Reviewing the RETRO 2

*A LED upgrade for Oldham and Speleo Technics headsets has been launched by the Mine Explorer Society. **Mike Bedford** tries it out and reports on his findings.*

Cave lighting has undergone a sea change in recent years with the introduction of LED-based lamps from several manufacturers. On offer are longer battery life and/or smaller and lighter batteries, a broader angle of illumination, and light which is closer in colour to that of sunlight. However, many of these new lamps are by no means cheap. Taking this into account, together with the fact that many cavers still have perfectly serviceable tungsten filament lamps, it's not hard to see why they haven't been adopted universally. The *RETRO 2* aims to overcome this reluctance to change by offering a lower-cost alternative. As a £75 upgrade for fitting into either an Oldham or a Speleo Technics headset, the *RETRO 2* allows owners of these conventional caving lamps to take the plunge for less than the cost of buying a new LED-based lamp. Here I review the *RETRO 2* looking at its specification, how easy it is to install, and how well it works underground.

Features

Various tables and graphs are shown later for the more technically-minded. To set the scene, though, here are the most important details.

The RETRO *2* uses a pair of 1W Luxeon white LEDs which, reportedly, have a greater combined light output than the single 3W Luxeon LED used in the Speleo Technics *Nova 3*. Four brightness levels are available (selected by turning the power switch off and back on again within one second) giving 13lm, 46lm, 67lm and 90lm respectively, compared to 48lm for an Oldham lamp with a 3W bulb. A series of bleeps is used to indicate the mode (which the *RETRO 2* remembers when it's switched off) when the unit is switched on or when the mode is changed. In mode 2 – the closest to the brightness of an Oldham lamp – the battery life is 51 hours with an Oldham battery pack, compared to 21 hours for an un-modified Oldham.

The *RETRO 2* features both a low-voltage and an over-heating alarm.

Because of its low power rating many cavers will prefer to use the *RETRO 2* with a smaller battery pack. The use of a voltage converter means that it can be used in conjunction with any battery from 1.0V to 7.0V although it won't operate at full brightness below 1.3V.

Installation

According to the instructions, installation requires only a small flat-bladed screwdriver and should take under ten minutes. The instructions are perfectly clear and it took me no longer than this to upgrade an Oldham lamp. On the basis of my experience, I would say that fitting the *RETRO 2* is well within the capabilities of any caver, not just the electronics enthusiast. And if you want to know what you're letting yourself in for before buying a *RETRO 2*, the box on the next page illustrates the main steps.

Having said that, there is one amendment I would suggest to the instructions which applies to anyone upgrading a full Oldham lamp (battery and all), as opposed to just a headset. Having seen someone blow the fuse on an Oldham battery pack by carelessly poking around in the headset with test probes, it occurred to me that a screwdriver is equally capable of causing a short. Anyone's hand can slip so I would recommend removing the reflector, main bulb assembly and pilot bulb holder and attaching the *RETRO 2* PCB only while the fuse is removed or one of the battery terminals disconnected.

In Use

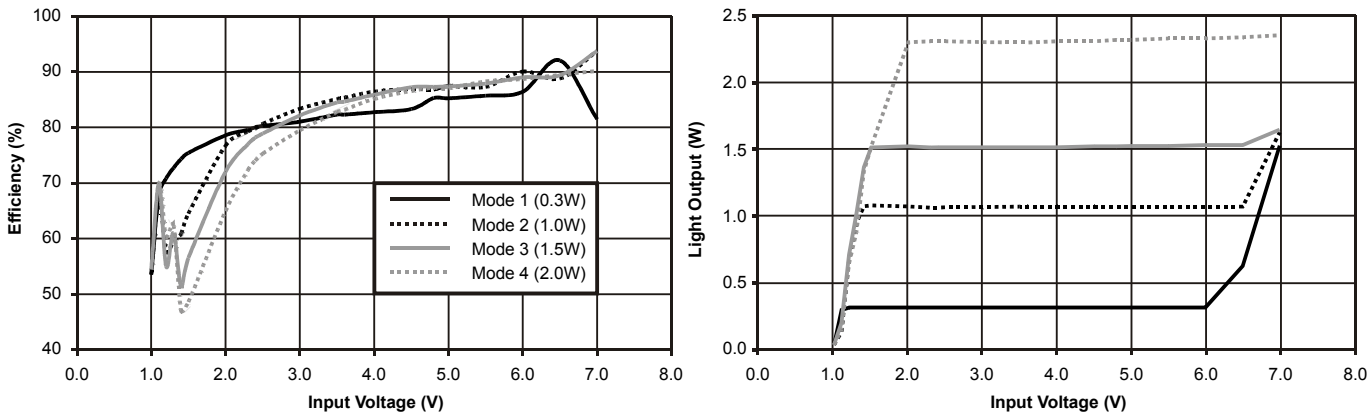
Underground tests were carried out in typical walking passages around a metre wide and two metres tall. It wasn't used in a large chamber where its higher power modes would be most useful. To provide some comparisons, a conventional lamp and two other LED-based lamps, a Speleo Technics *Nova 5* (originally called just the *Nova* but now referred to as the *Nova 5* to differentiate it from the more recently launched 3W *Nova 3*) and the 14-LED version of Speleo Technics *FX-LED* were also used on the trip. Of these two comparison lamps, only the *Nova 5* has, like the *RETRO 2*, multiple brightness modes.

