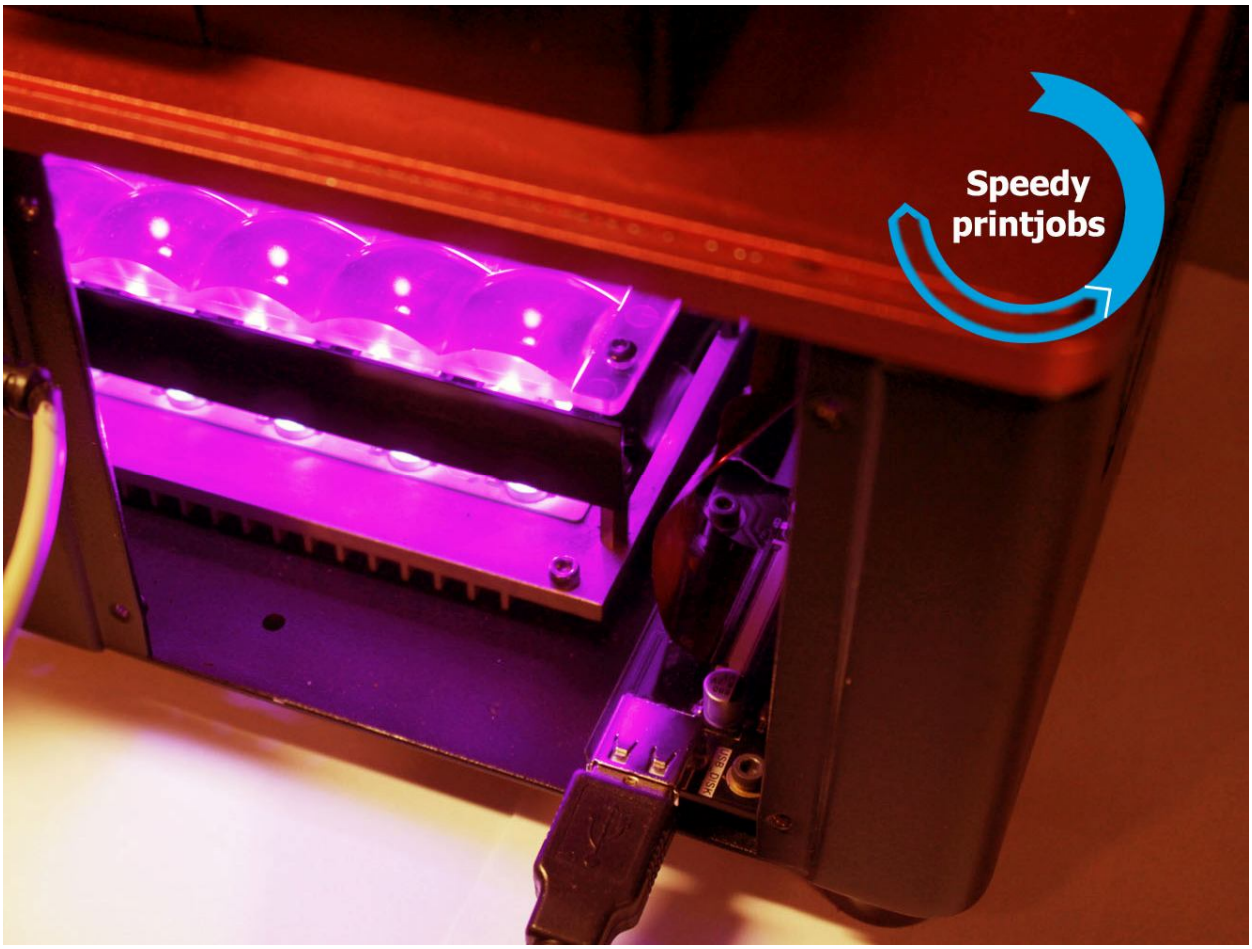
UV Blaster 30 KIT

upgrading an Elegoo Saturn



Info

The *UV Blaster 30* KIT is an upgrade-kit for an Elegoo Saturn 3D resin printer. It reduces the total print-time, by the use of quality high-power UV LEDs. Upgrading, requires a more powerful adapter. Info about this can be found in this document. A detailed step-by-step-plan and images are included to support the process of updating the Elegoo Saturn 3D resin printer.

UV Blaster 30 KIT is designed and manufactured by SMDKing.

CONTENTS

NOTE :
An upgrade can be performed by just following the steps in the content-description above. If needed you can verify each step which includes a picture for clarifications at given page.

Advantages

UV LED-modules offer several advantages, compared with original ones in Elegoo Saturn, like :

- Faster 3D printing
- More accurate ON-OFF response-time
- No step-up inverter required
- Less chance to damage onboard MOSFETs
- More UV-reflection thanks to white colored boards
- Good thermal transfer to heatsink
- Freeing up internal space

Contents of UV Blaster 30 kit

- UV LED-modules (3 pre-wired boards)
- Syringe with super conducting thermal grease
  - Color : grey
  - Thermal conductivity : 2.8 W/mK
  - Dielectric constant : 5.1
  - Operating temperature : -30 to 300 °C / -22 to 572 °F
- Extended feet
- Fan-module

Specifications UV LED-modules

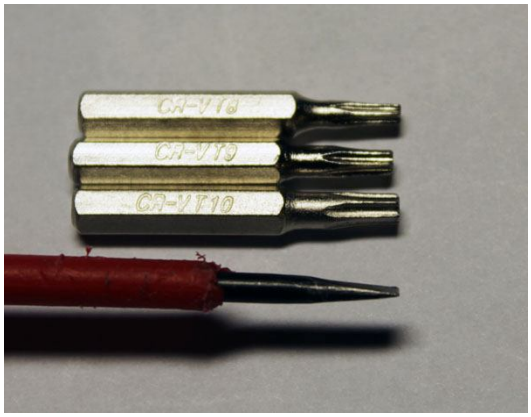
UV Light	: Narrow band UV-A spectrum
Voltage	: 24 V DC
Current	: 1.65 Ampere / *UV LED-board*
LEDs Emitting power	: Approx. 33 Watts per *UV LED-module*, total ± 100 Watts per module

Replacing powersource

Since the modules consumes more energy, the original power adapter is not capable to provide enough power. A different power adapter is required. The minimum requirement is approx. **150 Watts at 24V DC**. Get a 6 Amps, 24V DC power adapter, including a 2.5mm jack from a reliable manufacturer / store.
NOTE : If you order one directly from China, keep in mind, the given ratings (Watts) are not always reliable. Our experiences show some sellers exagerate or mention peakcurrents a power adapter can supply. To be on the safe side, go for a **10 Amps, 24 V DC powersupply**. Besides, more available power offers additional headroom for upgrades like extra internal cooling-fans, if desired.

Tools needed for installation

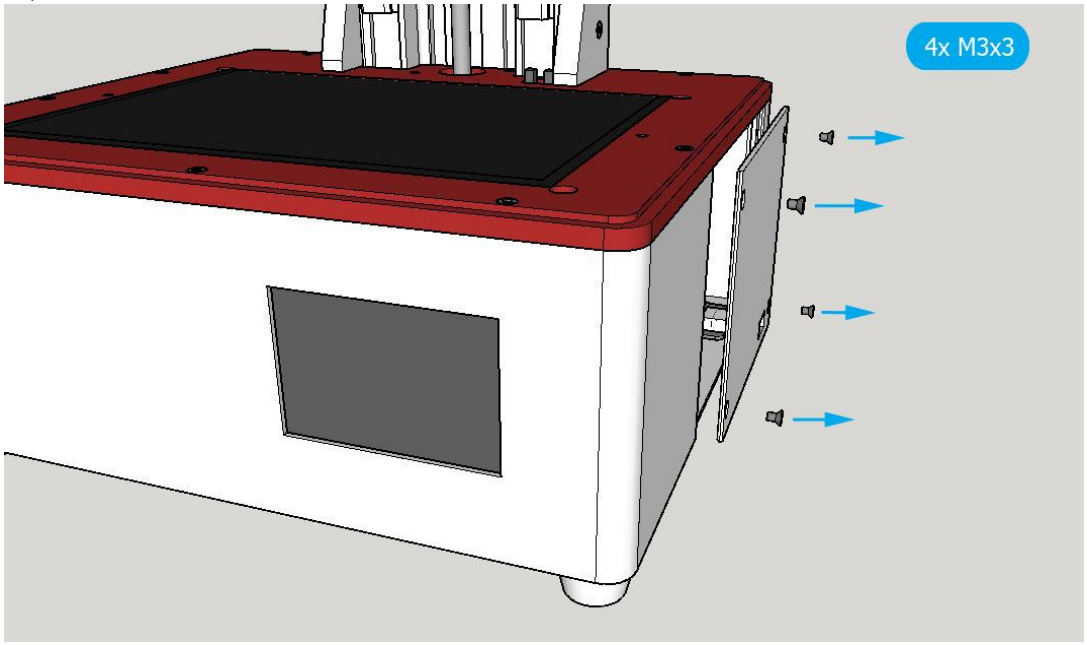
- Screwdrivers
  - Torx V8, V9 and V10
  - Flathead 2.5 mm wide
- Cleaning paper tissue(s) for heatsink
- Cleaning fluid i.e. alcohol, IPA (to remove thermal grease)



Installation, UV LED boards, step by step

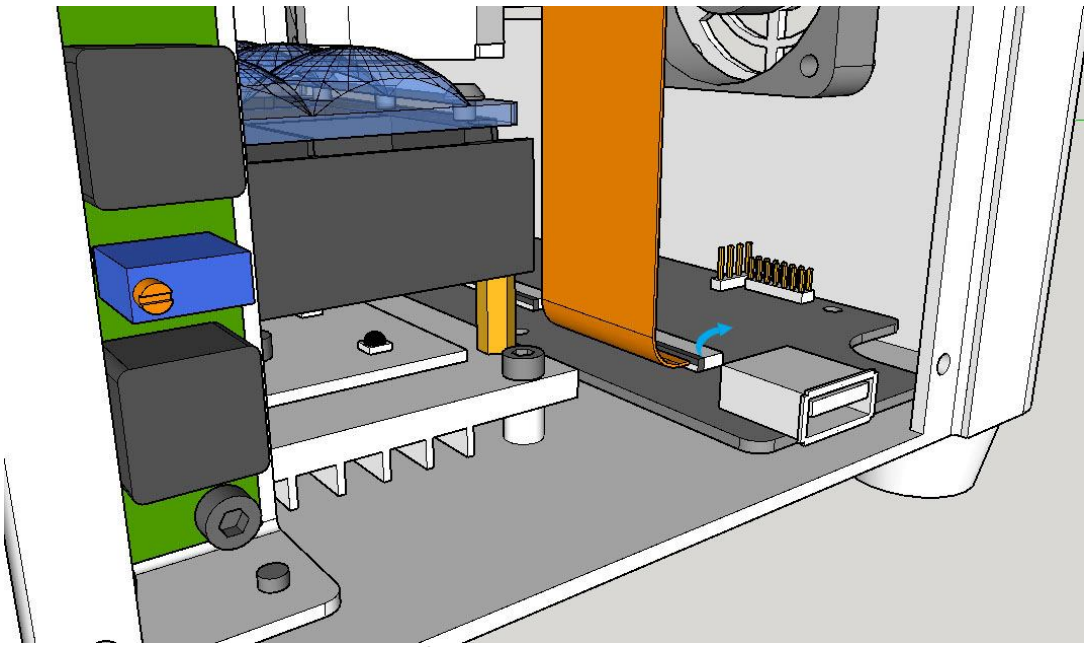
The whole process is a matter of removing screws, unplug connectors and remove some parts. Next step is insert UV LED-boards (with thermal grease) and replace a **green** connector. What remains is plugging connectors, placing parts back and inserting the screws into place.
All steps include an image as extra help, or for those who got stuck somewhere in the middle. If screws are involved, a blue banner shows the amount and size of them.

