

LVR3A Installation Notes Revised May 12, 1999

Software version 3.2 April 20, 1999

You will notice that your LVR3 has three wires (red, yellow, and black) soldered onto the PCB. Page 2 of the schematic has 3 wiring examples. These wires connect up as follows:

RED wire	connect to battery positive	node BAT	BATTERY+ & BULB +
BLACK wire	connect to battery negative	node GND	BATTERY-
YELLOW wire	connect to other side of bulb	node BULB	BULB-

Note that since the BULB+ is the same connection as BATTERY+ you must be careful not to have the BULB- shorted to the BATTERY- through common metal frame connection, which can happen with some lighting systems. In other words the LVR3A has a positive common, NOT negative.

The LVR3A must have the battery connected in the proper polarity. If it is connected backwards it may damage the unit unless you purchased the option of reverse polarity protection (resettable Poly-Fuse and diode). If you use polarized plugs on your battery this should not be a problem. If not, you should consider installing a fuse between the battery plus and the LVR3A red lead and a diode from the red lead to the black lead (see configuration #1 page 2 of schematic). This will provide reverse polarity protection for the LVR3A, but not for the bulb. The maximum input voltage is 16 volts limited by C1, unless you bought a 12 volt output unit in which ups the maximum to 30 volts.

The LVR3A has internal programming that will warn you when the battery is getting to low, by slightly dimming the bulb about once per second. This warning can be disabled by connecting a switch in place of the On/Off button. Also, the LVR3A has a low battery cutoff feature which will turn the LVR3A off once the battery gets below this programmed set point. It also can be disabled with the same switch (as above). Both of these features are set to specific voltages depending on what type of unit you ordered and can not be changed later.

The LVR3A is designed to dim up the bulb when the power is connected to the LVR3A via some switch between the battery and the LVR3A. If you are using more than one bulb on a single LVR3A, then only the first bulb turned on will be dimmed up. The standard LVR3A does not automatically sense if the bulb is connected, so if you use a switch between the bulb and LVR3A then the dim up feature will not work and the standard LVR3A will be running all the time. This may be OK for your application. However, if you purchased the bulb sensing auto On/Off feature, then the LVR3A will turn on and off automatically when the bulb is connected or disconnected (See configuration #4 on page 3 of schematic).

Model	Bulb Voltage	Maximum Current	Input Voltage Range	Warning Flashing	Low Bat. Cutoff
		5 Amps	Bulb to volts	2% above bulb	
12V6	6.0 volts	5 Amps	6 to 15 volts	10.5 volts	9.0 volts

If you purchased the auto sensing ON/OFF feature then the LVR3A will automatically switch on and off when the bulb is connected or disconnected from it. With this feature, the LVR3A is always connected to the battery and does not need to be disconnected. Short of that, I recommend using a power switch between the LVR3A and the battery, but not having the bulb current go through this switch. (See configuration #1) This configuration provides zero off current and no bulb current power loss through the ON/OFF switch. Make sure that the external 1K ohm resistor is in place. Another good option is to wire the 2 center holes on the LVR3A PCB to a momentary button. This button will turn your headlamp on or off each time you hold the button down for about 1 second.

Although the LVR3 does not need a large capacitor in parallel with the battery (like the LVR2), you can get slightly more power from high ESR batteries (alkaline, lithium, etc.) if you do install a cap. In order for this cap to help it will need to be in the 1000 uF to 50000 uF range depending on your bulb size.

The standard LVR3A has a SMD power FET which can handle up to 5 Amps peak. Above that you should have order the optional TO-220 power FET which can handle 7 amps peak. Above 7 amps I recommend a small TO-220 heatsink for the power FET. If your loads are above 10 amps, then a heatsink is needed. If you specified this when ordering, then the power FET will come with an appropriate heat sink.

If you have any problems, questions, comments, please feel free to contact me at: willie@cs.indiana.edu

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READ THIS!

IF YOU THINK YOUR UNIT MIGHT GET WET, PROTECT IT!

The LVR3A must be protected from water. It can be put in a box (battery case) or potted. If it is potted, use a material designed for electrical potting or a material that you know has been tested. Standard silicone rubber will corrode the unit. However, Plasti-Dip tool handle coating material works well for this purpose and is available at most hardware stores. This is what I use to coat LVR's if purchased it with the optional water resistant coating.

If you chose not to coat or pot you unit you should put it into some sort of enclosure. Headlamps like a Petzl provide a nice enclosure which will keep direct water off of the unit. The box you chose need not be water tight if you know you can keep water from getting directly on the printed circuit board. One problem with a "water tight" box is that if it is not completely water tight, water will tend to build up in it, where as a non sealed box it will evaporate and dry out. Condensation in a non sealed box can potentially be a problem, but distilled water has very high resistivity and as such I haven't noticed this to be a problem. For water immersion use like caving, potting or a sealed box is needed. For diving, a pressure vessel must be used.

RELIABILITY

I have been selling these units for 6 years now and the only failures that I know of have been either broken wires, water damage, or power hooked up reversed except for one bad IC and 2 bad tantalum caps. The electronics are very reliable, much more so than most of the rest of the lighting system.

USE A GOOD QUALITY BATTERY HOLDER

If you are using an after market battery holder, you will be much happier down the road if you use a good quality holder. The cheap plastic holders that are sold at Radio Shack will not last long before the plastic case splits out. Also, these holders can not handle much current before the wiring gets hot and melts into the plastic. Mouser Electronics and Digikey both sell metal battery holders made by Keystone Electronics. These are the best holders I know of, and are still reasonably priced. For caving applications, I recommend soldering to the batteries. I have found it to be the only reliable battery connection.

CAUTIONS ABOUT USE

If the power is connected backwards to the LVR3A, it will be damaged! So if you have battery connectors that can be plugged in backwards, be careful or replace them with polarized plugs. Also, some battery holder allows for the cells to be installed backwards. My favorite Keystone Electronics holders allow this. **BE CAREFUL!** If you think this may be a problem with your setup, then you should consider the option of reverse protection with a fuse and a diode (configuration #1 on page 2 of schematic). Then if you hook the battery up backwards the fuse will blow and nothing else will be damaged.

If you are using lead acids or NiCad's you may want a fuse in series with the battery located near the battery. These batteries can deliver high enough current to melt your wiring if shorted. If the battery pack is under clothing, this could prove painful if the wire melted into your skin. On the other hand, careful wiring should prevent any short circuits and also fuses do have resistance and some power is lost in the fuse. I personally do not use fuses, but I mention this for people unaware of the possible hazard.

Although the warning flashing will tell you when you are at the end of the battery life, some battery and bulb combination may go out very fast once the battery has been depleted. If you need to know how much battery life you have left, I suggest measuring your batteries with a volt meter. If your application is critical, a small digital volt meters can be connected to the battery and provide a continuous display of the battery condition.

Since the LVR3A is a switching regulator some radio frequency noise is generated. Although the emissions are well within FCC guidelines, there is still a possibility of interference with AM, FM, or two-way radios. If interference is suspected, try turning off your headlamp. Interference from the regulator would be noticed as a 250 Hz whine.

WARRANTY

I can not and do not make any warranty claims whatsoever. You must assume any risk should the LVR3A fail during use. You must assume any risk of injury or death cause by the failure of the LVR3A during activities such as but not limited to caving, cycling, climbing, diving, or mountaineering. If you use this unit in activities where lighting is life critical, you should have completely independent backup lights available. If you are not willing to accept this risk please send the unit back and I will refund your money.

However, I will repair a broken unit, normally for free, depending on what happened to it.