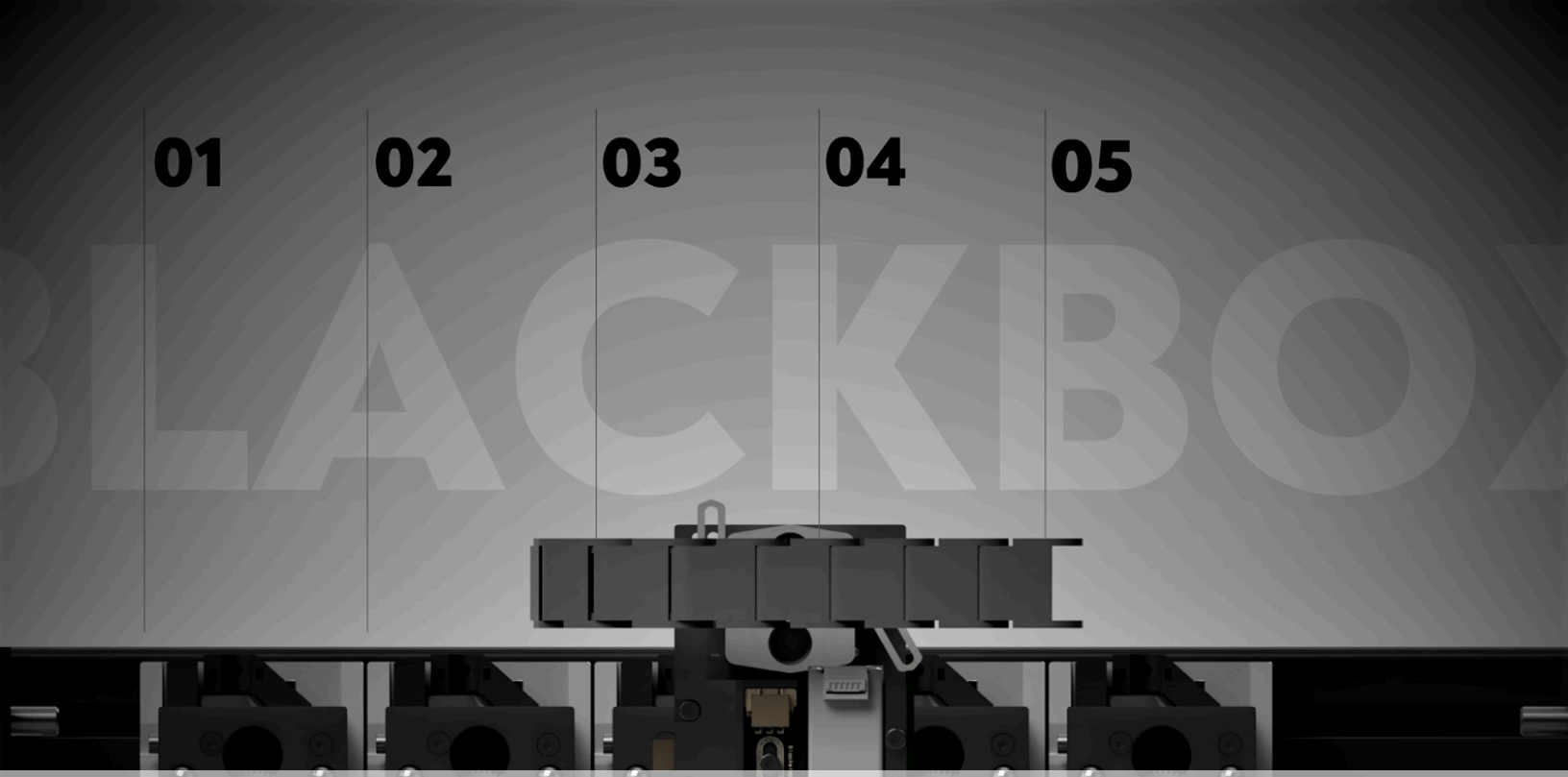


BLACKBOX CE

Water Cooling

DOCUMENTATION VERSION 1

Blackbox CE Mechanical Assembly:

11. Water Cooling

Change Log

Version	Notes
1	Initial Release

Tools

Hex Wrenches
Reamers
Soldering Iron with Heatset insert tip
Open ended wrenches for water fittings
Isopropyl Alcohol
Lint-Free cleaning wipes

Parts

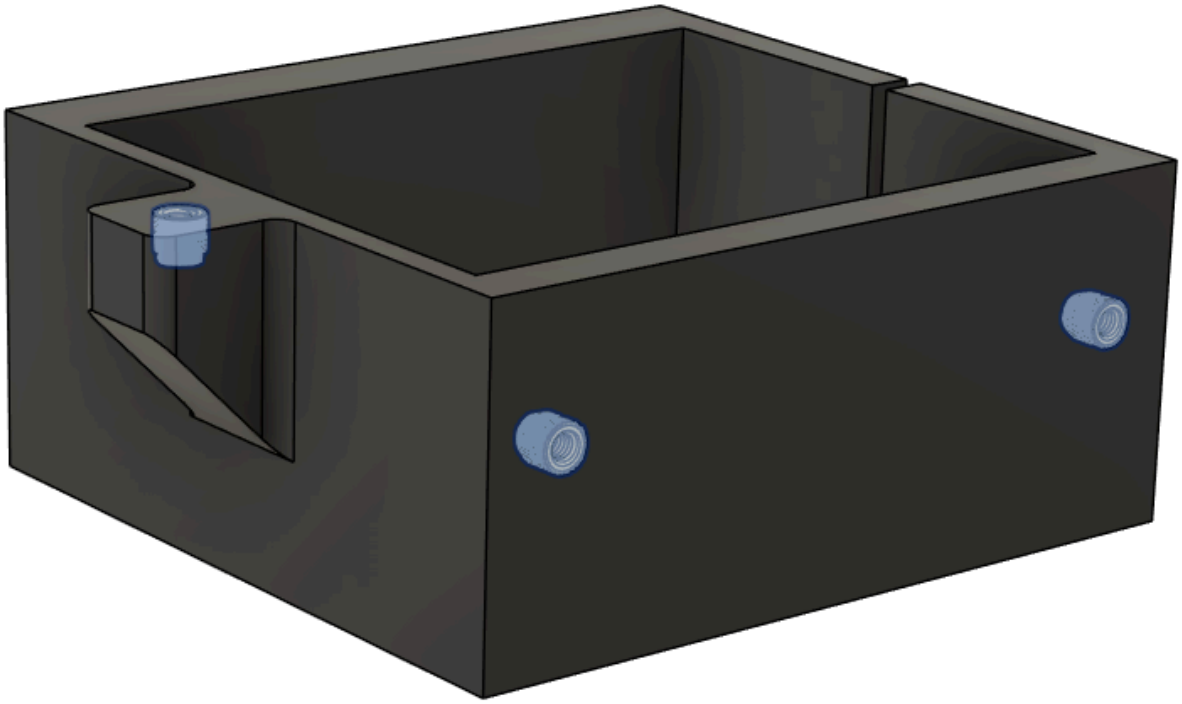
QTY	Description
13	M3_4.6x4mm_Heat_Set_Insert
1	60mmRadiator
1	2060 Axial Fan (24V)
1	Pump/Reservoir Assembly
3	Fitting_BSPT_6mm_Tube
1	Fitting_BSPT_6mm_Barb
1	Fitting_BSPTF_6mm_Tube
4	Fitting_Coupler_6mm_Tube
2	Fitting_BSPT_Elbow_6mm_Tube
2	UOM = Feet 8x11mm Silicone Tubing
10	UOM = Feet 4x6mm Nylon Tubing
1	Water_Block_NorthBridge
2	DIN912_M3_6mm_SHCS
11	DIN912_M3_8mm_SHCS
2	DIN912_M3_16mm_SHCS
4	DIN912_M3_20mm_SHCS
5	DIN912_M3_25mm_SHCS
1	PTFE Tape
1	Thermal Paste
0.5	UOM = Liter Distilled Water

