

# Switching on to LEDs

If you want to cut your battery power usage but are unsure about converting your boat to LED lighting, here's what you need to know

WORDS AND PICTURES BY **RICHARD HALL**

**F**rom the early days of LEDs (Light Emitting Diodes) the promise of illumination by LEDs seemed to be an unachievable dream. But with the outset of the present technology in the mid-1990s the dream of LED lighting appeared to be just a matter of time.

Early boat versions of LED replacement

bulbs started to become available in 2004 and were supplied to the general leisure market for use on boats, caravans etc, but time quickly showed them to be inadequate for the purpose.

The primary problem with the early LED bulbs was the use of simple 'Voltage Regulators' (or just current limiting resistors)

within the bulbs which do not withstand the fluctuating supply from the boat's charging system – nor the high voltage spikes generated by alternators or whenever pumps, electric fridges, inverters etc are turned on/off.

The next generation of LED bulbs for the leisure market incorporated 'automotive' drivers designed to withstand the charging system in vehicles – unfortunately vehicles do not have the same heavy duty electrical equipment commonly found on boats and hence do not need to be tolerant of such a harsh electrical environment.

Many comments on canal web forums mention that they have a bank of leisure batteries which should remove any voltage fluctuations – if only it were true. Yes, the battery bank will supply large surges of power whenever required, however a battery is very slow to respond and does not even 'see' the short duration voltage spikes and hence has little or no damping effect on them. In the old days many of us might remember having to get suppressors fitted to our car alternator or ignition system to stop the crackling on our new car radio – the car battery does not remove the voltage spikes, nor will it on a boat.

The highest level of 'ruggedness' for boats especially, is the 'Protected' LED bulb which incorporates a voltage spike suppressor and a thermal safety fuse to prevent any possible risk from overheating (and hence fire risk). LED bulbs without this level of protection may not be fit for purpose – I have had many reports of suppliers suggesting that failed LED bulbs 'must have been hit by voltage spikes' and therefore cannot be replaced under warranty. If these suppliers are advertising that their bulbs are replacements for lights in boats, then they should be returned as 'Unfit for Purpose' – a good guide is to ask for LED bulbs that are 'protected from voltage spikes' to ensure your LED bulb will last the course.

### WHY CHANGE TO LEDs?

On average an LED bulb will use about 90% less power than an incandescent bulb – for the same light output. This in turn means you will save battery power which



LEDs can be fitted almost anywhere...

These units will happily replace the 'standard' Bulkhead light, below



means less engine running to recharge the batteries. Fewer hours burning fuel and emitting fumes to the environment, less wear and tear on the engine, alternator, batteries etc and longer periods between services from the fewer hours clocked-up running the engine.

Furthermore, LED bulbs are often rated to last 50,000 hours which equates to approximately 25 years if used for five or six hours every day. The 50,000 hours predicted by the manufacturers is the time predicted when the light output has dropped to 70% of the original brightness – thus, as long as the other electronics last the duration, the

bulb should still be working, albeit not quite so brightly.

**COMPARING LED BULBS:**

Many suppliers of LED bulbs quote the number of LEDs (or points) to quantify the brightness of the bulb – this can be misleading because modern LEDs can have clusters of single LEDs within each 'point'. The only realistic comparison is the Lumens specified, but whoever heard of a Lumen (a measure of the total 'amount' of visible light emitted by a source) before now? A better rough guide is to look at the Wattage of the LED bulb – the higher the Wattage the

higher the brightness should be.

Another useful guide is to replace existing incandescent bulbs with LED bulbs of 1/10th the power (in Wattage) – as an example, the common BA15D car type 21-Watt bulb would need at least a 2-Watt LED bulb to achieve the same amount of light.

**CHOOSING THE CORRECT LED BULB**

For most boat light fittings there are LED bulbs available from many suppliers, but the correct LED bulb requires a little detective work. One of the most common fittings is the 'Bulkhead' light, mostly fitted with a single- or dual-contact car type BA15D bulb; the obvious replacement would appear to be an LED Tower bulb. Unfortunately on an LED Tower bulb, half the light is shining upwards or sideways and is reflected back onto the bulb and is hence lost. A better solution is to imagine a flat surface with all the LEDs pointing downwards in the direction they are required – specialist Protected BA15D-15L bulbs are available for exactly this purpose and offer a lot more light than the common 21-Watt car bulb while consuming just three Watts.

