Cab'Ex

Light module

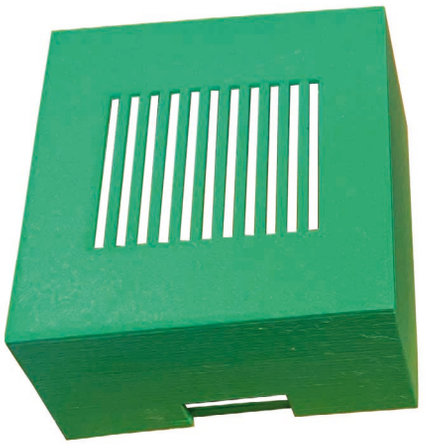
ByOlivier Garde

V1.0

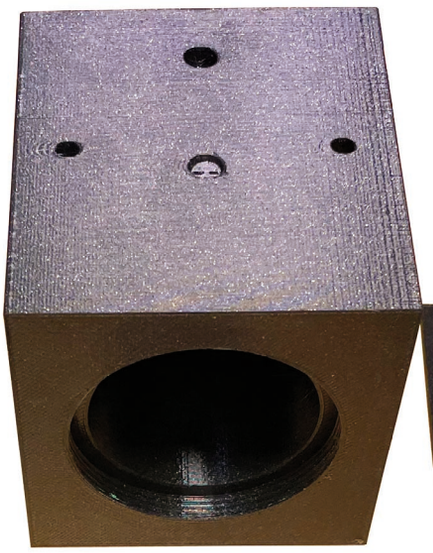
Lab'Ex

1a) 3D printing parts :

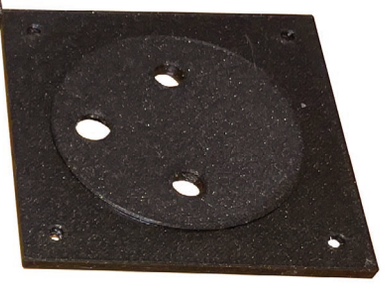
Several 3D printing parts will have to be made: (Download the zipped folder containing the 8 files on my Lab'Ex webpage,)



Top_Cover.stl



Main_body.stl



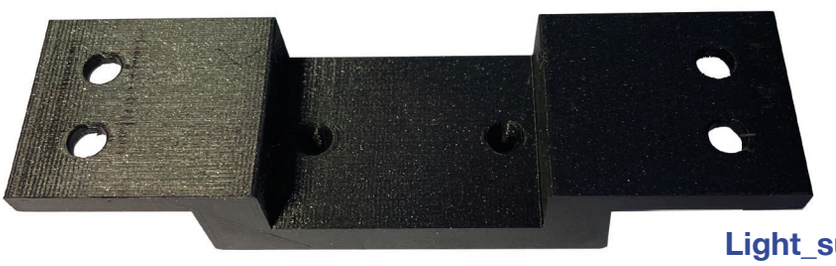
Back_plate.stl

Anchor_Support.stl

NutModuleLight.stl

power_supply_box.stl

Seal50-42.stl



Light_support.stl

The main part of the module and the support of the 4 Xenon bulbs must be printed in PETG because the Xenon bulbs give off some heat, PETG melts at a higher temperature than PLA. The other parts can be printed either in PETG or PLA.

Lab'Ex

1b) Optical part :

• **Diffuser in frosted glass:** diameter 2 inches in N-BK7, 600 grit, thickness 2.15mm that can be found at Thorlabs, reference DG20-600

https://www.thorlabs.com/thorproduct.cfm?partnumber=DG20-600

1c) Mechanical parts :

• **12 M3 brass inserts**

• **4 M3 countersunk screws, length 10mm, preferably with hexagon socket**

• **4 M3 screws, length 4mm, preferably with hollow hexagon**

• **4 screws M3 length 8mm preferably with hollow hexagon**

• **Aluminium adhesive tape width 50mm length 200mm approx.**

1d) Electronic and electrical parts :

• **4 xenon bulbs of 3V :** Diameter 2mm length 10mm. You could find them at Conrad but since a few months, the reference has disappeared from their catalog. You can use the bulbs fitted to the Mag Lite reference 2 Cell AA/AAA.