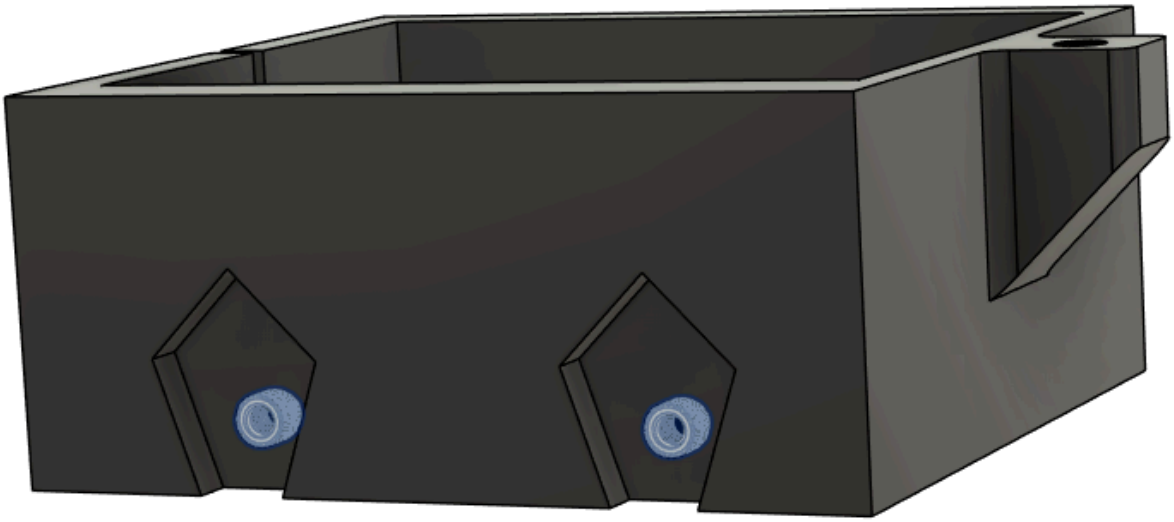
Printed Parts

QTY	Description	Material	Ver
1	Print_FanHousing	>=ABS	1
1	Print_PumpHousing	>=ABS	1
1	Print_PumpStrap	>=ABS	1
1	Print_AirGuide	>=ABS	1
1	Print_FanShroud	>=ABS	1
1	Print_WC_HoseRetainer	>=ABS	1
6	Print_WC_Retainer	>=ABS	1

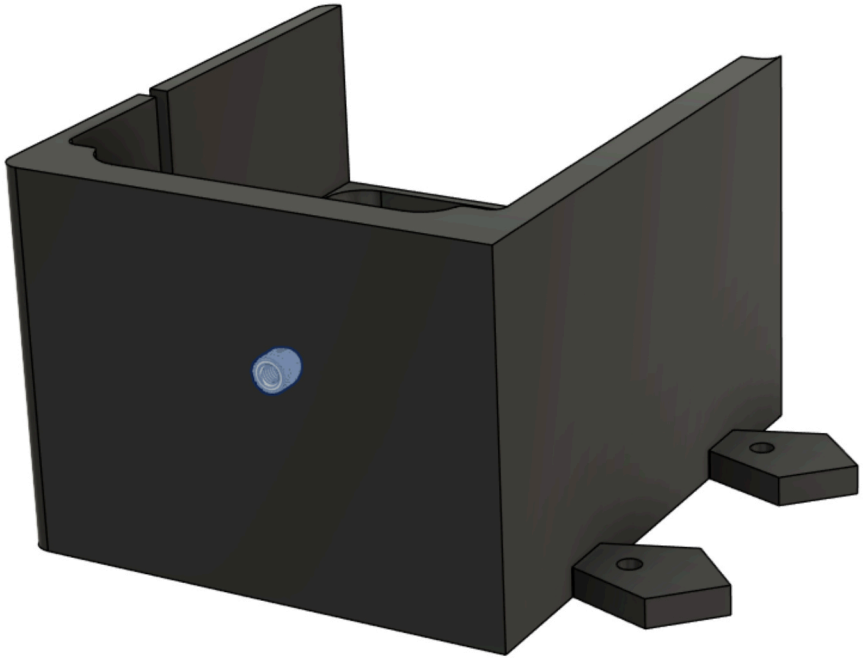
Step 1 – Printed Parts Preparation:

Locate Print_PumpHousing and install (5) M3 Heat set inserts in the following locations.

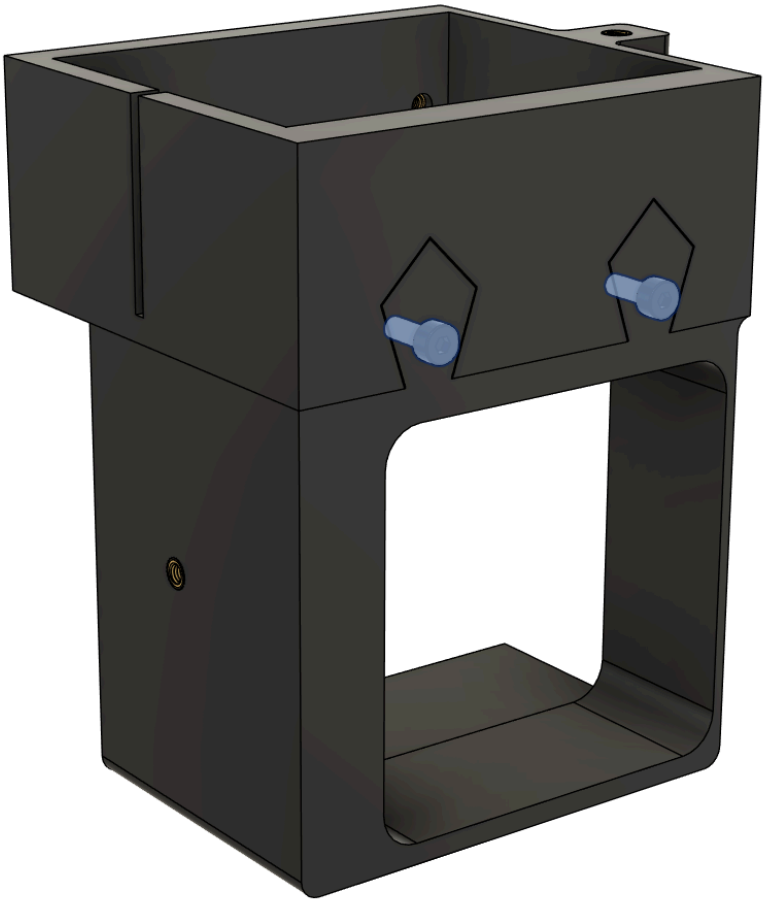




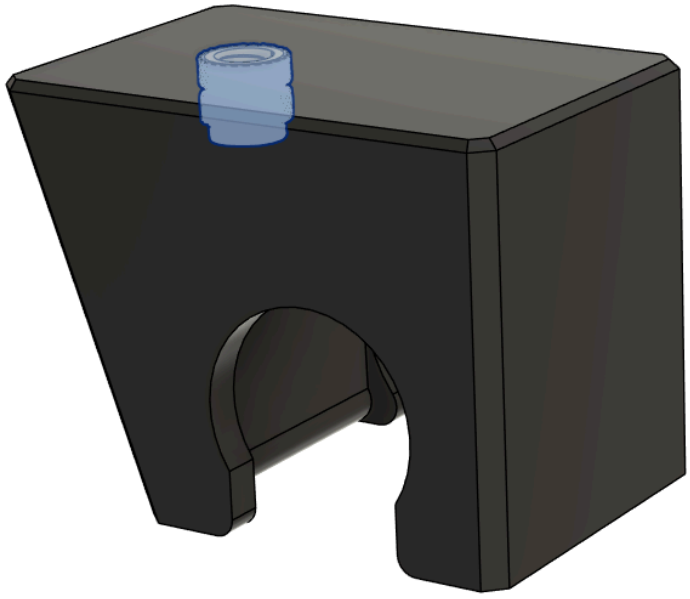
Locate Print_FanHousing and install (1) M3 Heat set insert as shown below.



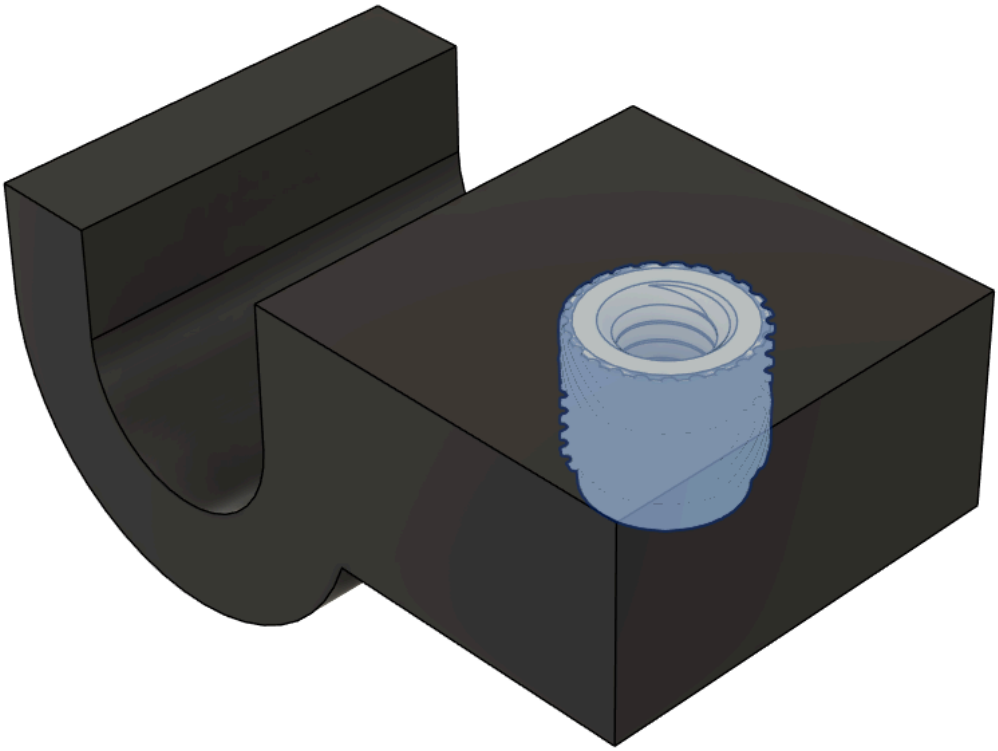
Secure the fan housing to the pump housing using (2) M3x8mm SHCS



Locate Print_WC_HoseRetainer and install (1) M3 Heat set insert as shown below.



