the other hand, Nissan's system is poised at speed, encourages manual operation, and its fixed-position paddles behind the wheel are easier to commit to habit.

Whether one gearbox is faster than the other is splitting hairs, but PDK lurches you forward on each shift without interrupting the power flow. Unless you've spent time with serious drag racers, it's an experience you've never had before. In development, Porsche had to drop a bit of torque on upshifts to keep the chassis stable. The gearbox and mechanicals could deal with the power, but upshifts in turns upset the rear end and were thus deemed "unsettling" to the driver.

Sport Plus's Launch Control feature is activated by pressing the brake and stepping into the throttle quickly. When the revs reach 6500 rpm, you side-step the brake and the Carrera catapults forward. The system was optimized for coarse, medium-rough road surfaces, but it analyzes slip and other parameters and then adjusts power output in relation to that. Unlike the GT2, with its dry-clutch Launch Control, Porsche says PDK's wet-clutch setup will withstand as many launches as you can. Apparently, Weissach test drivers couldn't do more than 20 LC starts in a row due to neck fatigue. Still, one would think it's gotta be hard on half-shafts...

The added power led to a massaging of the spring/shock and anti-roll bar package across the Carrera line. The 3.6 still comes with conventional shocks, revalved to work with new spring rates and bump stops. Porsche's electronically variable PASM suspension remains an option on the Carreras and standard on the Carrera S. The PASM-equipped cars also get new spring rates and anti-roll bars.

A third suspension will be available for 2009 in the United States: PASM Sport, which reduces ride height by 20 millimeters instead of the 10-mm drop with the

regular PASM system. Our only encounter with the new suspension happened on the Weissach test track during those hot laps with the factory drivers. PASM Sport features a more performance-oriented PASM system based on lessons learned with the PASM setups on the 997 GT3 and GT2. In addition to the lower ride height, stiffer springs, and revised damper valving, the package adds a mechanical limited-slip differential. Put through its paces, PASM Sport was obviously good for track work. The thrill rides also demonstrated how the PSM stability management works with the sport suspension. When flung around in the Sport mode with PSM on,

PDK shift buttons are better than those for the Tiptronic, but aren't intuitive compared to those of other manumatics. Due to the Sport Chrono Plus system's ability to affect PDK's parameters, it is now a must-have...

PSM allowed about 15° of rotation before intervening. With PSM off, unchecked sliding and big grins were easily attained.

Back behind the wheel, we found the new 911 is a deeply satisfying sports car. All of the launch cars have that familiar Porsche steering feel — razor sharp, with just the right weight and effort at turn-in but enough road feel to transmit what the front tires are doing. PASM has the ability to be fairly forgiving over lumps and bumps in its Normal mode. In the Sport mode, however, the computer-controlled dampers step the stiffness up a notch, giving you a good idea of just how rigid the 997's body shell is. When it clamps down, already crisp turn-in gets crisper.

We didn't run the new 997S all the way to its near-190-mph terminal velocity, but we did note that its suspension tightens up over speeds of 115 mph or so, making a rough — for Germany — piece of autobahn feel fairly bumpy. There were times while driving aggressively on mixed-surface backroads that the bumps forced us to hunt for the suspension buttons to

