

LVR3CP, LVR3CC Installation Notes Revised March 20, 2000

Software version 3.5 Nov 8, 1999

You will notice that your LVR3CC or LVR3CP has three large pads on the PCB. These pads connect up as follows:

Round hole	connect to battery positive	node BAT+	BATTERY+ & BULB +	Red Wire
Slot to edge	connect to battery negative	node GND or BAT-	BATTERY-	Black Wire
Oval hole	connect to other side of bulb	node BULB	BULB-	Yellow Wire

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 LVR3C has a positive common, NOT negative.

The LVR3C does not have reverse polarity protection (unless you ordered the reset-able Poly-Fuse and diode). Reverse voltage will quickly short C1, and may damage the power FET. If you use polarized plugs on your battery this should not be a problem. The maximum input voltage is 16 volts limited by C1.

The LVR3C has internal programming that will warn you when the battery is getting to low, by slightly dimming the bulb about once per second. Connect a switch in place of the On/Off/power-level button to disable the warning feature. The button on the PCB will turn the light on or off if held down for more than 1 second. If you press the button quickly and release, then the power level will switch to the next level. The LVR3C is designed to dim up the bulb when the power is connected to the LVR3E or when the button is pressed. The LVR3CP does not sense if the bulb is connected (unless you ordered the auto on/off option). However, the LVR3CC does have the auto bulb sensing.

The following lists the full regulation input voltage range for each type of LVR3CP (production units):

2.6 V	2.6 to 6.6 volts	Modified R2=31.6K R4=34.0K
2.9 V	2.9 to 7.25 volts	
3.4 V	3.4 to 7.25 volts	Software V3.6 (reduced range; 15% overvoltage)
3.9 V	3.9 to 9.75 volts	
4.5 V	4.5 to 9.75 volts	Software V3.6 (reduced range; 15% overvoltage)
5.5 V	5.5 to 13.75 volts	
6.4 V	6.4 to 13.75 volts	Software V3.6 (reduced range; 15% overvoltage)
8.0 V	8.0 to 15 volts	Modified R4=59K

Specifications for LVR3CC (custom unit):

Bulb voltage	Input voltage range	Warning flashing	Low Battery Cutoff voltage
5.5V	5.5 to 13.75V	6.0V	6.6V

The LVR3C does not need a large capacitor in parallel with the battery for most applications. However, you may need a capacitor for high power bulbs, because the voltage sags greatly upon startup causing the LVR3C to reset the microprocessor. If you specify higher power bulbs when you order, it will be shipped with an appropriate capacitor.

The LVR3C has a SMD power FET, which can handle up to 2 Amps peak. Above that you should have ordered the LVR3E with the optional TO-220 power FET which can handle 10 amps peak and up with heat sinks. If power is connected backwards, the SMD FET may be damaged even with reverse polarity protection, depending on the bulb and battery combination.

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

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LVR3CP & LVR3CC READ THIS!

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

The LVR3C 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 keeps direct water off of the unit. The box you choose need not be watertight 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 most failures have been either broken wires, water damage, shorted output or power hooked up reversed on older LVR's that did not have reverse protection (reverse protection is standard on the LVR3E). Less than 5 have had component failures. 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

The LVR3CC/P is not protected from short circuits. If you short the output the power FET can easily be damaged, which in turn can damage the microprocessor.

If the power is connected backwards to the LVR3CC or LVR3CP, it will be damaged (unless the reverse protection option was purchased) and the bulb may blow out! The power FET has an internal diode that will send the battery voltage to the bulb less the 0.7 volt drop. This small voltage drop can cause the FET to be damaged depending on bulb and battery combination, even with the reverse protection option. If you are using a 5.5 volt bulb on a 12 volt battery the bulb will get over 11 volts and blow out instantly. 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 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. However, fuses do have resistance and some power is lost in the fuse.

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 voltmeter. 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 LVR3CP 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 LVR3 fail during use. You must assume any risk of injury or death cause by the failure of the LVR3 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.