Step 1



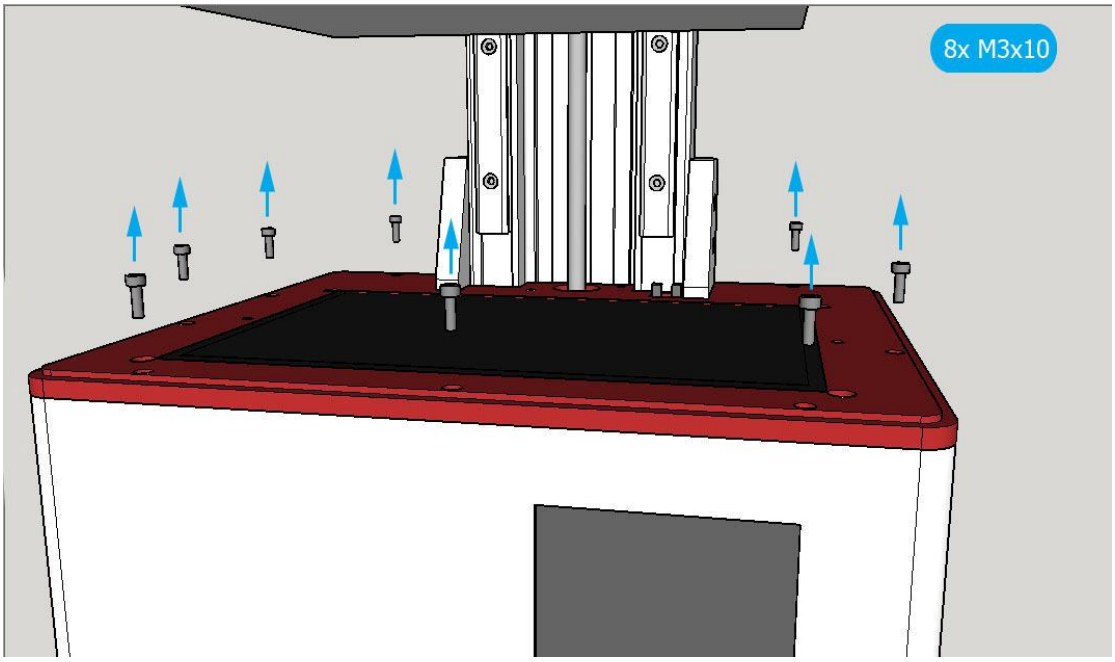
Remove 4 screws from USB side-panel and remove panel
NOTE : USB side-panel can be fixed to red top-plate with a piece of tape

Step 2



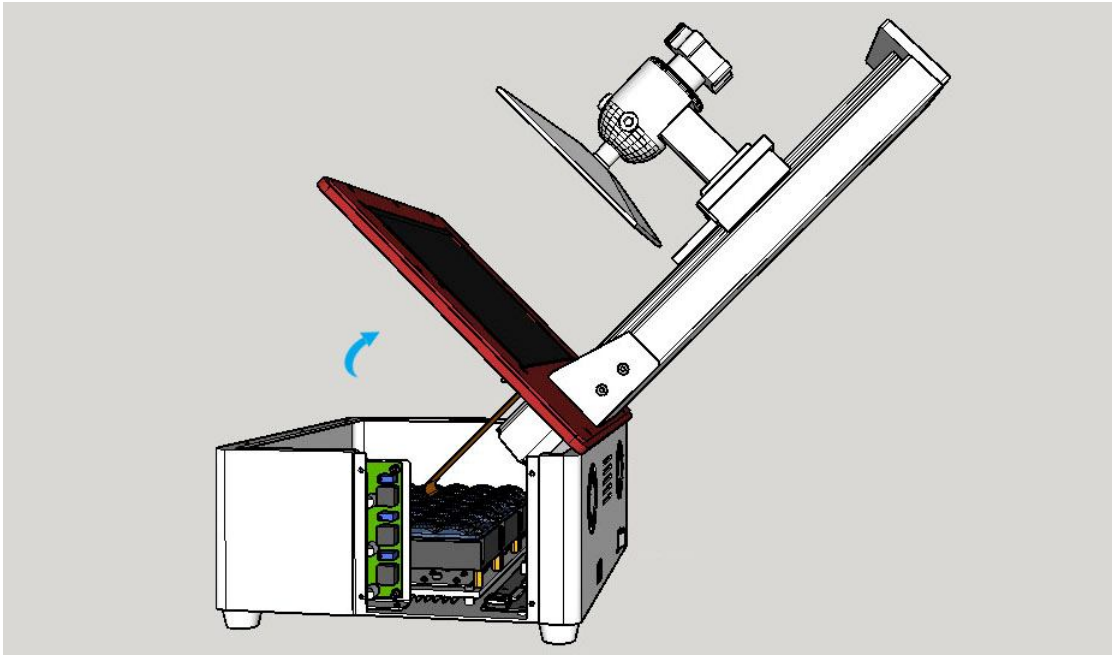
Carefully flip black plastic lid up (75° angle) from FFP-connector at motherboard.
Remove FFP LCD-cable from connector at motherboard.

Step 3



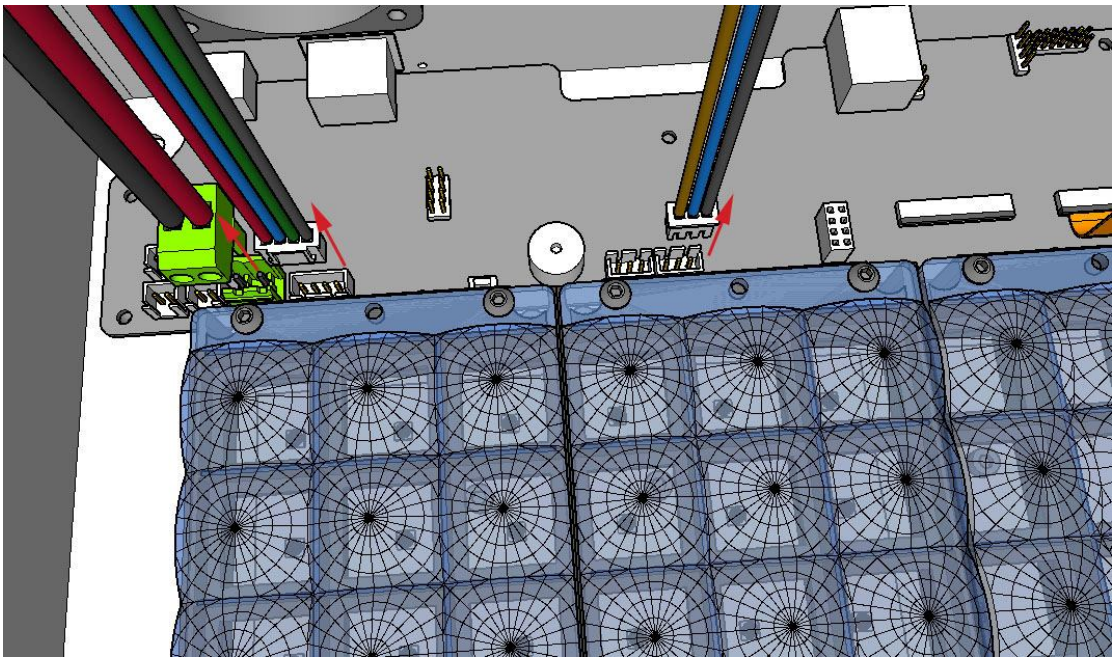
Remove 8 screws from red top-plate

Step 4



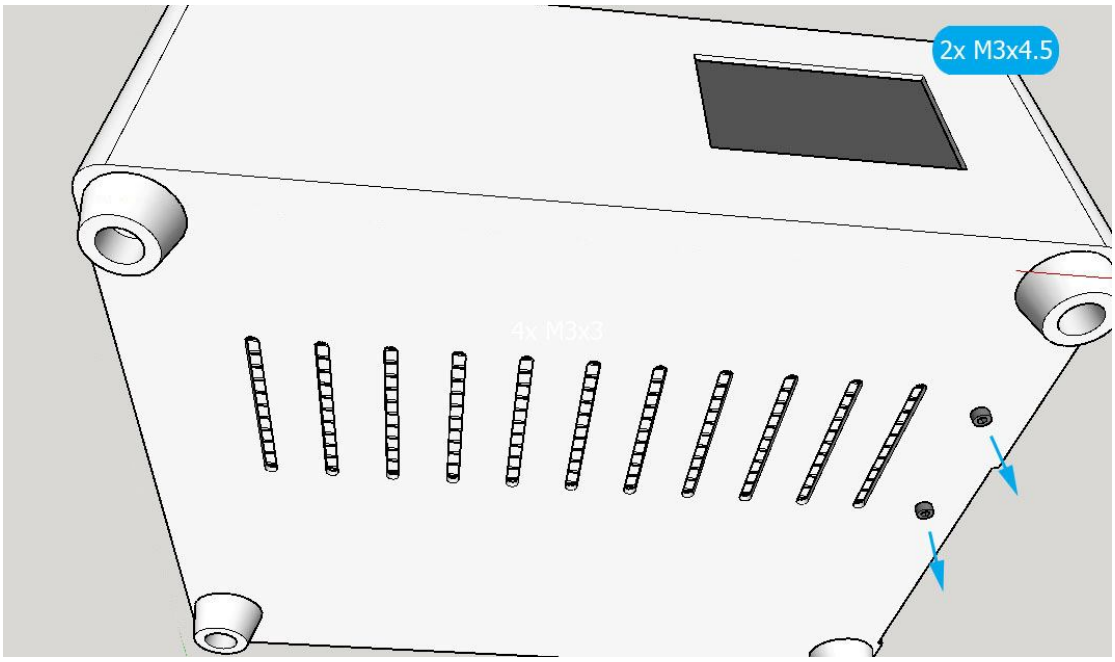
Tilt red top-plate in 45° angle, backwards

Step 5



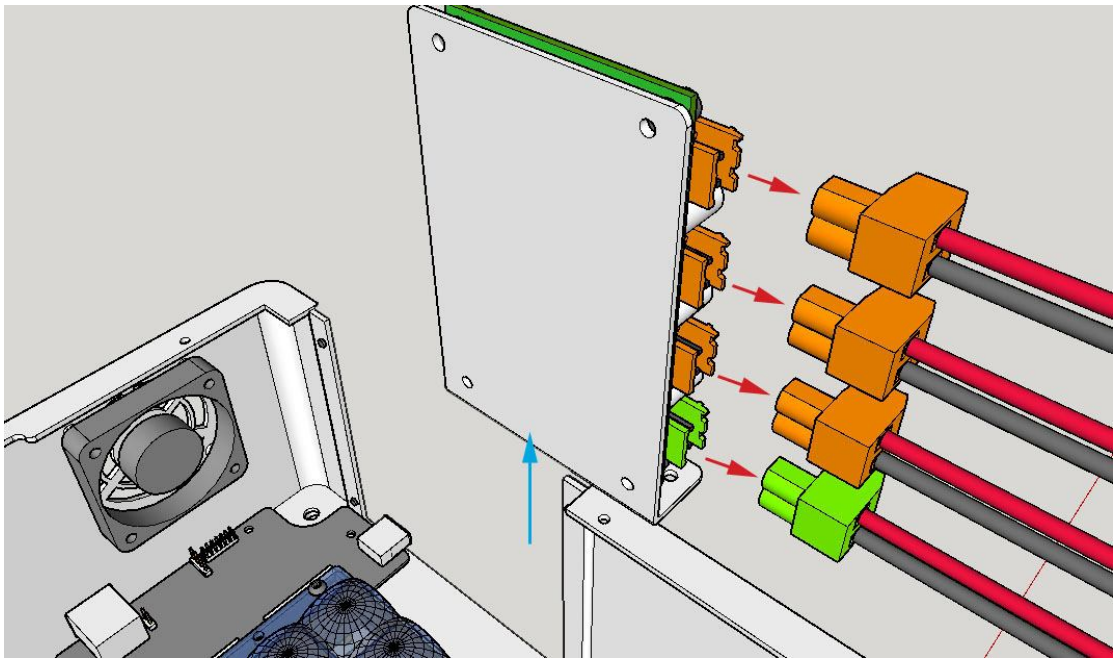
Detach white connector with 3-cables to "Z-" sensor (brown, blue and black)
Detach white connector with 4-cables to steppermotor (red, blue, green, black)
Detach green connector with 2-cables to inverter board (black and red)
NOTE : This green connector is needed (later) for the *UV Blaster 30* KIT

