Bright eyes

Most air-cooled 911s – as any owner will probably tell you – have pretty hopeless headlamps. Philip Raby finally had enough of the dark side and fitted a set of super-bright xenon lights to his 964 (above). Photographs by the author

Assemble a group of owners of pre-1993 911s and the one thing they're bound to agree on is that their cars' headlamps are, well, next to useless. Although the power of the bulbs has certainly increased over the years, the 911 used basically the same H4 headlamps from 1963 right the way through to 1993. After that the 993 and more recently the 996-model cars had much-improved reflector-type headlamps.

By current standards even the H4 units leave a lot to be desired – especially in a car as quick as a 911 – and so I decided to replace my Carrera 4's standard bulbs with HID (high-intensity-discharge) xenon units.

Xenon headlamps have become a common sight over the last few years, with most manufacturers (including Porsche with its Litronic system; see page 96) offering them as an extra-cost option. The lamps' distinctive blue-white output is unmistakable.

A conventional halogen lamp has a filament that heats up and glows when a current is passed through it – just like the mains-voltage bulbs in your home.

Xenon lamps, on the other hand, work in a quite different way. The glass bulb is filled with a mixture of xenon gas and halide salts. By means of a very high start-up voltage (typically 23,000 volts) an electrical arc is created between two electrodes. This first vapourises the salts, and then causes the gas mixture to ignite. The bulb then requires a much lower voltage in order to keep the arc burning.

Because there's no filament to burn out, xenon bulbs last around 10 times longer than halogen ones. More importantly, though, they give a far brighter light, while at the same time drawing less current and generating less heat. The CAAT Ultravision kit that I fitted (see panel, left) is claimed to give three times more light than the original H4 bulbs, while drawing just 35 watts, as opposed to 60 watts for a halogen bulb (see sidebar on page 97).

The *quality* of the light is quite different, too. A halogen lamp has what is known as a lower colour temperature (around 3200 kelvin; see page 98) and gives a very warm light. It looks yellow, in other words; again, something like a household bulb.

A xenon bulb, on the other hand, has a colour temperature of 4100 kelvin, which is

How much?

The CAAT UltraVision kit for H4 headlamps (as fitted to pre-1993 911s, and all 924s, 944s and 928s) costs £590 (all prices include VAT). For the later H1 lights fitted to the 993-model 911 the cost is £490. Kits for the 996 and Boxster also cost £490. Details from CA Automotive Technologies Ltd; tel: 01252 792572; fax: 01252 793344; enquiries@ca-automotive.co.uk; website: www.h-i-d.com. ■

Xenon bulb assembly (in author's hand) is about 30mm too deep to fit inside the standard 964 headlamp bowl, and is substantially larger than the original halogen bulb, the rear of which you can see still installed here in the glass headlamp unit on the right

much closer to noon daylight (typically 5500 kelvin). It's a far whiter light, in other words. This is closer to what human eyes are used to, and allows you to see your surroundings in their natural colours, even at night.

The CAAT Ultravision bulbs are claimed to be unique because they replace both the dipped and main-beam filaments of the halogen bulbs. The xenon bulbs have just a single power output, with a motorised reflector that swivels around the lamp when you switch from main beam to dipped, thus altering the apparent output and beam pattern.

The CAAT kit comes with everything you need to install it. For each xenon bulb there's an igniter (to generate the high trigger voltage), a ballast unit (to maintain the constant voltage after ignition) a high–low beam controller and, no less crucially, all of the necessary wiring and connectors.

And it's all 'plug and play', so you don't have to cut or otherwise alter the car's wiring loom, which is good news if you sell the car and wish to keep the xenon headlamps for its replacement.

Despite this apparent ease of fitting, though, I soon discovered that installing the system in my 964 wouldn't be quite as simple as I'd hoped. The xenon bulb assemblies are slightly deeper than the original halogen items. About 30mm too deep, in fact, to fit in the space behind the headlamp unit.

The problem is that the headlamp bowl (which is actually part of the car's wing) has a flat back, not dished as in earlier 911s (which, incidentally, have plenty of room for the lamps, as do both the later 993 and 996 models and the Boxster).

In search of a solution I contacted my local independent Porsche specialist, Autofarm (see panel on page 98), which is a stockist for CAAT Ultravision. There I spoke to Jack Phillips and Andy Fearns who had recently fitted a kit to a 964 RS.