There are also references on the RS Component website

• **4 Bi-Pin sockets 4 mm :**

that can be purchased at Conrad
Conrad reference : 001437397

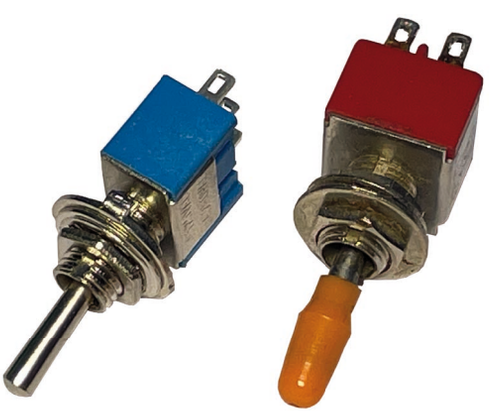
https://www.conrad.fr/fr/p/beli-beco-254-support-d-ampoule-culot-mini-lampes-bi-pin-4-mm-connexion-broches-a-souder-1-pc-s-1437397.html

• **1 green firefly :** for the calibration lamp
Bulb to be supplied in 220V with a resistor limiting the current.

Conrad reference : 1566394 - 62

https://www.conrad.fr/fr/p/tru-components-720215-luciole-110-v-250-v-fils-aux-extremites-vert-1-pc-s-1566394.html

• **2 switches :**



- 1 toggle switch 1RT
Reference at RS Component : 734-7062
https://fr.rs-online.com/web/p/interrupteurs-a-levier/7347062

- 1 toggle switch 2RT
Reference at RS Component : 734-7016
https://fr.rs-online.com/web/p/interrupteurs-a-levier/7347016

• a **100 KΩ 1/4W resistor (to limit the current in the green firefly)**

• **1 voltage regulator 12V 1A : LM7812**
Reference at RS Component : 704-4010

https://fr.rs-online.com/web/p/regulateurs-de-tension/7044010

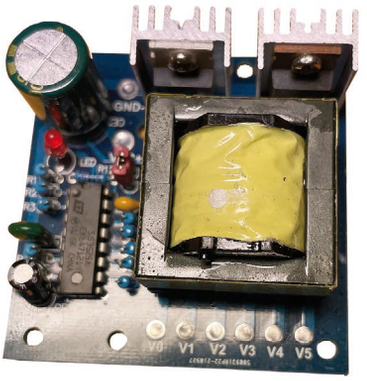
• **1 mini 12V female connector 5.5mm x 2.1mm**

https://www.amazon.fr/Prise-Femelle-Connecteur-Alimentation-Souder/dp/B083M3RV4J/

• **Cabling wire**

• **2 x 20mm long 1mm diameter heat shrink tubing**

• **a 12V to 220V converter module**
(to power the green calibration firefly).



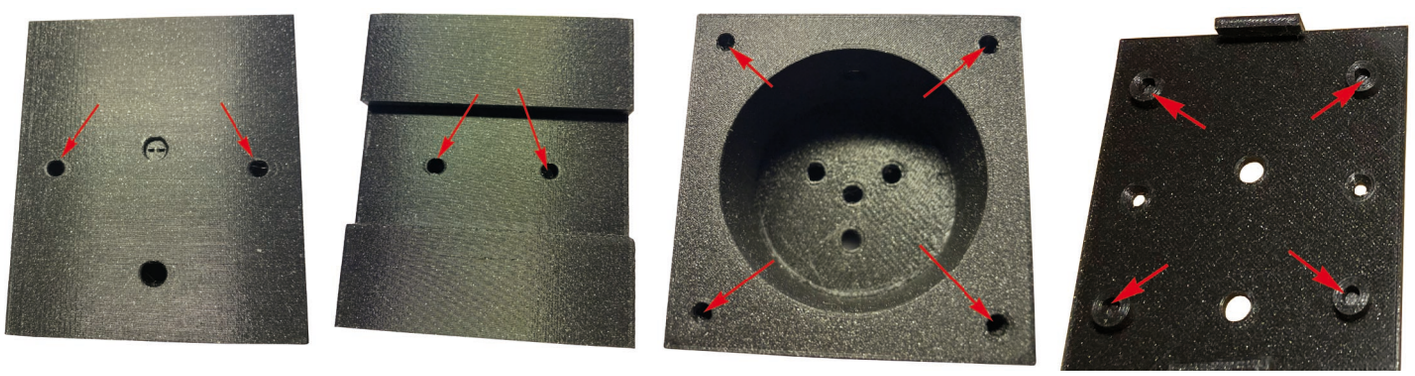
This module has the dimension 58 x 58mm.

It can be found on Ali Express :
https://fr.aliexpress.com/item/1005002064403933.html

There are other references but they do not necessarily have the same dimensions.

