

Quick Setup Guide for using a PLH3D-2W Laser Head with a Prusa i3 MK3S 3D Printer

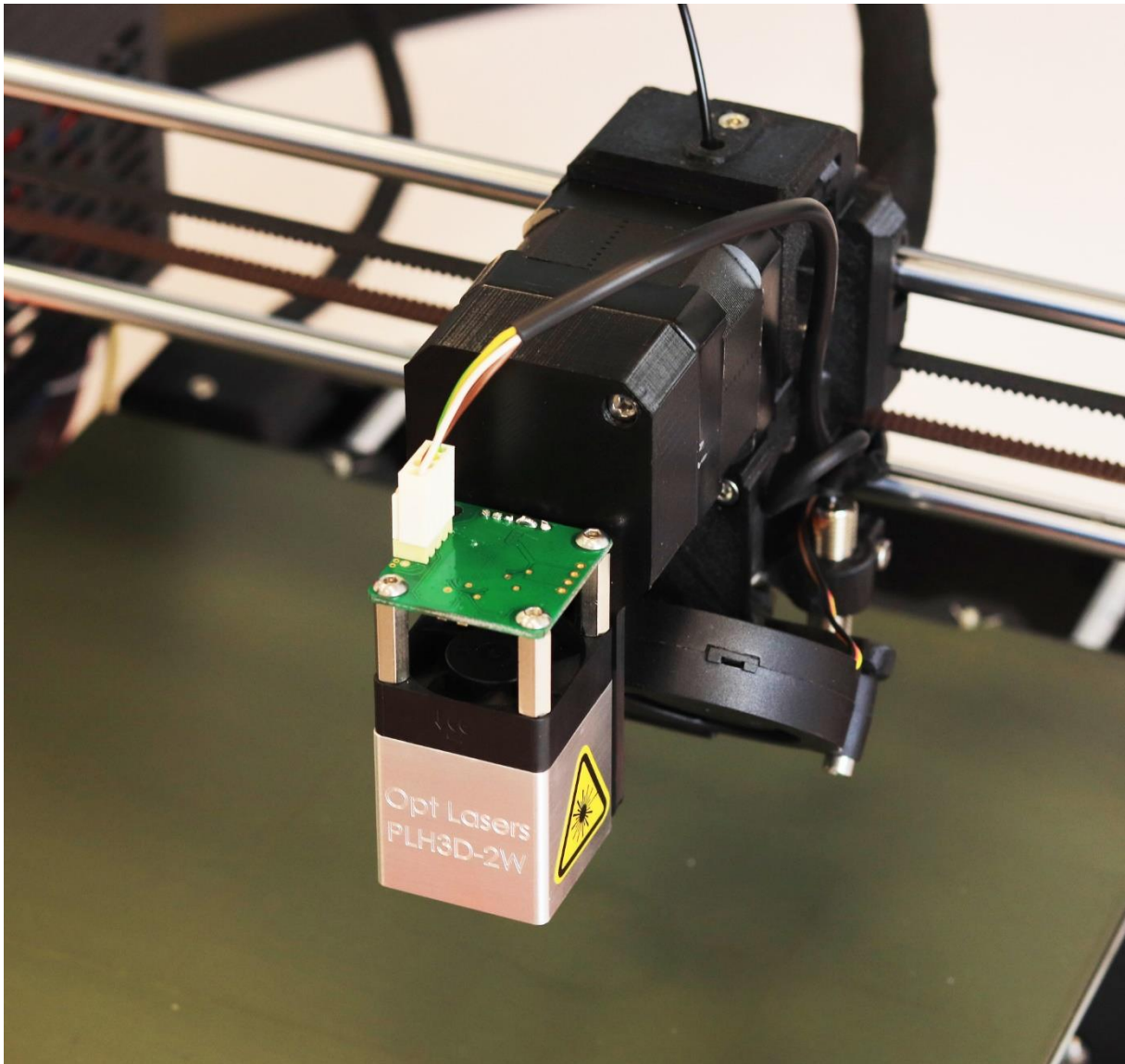


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General Laser Safety Warnings and Precautions

Only person with specialized training and appropriate laser safety knowledge can use and maintain the laser head. The laser head operator must be aware of laser radiation hazard.

While laser head is operating protection Laser Glasses designed for 190 – 540 nm (OD 7+) should be used. Make sure that all personnel in the same room worn protection glasses.

Eye exposure to the direct or diffusely reflected laser beam is a hazard. The laser head beam may cause permanent eye damage.

Skin exposure to the laser beam is a hazard. The laser beam may cause serious skin burns. Laser beam may easily burn cloth.

It is possible to get serious injury while using this product or being in the vicinity of an individual using it. Improper use of the laser head can result in injury or death.

Flammable substances exposure to the laser beam may pose fire hazard. The laser head operation in an explosive atmosphere may be dangerous. The working area must be well ventilated. During the operation laser beam may ignite gases or flammable liquids.

Before making any adjustments, changing accessories or performing maintenance, the laser should be powered off and disconnected from the power supply and CNC main board.

The laser head must be properly mounted to a rigid body such that it cannot be moved unintentionally. Unintentional move of the laser head is dangerous.

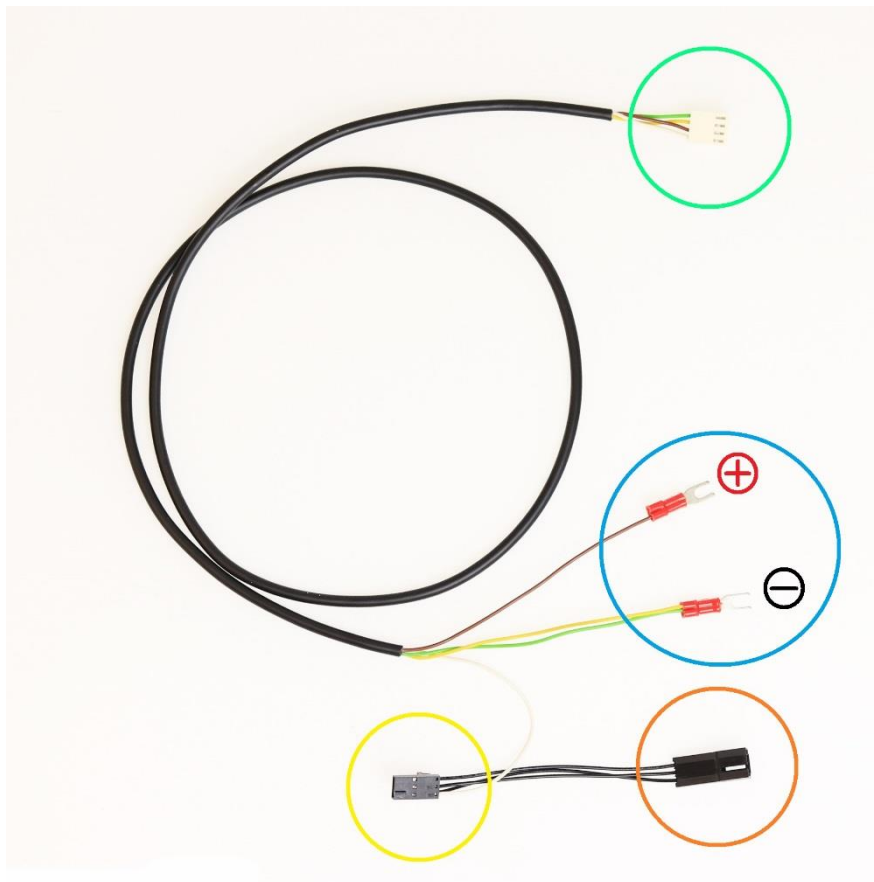
The unauthorized personnel must have no access to the system into which the laser head is integrated. The laser head must be stored out of the reach of children. Untrained persons are not allowed to operate, maintain and observe operation of the laser head.

Specular reflection materials should not be placed in front of operating lasers head. Remember, diffused reflection of the laser beam is uncontrolled and may pose hazard to eye.

Appropriate shielding should be used around the system into which the laser head is integrated. The system in which laser head is used must be equipped with key switch and safety interlock.

Responsibility of use or misuse belongs to the end user. Tomorrow's System and its affiliates accept no responsibility for use or misuse by the user. If you may not be able to use this product properly, we recommend that you do not begin use or cease use immediately.

