

# Halogens or HIDs

## Watt Driving Lights for You

**We all know that auxiliary lights are necessary for safe night driving on bush roads, but do you need to spend up on HID lights or are halogens good enough?**

The black art of lighting up bush roads has produced a dazzling array of add-on equipment, which makes selecting a pair of night-vision aids quite a business. The reason for buying after-market lights should be to enhance standard 4x4 headlight penetration, which is inadequate for driving on



Australian country roads. However, as happens also with the purchase of wheels or tyres, appearance often influences the buyer, rather than performance.

Our laboratory and real-world light tests over the years have shown that price isn't a reliable guide to light performance, because many of the most expensive lights on the market have performed ordinarily, while some of the cheaper ones blazed brilliantly.

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The most confident light makers have supporting literature that shows approximate light patterns on the road surface and pattern distances in metres. However, even such diagrams can be 'fiddled' because light intensity is very difficult to quantify.

By far the most popular auxiliary lighting choice of 4x4 owners is a pair of round spotties, but there's not much point settling on a pair and then discovering they won't fit your bar. Vehicle registration authorities in some States are policing light fitments that project beyond the front profile of the vehicle or the 'roo bar.

The aim of this is to ensure that there are no sharp projections that could harm pedestrians in a collision, so if you want to stay within the letter of the law and be a good 4x4 citizen, you should ensure that your new lights fit within the bar profile. The top of a light may project, provided it can bend back freely within the bar profile in the event of a pedestrian impact.

Another fitment factor is the need to adjust and tighten lights when they're in position on your bar. Make sure you're going to be able to access the adjustment nuts or cap screws once the light is in place.

Bearing in mind that most State and Territory rules now insist that spotties tuck inside the 'roo bar envelope, most buyers finish up with a pair of round lights with diameters from 150mm up to 230mm.

Most light makers recommend a pair that combines a pencil or 'spot' beam light for maximum distance illumination and a spread beam, to light up the road edges.

Another arrangement preferred by some is a pair of pencil beams and yet another combination is a pair of spreads.



## What is a 'Halogen' Light

**The great advance of the halogen bulb is the fact that it's pressure filled with an inert halogen gas that greatly reduces the amount of 'evaporation' from the filament.**

In any incandescent bulb, electricity passing through a thin filament causes it to glow: the higher the temperature, the brighter the bulb. However, during the process, atoms of the wire fly off, so that the wire decays to the point where it burns through or breaks.

In a conventional bulb, such as most taillight globes, the atoms deposit on the inside of the glass, eventually clouding the bulb and reducing its output.

The great advance of the halogen bulb is the fact that it's pressure filled with an inert halogen gas that greatly reduces the amount of 'evaporation' from the filament. In addition, the gas forms a tungsten halide compound with the few atoms that do break away from the filament. This halide returns to the filament, breaking down to its original components of tungsten and halogen gas, thus improving the life of the bulb and eliminating clouding. That said, the halogen's 'hot wire' process is still only five percent efficient, with 95 percent of the electrical input being shed as heat.

The halogen bulb will wear out, through the effects of filament degradation, vibration and the extreme heat of the bulb: around 400°C. Rough roads, poorly installed lights and clear plastic light covers used at low speeds, where there's insufficient cooling airflow, all contribute to shortening of bulb life. In bush-travel conditions, a halogen 55W bulb may last for only 200 working hours, but a 100W bulb for as little as 50 hours.

## What Watts

If vehicle lights were similar to household lights wattage would be the main indicator of brightness, but vehicle lights differ in a very significant way from house lights. When you buy a new globe for your house, you don't expect it to be 'directional', unless you're buying outside spotlights or indoor 'down' lights.

Vehicle lights need to be directional, in a precise way, and that's where the science comes in. This directional component comes from the reflector finish and shape and, in the case of most spread beams, from the lens fitted to the front of the light.