Step 6



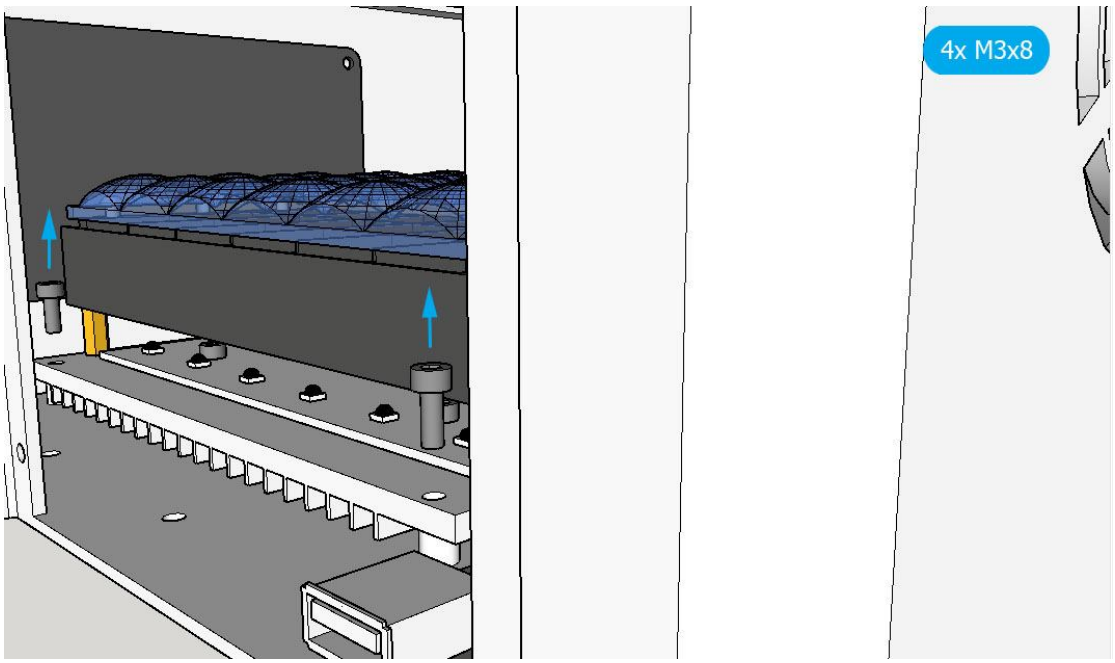
Remove 2 screws of inverter-bracket at bottom of case
NOTE : Make sure you keep the inverter-bracket inside the case stable, with 1 hand

Step 7



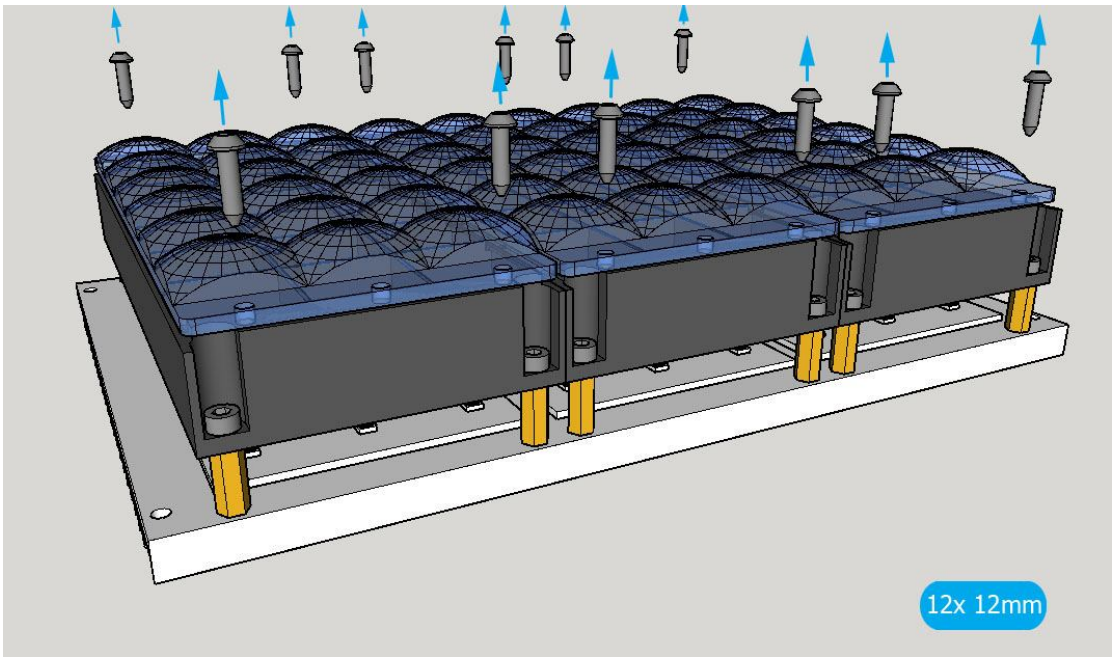
Lift inverter-bracket from case
Detach 3x orange jacks from inverter-board
Detach green power jack from inverter-board

Step 8



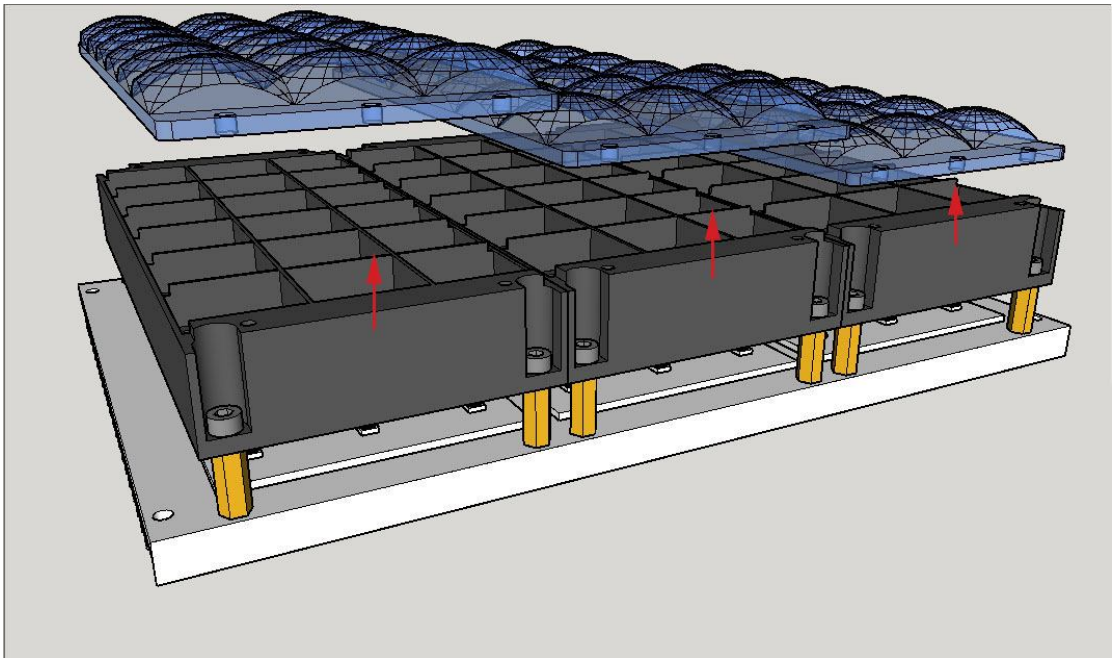
Remove 4 screws which fixate UV panel from all 4 corners at heatsink, to case

Step 9



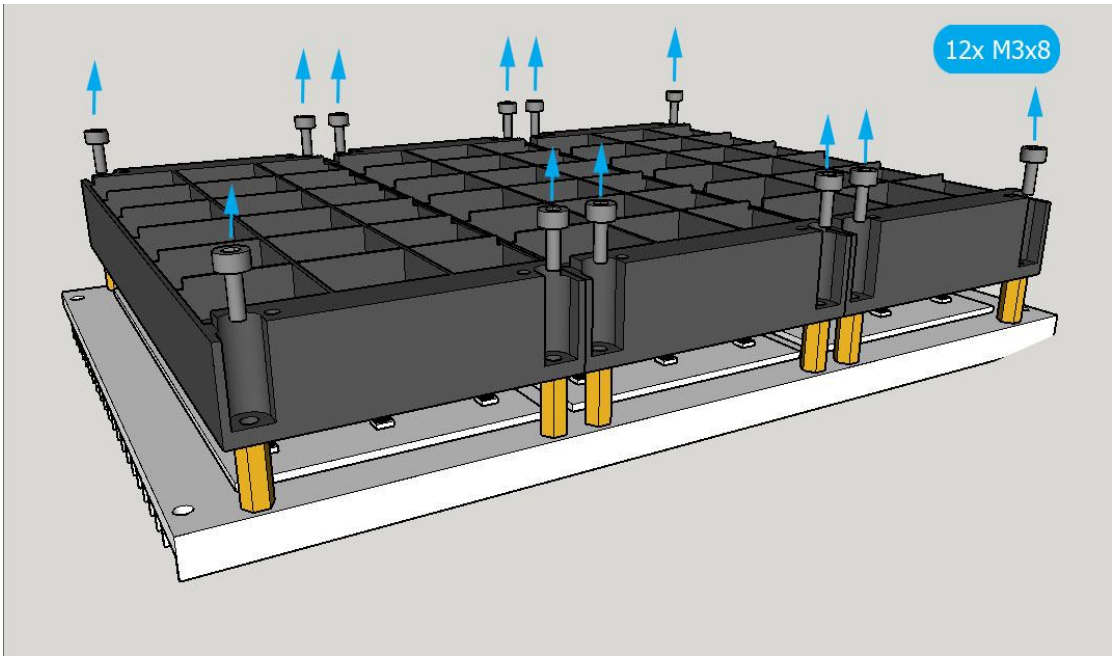
Remove 12 screws which fix 3 LED-lenses to black distance-beds.