Cable description



- connect to PLH3D-2W laser head

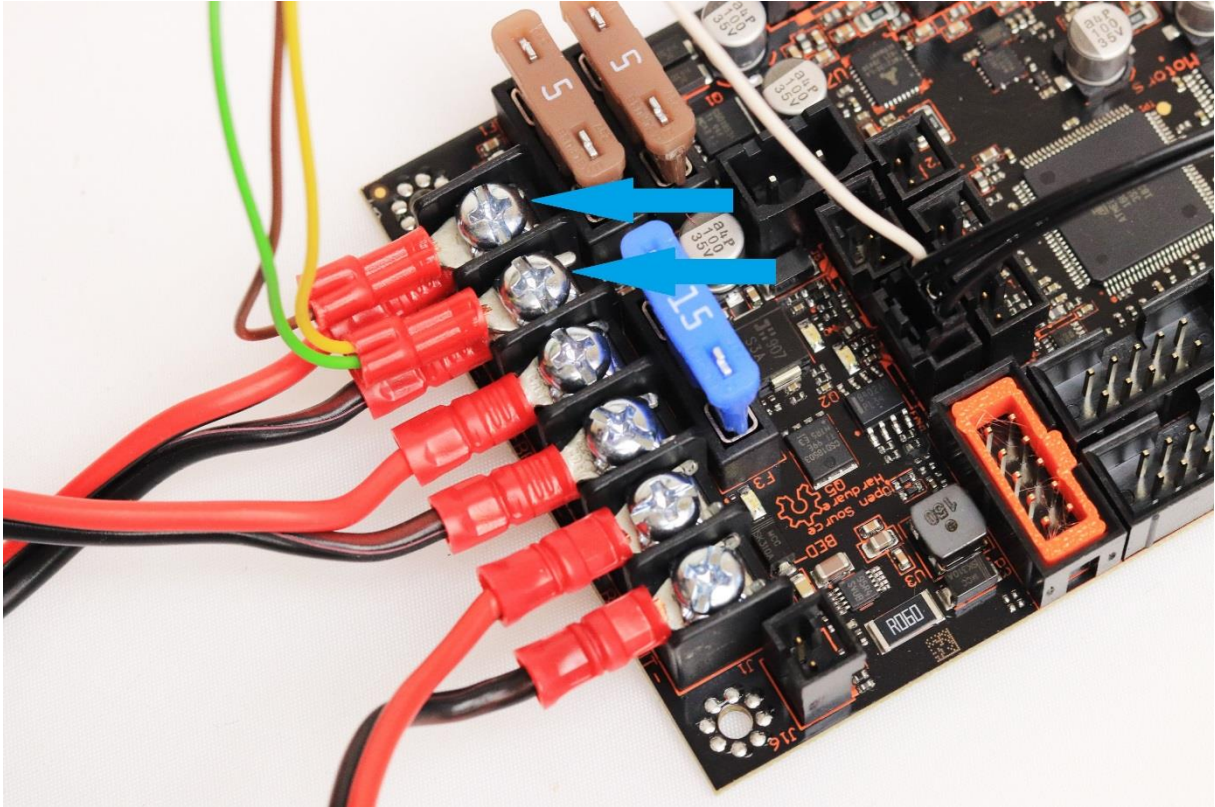
- connect to PWR IN connectors on EINSY board

- connect to wire of front print fan

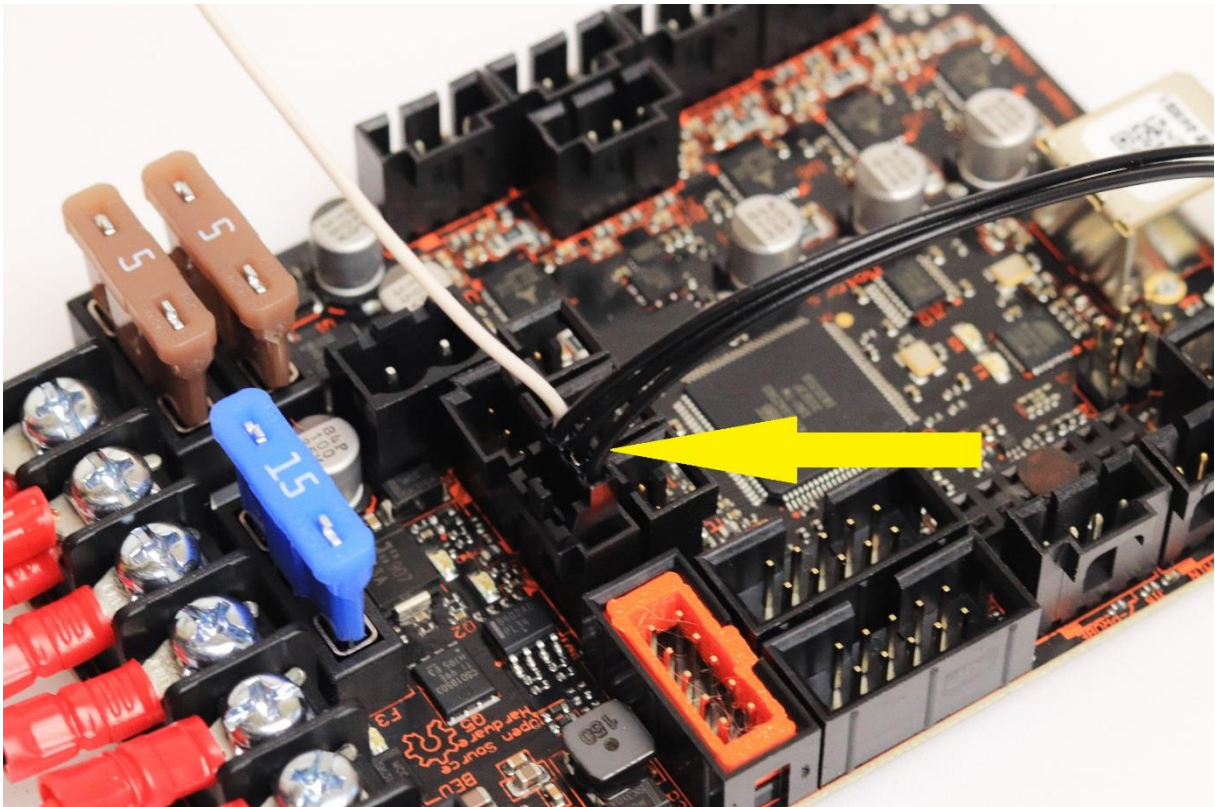
- connect to front print fan connector on EINSY board

How to connect

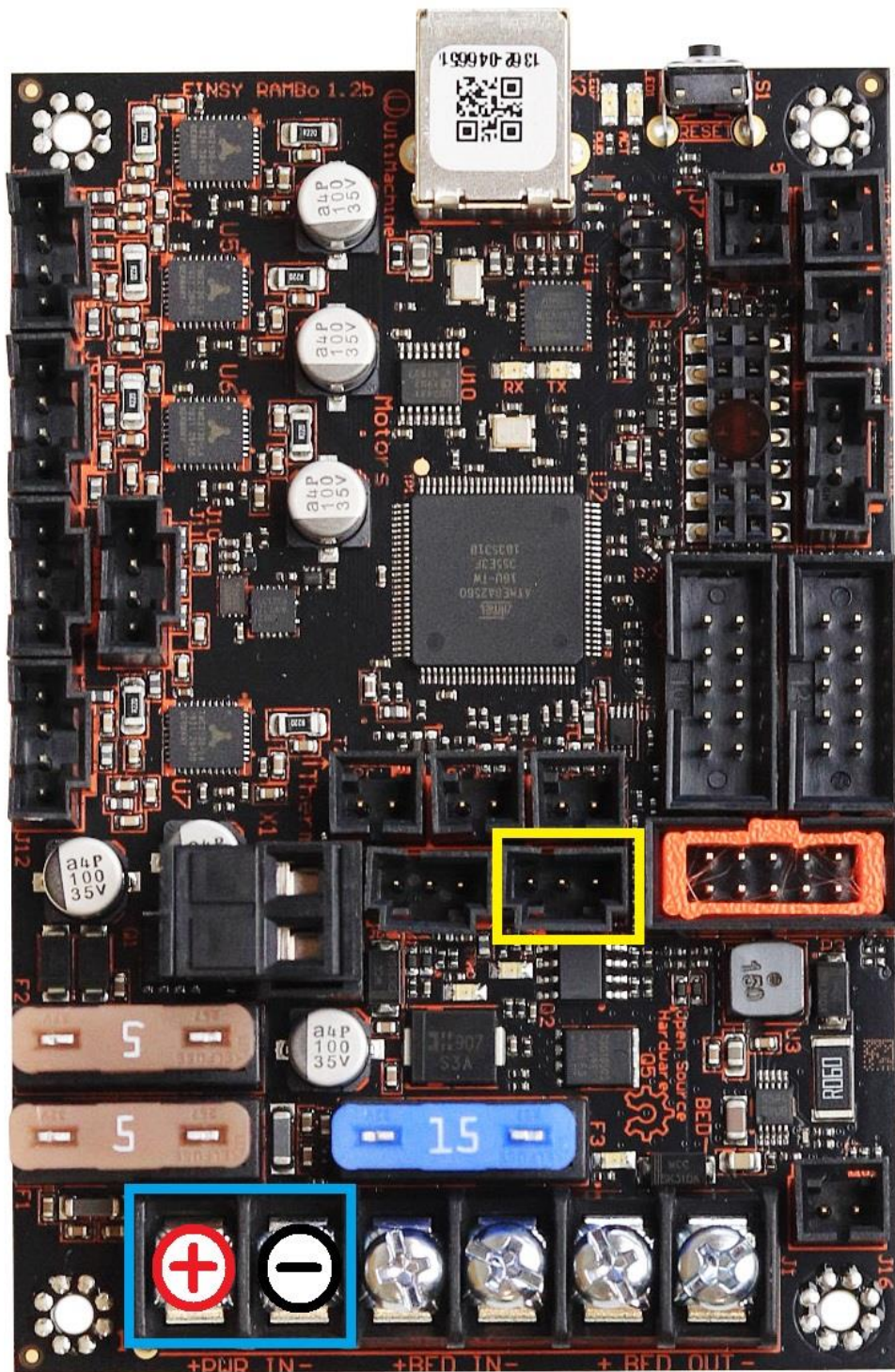
1. Connect PWR- and PWR+ (parallel to wires that have been connected already)