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A pencil beam usually relies solely on reflector shape and finish for beam direction, and has a plain lens.

Spread-beam lights used to rely totally on shaping of the lens - fluting or bars moulded into the glass - to bend the light from the reflector into a shorter, but wider shape. However, there's an increasing trend to use free-form reflectors to shape the beam spread, through a clear lens.

Free-form headlights are now the standard offerings in most new 4x4 vehicles. Fashion dictates that modern headlights have clear lenses, so the reflector has to do all the beam shaping.

That technology has now moved from headlights into spotties.

A relatively recent development in halogen globes means 65-watt-powered IPFs can match many 100-watt models. HID lights typically use 35-watt globes, yet outshine most 100-watt halogens.

## Lab Testing

At Outback Travel Australia we regularly check out different lights and periodically we use Narva's Melbourne light laboratory to measure actual performance. This lab has a light stand at one end, a white wall at the opposite end and in between, the floor, ceiling and walls are covered with dark, non-reflective surfaces. The height and width of the white wall represent the common limits of long-distance and spread-beam lighting.



For a power supply we use a new calcium battery, connected to an electronically controlled charger that delivers a constant 13.8 volts. We settled on this charging level, because it's typical of vehicle charging system voltages. A new battery has an open circuit voltage of 13.2 volts and the charging circuit voltage must exceed that for current flow.

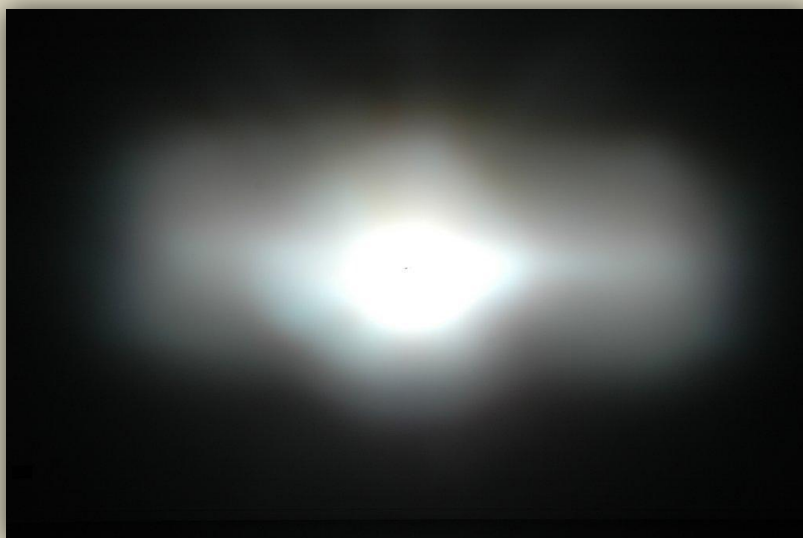


The lights are connected to the battery, using the light manufacturer's loom where provided and we check battery voltage before each test.

From our experience with measuring laboratory light patterns and relating those patterns to real-world conditions we know that the best pencil beam lights have a large 'hot spot' in the centre of the combined-light beam, with little diffusion into the bands of lesser intensity.

The best spread-beams show flattish concentrations of light around a shallow-oval centre, fanning out to at least 10 degrees either side of centre.

Less effective pencil beams have a wider diffusion of light, with a smaller central hot spot, while some wide-spreads spray light over a very wide angle, losing intensity in the process.



## Halogen Light Test Summary



Of the lights we've evaluated over the past two years the budget 'buys' are Narva Ultima 175s and KCs, but some KC models come with 130W globes that are overkill for the reflectors and optics. We'd downsize the power to 100W.



The old-design Cibie Super Oscars are a bargain if you can pick up a pair for \$350.



Around the \$400-\$450 mark the decision is tough, but the best combination beams for on-road bush driving are the IPF 900XS and the Narva Ultima 225.

Lightforce's new Genesis should make an ideal low-speed, bush-track night light, because it has a good hot-spot beam centre and by far the widest spread.