Step 10



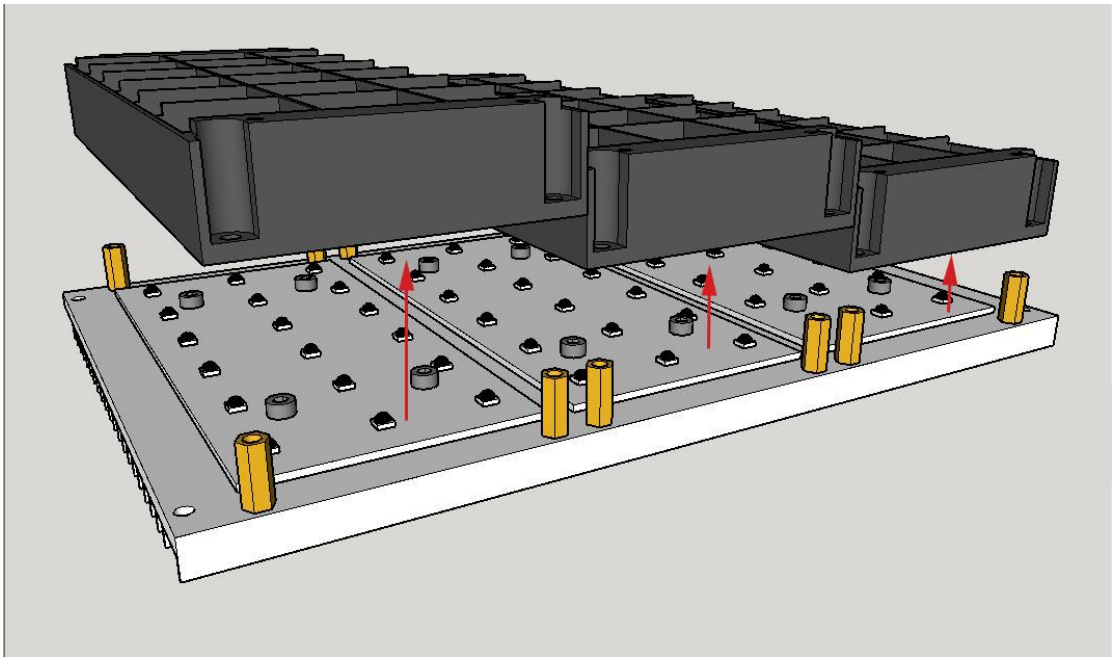
Remove 3 LED-lenses and store safely

Step 11



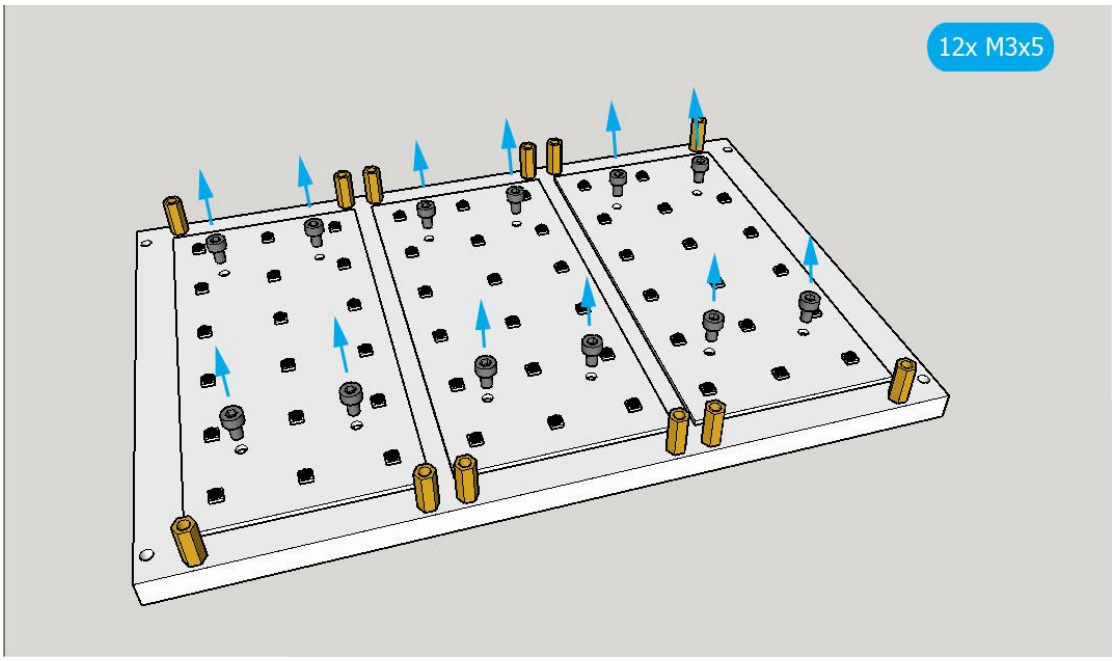
Remove 12 screws which fixate black distance-beds at metal spacers from heatsink.

Step 12



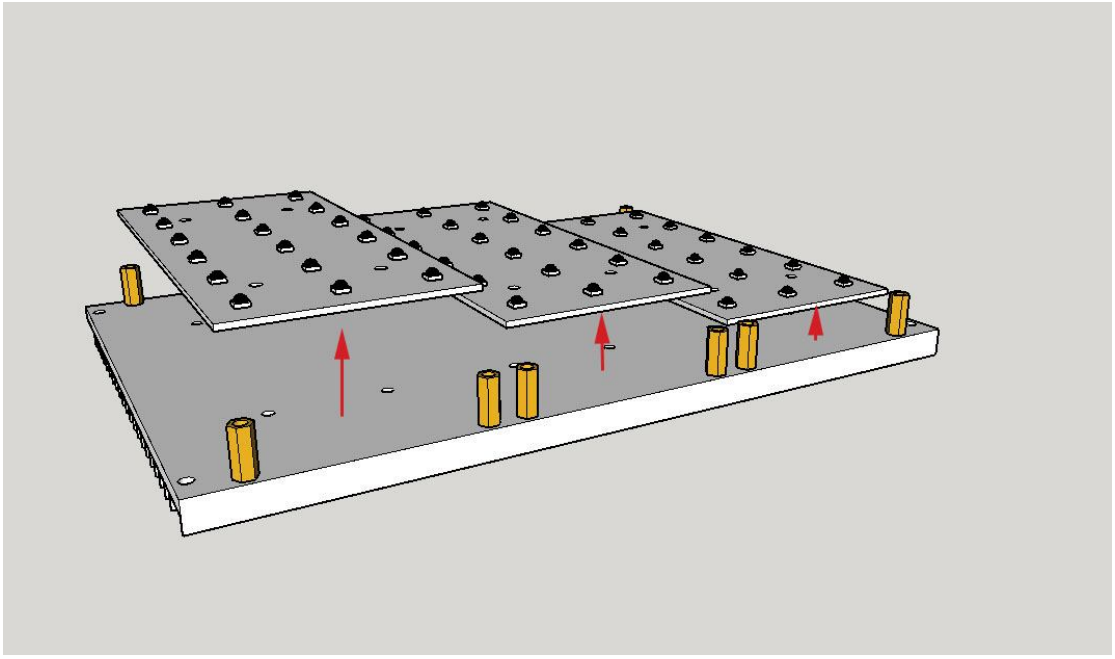
Remove all 3 distance-beds

Step 13



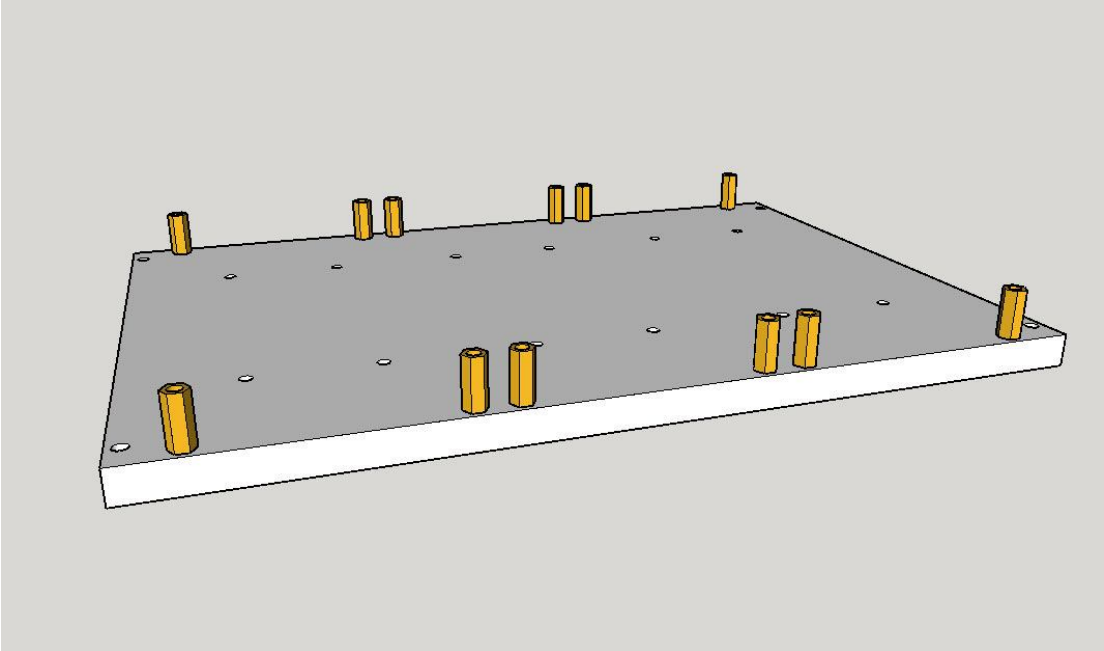
Remove 12 screws, which fixate UV-boards to heatsink

Step 14



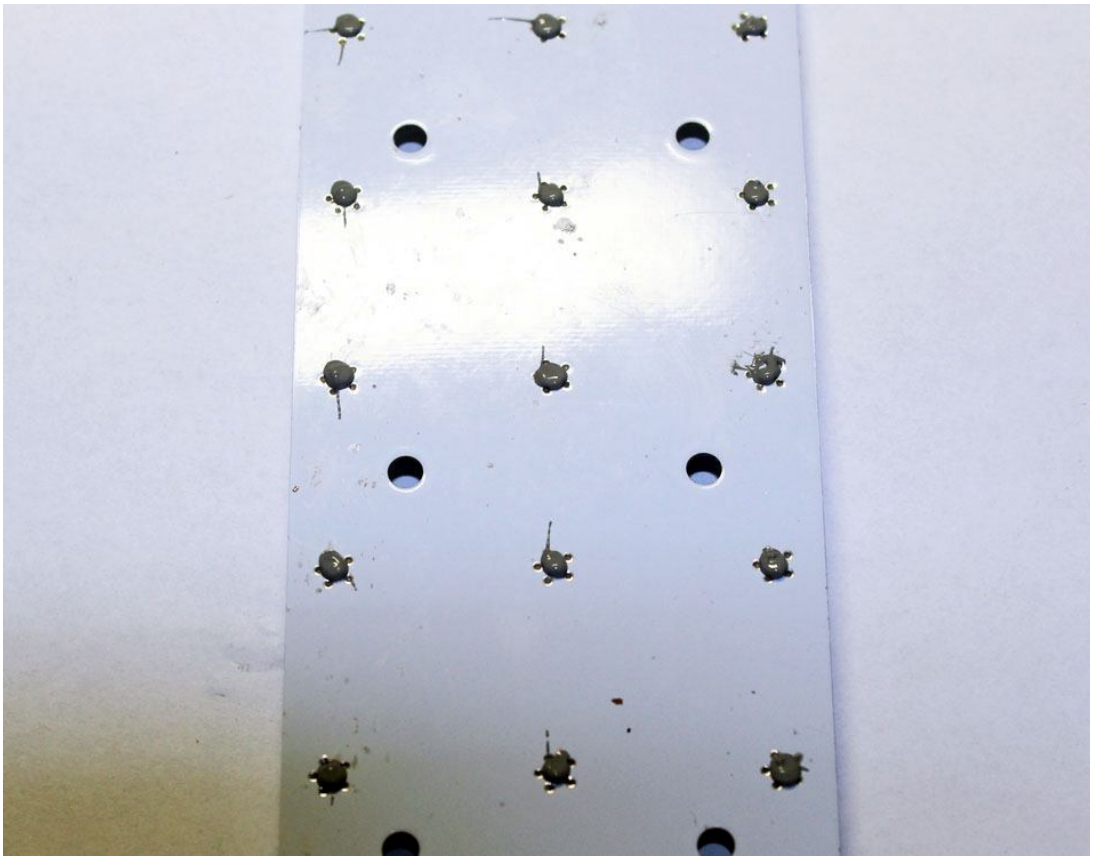
Remove UV boards

Step 15



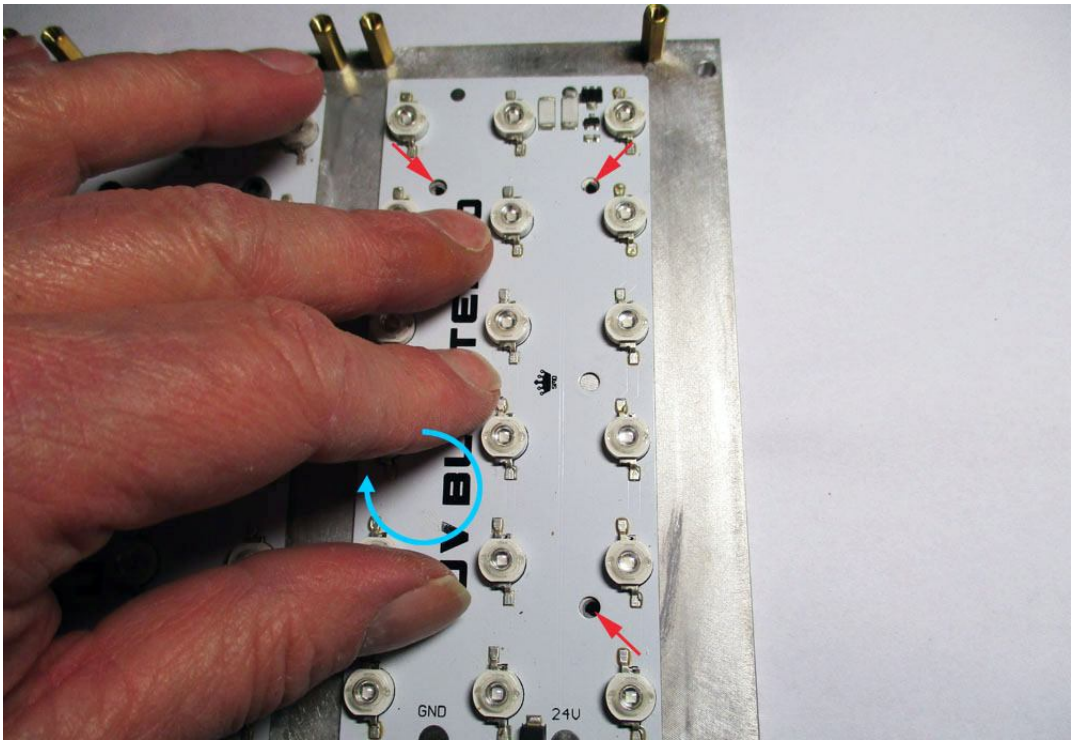
Clean heatsink thoroughly with cleaning fluid (i.e. alcohol, IPA)