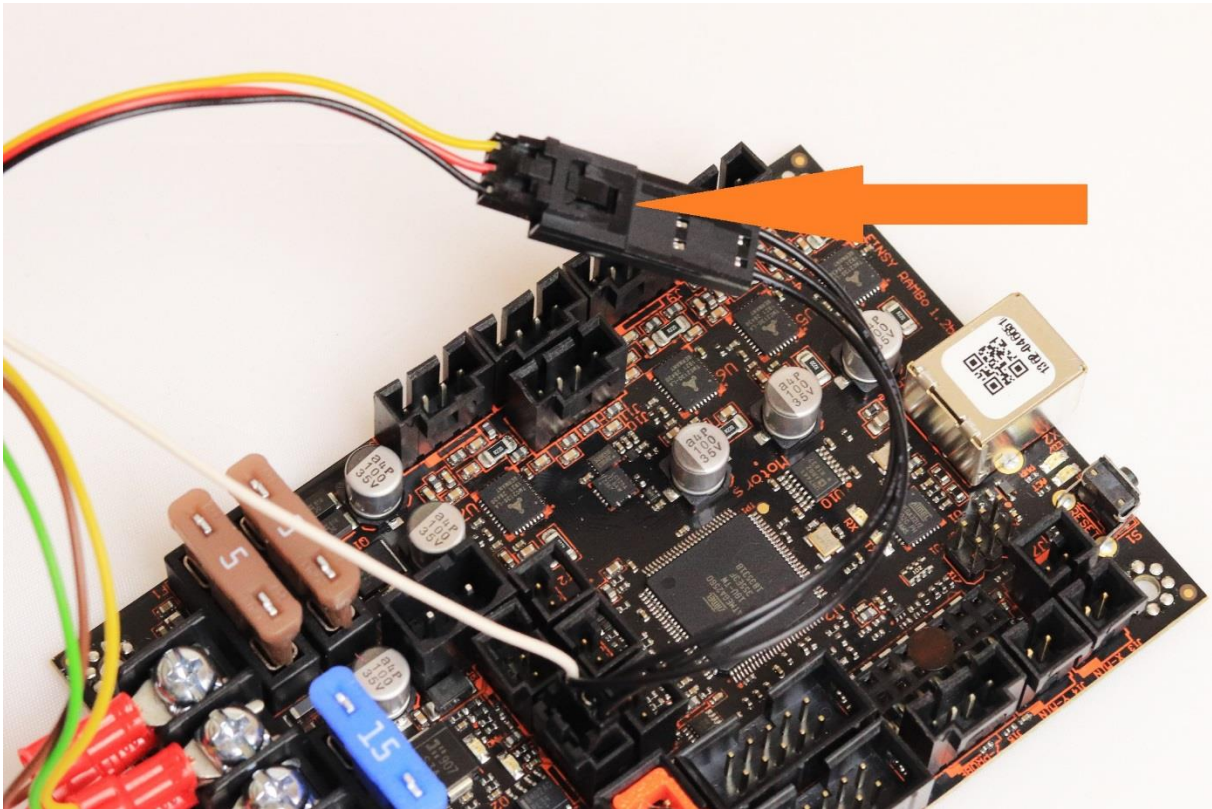
2. Connect laser control input to the connector on EINSY board (instead of front print fan cable).



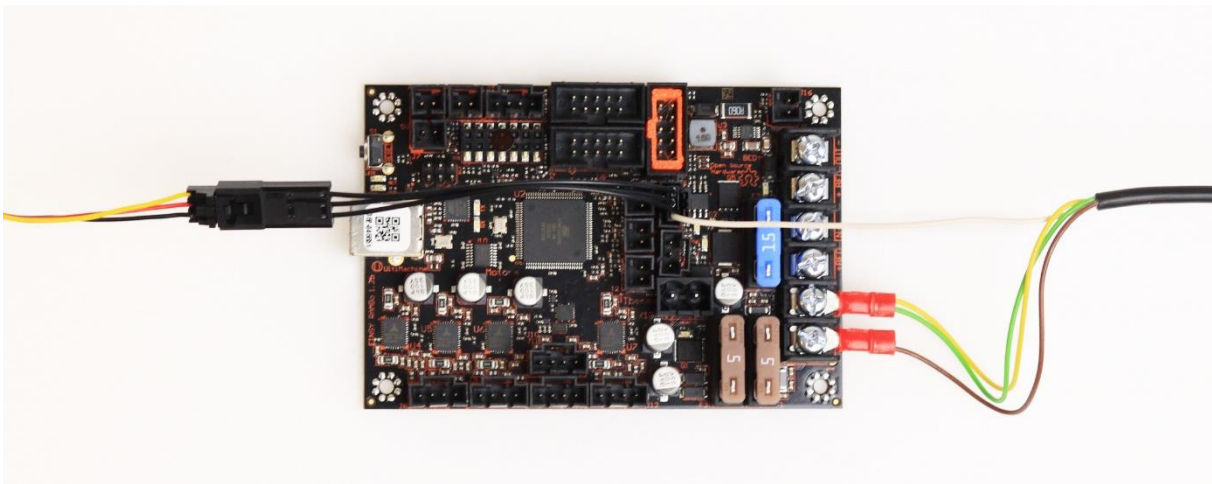
3. Check with photo below, if you plugged those in correct slots.



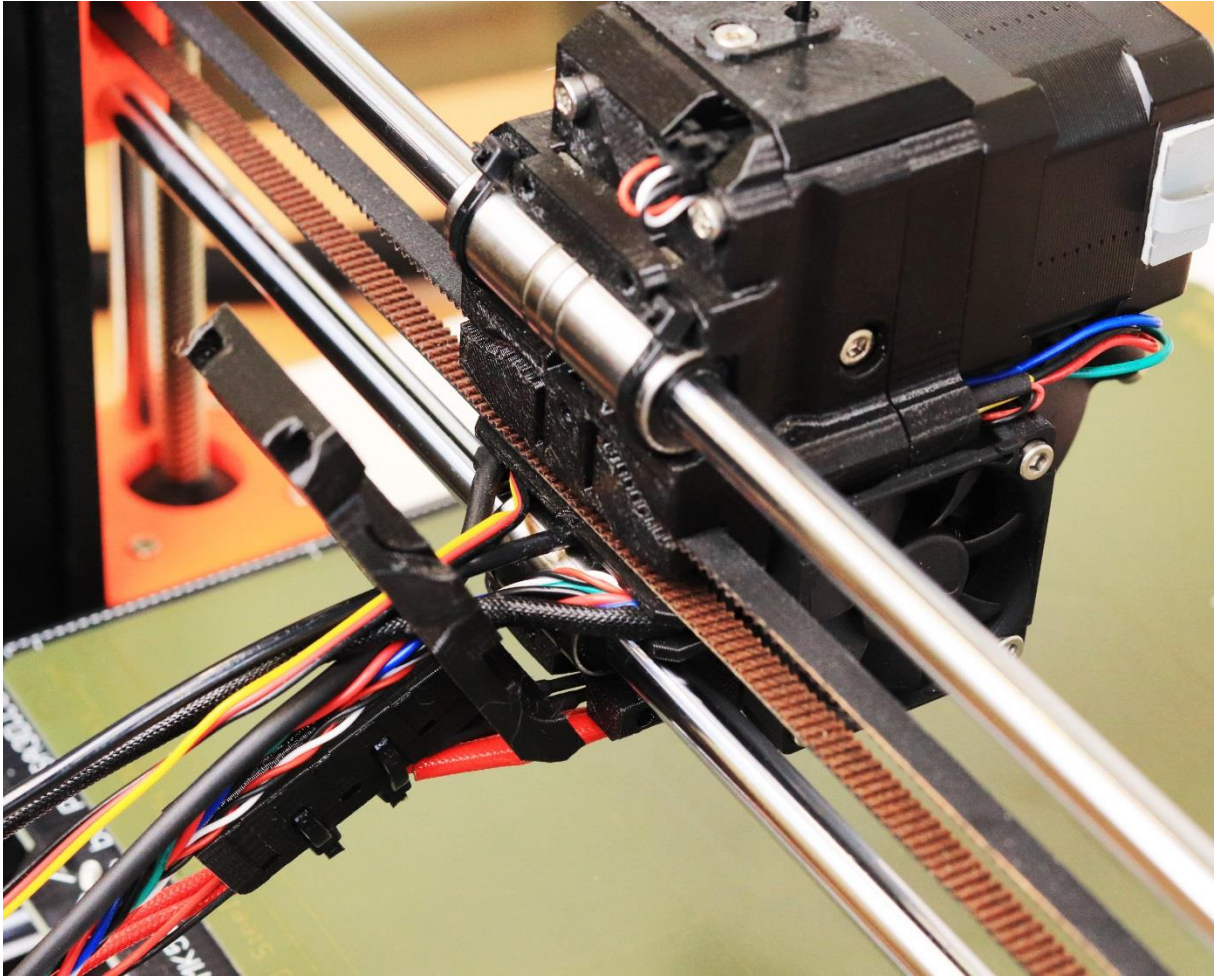
4. Connect front print fan cable.