For table lights and wall lights, which are surrounded by glass or translucent shades, you should opt for the Tower style bulbs which shine light in 360 degrees as well as ▶

## BACK CABIN: LED LIGHTING



A single 6W LED tube, left, outshines three fluorescent 8W ones, right



from the top – ideal for Tiffany and Oil Lamp style fittings.

For wall mounted spotlights (with a metal shade) go for bulbs that have all the LEDs facing away from the connector as shown in the photograph below. These are often called vertical types and have the connection pins on the back. Other LED types available include the MR11 and MR16 standard bulb footprint.

Recessed ceiling lights commonly use the small G4 capsule bulb and should only have a maximum 10W rating to avoid any fire risk. Some fittings are rated on the back as 20W but this is only when surface mounted (with

appropriate mounting ring) – in all domestic and commercial cases these specify that they should not be fitted within 50mm of combustible material and should have adequate free air ventilation of 75mm.

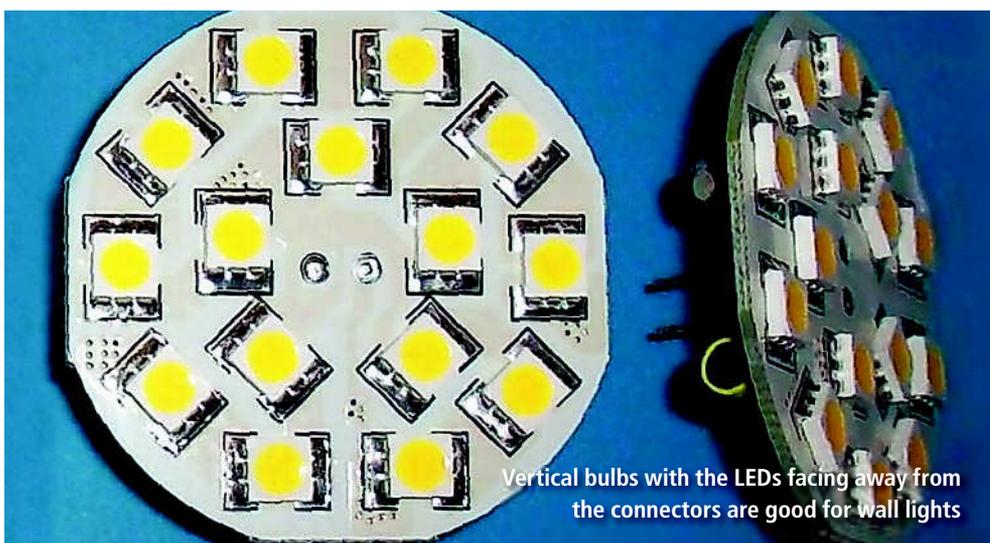
Unfortunately, the marine market is not subject to these regulations and some people ignore the warnings supplied with each fitting; it's worth talking to your builder if you are having a boat built. However, converting these fittings to LED is both energy saving and eliminates any possible fire risk from overheating bulbs/fittings.

### FLUORESCENT LIGHT CONVERSION:

Even the ubiquitous fluorescent tube can be replaced with LED tubes – this is a good investment in so far as the LED version should last 25 years or so and a single 6W

LED tube will be brighter than three 8W fluorescent tubes. In all cases the high voltage driver (some call it a ballast unit) needs to be removed or bypassed, but this is relatively simple and can be done with just a little DIY skill. The high voltage driver board is also a common point of failure and hence a 'dead' fluorescent unit can be revitalised by conversion to an LED tube. The picture above shows a single 6W LED tube on the left out shining three 8W fluorescent tubes on the right.

Any light fitting can be converted to low voltage LED bulbs including standard 230v wall, ceiling and table lights from your DIY store. In most cases it is simply a case of removing the mains plug and fitting an LED adaptor before inserting the relevant LED bulb – the fitting is then ready to be connected directly to your 12v or 24v system. Adaptors available include BC (standard domestic bayonet), GU10, SES (small Edison Screw) and ES (standard Edison Screw) which cover the majority of light fittings available on the high street. 



Vertical bulbs with the LEDs facing away from the connectors are good for wall lights

RICHARD HALL HAS been involved in electronics since his apprenticeship back in 1968. His involvement with narrowboats started with regular boat trips in the mid-80s leading to his first liveaboard in 1996, which led to the diversification into LED lighting for boats. He set up Bedazzled ([www.bedazzled.uk.com](http://www.bedazzled.uk.com)) to support and supply marine LED lighting in 2005.