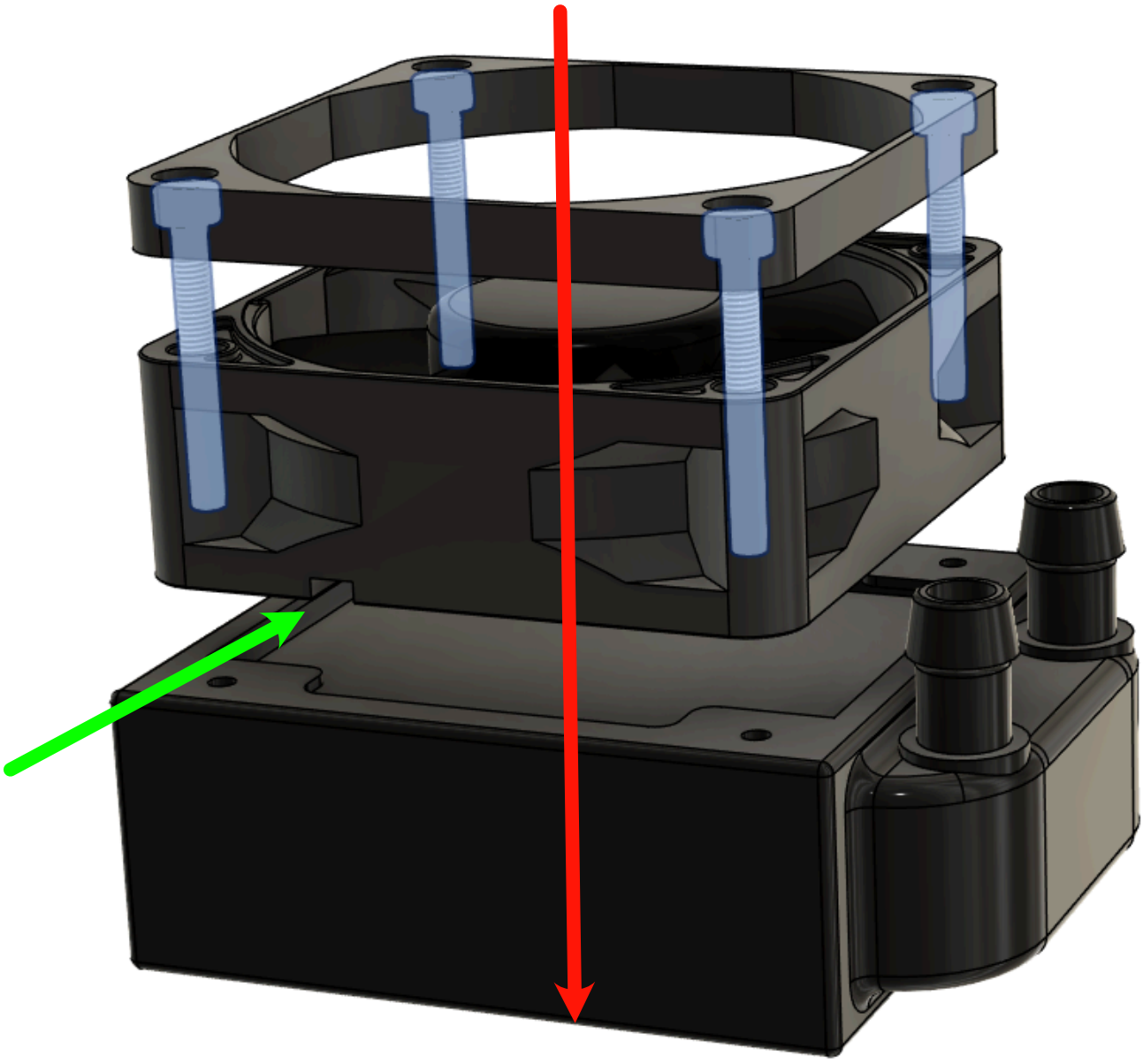
Locate (6) Print_WC_Retainer and install (1) M3 Heat set insert into each as shown.



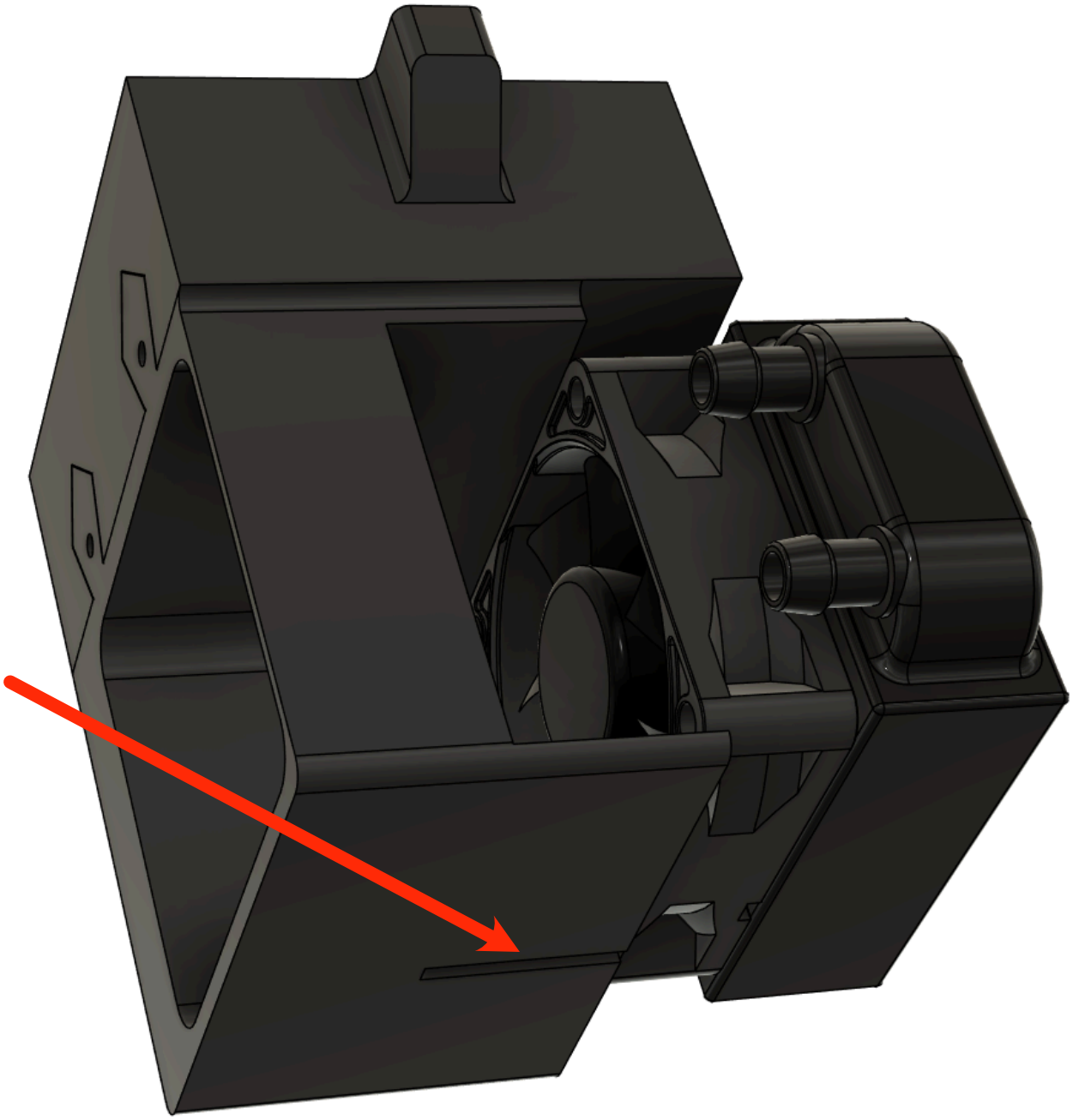
Step 2 – Water Console:

Locate Print_FanShroud and use (4) M3x25mm SHCS to capture the 6020 fan and secure them to the 60mm radiator as shown below.

NOTE: The wires for the fan should exit the relief channel marked in GREEN as oriented below!