All four brightness modes provided sufficient illumination to be able to cave safely although mode 1 is definitely dim and would make caving slow and tiresome. It's probably best to consider this as a battery saving mode for use while you're not moving or, for emergencies, if your battery life is low. Mode 2 provides perfectly acceptable illumination and is the mode I would choose for normal use. Modes 3 and 4 appear very bright although, in common with all current LED-based lamps, they still don't offer the penetration of a 3W filament bulb at distance.

Turning our attention to brightness comparisons, I placed the *RETRO 2* slightly behind the *Nova 5* with both units set to their maximum brightness. Another caver placed them in the reverse order suggesting that, on balance, they are probably similar. In fact the *Nova 5* produces 100lm of light (i.e. slightly more than the RETRO *2*) and the perceived differences are probably due to differences in the angle of illumination and the colour of the light. In fact the *RETRO 2* has one of the narrowest illumination angles of any LED-based lamp I've seen although it's still far broader than that of a filament-based lamp. The colour of the *RETRO 2* is the blueish white which is typical of most white LEDs compared to the *Nova 5* which has a decidedly greenish tint. In mode 2, the RETRO *2* is appreciably brighter than the 14-LED *FX-LED* at its single brightness setting.

Ergonomically, the method of mode changing and switching on and off the *RETRO 2* seems far more intuitive than that of the *Nova 5*. This was a criticism of the *Nova* when it was first reviewed in these pages (Gibson, 2003).

Finally, because of its relevance to rescue teams and people involved in cave radio experimentation, tests were carried out to determine the degree of interference caused to *HeyPhone* communication. This was in response to reports that some rescue teams had experienced difficulty using the *HeyPhone* in the vicinity of a *Nova 5* due, presumably, to its micro-controller and switched mode power supply. In marked contrast to these reports, we found that the



Efficiency and Light Output vs. Input Voltage (Data Supplied by Manufacturer)

Nova 5 only produced significant interference to the *HeyPhone* when placed within about 100mm of either the unit itself or one of the leads to the earth electrodes. Placing the lamp adjacent to the microphone or microphone lead produced no interference which means that someone wearing a *Nova 5* headset would not experience interference while using a *HeyPhone* normally. However, the *RETRO 2* performed even better in this respect. No interference was detected, however close the headset was place to the *HeyPhone* or its antenna leads. On a related topic, you may be interested in an item in this issue's *We Hear* column (Bedford, 2006).

Oldham headsets are not very waterproof – even with the O-ring provided as part of the *RETRO 2* kit – and a circuit board packed with electronic components is much less tolerant of a dowsing than a pair of tungsten filament bulbs. I therefore took heed of the manufacturer's recommendation and didn't try immersing the headset as part of my evaluation. Immersing the headset will invalidate the warranty and the user is instructed to turn it off immediately, dismantle and dry the headset if the chamber should become flooded.

The Bottom Line

Despite the advantages quoted for LED-based lamps, some are subjective and not universally appreciated. Some people find the whiter light (compared to a filament bulb) too cold and also prefer the narrow spot of a conventional caving lamp easier to use than the broader, flatter illumination provided by a LED-based lamp. So, before taking the plunge, if you've never used a LED lamp, try one out before you go any further. It doesn't have to be a *RETRO 2* as nearly all LED-based lamps share these properties.

Thinking specifically about the *RETRO 2*, the main reservation I have concerns the waterproofing or, more accurately, the lack of it. This is a criticism, admittedly, of the Oldham headset into which it is fitted, rather than of the *RETRO 2* itself, but it still impacts on the usefulness of the product. This is an inherent limitation of the upgrade approach and must be considered one drawback compared to the more expensive approach of buying a ready-built LED-based caving lamp. The *Nova 5*, for example, is fully waterproof. Having said that, I'm told by cave lighting specialist Stuart Kirby that he has the capability to make Oldham headsets waterproof to several metres. And *RETRO 2* designer Mike Hrybyk told me that, by applying copious quantities of Vaseline to the felt washer around the rotary switch, the unit can be waterproofed to a depth of one metre. Alternatively, if you're upgrading a Speleo Technics headset, this is inherently more waterproof than an Oldham, even without taking any special precautions.