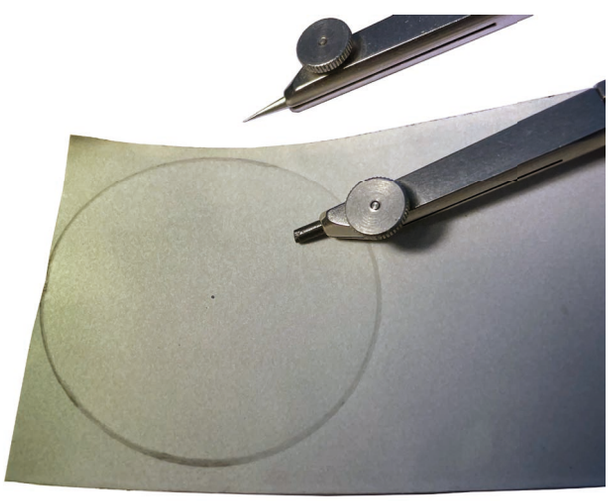
2) Assembly :

2.1 Put in place the 12 inserts by heating them with a soldering iron on the main block (8 M3 inserts) and on the base of the case containing the 12V->220V converter (4 M3 inserts). Be careful not to overheat the inserts (to avoid deforming the 3D printing part) and to insert them perpendicular to the surface of the case.

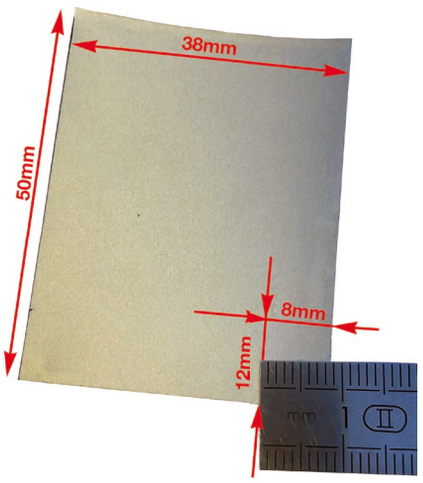


2.2 Cutting in aluminium adhesive :

- A circle of 43.7mm diameter. Place the cut piece in the main block without gluing it and mark the 4 holes for the bulbs. Drill the 4 holes with for example a hole punch for binder sheets.

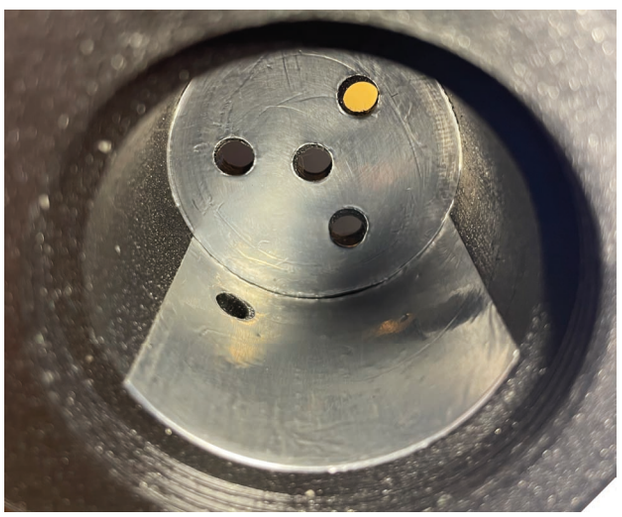


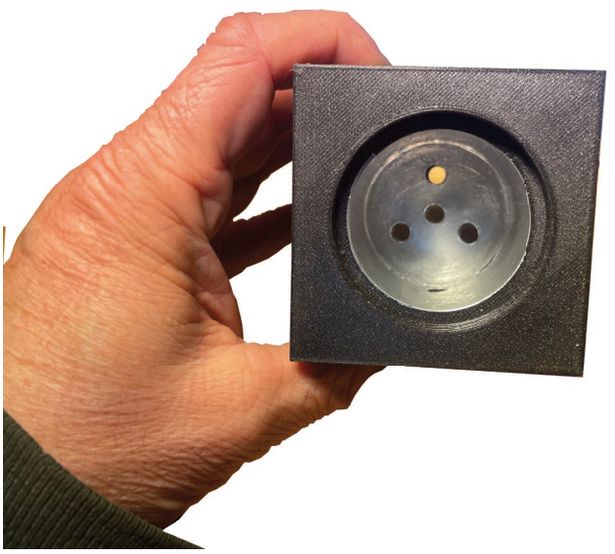
- 3 rectangles of 38 x 50mm. On one of them, a hole must be drilled to let the calibration lamp pass through, still with the technique of the punch of sheets of binders and respecting the quotes indicated on the figure below.



- Glue the round adhesive to the bottom of the main block, making sure to orient the lamp holes.