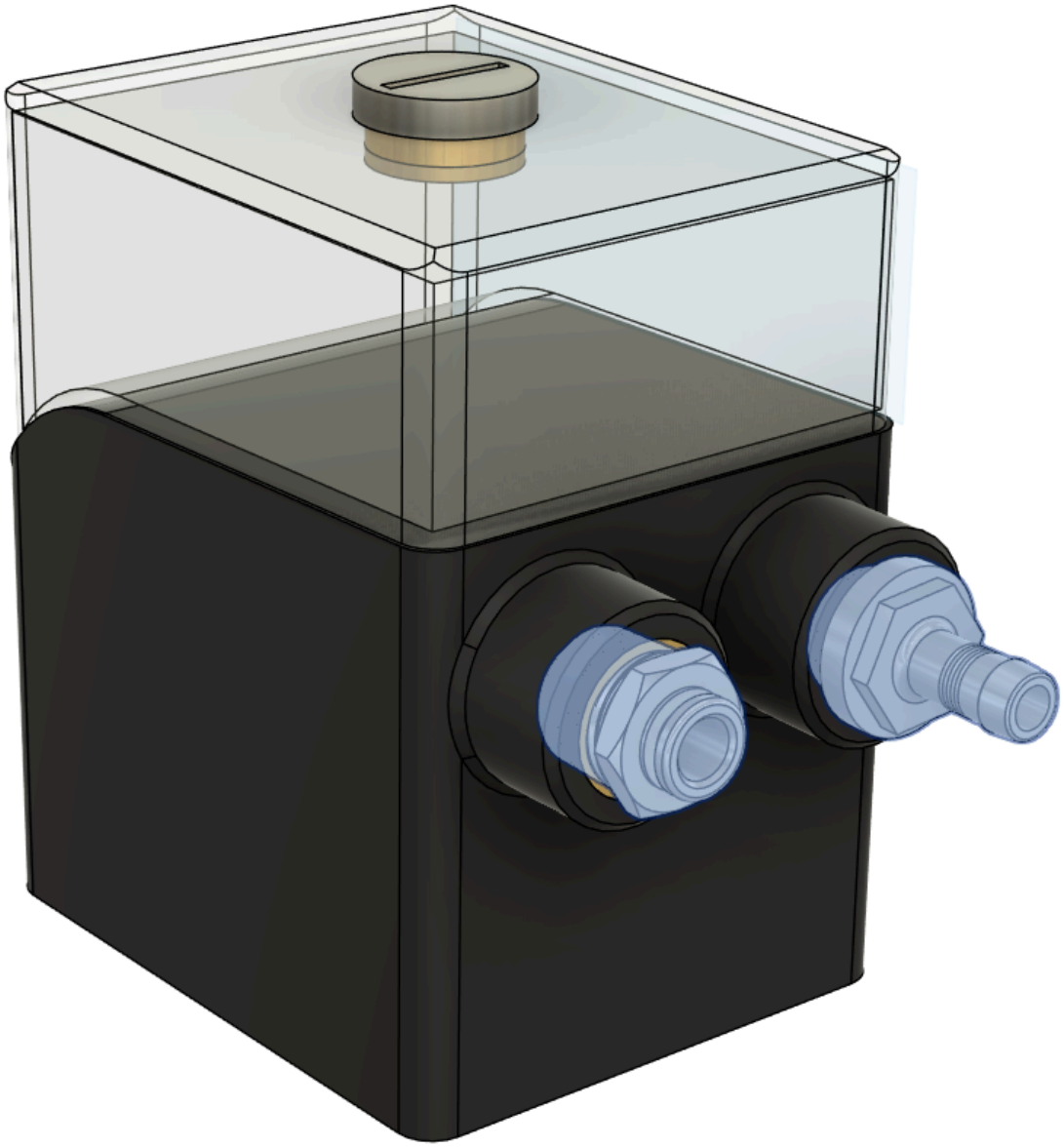
Insert the radiator/fan assembly into the printed part housing from the back. During assembly guise the fan wires through the channel marked in RED.



Locate Print_AirGuide and secure to the back side of the radiator using (2) M3x6mm SHCS.

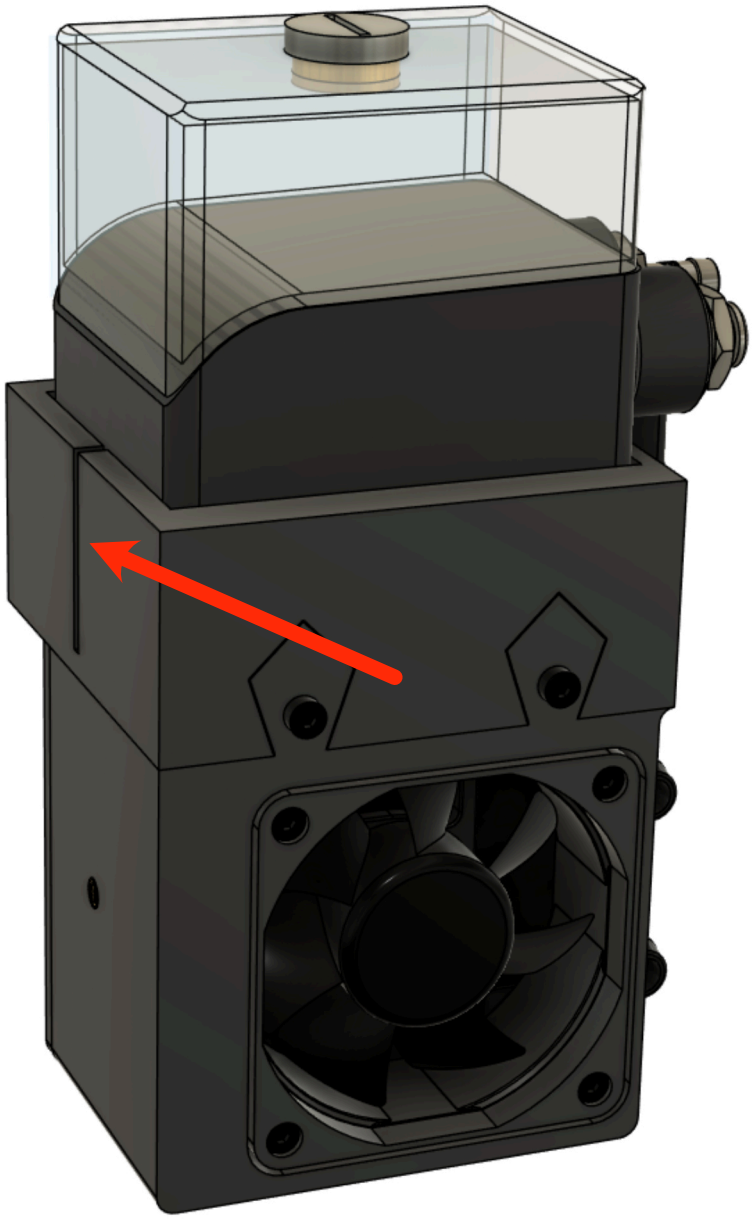
Remove any existing water fittings from the inlet and outlet of the water pump. Use the below image as reference to install (1) BSPT-to-Tube fitting and (1) BSPT-to-Barb fitting.

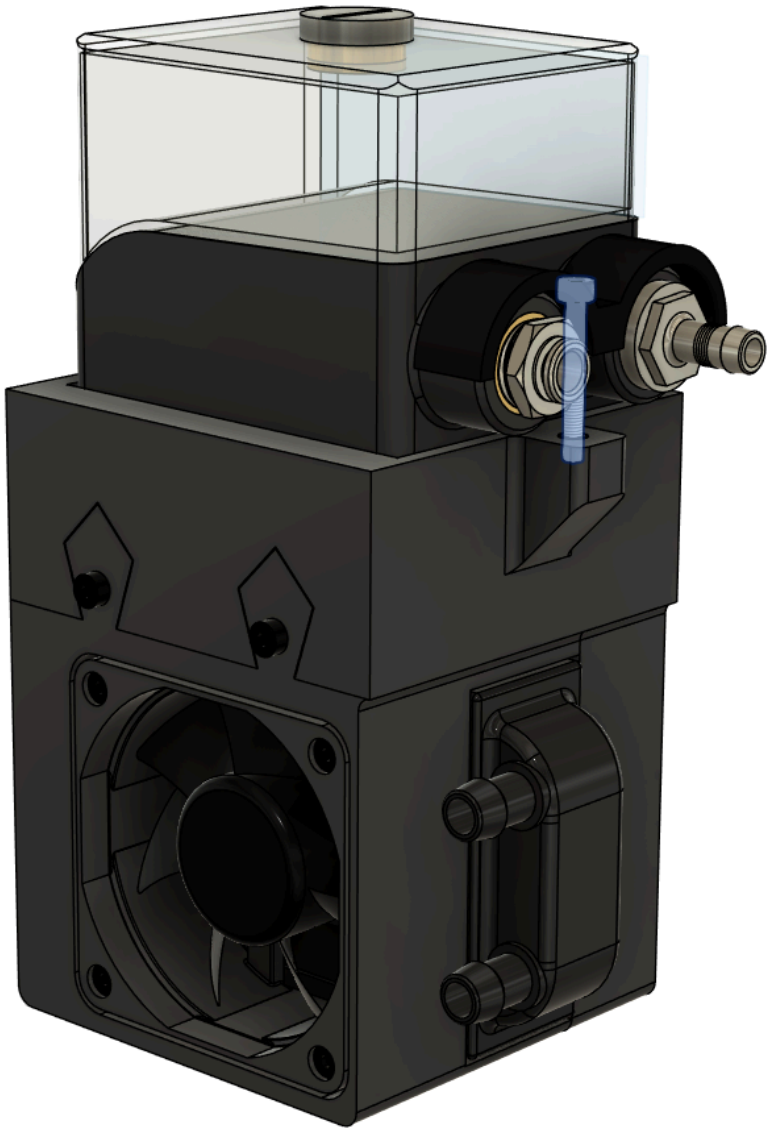
NOTE: The Barb fitting will seal via an O-ring and standard threads. The Tube fitting will seal via pipe threads. Pipe threads become tighter slowly as the mating thread's pitch begin to interfere. If you've not worked with pipe threads before, please take the time to familiarize yourself with them!