I would also be cautious about using the *RETRO 2* with a 6.0V lead acid battery such as the Kirby 'Kidney' pack. The *RETRO 2* input voltage is specified as 1.0 – 7.0V whereas a newly charged 6.0V lead acid will have a

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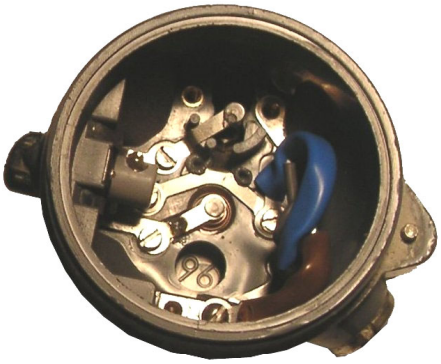
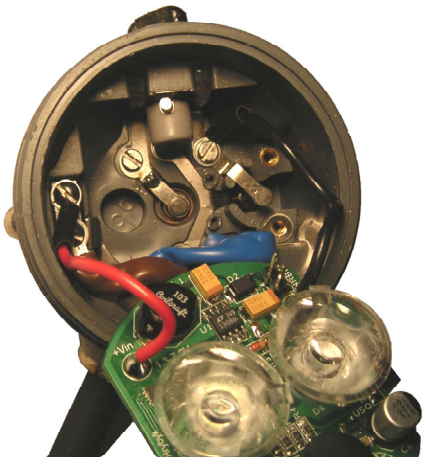
Upgrading an Oldham Headset





Step 1: *Unscrew the bezel and remove the glass. Take out the reflector and main bulb assembly and then unscrew the pilot bulb and remove the pilot bulb assembly. Keep these parts safe, just in case you ever want to un-modify your lamp.*

Step 2: *Check the polarity of the terminals inside the headset and then connect the RETRO 2's red wire to the positive terminal block ands the green lead to the contact screw for the pilot bulb. Try out the RETRO 2 before proceeding.*

Step 3: *Compress the battery leads and then press the RETRO 2 board into place, taking care only to apply pressure to the two points shown in the instructions. Replace the bezel having first inserted the O-ring provided on top of the glass.*

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higher terminal voltage than this. Certainly it will soon reduce once it's on-load but the LEDs will be over-driven if you apply more than 7.0V to a *RETRO 2*.

For anyone contemplating this approach, the ultimate question is surely whether to upgrade an existing lamp or to buy a LED lamp. I've already referred to the fact that many ready built caving lamps are expensive but this refers mainly to complete lamps, lithium-ion battery pack and all, so we're not really comparing like with like. LED lamps without the battery pack are still more expensive than the *RETRO 2* but not by a huge margin. A Speleo Technics *Nova 3* headset costs around £85 and the *Nova 5* in the region of £100 although you do occasionally see them discounted. So, the bottom line is that for ten minutes work, you're probably saving yourself about £10 to £25.

Furthermore, the specification and performance are really quite impressive. If you don't anticipate free-diving sumps this is probably a worthwhile saving.

	Oldham 4.0V 16Ah	FX2 2.4V 7Ah	FX3 3.8V 7Ah	FX5 6.0V 7Ah
Oldham 3W, 21lm	21	5.8	8.5	14
Mode 1 0.3W, 13lm	170	40	66	116
Mode 2 1W, 45lm	51	12	20	35
Mode 3 1.5W, 67lm	35	8.5	13.5	24
Mode 4 2W, 90lm	22	5	8.5	15.5

Battery life in each brightness mode, with an Oldham bulb for comparison, for a range of common battery packs

Ordering the RETRO 2

The RETRO 2 costs £75.00 including postage and packaging. To date it's only available directly from the manufacturer but you might find it in caving shops in the not-too-distant future.

Send your order with a cheque, made payable to Technical Concepts Ltd,. to the following address: The Mine Explorer Society, c/o Technical Concepts Ltd, 54 Middleton Drive, Bury, Lancashire, BL9 8DS.

If you have any queries please address them to Mike Hrybyk at **mike@mineexplorer.org.uk** or take a look at **mineexplorer.org.uk**.

References

Bedford, Mike (2006), *We Hear: Crashing LED Lamps*, CREGJ **64**, pp7-8

Gibson, David (2003), *Equipment Review: The Nova Caving Lamp*, CREGJ **54**, pp10-11

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