Step 16



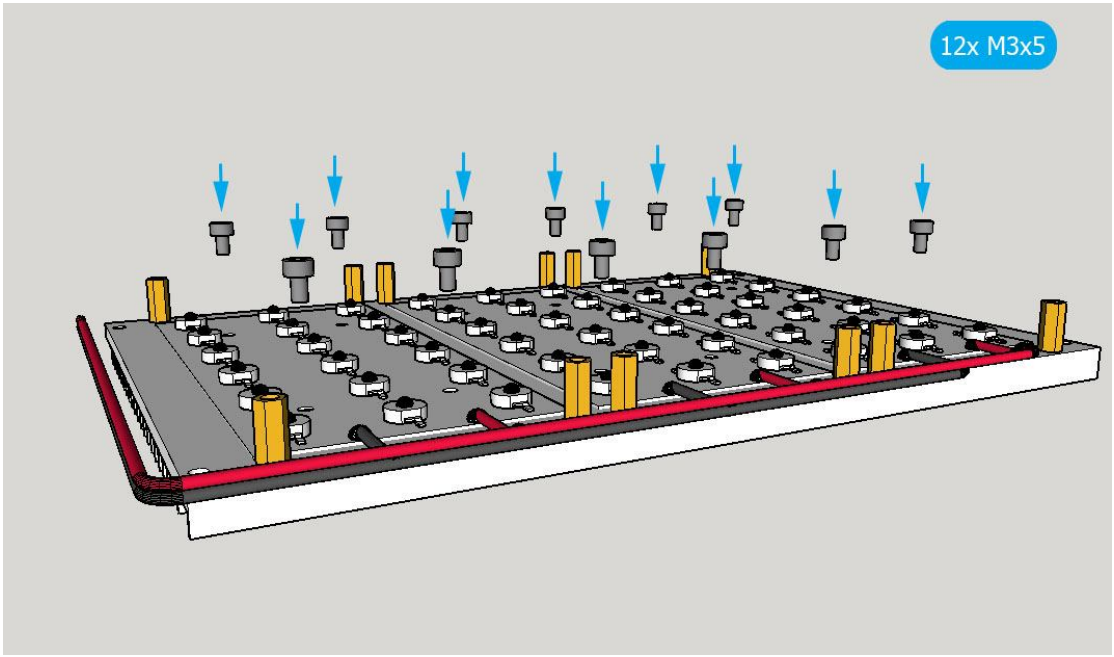
Make sure the UV LED-modules is perfectly flat, even at the corners. Apply thermal grease at backside of each *UV LED*-module, also at the corners. Included in the package is enough thermal grease for all 3 UV LED-modules. **Note :** Apply grease at thermal holes for UV-LEDs.

Step 17



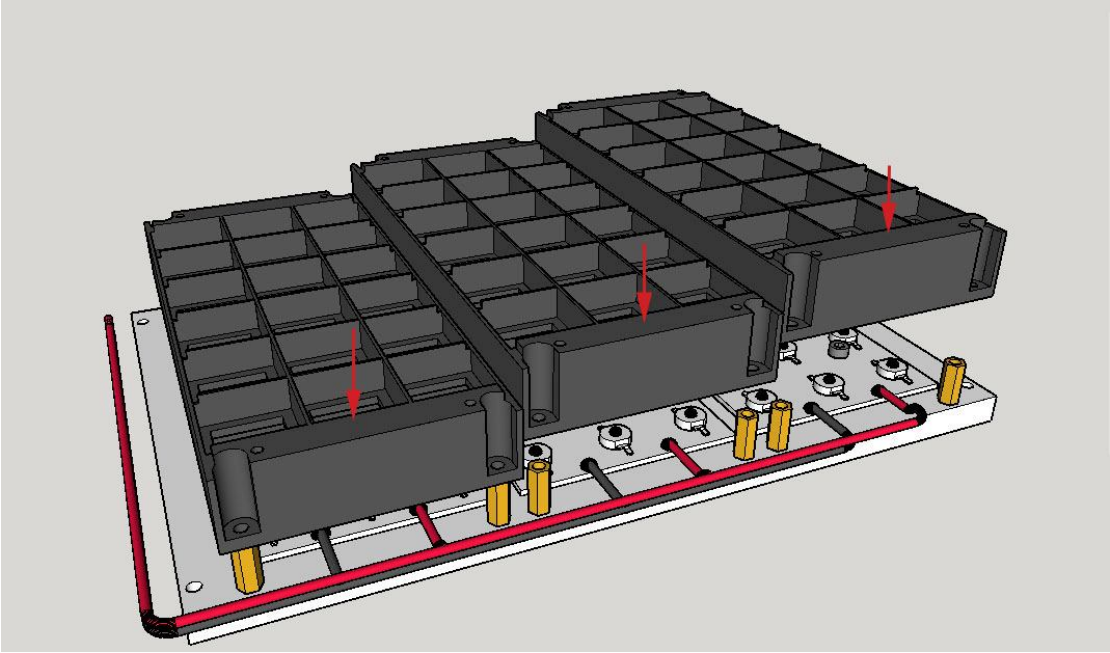
Slightly swirl / rotate *UV LED-modules* and push gently to smear out the thermal grease. Next, align *UV LED-modules* with holes at heatsink.

Step 18



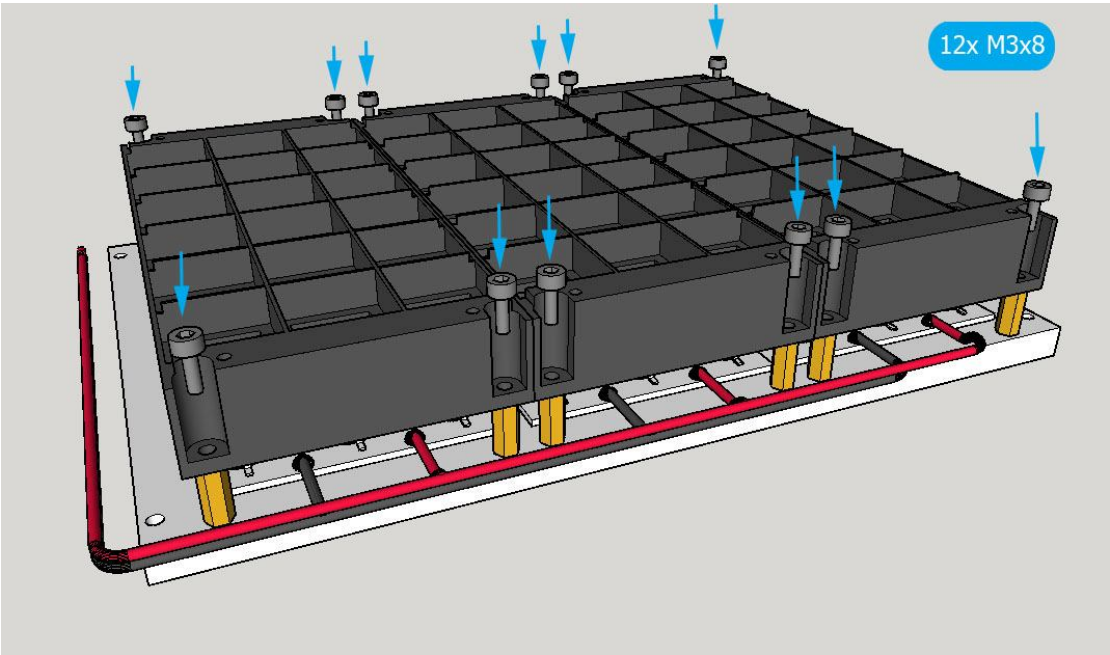
Mount 12 screws back into heatsink to fixate *UV LED-modules.*

Step 19



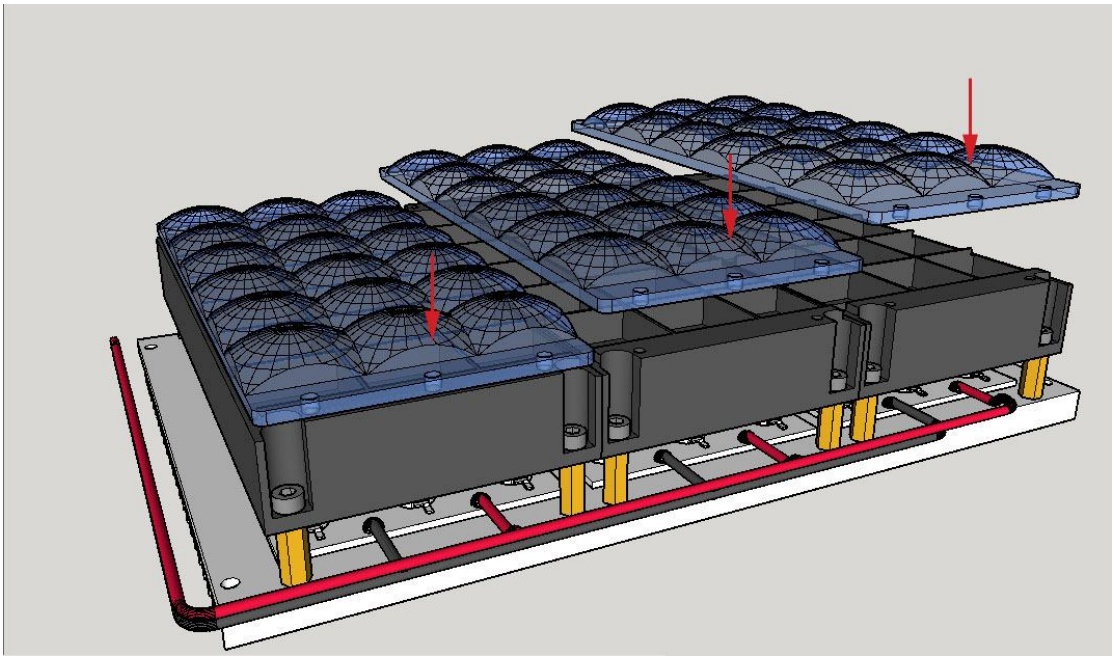
Add all 3 distance-beds back to original position

