By
Klaus-Eckhard Jost

Photos by
Becker Lacour

Technology

The Visible Cayenne

Porsche engineers use a unique mobile lab to develop safe electronic systems. These systems can be tested early under real driving conditions in the “glass Cayenne.”

Perfect view: Uwe Michael (below) and his colleagues have turned a Cayenne into a mobile lab

The Cayenne is known for exceeding limits and conquering new territory. But this silver sports SUV with the chassis number WP1ZZZ9PZ4LA46227 advances into completely new dimensions. The electronic specialists around Chief Development Engineer Uwe Michael have turned it into a rolling test lab.

At first, the plan sounded utopian: Michael and his staff wanted to make the electronics visible. Glass helped them get a better perspective—and to give the Cayenne a new kind of transparency, previously unknown among developers. After about eight weeks of model making, the glassy Cayenne was reality.

Large metal sheets had been cut out of the fenders and doors, and replaced with Plexiglas attached by Velcro strips, removable at will. The spoiler, too, is made of the transparent plastic. Opening up the interior was more difficult. For starters, all the seats except the driver's had to go, along with the paneling on the doors, the trunk and the instrument panel, as well as the carpeting and the insulation.

"We want to test the architecture early and efficiently," Michael says. "In this car, the engineers can reach the most obscure installation spaces any time, and very easily. That way, we can remove and re-install the components without too much effort." But more importantly, the interplay of the various systems can be tested at a very early stage of development. For this, the electronics development boss starts with a reduction program called "Architecture 2007+." That is an electronic ▸

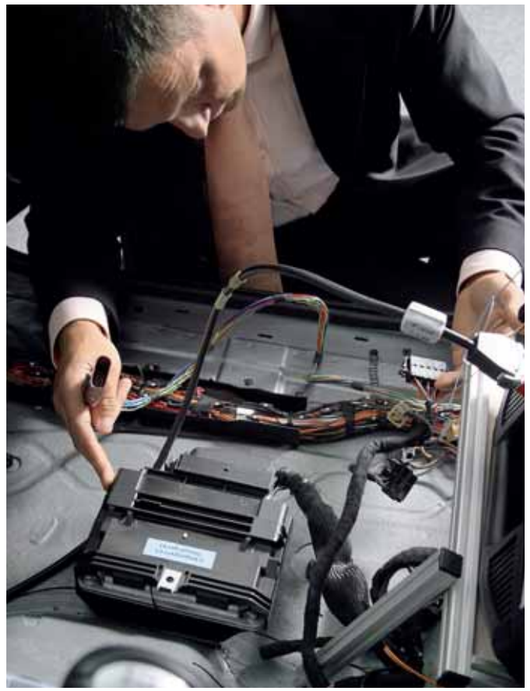
Networking: A mile and a half of cable winds through the insides of a Porsche—without networking, there would be four times as much

standard architecture using a maximum number of hardware and software modules for all production series and models. The assumption is that up to eighty percent of components will be identical, to ensure high quality and to contain costs. Architecture 2007+ is making its debut with the Panamera, Porsche's fourth production series, scheduled to come onto the market in 2009.

"Almost every function in the car is now electronically controlled," says Michael. Even such a classically mechanical component as the ceramic brake disc has an electronic wear indicator—and a list of such examples could be extended endlessly. So it's no surprise to hear Michael speak of over forty networked control devices with eighty computers, dozens of antennas and hundreds of sensors and servomotors in a vehicle. But the cable tree isn't growing at that pace, because a wire can carry more than one command at the same time. That keeps the total length of wiring in a Porsche down to about 2,500 meters—over a mile and a half—instead of the ten kilometers (six miles) it would need without networking. That reduces vehicle weight by 25 kilograms (55 lbs.).

"All control devices communicate with each other via the cables," says Michael. Making this cable network (CAN BUS) visible is at the top of the specifications list for the glassy Cayenne. Michael heads straight for the driver's door and flips a few toggle switches on a board next to the steering wheel. Right away, LEDs all over the car start flashing blue, red, green, and yellow. Mainly blue. "Everything that has to do with the drive CAN is blue," Michael explains. Green marks the Infotainment CAN—more or less the Porsche Communications Management (PCM) system, the instrument panel, and the phone. The so-called MOST BUS is yellow: that's an optical fiber that connects the audio components, the radio, the navigation system, the CD changer, the phone, and the amps with each other. The red lines indicate such comfort components as the door and seat adjustments, or the climate control.

This networking makes some astonishing things possible. Take the brakes, for example. The anti-lock braking system (ABS) control device calculates the best braking effect on the basis of ▸



Let there be light: Hundreds of sensors and servomotors send signals to control devices; communications made visible

information from the suspension damper control, the longitudinal and transverse acceleration sensors, the steering-angle sensors and the wheel rotation speed. The air conditioner works better when fed with data on outside temperature, vehicle speed, engine speed and solar heating.

Of course, the electronic components were also thoroughly tested before going into production in the past. But the networking test on the old CAN-Mobil were done only in the lab. Before every test, the test car had to be set for the respective production series. It couldn't record signals from the wheels or the engine, and it had a difficult time simulating the effects of such special demands placed on a car in everyday use as jarring, temperature variations, or atmospheric humidity.

The unusual silvery-gray Cayenne with the chassis number WP1ZZZ9PZ4LA46227 has not only become an important helper in the development of new electronics based on Architecture 2007+; it has already also become an admired object in its own right. It is displayed at special events, where it is examined with just as much interest as it enjoys "on the job" at the Weissach Development Center or at the production sites in Zuffenhausen and Leipzig.

A second see-through Porsche is already taking shape on the shop floor—for the After-Sales Department, too, has recognized its possibilities. Such a Cayenne can be useful for training technicians locally in areas other than the electronics—for it opens up all parts of a Porsche. ◂