The solution, they suggested, was to drill a 65mm-diameter hole in the back of the headlamp bowl and then fill it with a rubber cap. The cap's a Volkswagen item designed to fit on top of the rear dampers in the boot of a Mark I Golf. A trip to my local VW dealer secured me a pair of these (part number W171 512 135) for just £3.95 each plus VAT.

Now for the fun bit. Armed with a 65mm hole-cutter and an electric drill I was ready to attack my precious Porsche. Before I started, though, I had a rare cautious moment and decided to remove the front wheelarch liners, just to make doubly sure that there was nothing vital behind them.

Just as well, too. Half an inch behind the left-hand bowl resides the electric water pump attached to the massive reservoir for the windscreen washer (Autofarm's RS would have had a much smaller and lighter container, safely out of the way within the luggage compartment). I undid the two bolts holding this in place and managed to move it back far enough to be out of the way of the aggressive hole-cutter.

In the right-hand wing I found that a bracket holding the horn for the original fac-

Rubber cap from the rear damper from a Mark I Golf is ideal for creating (dry) extra space at rear of headlamp bowl in order to accommodate special xenon bulb

Xenon phobia

When I posted a message on the Rennlist Porsche-enthusiast boards (www.rennlist.com) commenting on xenon headlamps, I received a number of answers from people who don't like the new technology. Xenon lights on oncoming cars were dazzling, they argued, and so potentially dangerous.

It's interesting to note that similar complaints were made against halogen headlamps when they first came into general use over 20 years ago. It's been suggested, therefore, that oncoming drivers are being drawn towards the unusual headlamps, and so notice their increased brightness. But once xenon lamps become more commonplace drivers will become accustomed to them, and shouldn't have a problem.

Meanwhile it's important to ensure that your headlamps are correctly adjusted if you are running xenons (or even ordinary H4 or H1 lights, of course), and to remember to dip them in good time when you see an oncoming road user. And that includes pedestrians and cyclists as well as other motor vehicles. ■

Light option

Porsche's current model range has the option of factory-fitted xenon headlamps, which the company terms Litronic.

Standard on the 911 Turbo (above), Litronic headlamps work in a similar way to the CAAT kit. They have a single xenon bulb with a moveable baffle that switches between main and dipped beam – a system sometimes known as bi-xenon.

In addition the headlamps are self-levelling to reduce the risk of dazzling oncoming traffic, and also include a high-pressure cleaning system.

The lamps on the Cayenne Turbo feature a further refinement – Dynamic Cornering. In essence this means that as the car turns in to a bend so the lights swivel to attempt to give advance warning of any unseen hazard.

Litronic headlamps are a £626.28 (including VAT) option on the 911 Carrera and Boxster, and £789.71 on the Cayenne 'S'.

If you're about to order a brand-new Porsche this is one option that is certainly worth considering. ■

Hole-cutter needs to be suitable for cutting steel – the average DIY tank cutter simply won't be up to the job. This one made short work of the headlamp bowl, removing a neat steel disc (right)

tory alarm system was welded to the rear of the bowl, which meant that I would have to drill my hole very slighter lower than I might otherwise have done.

Once the holes were made I cleaned up the rough edges with a file and painted them to stop rust forming. As Autofarm had promised, the rubber caps fitted the holes perfectly, but the one on the left-hand wing fouled the aforementioned washer reservoir.

I figured that the main use of the cap was simply to form a neat edge to the hole, and it didn't need to be watertight. After all, there are the plastic wing liners and there are other electrics (including indicator lamps, horns and washer motor) under the wings, and all appear to be clean and free from corrosion, even after 14 years.

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Cutting the top off the rubber cap created a grommet that fitted into the hole and created an ideal route for the wires to run through. Photo below shows the left-hand bowl, and you can just see the headlamp washer pump behind the hole

You watt?

Electricity can be compared to the flow of water in a pipe. Voltage (named after the Italian physicist, Alessandro Volta) is effectively the 'pressure' of the electricity; the higher the voltage, the more force it has. More specifically, it's the potential difference between the positive and negative terminals on the battery.

Current, which can be likened to the rate of flow of the water, is measured in amps (after the French physicist, André-Marie Ampère). Resistance, measured in ohms (in honour of the German physicist, Georg Simon Ohm), can be thought of as the diameter of the pipe. The bigger the bore, the more easily water will flow through it.