Step 20



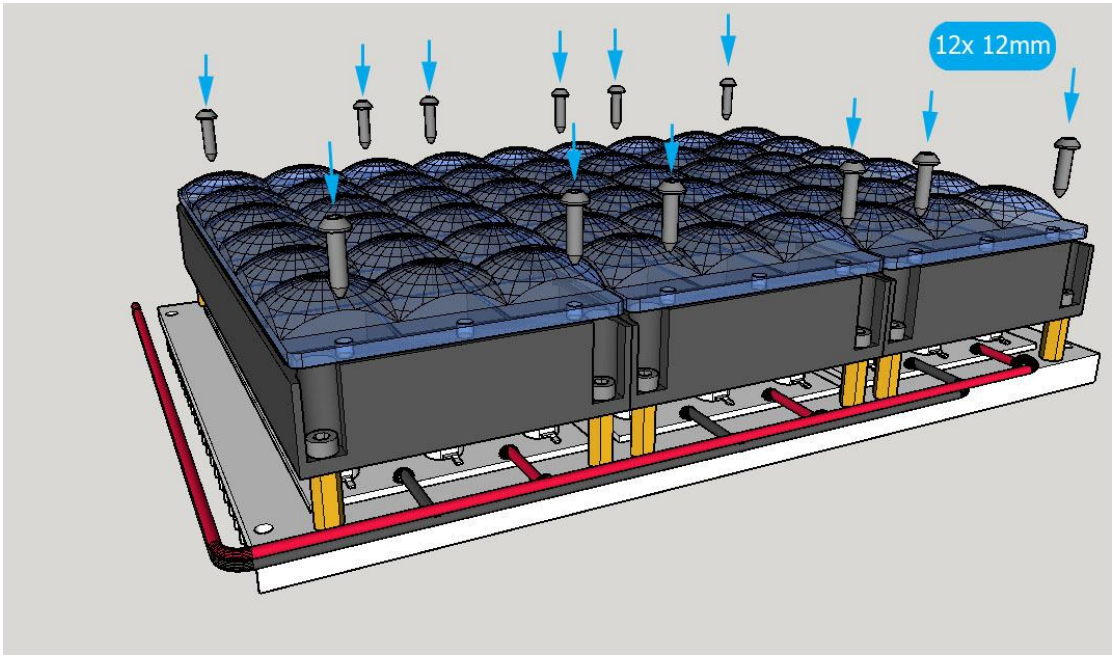
Insert all 12 screws to fixate distance-beds

Step 21



Add and align all 3 LED-lenses to distance-beds

Step 22

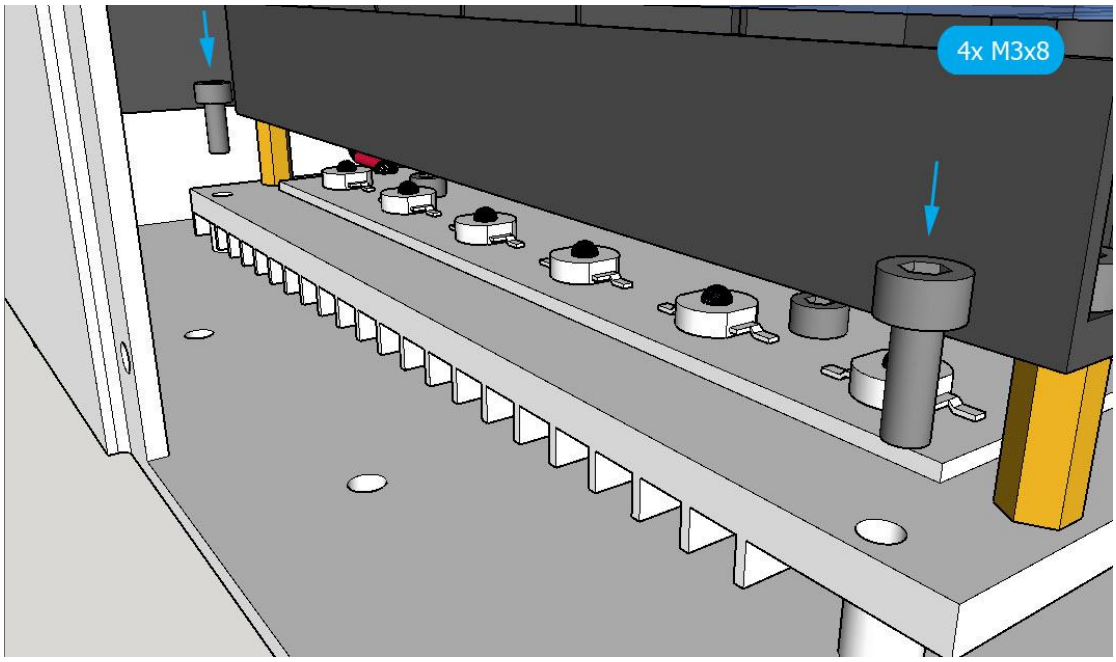


Insert all 12 screws back to fixate LED-lenses

IMPORTANT NOTE : Don't tighten the screws too much or it may irreversible damage the transparant plastic LED-lenses.

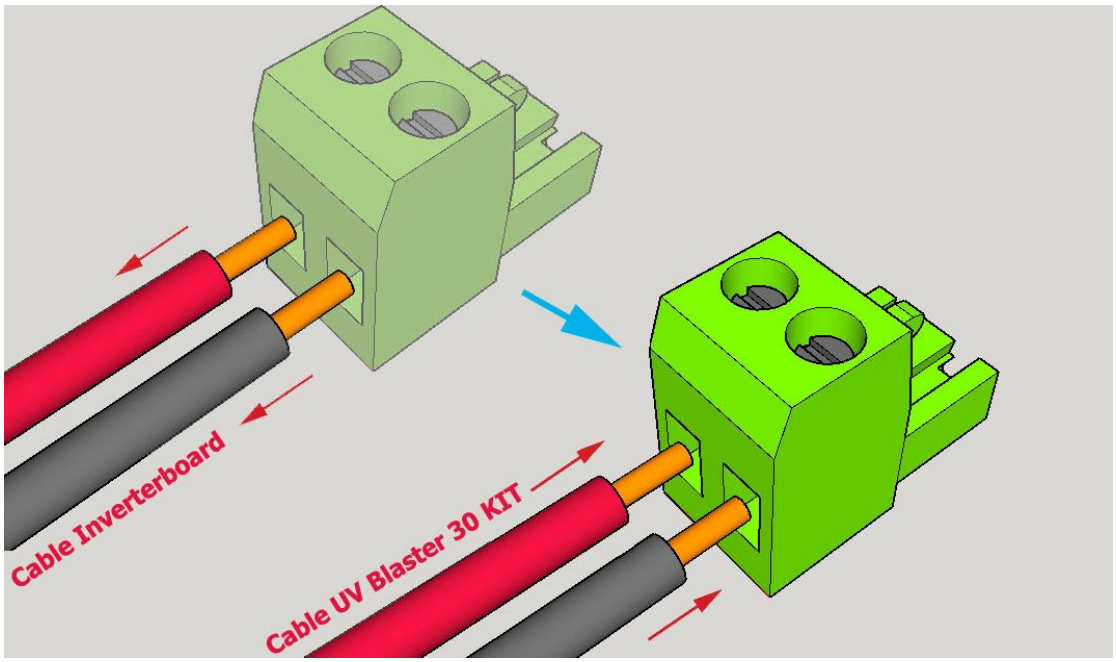
Suggestion : Clean top of LED-lenses with microfiber cloth.

Step 23



Align heatsink and insert 4 screws back, in all 4 corners of heatsink, to fixate it to case

Step 24

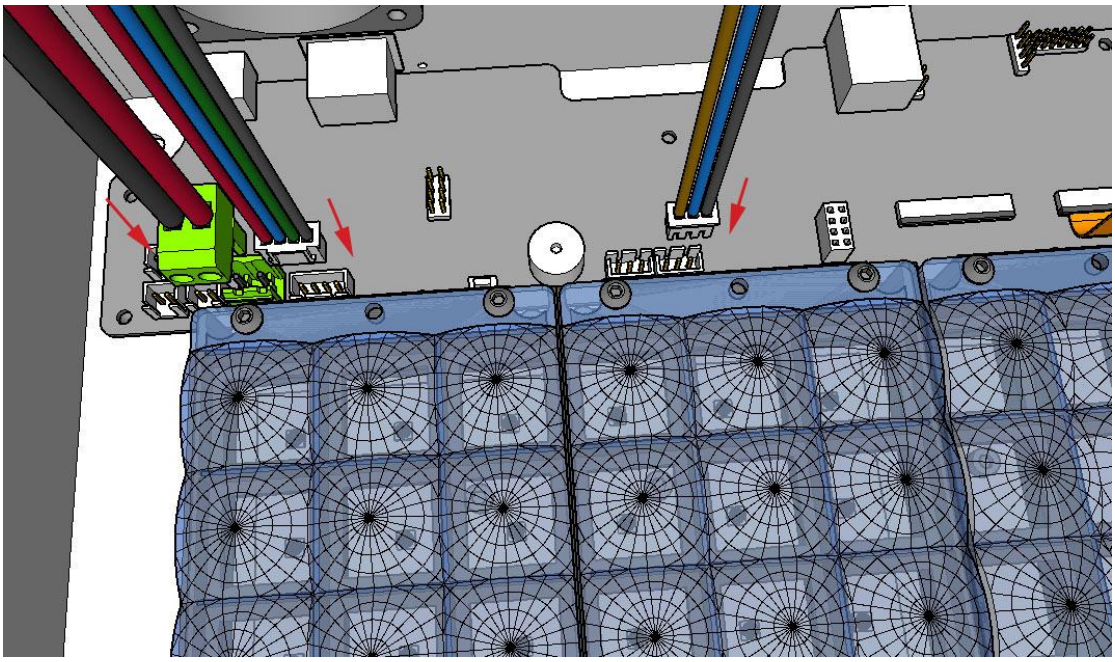


Attach **green** connector from original inverter board to powercable of *UV LED-modules.*

NOTE : The green socket at the motherboard, text "-LED+" is printed and indicates the position of **plus** (red cable) and **minus** (black cable).

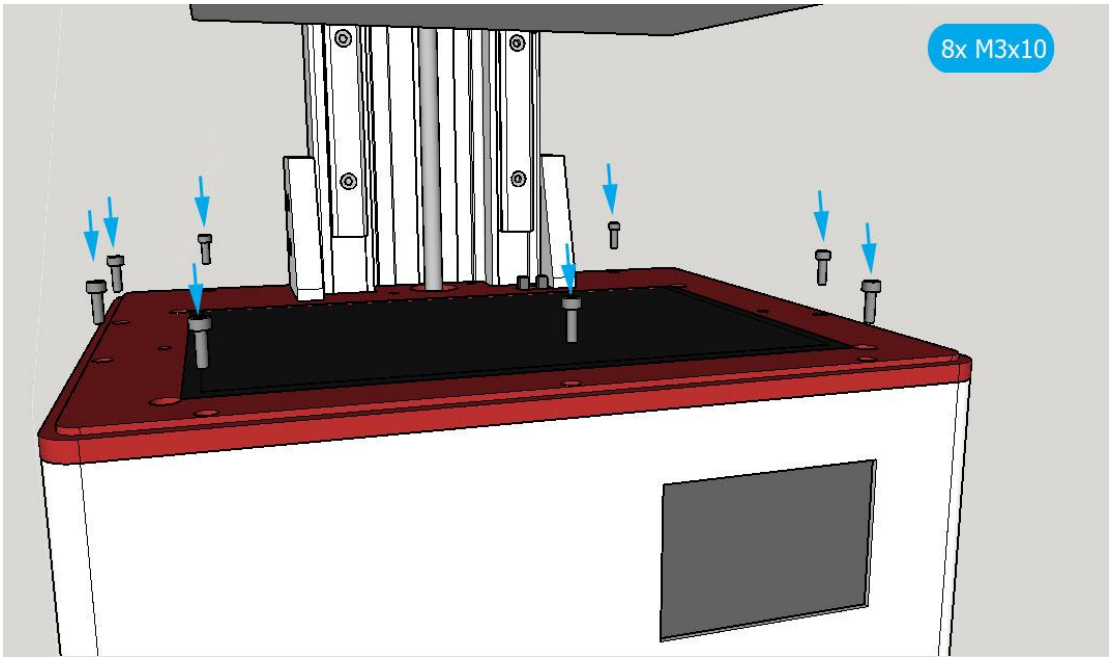
As an extra feature / precaution, *UV LED-boards* are protected for inversed polarity. If accidentally inversed polarity occurs, no damage will happen : LEDs will just not turn ON.