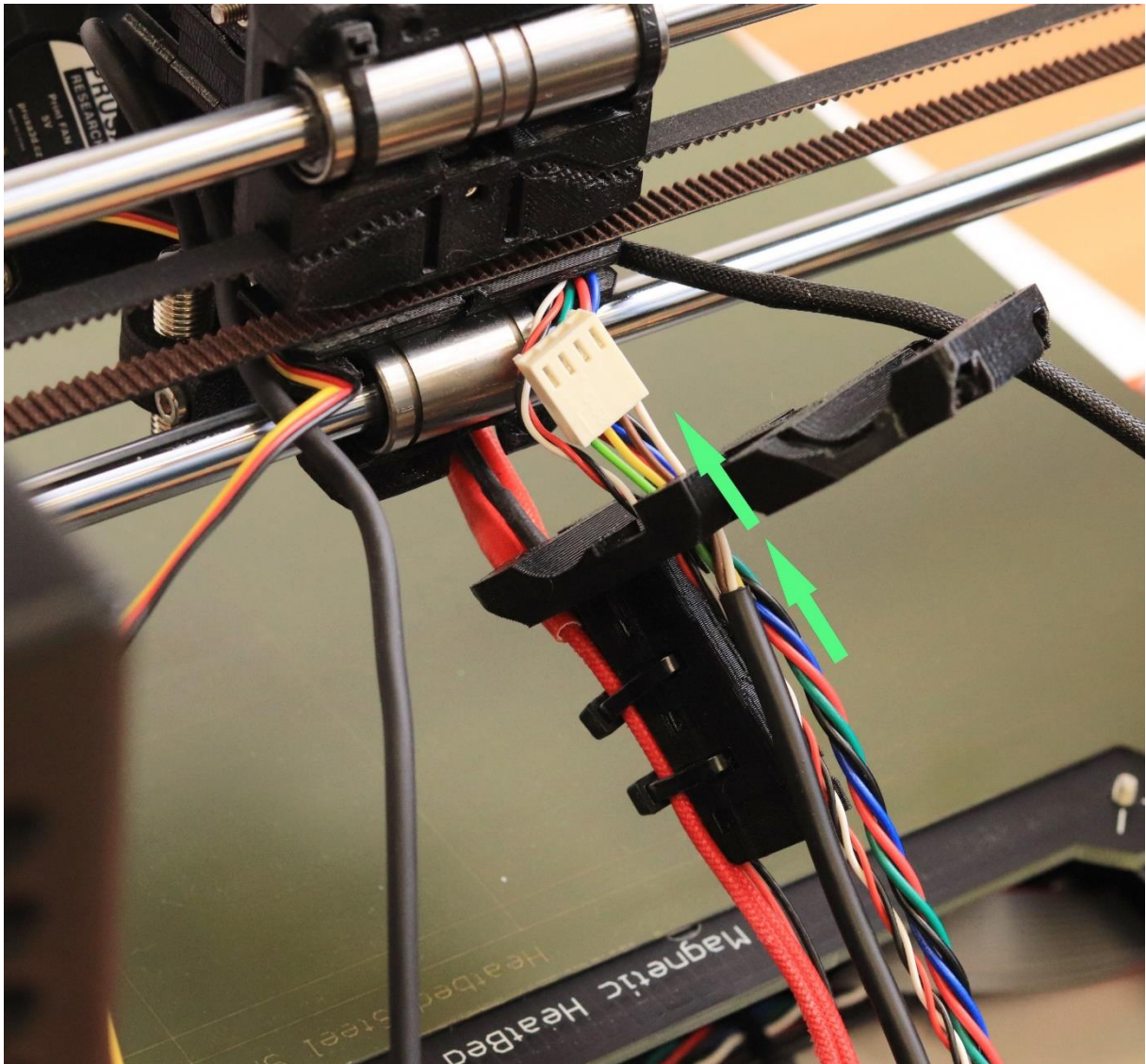
5. View of wires connected.



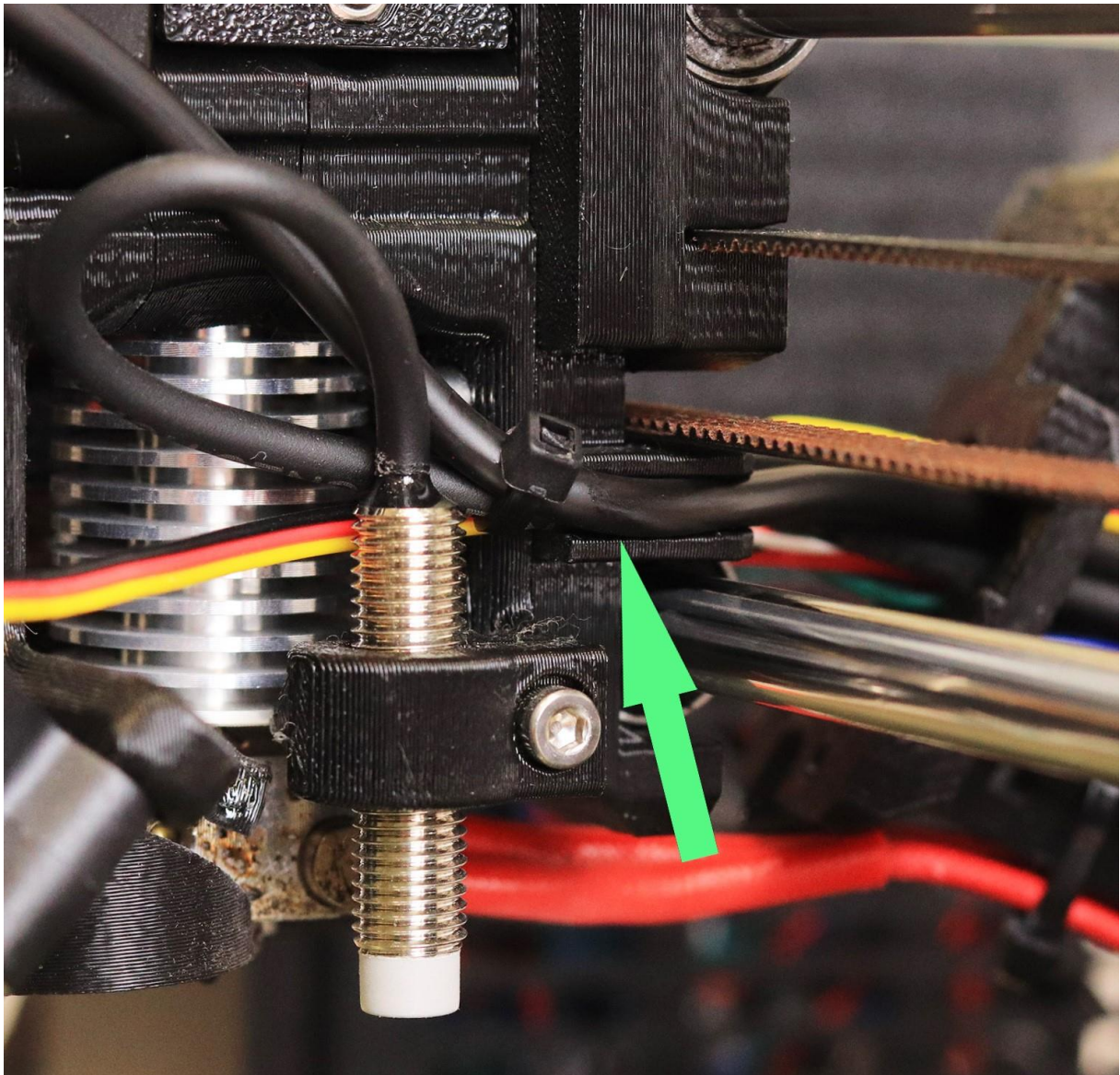
6. Unwrap the cable bundle which connects EINSY board with extruder and dismount X-carriage-back.