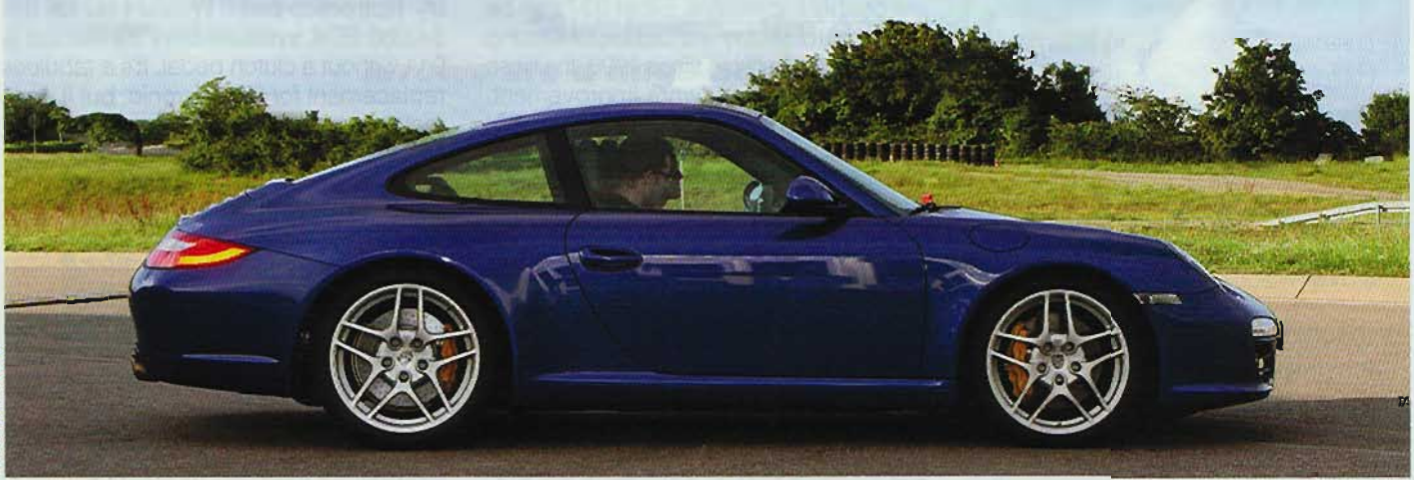


PHOTO JEFF GLENN

2009 Carrera/Carrera S

TYPE Rear-engined 2+2

CHASSIS Steel unibody

ENGINE 3614-cc/3800-cc flat six, water-cooled

VALVETRAIN DOHC, 4 valves per cylinder, variable valve timing and lift

INDUCTION Bosch DME SDI 3.1 Direct Fuel Injection

BORE 97/102 mm

STROKE 81.5/77.5 mm

COMPRESSION RATIO 12.5:1

REDLINE 7500 rpm

HORSEPOWER 345/385 bhp @ 6500/6500 rpm

TORQUE 287/310 lb-ft @ 4400/4400 rpm

OUTPUT PER LITER 95.6/101.3 bhp

TRANSAXLES Six forward gears + reverse (manual)
Seven forward gears + reverse (PDK)

GEAR RATIOS (MANUAL)

First	3.91
Second	2.32
Third	1.56
Fourth	1.28
Fifth	1.08
Sixth	0.88
Reverse	3.59
Final Drive	3.44
Clutch Diameter	240 mm

GEAR RATIOS (PDK)

First	3.91
Second	2.29
Third	1.65
Fourth	1.30
Fifth	1.08
Sixth	0.88
Seventh	0.62
Reverse	3.55
Final Drive	3.44
Clutch Diameter	202/153 mm

WHEELS 18x8 (f) & 18x10.5 (r) Carrera
19x8 (f) & 19x11 (r) Carrera S

TIRES 235/40ZR18 (f) & 265/40ZR18 (r) Carrera
235/35ZR19 (f) & 295/30ZR19 (r) Carrera S

LENGTH 174.6 inches

WIDTH 71.2 inches

HEIGHT 51.6/51.2 inches

WHEELBASE 92.5 inches

TRACK 58.5 inches front, 60.4/59.7 inches rear

DRAG COEFFICIENT 0.29

FRONTAL AREA 2.01 meters^2

CURB WEIGHT 3,120/3,142 pounds (coupe)

CURB WEIGHT 3,308/3,330 pounds (Cabriolet)

0-62 MPH (MANUAL) 4.9/4.7 seconds
5.1/4.9 seconds (Cabriolet)

0-62 MPH (PDK) 4.7/4.5 seconds
4.9/4.7 seconds (Cabriolet)

0-124 MPH (MANUAL) 16.6/15.2 seconds
17.5/16.1 seconds (Cabriolet)

0-124 MPH (PDK) 16.3/14.8 seconds
17.2/15.7 seconds (Cabriolet)

TOP SPEED (MANUAL) 179/187 mph

TOP SPEED (PDK) 178/186 mph

BASE PRICE $75,600/$86,200 (coupe)
$86,200/$96,800 (Cabriolet)

go back to the Normal mode. Once we did, PASM coped with the terrain. When things smoothed out, we found ourselves pushing buttons again, wishing PASM was as smart and intuitive as PDK...