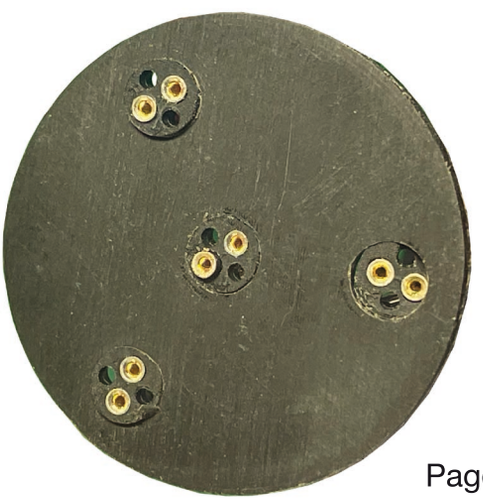
- Glue the 3 adhesive strips on the perimeter of the cylinder. The length of the last piece will need to be adjusted and a slight overlap can be considered.





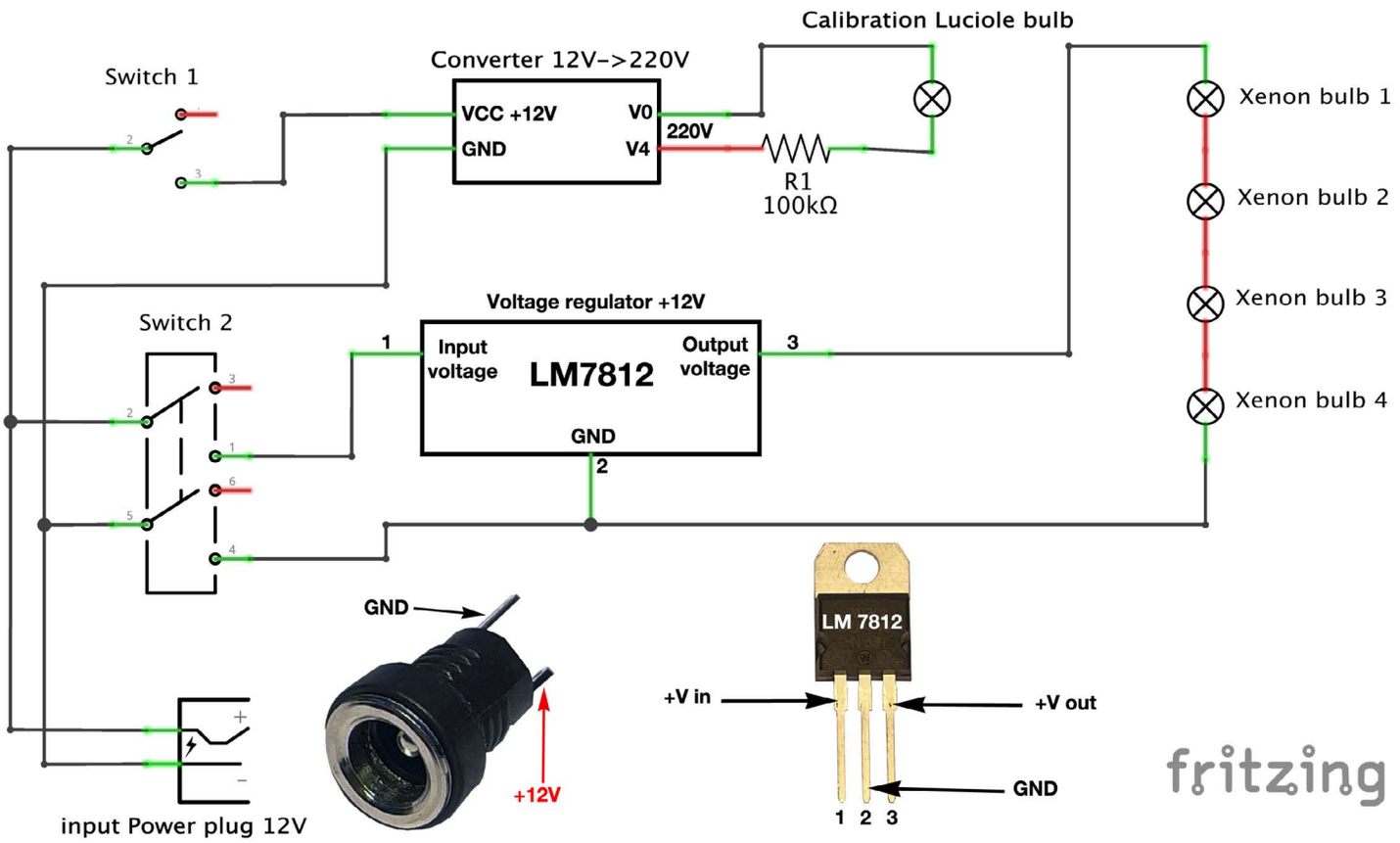
2.3 Assemble the sockets on their support :

The 4 sockets supporting the Xenon bulbs must be inserted on the support plate by forcing a little in the holes provided for this purpose. If there is too much clearance not allowing the rigid maintenance of the 2 parts, we can use an epoxy or cyanoacrylate glue.