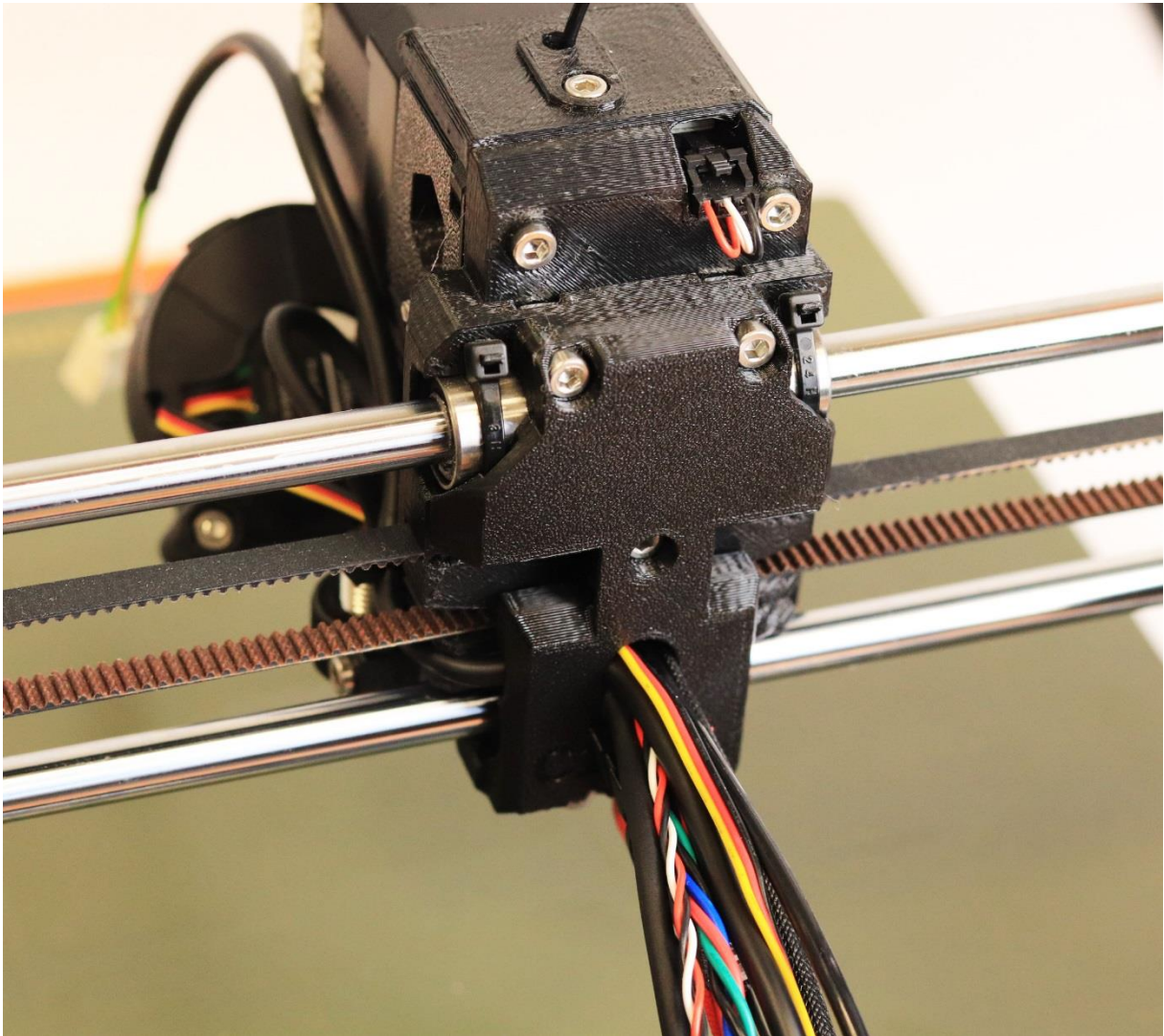
7. Pull the black nylon filament guide, P.I.N.D.A. sensor cable and hotend fan cable through the X-carriage-back to make more space. Push PLH3D-2W laser head cable through the hole, to the extruder side.



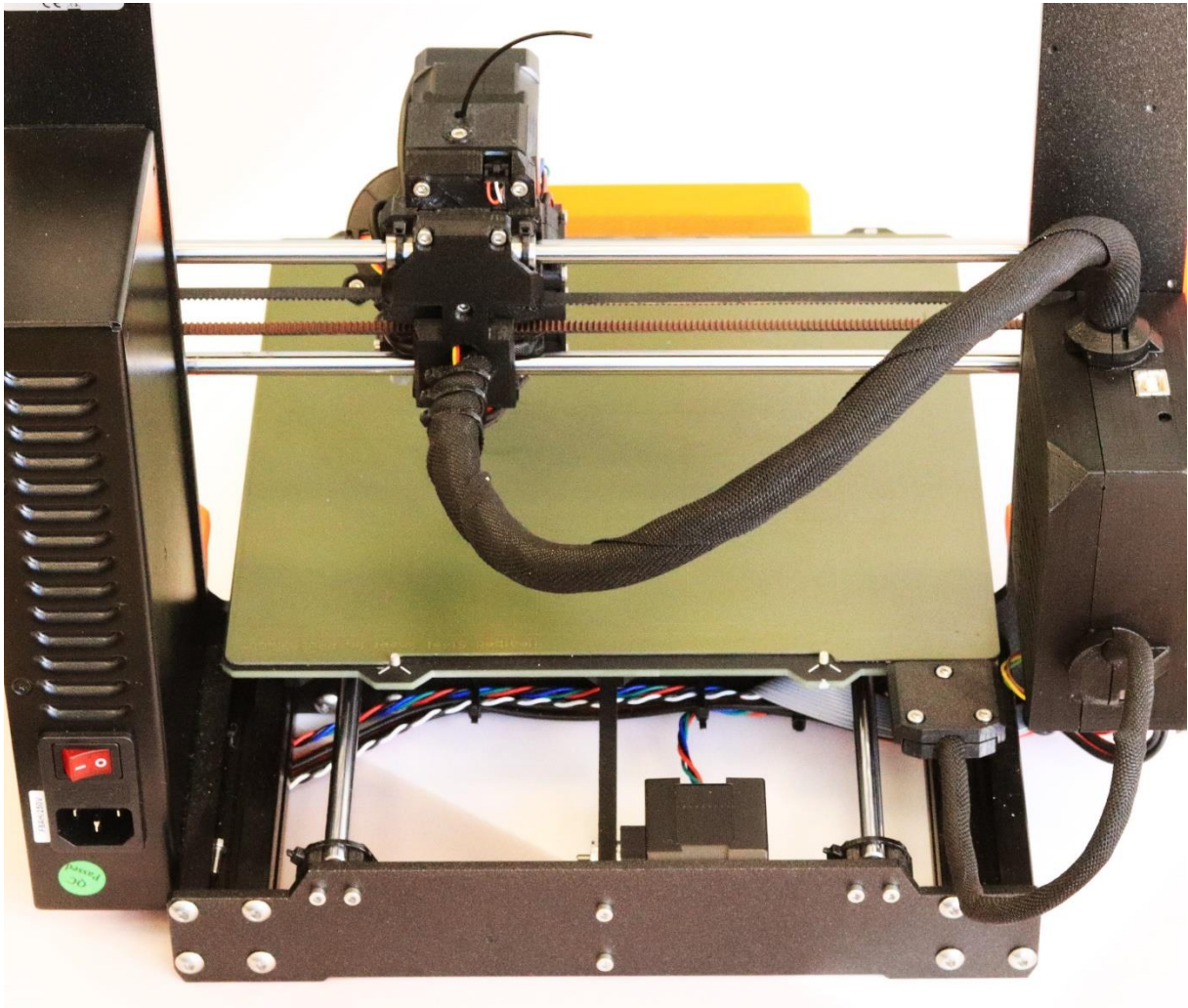
8. Push black nylon filament guide, P.I.N.D.A. sensor cable and hotend fan cable back.
9. Push the PLH3D-2W laser head cable in the channel together with the P.I.N.D.A. sensor and fan cables. Use zip tie to mount it firmly.