Step 25



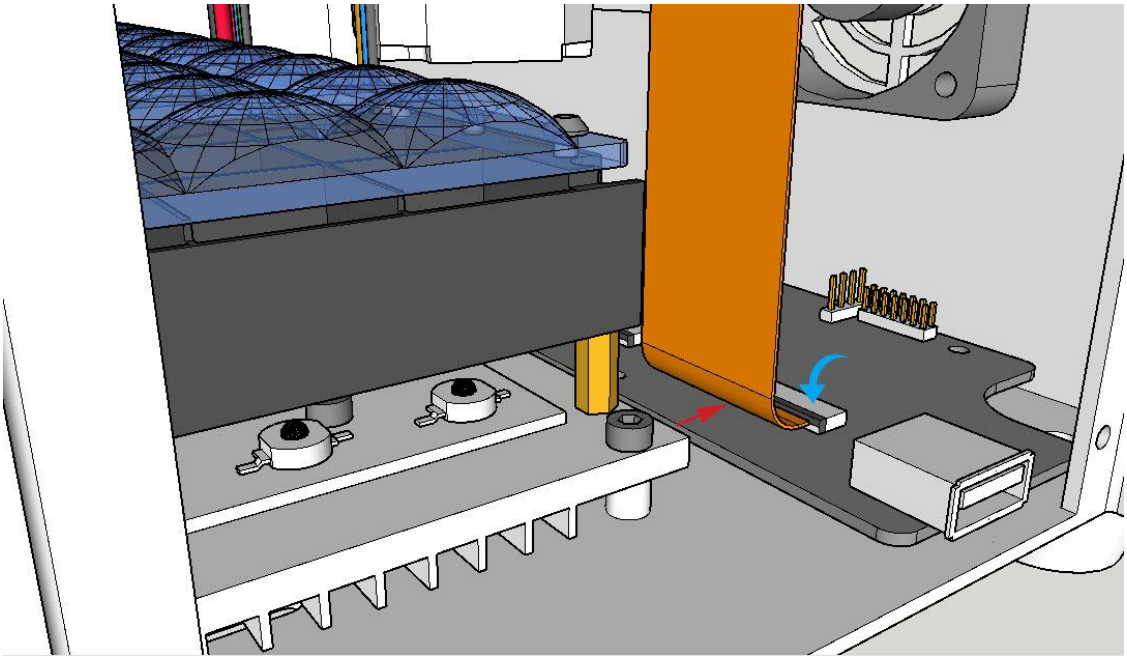
Attach white connector with 3-cables to "*Z-*" sensor (brown, blue and black)
Attach white connector with 4-cables to steppermotor (red, blue, green, black)
Attach green connector with 2-cables to *UV LED-modules* (black and red)

Step 26



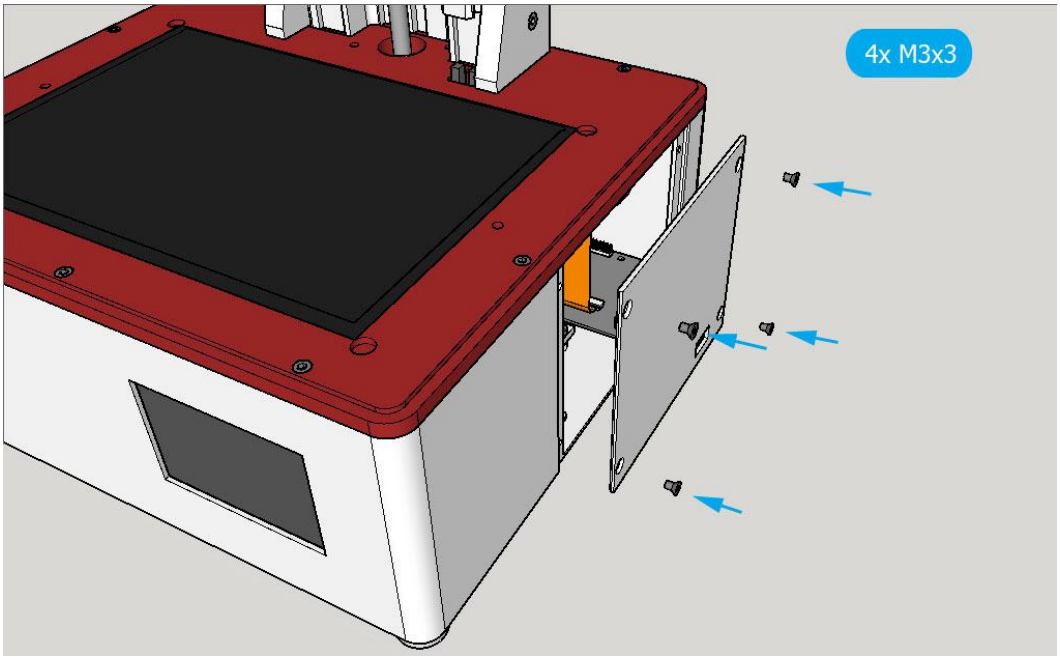
Align red top-plate back onto case and insert 8 screws to fixate it.
Note : Be sure there's no hardened UV resin left in these screw-holes. If there is, remove / clean it carefully. Heads of screws should be right below the surface. No excessive force is required to tighten it to the end of the screw-threading.

Step 27



Attach FFP LCD-cable inside connector at motherboard correct.
Carefully flip black plastic lid (75° angle) from FFP-connector down to fixate FFP LCD-cable

Step 28

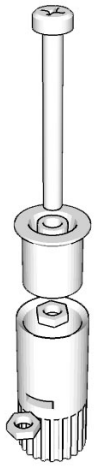
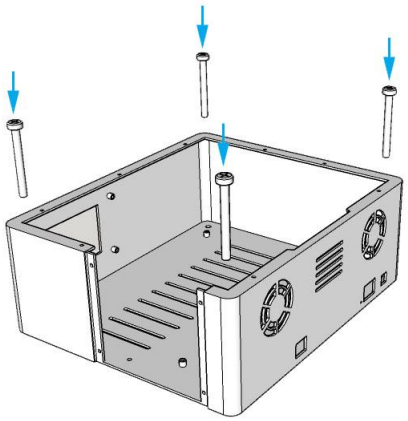
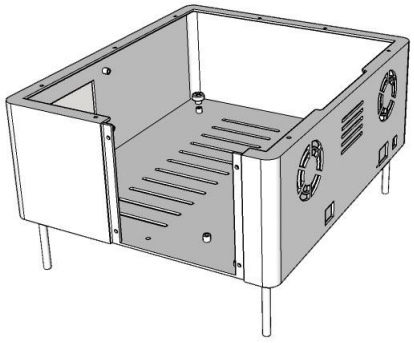
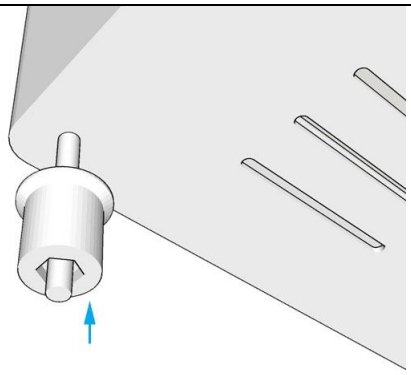


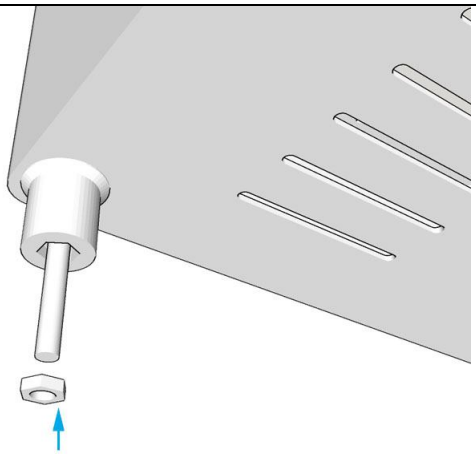
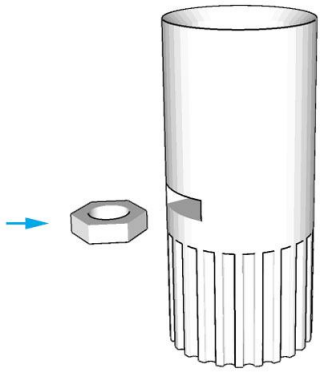
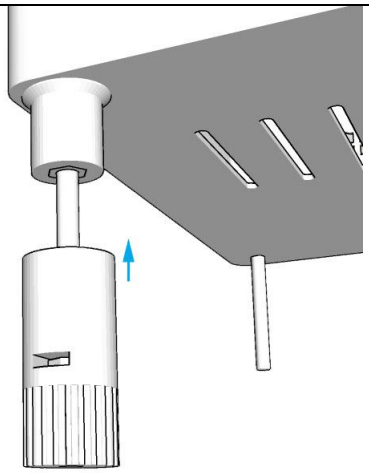
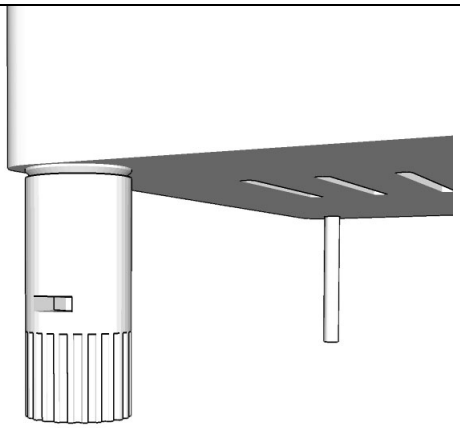
Align USB-panel back to original position at side of case.
Insert 4 screws to fixate USB side-panel.
NOTE : The USB-connector needs to be be easy accesible.

Now, turn on Elegoo Saturn and perform a displaytest. If all went fine, 2 more steps should be performed :
1) Installation of legs
2) Installation of fan-module

Extended feet

Since the UV LED-modules generates more thermal power than original UV-LEDs, additional cooling is required. This is done by adding the included fan-module at the bottom of the printer.
To enable the fan-module to operate, additional space is required at the bottom of the printer. The printer needs to be "elevated". This is the reason why the extended feet are designed and included in the package. An additional feature: the printer can be leveled. This is comes in as a great feature, when the printer is located at an uneven or not leveled surface. Installation of these extended feet are pretty easy. Remove original parts and replace them via the following steps below :

<table>
<tr>
<td> 
Remove M6 bolt</td>
<td> 
Replace former bolts and feet by M6 bolts</td>
</tr>
<tr>
<td> 
M6 bolts should be tightened by a screwdriver</td>
<td> 
Slide-up top-part over M6 bolt</td>
</tr>
</table>

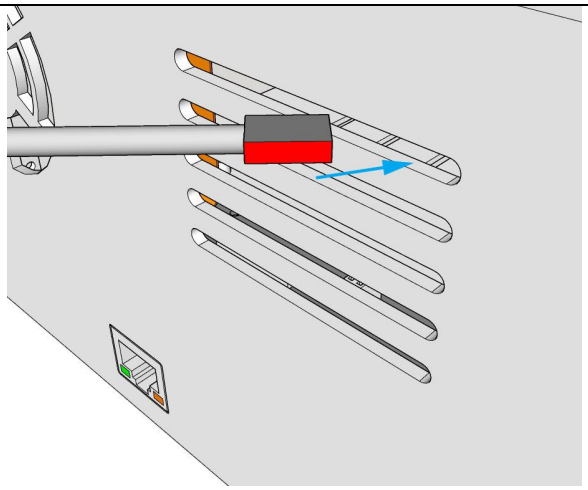
<table>
<tr>
<td> 
Add M6-nut to M6-bolt and make it fit into top-part. Tighten top-part with nut firmly, by rotating it clockwise</td>
<td> 
Insert M6-nut into gap of bottom-part
(Note : probably already installed for you)</td>
</tr>
<tr>
<td> 
Slide bottom-part over M6-bolt</td>
<td> 
Rotate bottom-part clockwise, until it slightly touches top-part</td>
</tr>
</table>

Proceed for remaining extended feet.

When complete installation is done, use legs to level the Elegoo Saturn machine. But before doing this, perform the last step, which is installation of the fan-module.