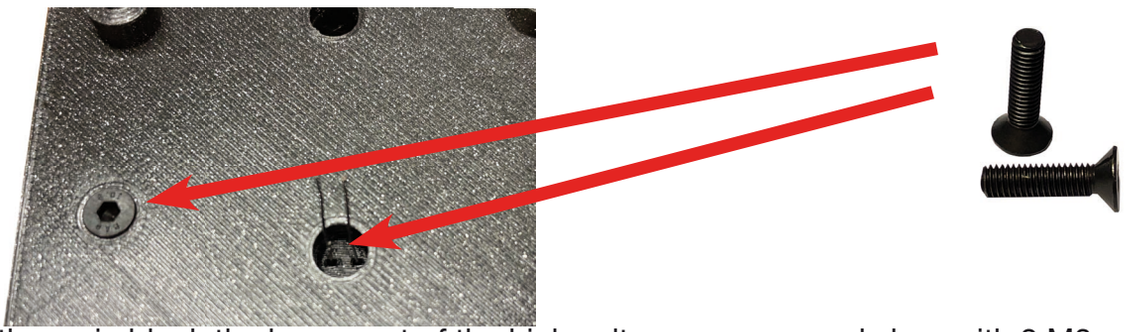
2.4 Wiring the electrical/electronic part :

Here is the wiring diagram of the whole electrical/electronic part



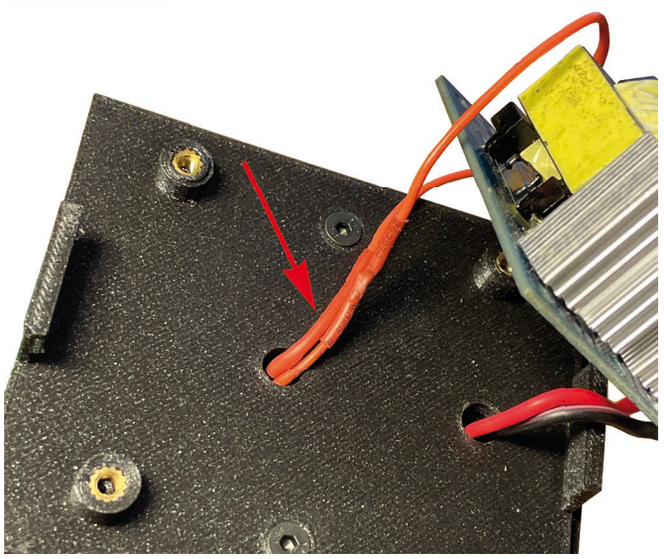
The Xenon lamps have a nominal voltage of 3V, hence the assembly in series of 4 bulbs to be able to operate under 12V. The LM 7812 voltage regulator is used here rather as a voltage limiter in order not to have a voltage higher than 12V in the Xenon lamps (the 12V power supplies tend to deliver a slightly higher voltage and the Xenon bulbs do not tolerate too much overvoltage).

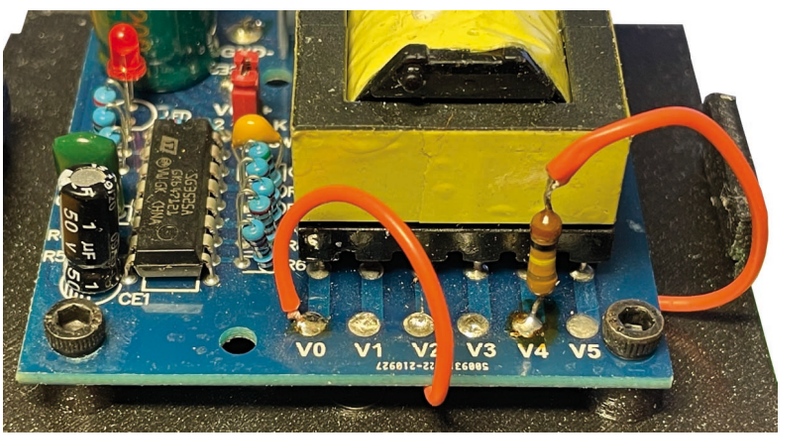
In the main block, insert the 2 wires of the firefly in the holes provided. The 2 wires will have to be covered with a heat-shrinkable sheath to avoid any short circuit.