Flowing water has power – try sticking your finger over the end of a garden hose. Electrical power is measured in watts (after the Scottish inventor, James Watt). In order to achieve more electrical power you need to increase either the voltage or the current. In other words, power equals voltage multiplied by current; conversely, you can work out the current in any given circuit by dividing the power (in watts) by the voltage.

The voltage from your car battery is fixed at 12 volts, so you need to increase the current to achieve more power. But the amount of current a circuit can draw is limited by the resistance of the wires. Which is why heavy-duty circuits (such as that for the headlamps) use thicker cables – the equivalent of large-bore water pipes.

When you turn on the lamps the dashboard switch handles only a relatively low current to operate a relay. The switch circuit activates a solenoid which in turn completes the circuit for the lamps themselves. Thus you don't need heavy-duty switches and thick cables running up to the dashboard. ■

Ballast boxes (left) fitted inside the luggage compartment and were neatly covered by the loose-fitting carpet (right)

So I cut the top off the cap, effectively turning it into a large grommet, and secured the resulting rubber ring into the hole using silicone sealant. This not only avoided the clearance issue, but also created an excellent route for the wires for the xenon headlamps, so I did exactly the same for the right-hand cap, too.

The next step was to find places for the various boxes of electronics (three for each lamp), and then to link the various cables together. Again, though, this wasn't quite as straightforward as I'd expected.

The problem was that the cables were all rather too short, which meant that all of the components had to be mounted within about 30cm of each other. And each box needed a flat surface to which it could be secured with double-sided adhesive tape.

After much experimenting with different configurations I mounted the large ballast box in the luggage compartment, on the sides of (for want of a better term) the chassis members. The smaller igniter and control units (one each per side) I mounted on the outside of the same chassis members, beneath the wings.

I was able to run the cables through the inner wings using existing grommets and holes. All the cables had the correct connections to plug straight into the car's existing headlamp leads, and it took a matter of minutes to connect everything up.

The final job was to run fused power cables from each ballast box to the car's battery – a straightforward task since the battery is also in the luggage compartment.

Then the moment of truth. I turned on the headlamps, and everything worked precisely as it should. And why not? There's really no way you can get the connections wrong.

One minor problem I found, though, was that when I turned on the lights the ABS warning lamp would come on, too. This puzzled me, but after I'd made some enquiries it turned out the problem was caused by a voltage drop when the xenon system first ignites. Other 964 owners may have experienced a similar problem when the ABS light takes a minute or two to extinguish when first driving off. It's very sensitive to voltage, and if either your battery or charging system isn't up to scratch it tells you in no uncertain terms. The solution in my case was to fit a new battery – obviously the old one was past its best.

Out in the dark, the difference really is phenomenal. The headlamps really are superb now. And just how many air-cooled 911 owners can honestly say that? ■

Control and igniter units (see text) are located inside the front wings – an area that's kept clean and dry by the plastic wheelarch liners. Photo above shows the view under the left-hand wing

Take care!

XENON HEADLAMPS OPERATE AT very high voltages. The currents involved are relatively low, but you could still receive a nasty shock, so ensure that the headlamps are turned off before you tamper with any of the wiring. And when fitting the system don't finally connect the power cables to the battery until everything else is linked up. ■

Temperature control

So-called white light is a mixture of wavelengths. It can be broken down into its constituent colours with a prism or, more dramatically, by droplets of rainwater to form a rainbow.

But 'white' light varies a lot depending upon the wavelengths making it up. Daylight is at its whitest around noon, and becomes progressively more red as dusk approaches. Midday light on a cloudless day is extremely blue, while domestic tungsten lamps contain a lot of red light.

The human brain can to an extent compensate for these different colour temperatures, which is why we can walk from a bright sunny day to a tungsten-lit room without noticing too much difference. Photographic film, on the other hand, can't do this, which is why photographs taken under tungsten light appear very orange unless either special film or a filter is used.

Colour temperature is measured in kelvins (after William Kelvin, the British physicist). The higher the number, the bluer the light. The extremes are candlelight (1930K) and noon daylight during the summer (5500K). ■

Thanks!

THANKS TO ROY CARVALHO OF CA Automotive (see page 95) and also to Jack Phillips and Andy Fearns of Autofarm for their help in producing this feature. Oxfordshire-based independent Porsche specialist Autofarm can supply and fit xenon bulb kits. For details call 01865 331234; fax: 01865 331666; e-mail: porsche@autofarm.co.uk; website: www.autofarm.co.uk. ■