The Narva Extreme is in a price category of its own, for those who need tool-free, positive beam adjustment and rugged construction.

## HID Lights

High Intensity Discharge lights are the brightest stars in the 4x4 lighting galaxy. We know that LED (light emitting diode) headlights are the newest techno craze, but for the moment at least the brightest choices in the 4x4 lighting arena are gas discharge bulbs.

These HID (high intensity discharge) lights are automotive equivalents of the household fluorescent tube, which is 20 percent efficient and almost everlasting. In contrast, the best halogen globes are around five percent efficient; with most of the electrical input being dissipated as heat.

HID lighting technology replaces the filament of the light bulb with a capsule of gas. The light emanates from an arc discharge between two closely spaced electrodes that are hermetically sealed inside a small quartz glass capsule.

(For the atomically literate, light is produced by passing a current through a metal vapor. Free electrons colliding with an atom in the vapor momentarily knock an electron into a higher orbit of the atom. When the displaced electron falls back to its former level, a quantum of radiation is emitted. The wavelength of radiation depends on the energy zone of the disturbed electron and on the type of metal vapor used in the arc tube.)



To operate, HID lights require high-voltage ballast units that supply and maintain high voltage and control the current. All first-generation HID lights had externally-mounted ballast units – usually fined aluminium boxes – but new-generation HIDs have internally-fitted ballast units.



The amount of light produced is greater than from a standard halogen bulb, while the HID globe consumes less power and more closely approximates the 'color temperature' of natural daylight.

Light engineers talk of colour temperature in Kelvin units. It's not important to understand the basis of the rating, but the comparative levels indicate why HID lights are brighter than conventional lights.

The typical colour temperature of a standard incandescent globe is less than 3000 Kelvin; a halogen globe falls into the 3000-4000 Kelvin range and HID lights exceed 4000 Kelvin.

HID lights have globes with wattages that are much lower than halogen lights. A typical HID globe is only 35W, compared with the average 100W for halogen driving light globes. Because the HID globe has no wire filament it's much more durable than a conventional 'hot wire' globe and should last at least 2000 working hours.

Although it produces useful output when first ignited, an HID light requires a few seconds to come up to full output. In addition, if power to the lamp is lost or turned off, the arc tube must cool a little before the arc can be re-struck and light produced. We observed this 'warmup' phase in the HID lights we tested, as the light 'temperature' rose and the colour of the light changed.

In summary, HID lighting has three key advantages over conventional halogen primary lights: more light output, whiter light and longer service life. The main disadvantage is cost, but prices are falling steadily.

## HID Light Evaluation



There's around \$1300 price difference across the HID driving light spectrum, so little wonder there's a wide performance difference as well.

All HID lights are brighter and whiter than the halogens, but in the sub-\$1000 segment the KC 4000 Series and Ironman Supernovas concentrate more on distance than spread.

A reasonable combination pair for on-road bush driving at the 'cheap' end of our HID test line up was the Nite Stalker 200 kit, but the best overall performer for less than a grand was the Piranha Cat pair.

In the \$1200-\$1300 range Narva's Ultima 225 and Extreme did battle with Lightforce's new Genesis.

The Narvas had a good combination of penetration and spread, making them ideal for on-road bush driving.



The Lightforce units seemed to be more specialised, with a very bright central spot and an extremely wide spread beam that wasn't as bright as its competitors', but looked ideal for bush-track night drives.



At the top-shelf end of the HID light market IPF 900XS HIDs give a very bright centre spot and very bright, controlled spread.

With their 75W globes the KC 9560 pod lights are the brightest lights we've ever seen in the laboratory and although the spread beam has excessive scatter there is still plenty of brilliance.



For detailed reports on our long-term testing of [Narva](#) and [Hella](#) HID lights, click on the links in this box or see the separate headings under 'Lights' in the 4WD Modifications Menu.