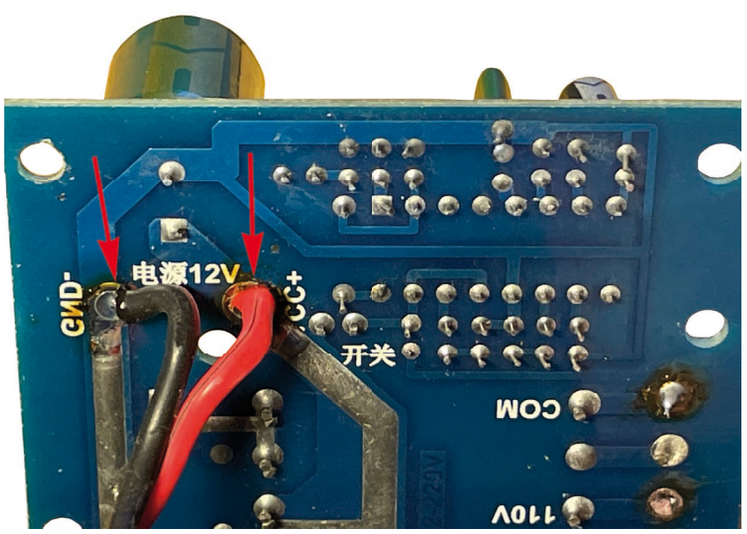
Fix on the top of the main block the lower part of the high voltage power supply box with 2 M3 countersunk head screws of 10mm length, making sure that the 2 wires of the firefly pass well in the hole provided for this purpose.

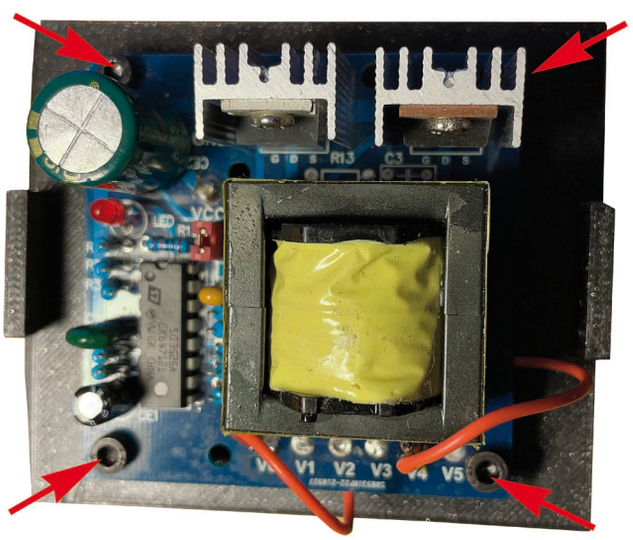
DO NOT HANDLE ELECTRICAL WIRES WITHOUT FIRST DISCONNECTING THE MODULE'S 12V POWER SUPPLY. HIGH VOLTAGE (120 TO 360V) IS PRESENT ON THE 12V/220V CONVERTER AND IN THE 2 WIRES SUPPLYING THE CALIBRATION LAMP. INSULATE THE 2 CABLES.