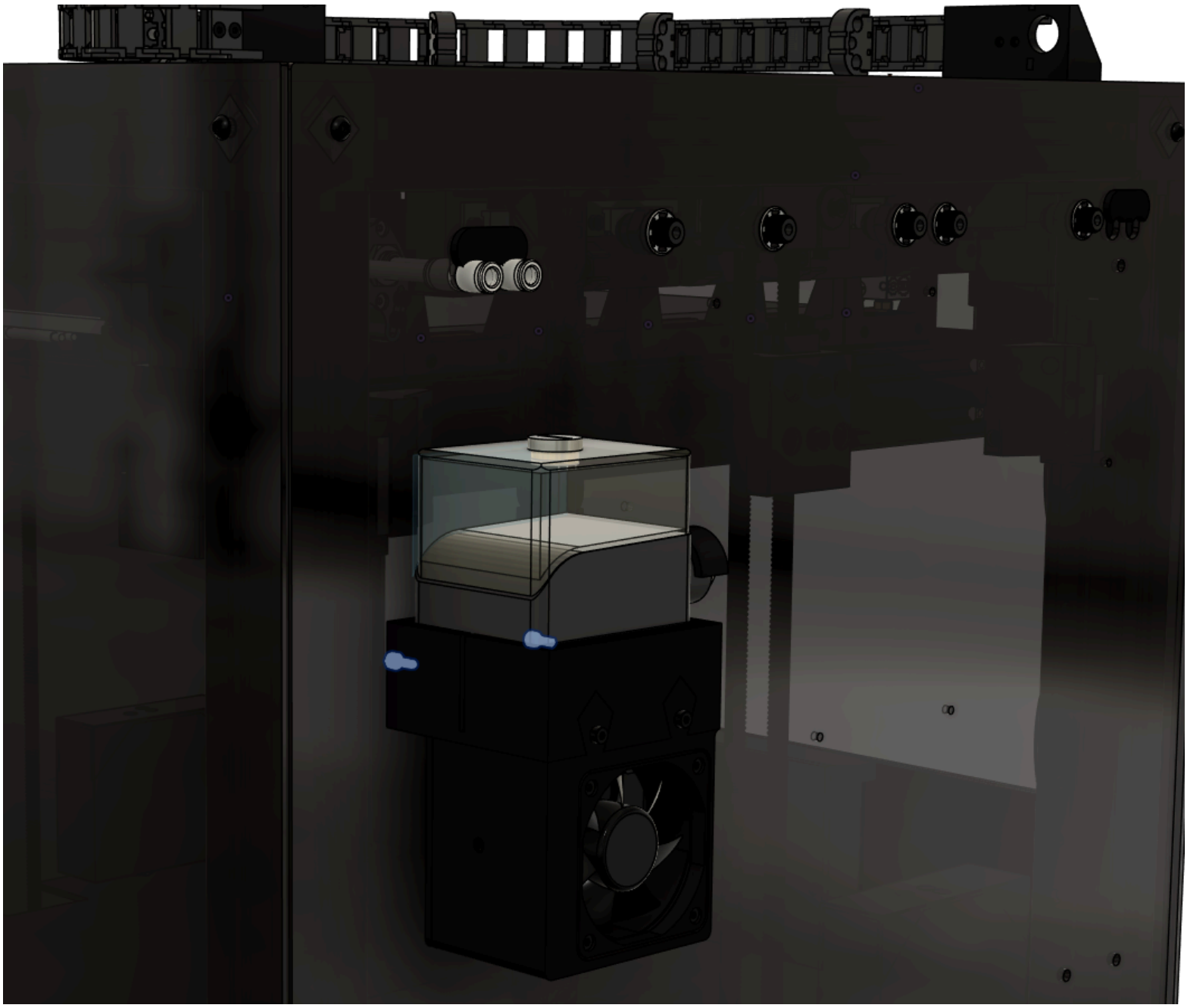
Slide the pump/reservoir down into the water console until it is fully seated. The water pump wires should be guided into and through the slot shown in RED.

Once seated, locate Print_PumpStrap and secure the pump using (1) M3x25 SHCS





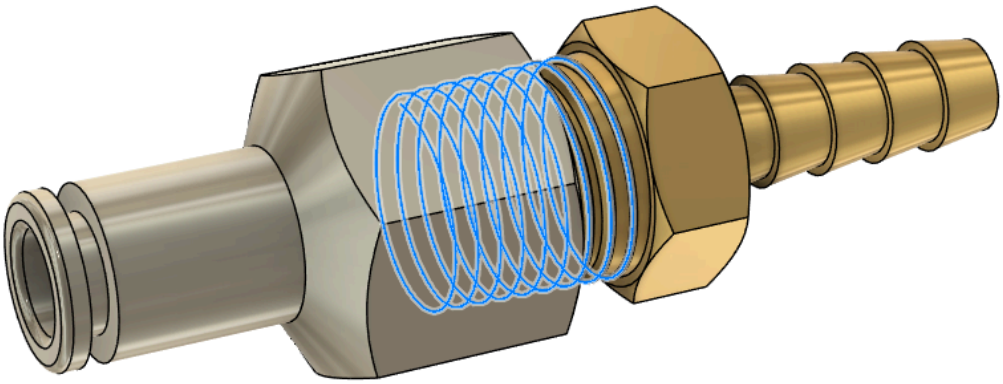
Mount the water console to the left enclosure panel in the location shown using (2) M3x8mm SHCS tightened from the inside of the machine. Access to the fasteners interfacing with this panel can be best accessed through the rear of the machine with the back panel removed!



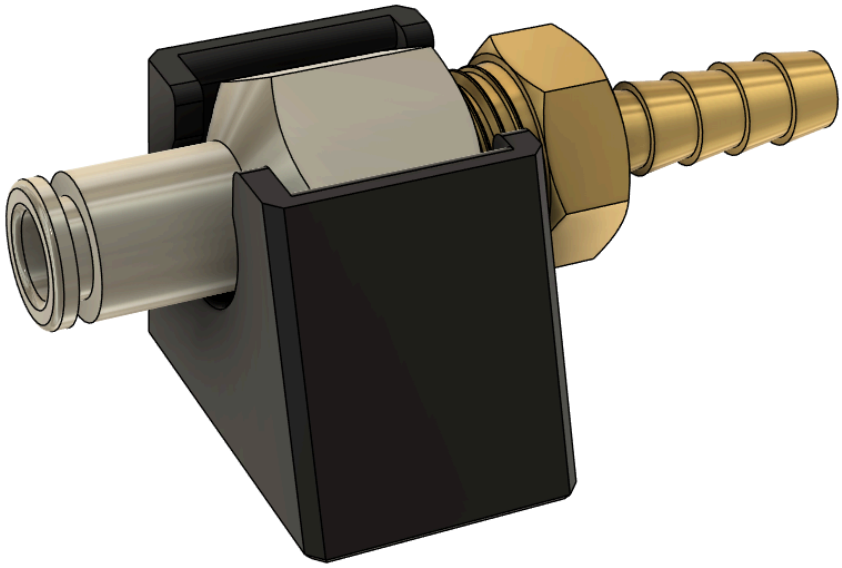
Step 3 – Plumbing:

Locate (1) Fitting_WC_BSPT_6mm_Barb and (1) Fitting_WC_BSPTF_6mm_Tube. Apply a couple of layers of PTFE tape to the male-side threads in a counter-clockwise direction (as viewed from the thread side) and thread the two fittings together.

Pipe threads become tighter slowly as the mating thread's pitch begin to interfere. If you've not worked with pipe threads before, please take the time to familiarize yourself with them!