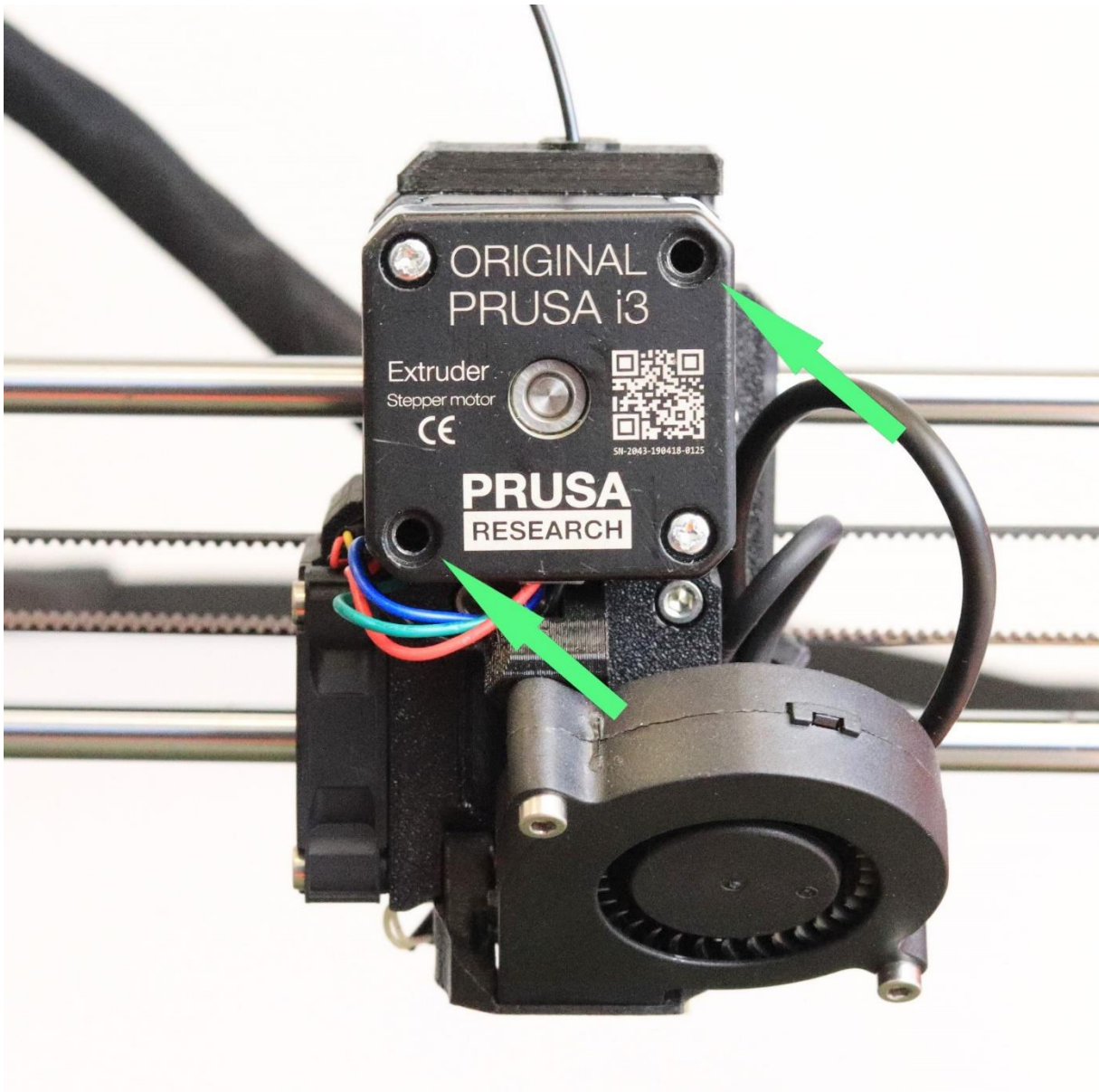
10. Set up X-carriage-back back to its place.



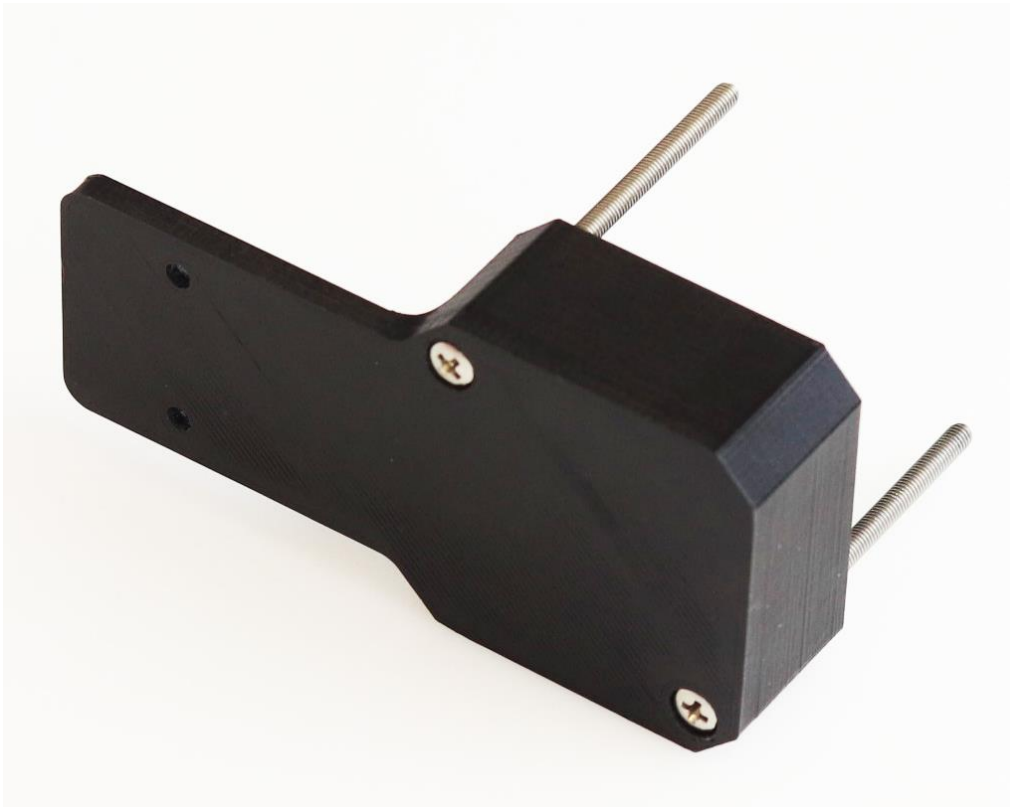
11. Twist textile sleeve with PLH3D-2W laser head's cable added to the bundle and mount the bundle back.



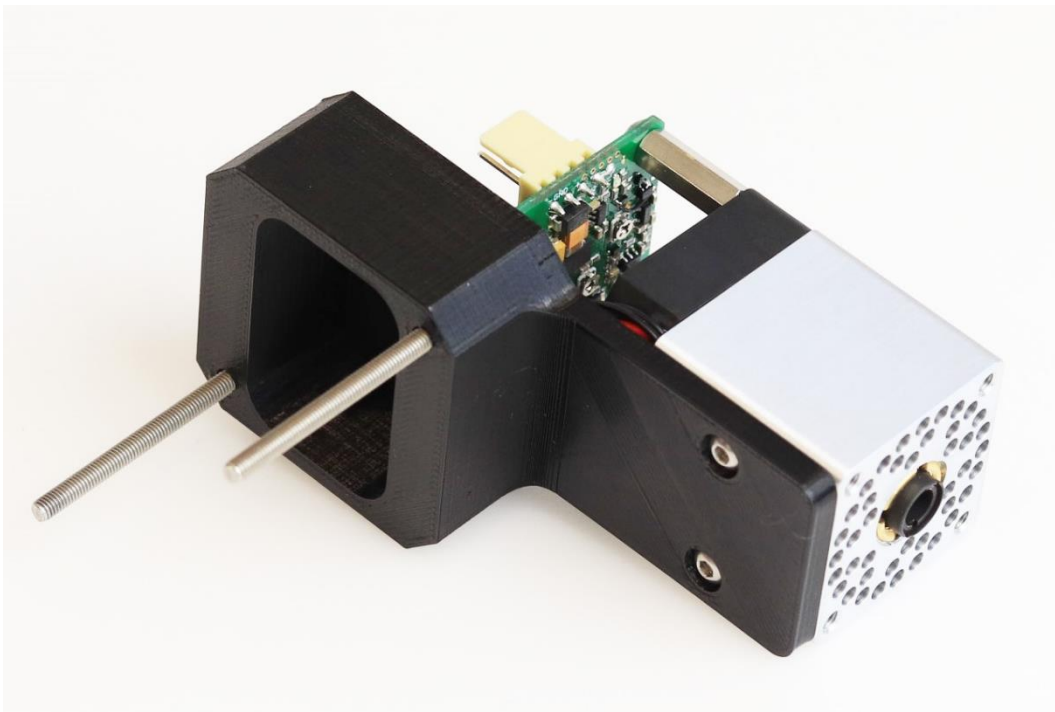
12. Unscrew top right and bottom left (view from the front side) of the extruder motor.