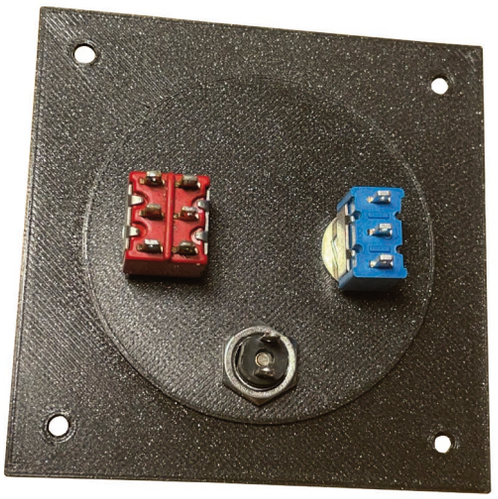


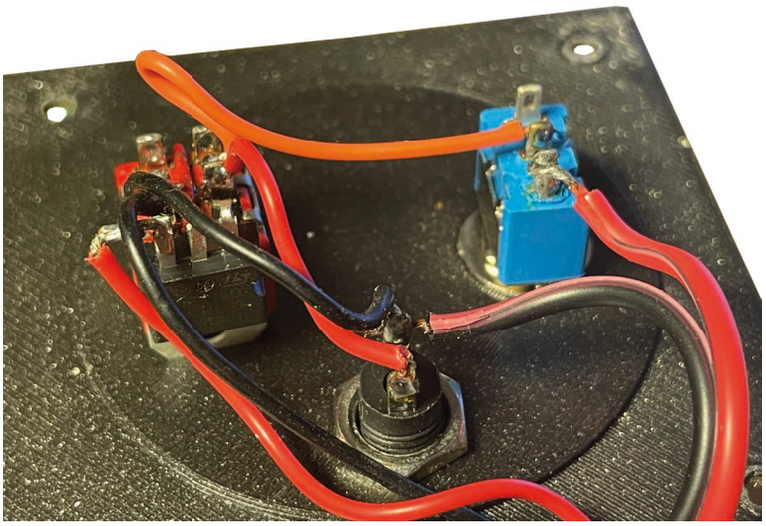
Extend the 2 wires of the firefly that we will cover with a heat-shrinkable sleeve. Then solder the 100 KΩ resistor on the converter at the V4 location as shown in the picture, and solder the 2 wires coming from the firefly (at V0 and on the other end of the resistor).



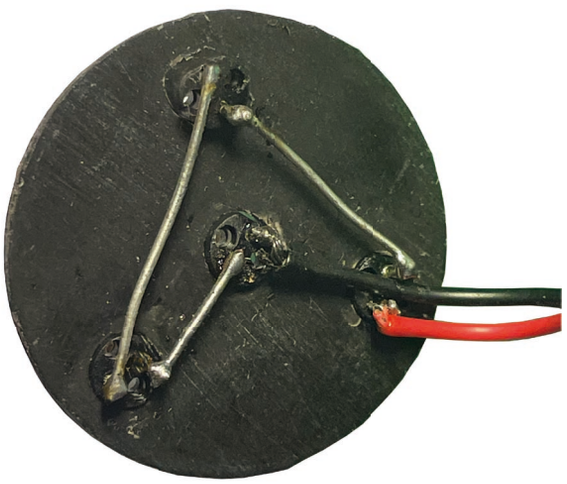


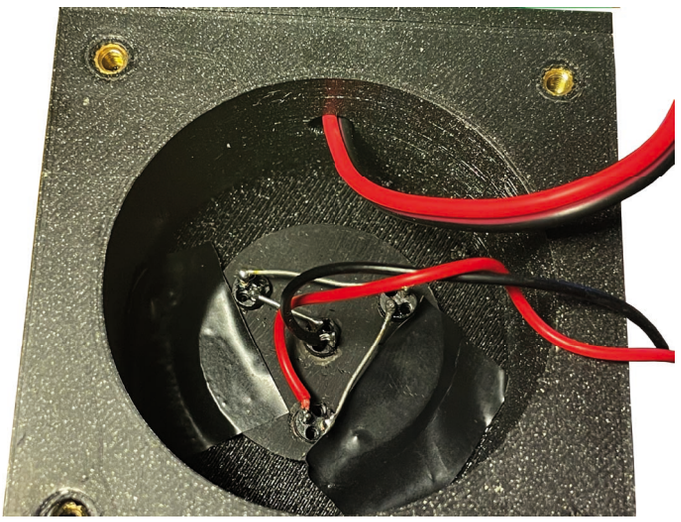
It is also necessary to solder 2 cables to supply 12V to the voltage converter. Solder a cable on the GND slot and another on the VCC +12V slot as shown in the picture and pass the cable through the hole in the box. Then fix the module in its place with 4 screws M3 of 4 mm length. On the module I used, I could not fix the 4th screw because of the heat sink of one of the transistors.





Fix the 2 switches and the 12V socket on the back cover of the light module. Proceed with the wiring using the electrical diagram on page 7. The LM 7812 voltage regulator is soldered directly to the switch (pin 1 and 2).