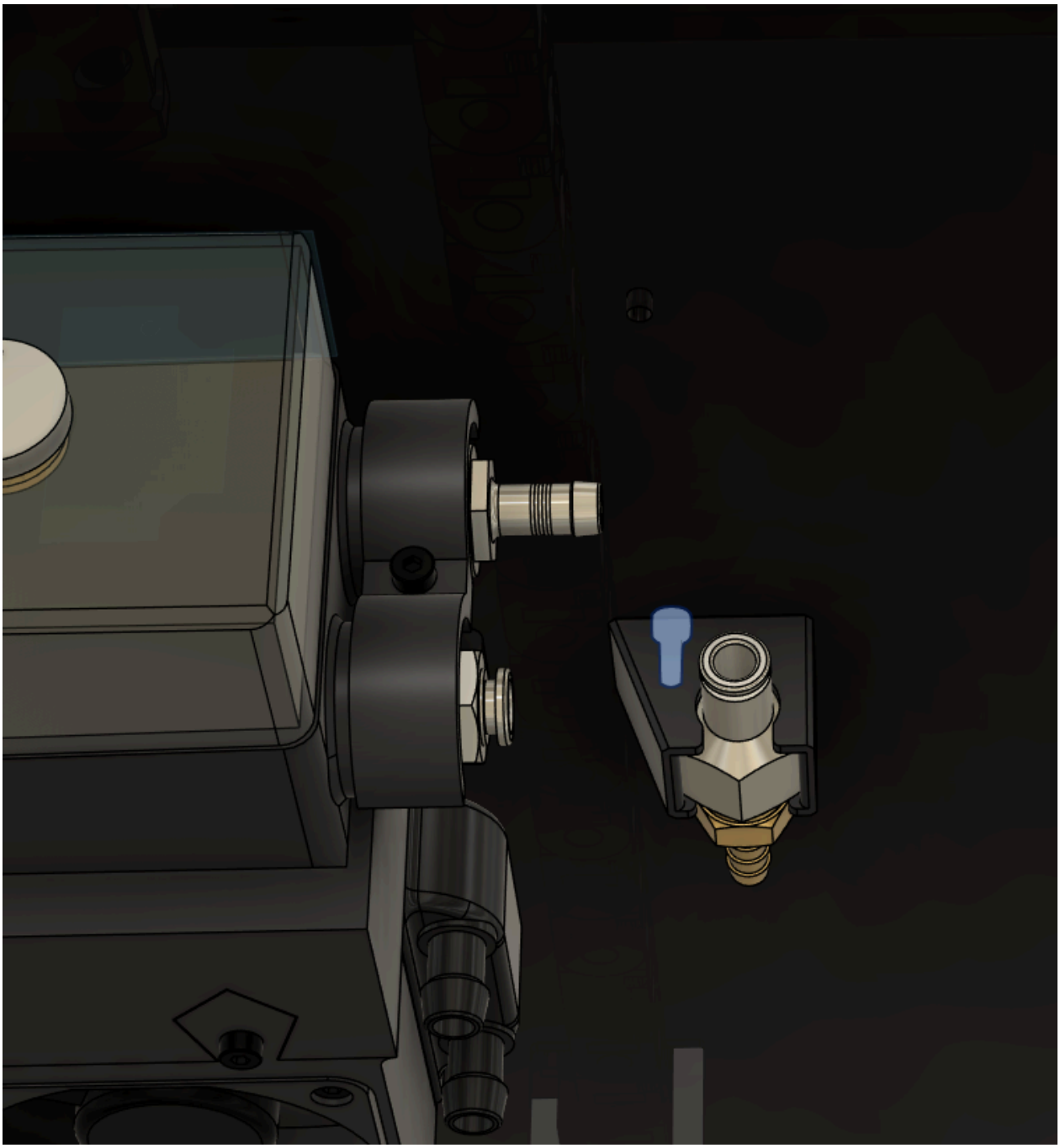


Fit the fully tightened fitting pair into the previously prepared Hose Retainer.



Secure the assembly to the left acrylic panel using (1) M3x8mm SHCS as shown below.

This fastener is fed through (and tightened) from the inside of the machine.

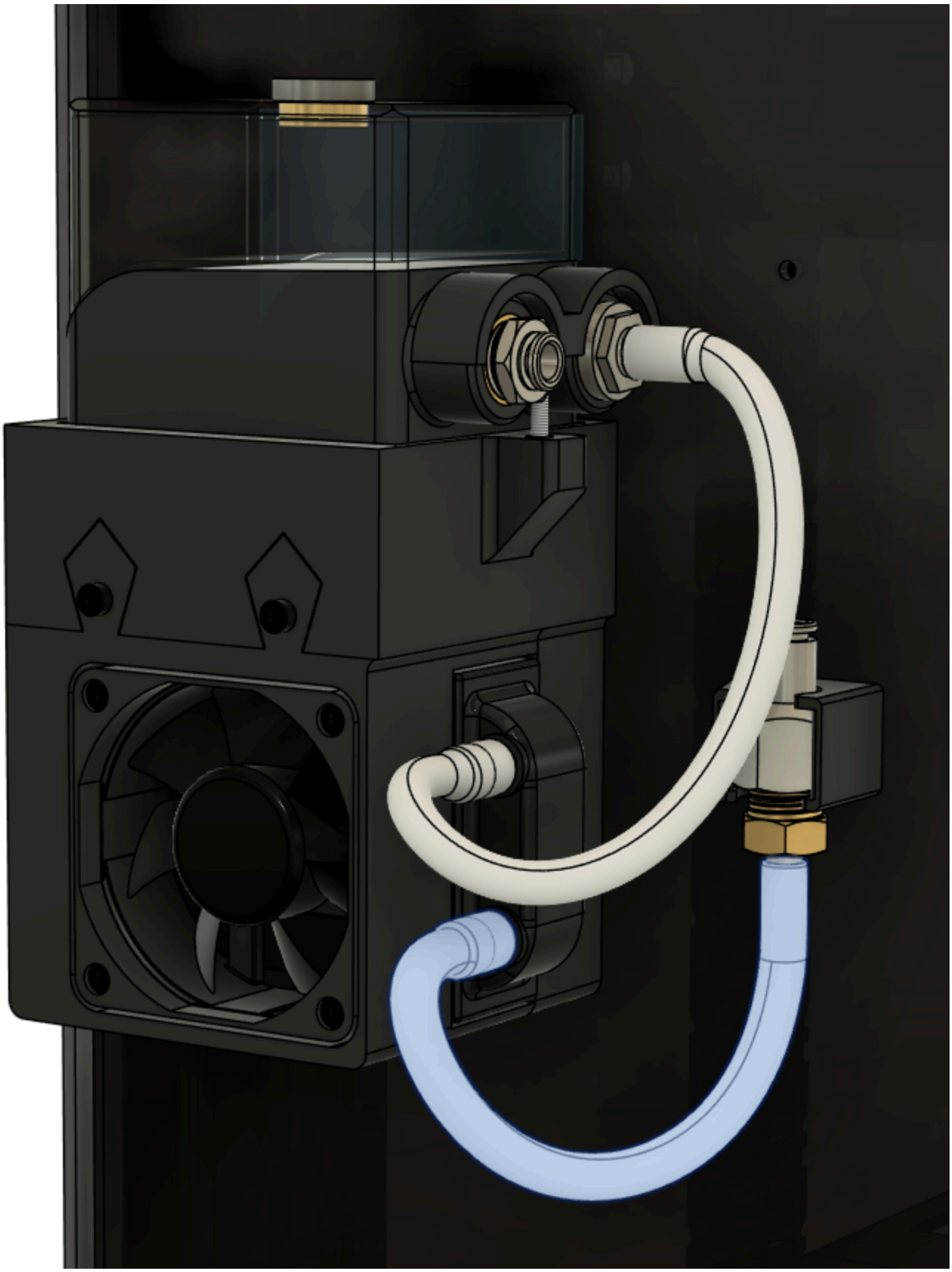


Cut a length of soft silicon tubing and fully seat each end at the radiator and water pump as shown below.

This guide will intentionally omit mention of any specific lengths! Generally speaking the goal will be to have as short of a given tube as possible while maintaining a smooth bend radius.

NOTE: Some users find it tempting to secure the silicone hose with a zip tie. The type of barb we use is negatively affected by this, especially when thin "clamps" are used. Leave them as-is!