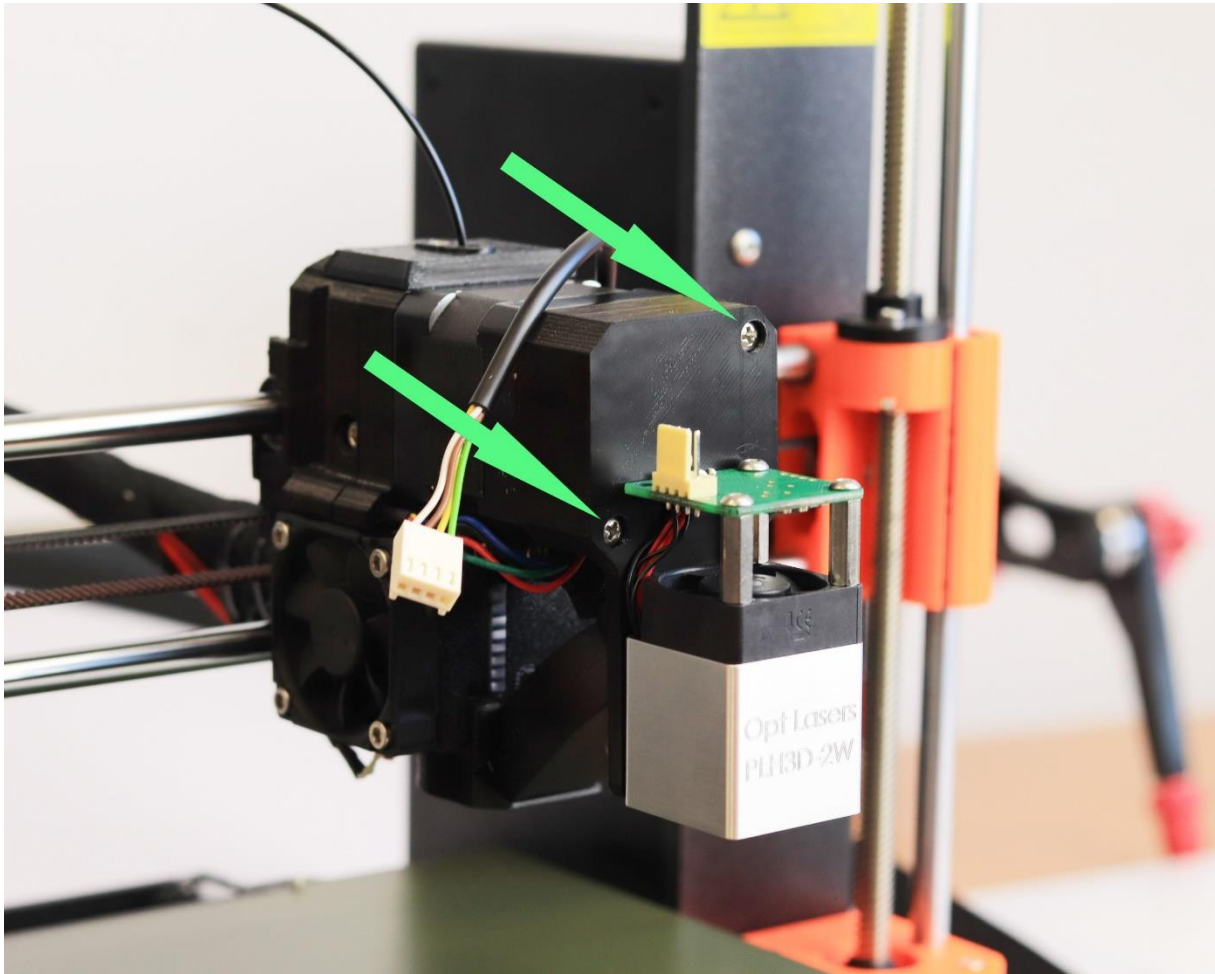
13. Push two M3x50 screws through the upper holes of laser head's holder.



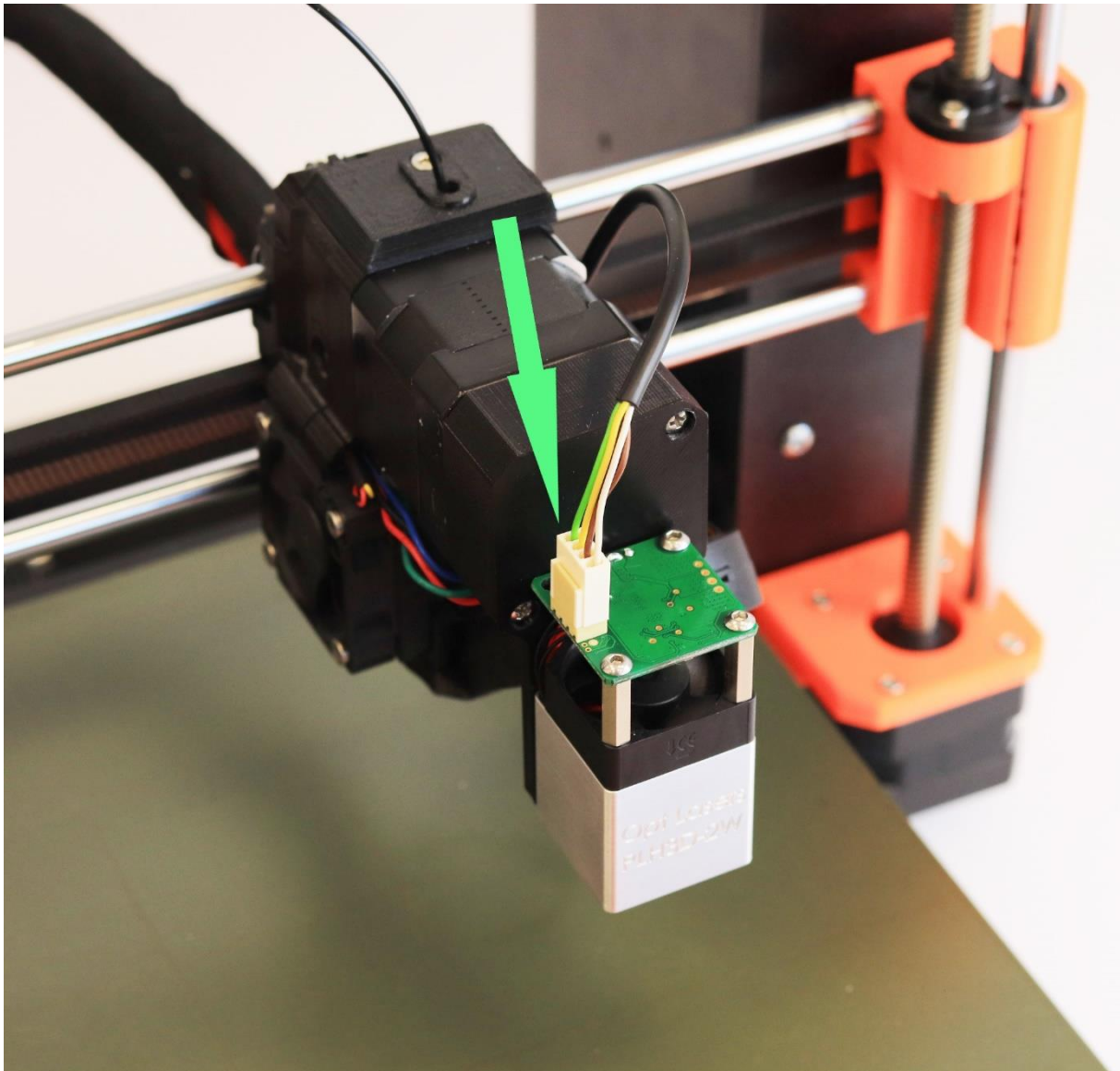
14. Mount PLH3D-2W laser head to the holder (use two M3x6 screws).



15. Using M3x50 screws, that were set up in the 13. point, mount PLH3D-2W laser head's holder to the extruder's motor.



16. Before starting work with laser, connect the cable. Always remember to cover heat bed or spring steel sheet with non-reflective material that will protect it from laser. Laser beam can damage heat bed or spring steel sheet very easily!