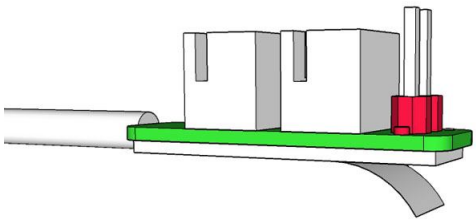
Fan-module (bottom)

There are 2 types of fan-modules available and distributed randomly. One type contains a single fan, which is also widely used for graphic video-adapters. The other type contains 2 pcs 60x60x11mm fans. No matter what version you get, installation is identical, concerning mounting and cabling. Pictures below show each step :

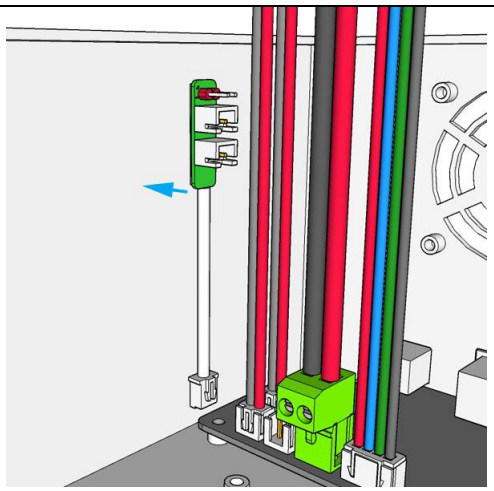


Slide cooling fan-plug and cable through back of air-exhaust

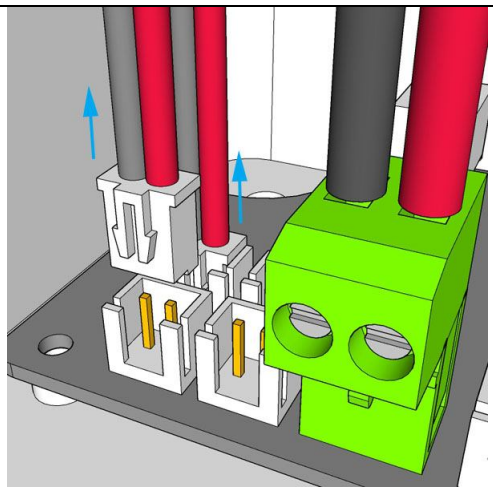
Take *Connector expander* out of zip-bag



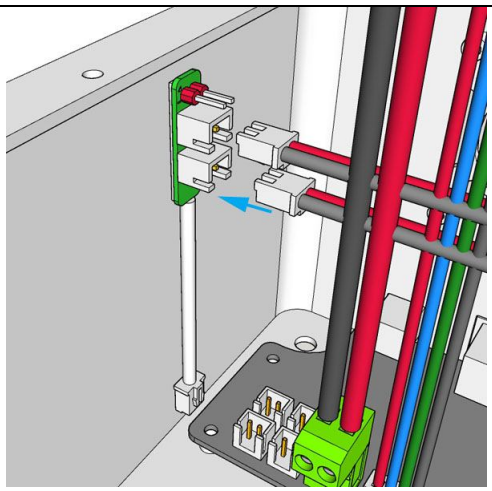
Remove paper cover from sticky foam



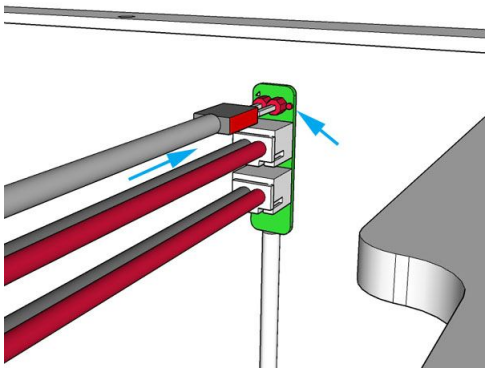
Attach *Connector expander* to side-wall



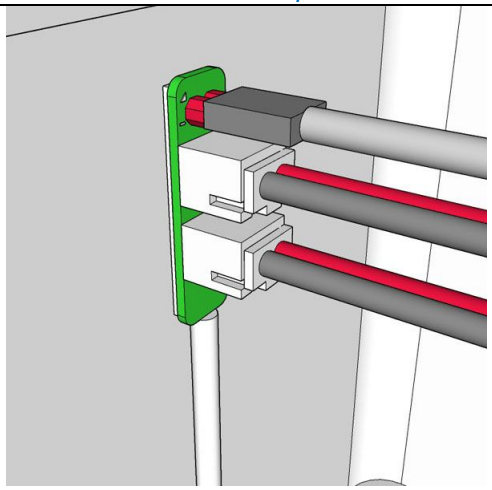
Remove both back-fan connectors
from mainboard



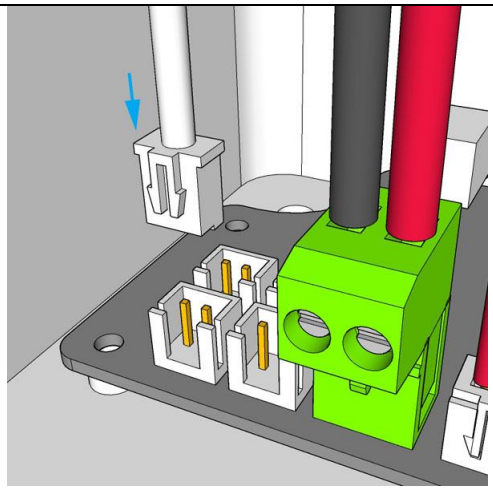
Insert both back-fan connectors
in *Connector expander*



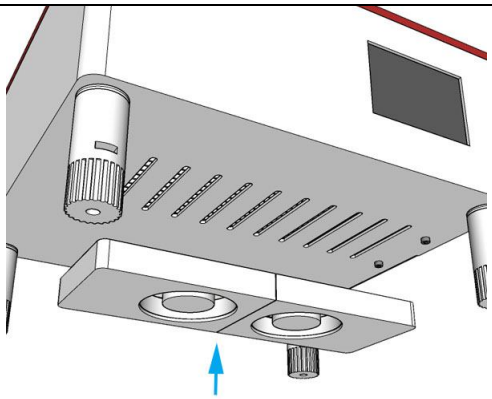
NOTE : Match red marking at cooling fan plug
and red marking near pin-header



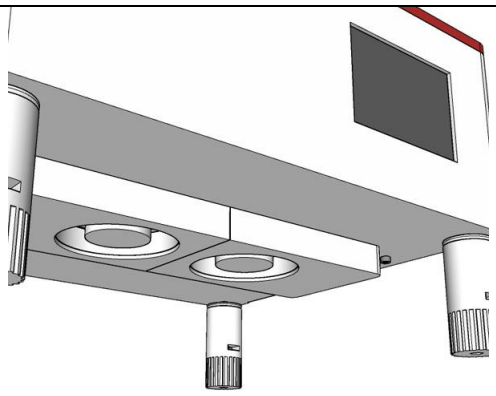
Insert cooling fan plug to pin-header



Insert plug of *Connector expander* in socket
of mainboard (marked **MB F+**)



Attach cooling fan module to bottom of Saturn

 Align fan-module to fully cover air-inlet	

IMPORTANT NOTES :

- *Never* leave a Saturn machine unattended while performing a printjob.
- When performing long enduring printjobs, keep monitoring internal temperature. If too high, pause machine to cool down.

Common assembly mistakes

Display not working

It is possible, after installation, the LCD is not working. There's a fair chance you installed the FFP-cable upside-down, back into mainboard connector. This is because the cable is long enough to allow this error to happen. Don't fear. Just open the printer again and check if the cable got inserted back correct.
If it was, just insert it correctly.

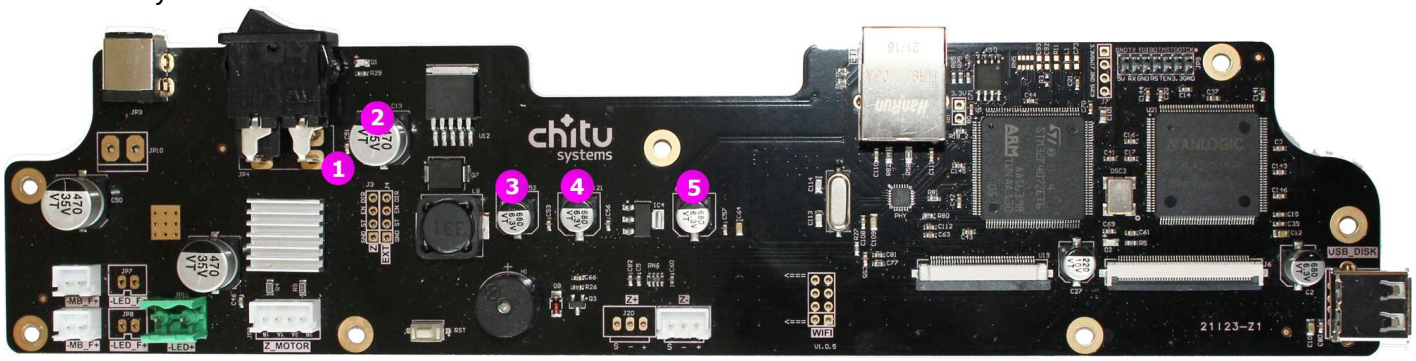
LEDs not working

If the UV-LED-boards don't emit, there's a chance you wired the power-connector to UV-LED-modules incorrect. It has to do about swapping the red,- and black cable into the original green connector. The UV LED-modules are protected against accidental swap of cables. So no harm here either. Just swap them and check if things work right from that moment.

Additional improvements

There are some design flaws on the Saturn motherboard. When checking the datasheet for the components used, odd values for capacitors are present. In addition, it was better if the power lines were insulated. By isolating power lines, the effects of current and voltage spikes caused in adjacent parts are reduced.
Below is a photo of the controller board, showing some key parts (by pink dots/number), which could use an improvement.

Important notice : Modifying the motherboard might void warranty. Performing these improvements are at your own risk.



1) **Isolate powerlane**

Right after the powerswitch, a combined powerlane is used for powersection, steppermotor driver and the UV-matrix / fans. To optimize the power-section for this motherboard, it's best to isolate this part. Isolating this parts means, if current/voltage spikes occur elsewhere (steppermotor / UV-LED part) it will reduce harmful effects to the powerregulation (to control-ICs). This powersection converts 24V DC into 5V via an LM2596 150KHz 3Amps switcher. Cutting this powerlane and bridging it by a rectifying diode will do protect this part better. You could even consider a Schottky-diode as it will respond faster to spikes than a default rectifying diode. A 3 Amps version for 30V or higher voltage will do the job.
The anode of a diode should be aligned to 24V DC part, the cathode to the LM2596. Cathode is mostly marked by a small line or ring at the body of the diode.

NOTE : It might be a tough job to perform this. The black mechanical powerswitch is a bottleneck because of its size. Best is to desolder this part first carefully. If you don't have access to tools to perform this task, skip this.

2) **Replace capacitor at input**

This is a 470uF / 35V SMD version. The datasheet of the 5-legged LM2596 switcher, next to it advises a 680uF capacitor. This suggest it's best to replace it original 470uF/35V capacitor by a 680uF/35V radial through-hole version. You can bend and cut the legs of such capacitor to fit. A SMD-version will work also, bit will take much more effort to solder. Also, there's a chance the through-hole version is cheaper to source than the SMD version.

3) **Replace capacitor at output**
As output /feedback for the LM2596 a 220 uF capacitor is suggested by the manufacturer datasheet. The onboard capacitor is a 680uF/6.3V version.
The switcher is generating some voltage-ripple, which means, the output Voltage is above and below 5 Volts. When spikes occur, it might go well past 6.3V. Next, the capacity of a capacitor might variate at a given Voltage.
If you like to be on the safe side, replace this capacitor by a 220uF/16V radial through-hole capactor and keep polarity in mind. At the side of a capacitor is often a line visible, marking the negative polarity. In the picture, you can see the black line at the top of this capacitor.

4) **Remove capacitor**
This is another 680uF/6.3V capacitor in the 5V powerlane. It only adds up the total capacity at the 5V output of the LM2596 and generates an imbalance. This capacitor should be removed if succeeded step 3) previously.

5) **Replace capacitor**
This capacitor is present at the output-section of the CJT 1117B-3.3V, which is a 3.3 Volt regulator. This voltage-regulator "transforms" 5 Volts into 3.3 Volts for the control-IC. Datasheet for this part suggests a value of 22 uF, while a 680uF/6.3V is present. This 680uF is way too much and can cause another power imbalance. You can replace this capacitor by a 22uF/6.3V radial through-hole version.

Like mentioned before, all suggested "repairs" will likely void warranty. However, in return the motherboard got improved and works better / more safe. The chance an electronic malfunction will occur is reduced.