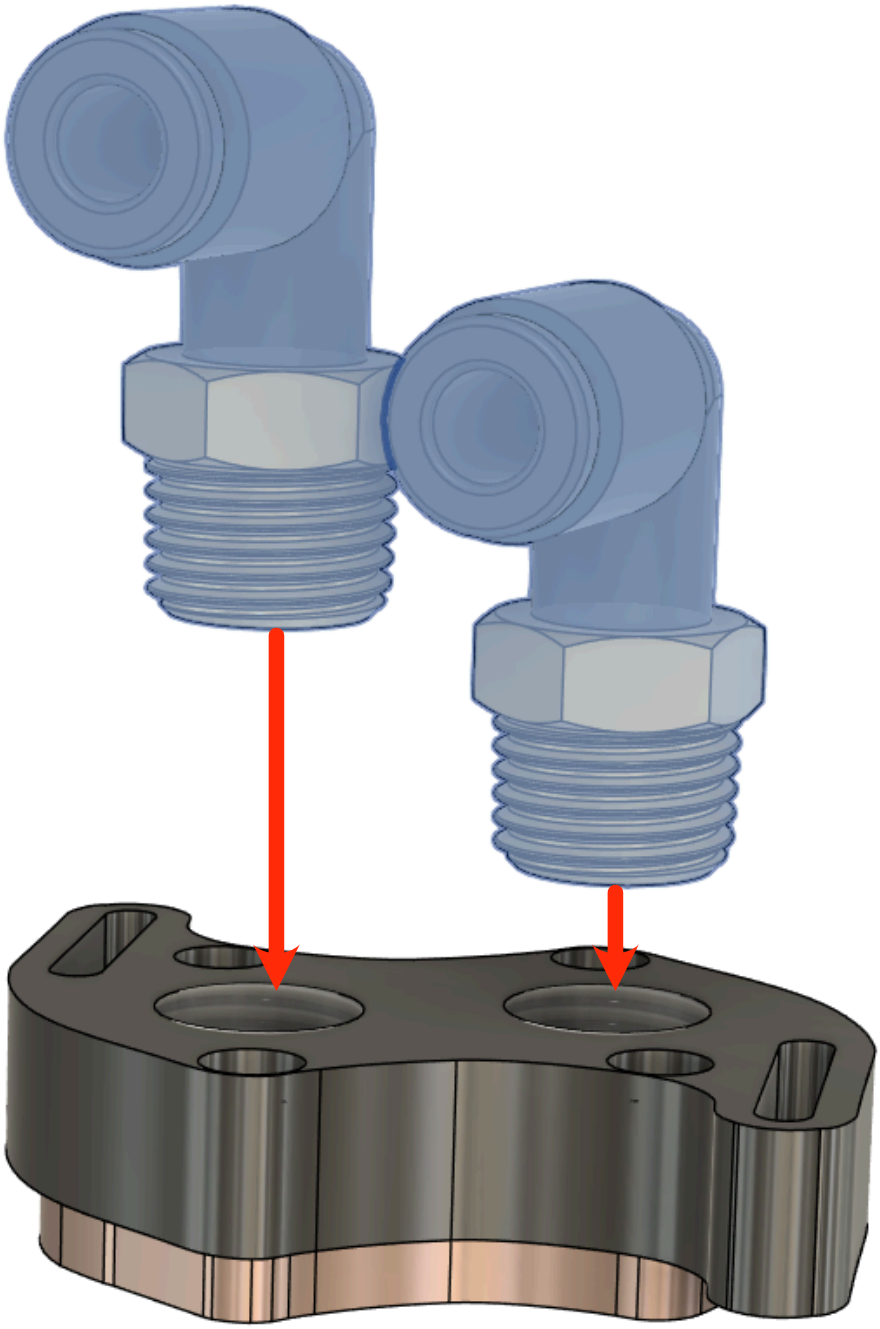
Cut a length of soft silicone tubing and fully seat each end at the radiator and conversion fitting.



Locate (2) Fitting_WC-BSPT_Elbow_6mm_Tube and install each into the remaining water cooling block.

NOTE: These fittings have the ability for the plastic elbow portion to spin independently of the brass threaded portion both during AND after tightening!

TIP: Install and fully tighten one fitting at a time! This will reduce the number of open-end wrench rotations during assembly.

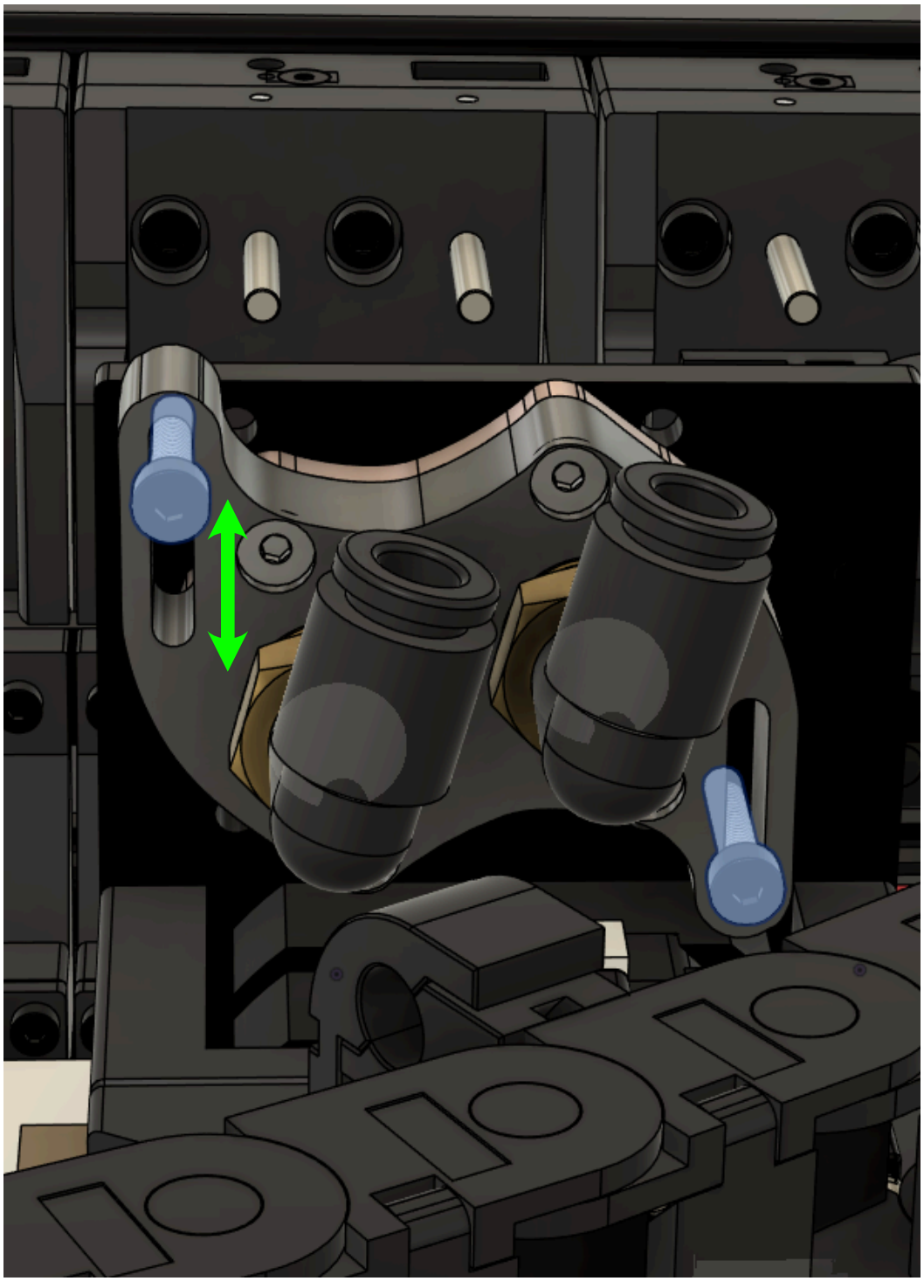


Remove the plastic film from the copper base of the water cooler and thoroughly clean both mating surfaces as performed in the “Tool Dock” Guide.

Secure to the X-Plate as shown below using (2) M3x16mm SHCS in the location shown below.

NOTE: The vertical position of the water block is adjustable. The ideal position leaves some clearance for the extrude motor connector while keeping the copper face of the black fully interfaced with the aluminum X-Plate.

NOTE: The below render also shows the ideal angle of the hose fittings during normal operation.



Cut (2) lengths of Nylon Tubing to serve as the plumbing between the left enclosure panel and the previously installed tool head water block. The below render shows these tubes as they installed when fully mounted and secure.