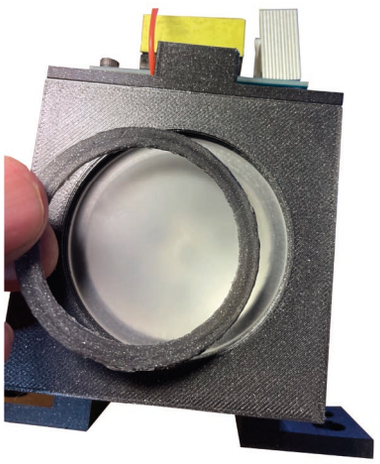


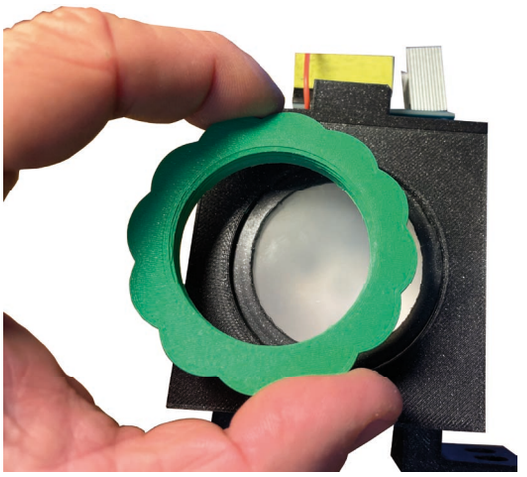
On the support of the 4 Xenon bulb sockets, connect the sockets in series as shown in the picture and insert the support in the main block. In order to maintain this support in place, you can use electrician's tape to apply the support to the bottom of the main block.

Screw the rear cover onto the main block with 4 x M3 screws of 8 mm length.

2.5 Attach the frosted diffuser :

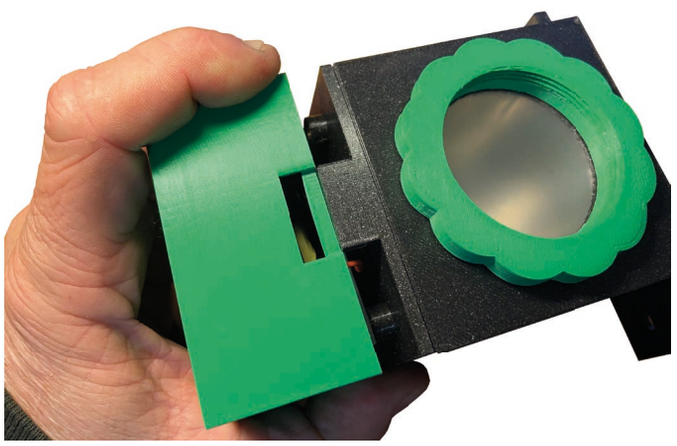
- Place the diffuser on the main block and add the gasket before screwing the nut.

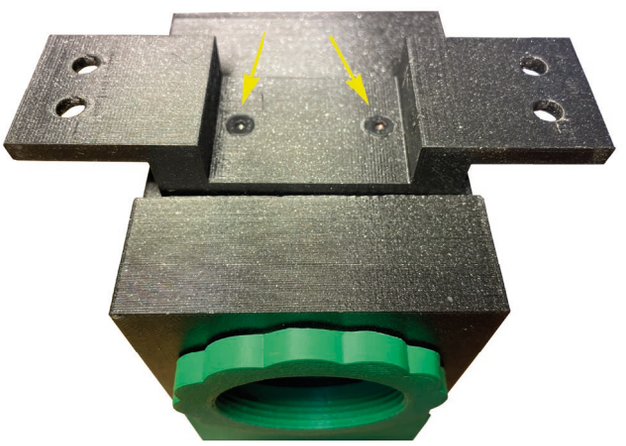




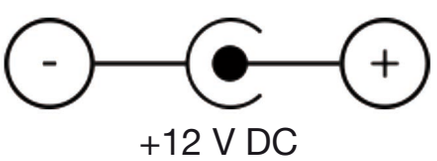
Do not force the tightening of the nut, it is just necessary that the diffuser is well maintained in its housing.

2.6 Attach the top cover and mount the flange :

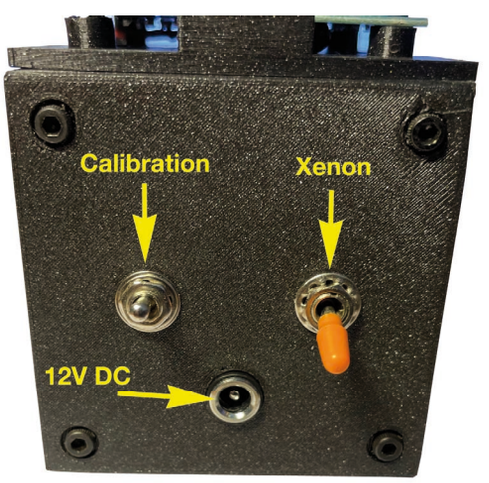




The top cover clips onto the housing. Finally, mount the flange with two 10mm long M3 countersunk screws.



+12 V DC



Your light module is ready to use, you have to supply it with 12V on the female plug at the back of the box, respecting the polarity (positive in the center of the plug). The left switch controls the calibration lamp, the right switch controls the 4 Xenon lamps.