I expected a difference in the handling in a similarly equipped Carrera Cabriolet, maybe with less focus due to the open top. What blew me away was how nice the Cabrio was to drive in all conditions, especially on bumpy roads. Cowl shake is absent but, with the same suspension, the slightly less rigid chassis seemed to soak up some of the bumps that made the coupe feel nervous in the Sport mode. It was a bit easier to accurately place the car on inferior surfaces. In both PASM-equipped 997s, I found myself frequently playing with the buttons to adjust the car to road conditions. A brief encounter with a base PDK-equipped Carrera on 18-inch wheels without PASM led me to believe the standard chassis and 18-inch wheels is still a good compromise between ultimate performance and comfort.

Speaking of wheels, standard Carrera issue is still a set of 18 inchers, now called "Carrera IV," that make the Fuchs pattern out of Star Trek-shaped open fingers. The front wheels measure 18x8 and wear 235/40ZR18 tires. The rears have been widened by half an inch to 18x10.5 and wear 265/40ZR18s. Carrera Ss get handsome new "Carrera S II" 19s with a certain "Made in Italy" feel to them. They measure 19x8 with 235/35ZR19s up front and 19x11 with 295/30ZR19s out back.

As usual, the latest Porsche stoppers are deeply impressive. Either 997 can be driven hard all day without experiencing fade. For the first time since 1998, the base 911 gets a real hardware improvement. The cross-drilled and ventilated front rotors on Carreras have grown from 12.52 inches in diameter to 12.99 and measure 1.34 inches thick. The rears move up from 11.77 in diameter, to 12.99 by 1.10 inches.

New four-piston monoblock calipers, still finished in black, have added bracing to help reduce fade. Scoops on the front suspension and additional openings in the floor feed more air to the rotors to further increase resistance to fade. The Carrera S uses the same setup but for red paint on its calipers, eliminating the previous S's big-brake advantage. Adding to the usual host of Porsche acronyms is Brake System Pre-Filling and Brake Assistant. Lift off the throttle quickly and fluid is automatically pumped to rest the pads against the rotors to quicken response. If the computer senses a hard and fast application of the brakes indicative of a panic stop, the system activates with optimal pressure for the shortest possible stop. Fortunately, this feature can be deactivated for spirited driving by turning PSM off or pressing SCP's Sport button.

From our brief time in the new 997s, it's clear this is more than a mere refresh. The new engines and PDK are advances of the kind one usually sees in an all-new model, not an update. Top speed is up by two mph in the Carrera to 179 and five mph in the S, to 187, which breaks through the magic 300 km/h. PDK beats the previous Tiptronic to 60 mph by a second *and* is 0.2-second quicker than the manual, pushing the Carrera to 62 mph in 4.9 seconds and the 997S to 62 mph in 4.7. Order the Sport Chrono Plus box along with PDK and times drop further to 4.7 and 4.5, respectively, thanks to Launch Control — nearly half a second faster than the manual! PDK does, however, trim one mph from the top speed of both 997s.

PORSCHE IS CONFIDENT **PDK WILL CHANGE THE WAY** WE AMERICANS ORDER OUR 911s...

Against Porsche's own figures for the first 997, the new Carrera has gained 45 pounds — largely due to its bigger brakes — to weigh in at 3,120. The S gains just 12 pounds to come in at 3,142. Adding the PDK system adds another 66 pounds, but that's better than the 88 pounds added by Tiptronics past. Would I go for the $4,080 PDK system? Only if I wanted a 911 without a clutch pedal. It's a *fabulous* replacement for the Tiptronic, but it can't match a manual for driving satisfaction.

Porsche, however, is confident PDK will change the way we Americans order our 911s. U.S. buyers clearly prefer 911s with manual transmissions, as only a third specify Tiptronic. Powertrain chief Neusser thinks PDK will narrow the gap to 50-50 in the States — more on par with European ordering habits. Whether he's right remains to be seen, but we suspect the latest 911 will sell well, even in a weak economy. Quicker and more efficient than its predecessor, it's business as usual. ●