G-code

To cut or engrave, it is necessary to generate the appropriate G-code that using the following commands:

Header	
M104 S0	Set hotend temperature to 0
M140 S0	Set bed temperature to 0
G28 W	Auto home (without mesh bed leveling)
G92 X0 Y-86 Z-45	Offset to Y=-86 Z=-45. This way laser spot will be at the place when normally hotend was.
M107	Print cooling fan off (disable laser)
G0 X0 Y0 Z0 F2000	After this command is done, material can be put on bed and laser can be connected to cut/engrave
M0 Click to continue	Wait until user push the button

Before every G0, G1 commands	
M106	Laser ON
SXXX	PWM duty where XXX is number between 0 and 255 (e.g.: 0 = 0% and 255 = 100%)
Footer	
M107	Print cooling fan off (disable laser)
G92 X0 Y0 Z0	Reset selected workspace

To see an example of G-code, please refer to **Appendix 1**.

Precautions

Wear safety glasses when cable connected the 3D printer and the laser head is plugged (not only when the laser actually works).

There should be always command M0 used after home command (G28) in G-Code, to give user opportunity to prepare material on bed and connect laser head.

3D printer's bed should be covered during laser work, to protect it from damage.

Laser head should be disconnected soon after finishing the work.

Never use reset button when laser is connected (unplug it first).

Remember that working area is 86 mm shorter in Y axis when laser is used.

Appendix 1: G-Code example



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;(Header)

M104 S0          ;Set hotend temperature to 0
M140 S0          ;Set bed temperature to 0
G28 W           ;Auto home (without mesh bed leveling)
G92 X0 Y-86 Z-45 ;Offset to Y=-86 Z=-45
M107            ;Print cooling fan off (disable laser)
G0 X0 Y0 Z0 F2000
M0 Click to continue ;Wait until user push the button
M107            ;Print cooling fan off (disable laser)
;(Header end)

M106 S0
G0 X33.7441 Y21.5261 Z0.0000 F10000
M106 S255
G1 X53.7441 Y41.5261 F1000
M106 S0
G0 X33.7441 F10000
M106 S255
G1 X53.7441 Y21.5261 F1000
M106 S0
G0 X57.9859 Y31.5261 F10000
M106 S255
G3 X77.9859 I10.0000 J0.0000 F1000
M106 S255
G3 X57.9859 I-10.0000 J0.0000
M106 S0
G0 X6.2419 Y15.5494 F10000
M106 S255
G1 X6.7274 Y15.5345 F1000
M106 S255
G1 X7.1987 Y15.4893
M106 S255

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G1 X7.6564 Y15.4144
M106 S255
G1 X8.0986 Y15.3099
M106 S255
G1 X8.5274 Y15.1749
M106 S255
G1 X8.9407 Y15.0105
M106 S255
G1 X9.3402 Y14.8158
M106 S255
G1 X9.7250 Y14.5914
M106 S255
G1 X10.0958 Y14.3366
M106 S255
G1 X10.4515 Y14.0525
M106 S255
G1 X10.7936 Y13.7377
M106 S255
G1 X11.1137 Y13.4003
M106 S255
G1 X11.4027 Y13.0495
M106 S255
G1 X11.6622 Y12.6834
M106 S255
G1 X11.8901 Y12.3043
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G1 X12.0884 Y11.9102
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G1 X12.2558 Y11.5029
M106 S255
G1 X12.3932 Y11.0803

M106 S255
G1 X12.4996 Y10.6451
M106 S255
G1 X12.5760 Y10.1941
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G1 X12.6214 Y9.7304
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G1 X12.6204 Y8.7570
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G1 X12.5706 Y8.2771
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G1 X12.4874 Y7.8106
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G1 X12.3709 Y7.3594
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G1 X12.2216 Y6.9230
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G1 X12.0391 Y6.5011
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G1 X11.8230 Y6.0935
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G1 X11.5736 Y5.6997
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G1 X11.2911 Y5.3213
M106 S255
G1 X10.9757 Y4.9575
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G1 X10.6289 Y4.6099
M106 S255

G1 X10.2660 Y4.2938

M106 S255

G1 X9.8881 Y4.0108

M106 S255

G1 X9.4948 Y3.7609

M106 S255

G1 X9.0876 Y3.5442

M106 S255

G1 X8.6662 Y3.3614

M106 S255

G1 X8.2301 Y3.2116

M106 S255

G1 X7.7793 Y3.0949

M106 S255

G1 X7.3129 Y3.0115

M106 S255

G1 X6.8330 Y2.9616

M106 S255

G1 X6.3398 Y2.9451

M106 S255

G1 X5.8407 Y2.9616

M106 S255

G1 X5.3574 Y3.0109

M106 S255

G1 X4.8881 Y3.0935

M106 S255

G1 X4.4342 Y3.2090

M106 S255

G1 X3.9954 Y3.3574

M106 S255

G1 X3.5707 Y3.5390

M106 S255
G1 X3.1617 Y3.7532
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G1 X2.7659 Y4.0014
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G1 X2.3865 Y4.2813
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G1 X2.0211 Y4.5949
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G1 X1.6729 Y4.9391
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G1 X1.3554 Y5.3004
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G1 X1.0709 Y5.6763
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G1 X0.8194 Y6.0670
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G1 X0.2676 Y7.3216
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G1 X0.1505 Y7.7682
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G1 X0.0668 Y8.2301
M106 S255
G1 X0.0168 Y8.7047
M106 S255
G1 X0.0000 Y9.1932
M106 S255

G1 X0.0177 Y9.7252
M106 S255
G1 X0.0711 Y10.2341
M106 S255
G1 X0.1600 Y10.7214
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G1 X0.2844 Y11.1858
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G1 X0.4444 Y11.6276
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G1 X0.8679 Y12.4452
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G1 X2.3148 Y14.1271
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G1 X3.4244 Y14.8901
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G1 X3.8366 Y15.0914

M106 S255
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M106 S255
G1 X4.7292 Y15.3844
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G1 X5.2107 Y15.4762
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G1 X4.8334 Y14.1669
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G1 X4.3936 Y14.0053
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G1 X79.8279 Y3.0185
M106 S255
G1 X79.3967 Y3.0457
M106 S255
G1 X78.9767 Y3.1272
M106 S255
G1 X78.5671 Y3.2631
M106 S255
G1 X78.1719 Y3.4517
M106 S255
G1 X77.8117 Y3.6841
M106 S255
G1 X77.4907 Y3.9584
M106 S255
G1 X77.2089 Y4.2745
M106 S255
G1 X77.9266 Y5.0907
M106 S255
G1 X78.2799 Y4.7354

M106 S255
G1 X78.6420 Y4.4589
M106 S255
G1 X79.0123 Y4.2614
M106 S255
G1 X79.3911 Y4.1431
M106 S255
G1 X79.7783 Y4.1035
M106 S255
G1 X80.2047 Y4.1514
M106 S255
G1 X80.5897 Y4.2949
M106 S255
G1 X80.9378 Y4.5338
M106 S255
G1 X81.2076 Y4.8442
M106 S255
G1 X81.3716 Y5.1929
M106 S255
G1 X81.4264 Y5.5798
M106 S255
G1 X81.3469 Y6.0431
M106 S255
G1 X81.1084 Y6.4529
M106 S255
G1 X80.8992 Y6.6529
M106 S255
G1 X80.5903 Y6.8772
M106 S255
G1 X80.1814 Y7.1261
M106 S255

G1 X79.6727 Y7.3992
M106 S255
G1 X79.2234 Y7.6468
M106 S255
G1 X78.8357 Y7.8928
M106 S255
G1 X78.5094 Y8.1375
M106 S255
G1 X78.2445 Y8.3810
M106 S255
G1 X78.0410 Y8.6230
M106 S255
G1 X77.8517 Y8.9356
M106 S255
G1 X77.7165 Y9.2696
M106 S255
G1 X77.6356 Y9.6250
M106 S255
G1 X77.6085 Y10.0016
M106 S255
G1 X77.6519 Y10.4893
M106 S255
G1 X77.7821 Y10.9324
M106 S255
G1 X77.9990 Y11.3317
M106 S255
G1 X78.3027 Y11.6871
M106 S255
G1 X78.6707 Y11.9776
M106 S255
G1 X79.0829 Y12.1854

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M106 S255
G1 X79.5392 Y12.3098
M106 S255
G1 X80.0392 Y12.3514
M106 S0
G0 X27.8161 Y21.5261 F10000
M106 S255
G1 X7.8161 F1000
M106 S255
G1 Y41.5261
M106 S255
G1 X27.8161
M106 S255
G1 Y21.5261
M106 S0
G0 X0.0000 Y0.0000 F10000
;(Footer)
M107          ;Print cooling fan off (disable laser)
G90           ;Absolute positioning
G92 X0 Y0 Z0  ;Reset selected workspace to 0, 0, 0
G0 X0 Y0
;(Footer end)
```