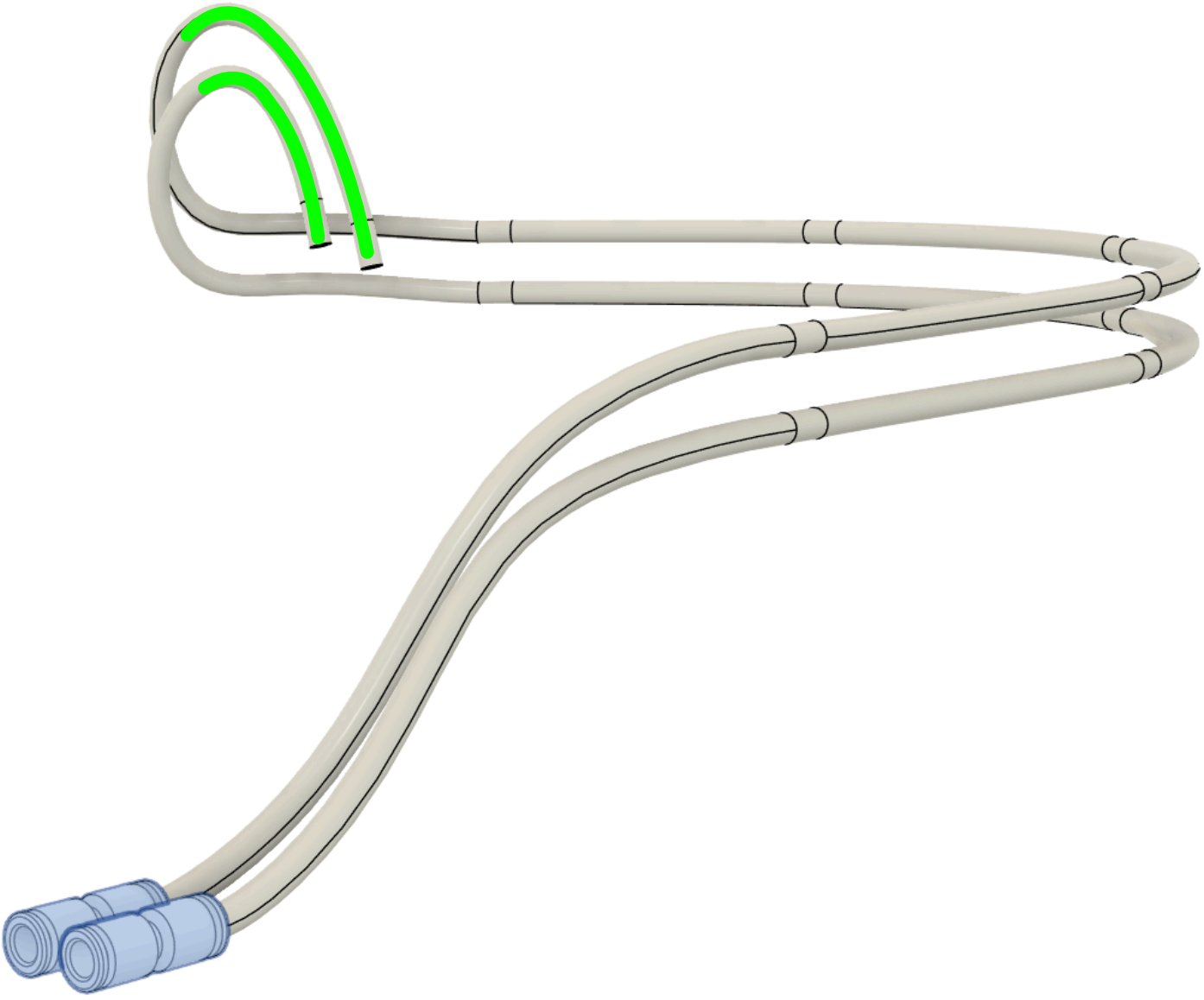
NOTE: The 'hoop' at the far end marked in GREEN must be retained.

NOTE: These tubes (when secured) must allow for movement of the tool head without binding to all corners of the build area.

See the next page for additional reference views.

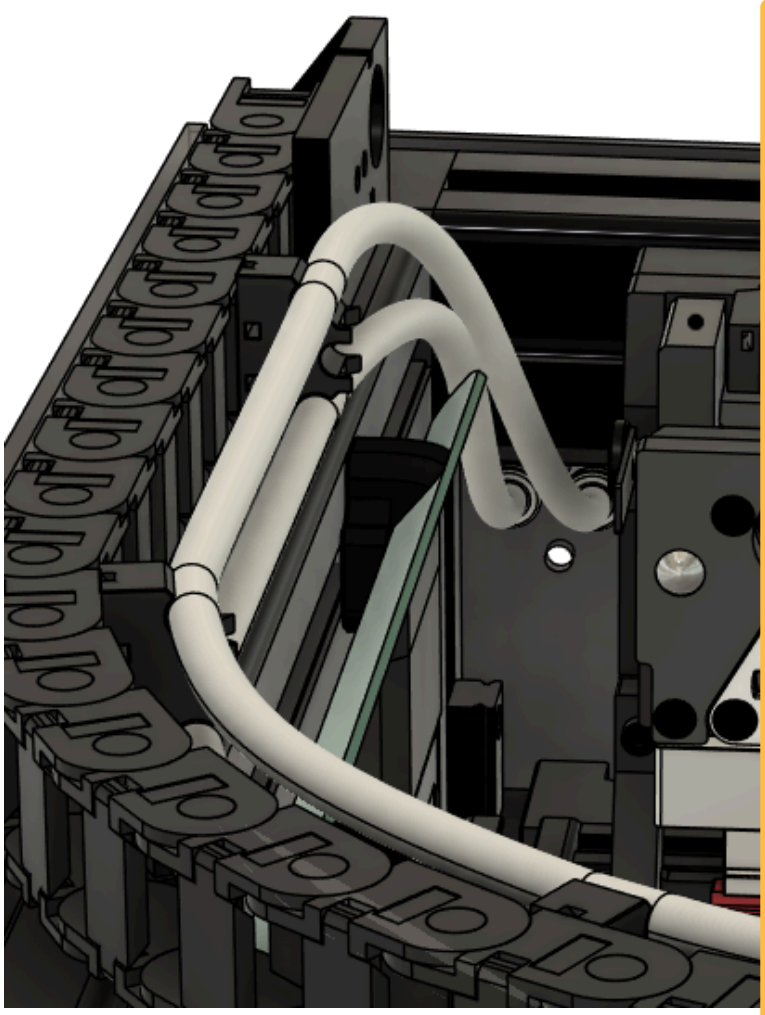
Locate (2) Fitting_WC_Coupler_4x6mm and push them onto the end of each tube prepared above.

NOTE: These fitting seal via a sealing ring that interfaces with the OUTSIDE of the tube! Be sure the first 4-5mm of tubing is clean and without deformation or gouges!

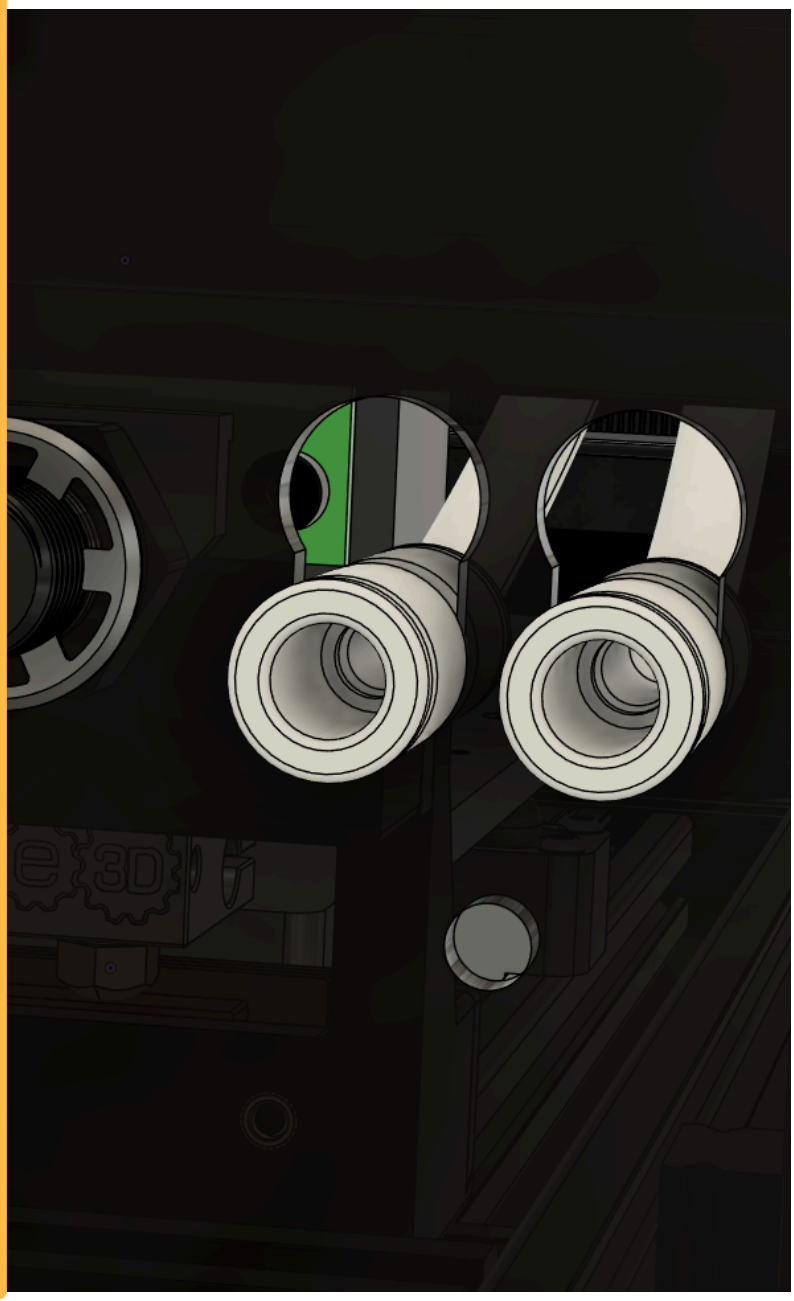


Use the following renders to guide the appropriate tubes to their installed positions at the left enclosure panel

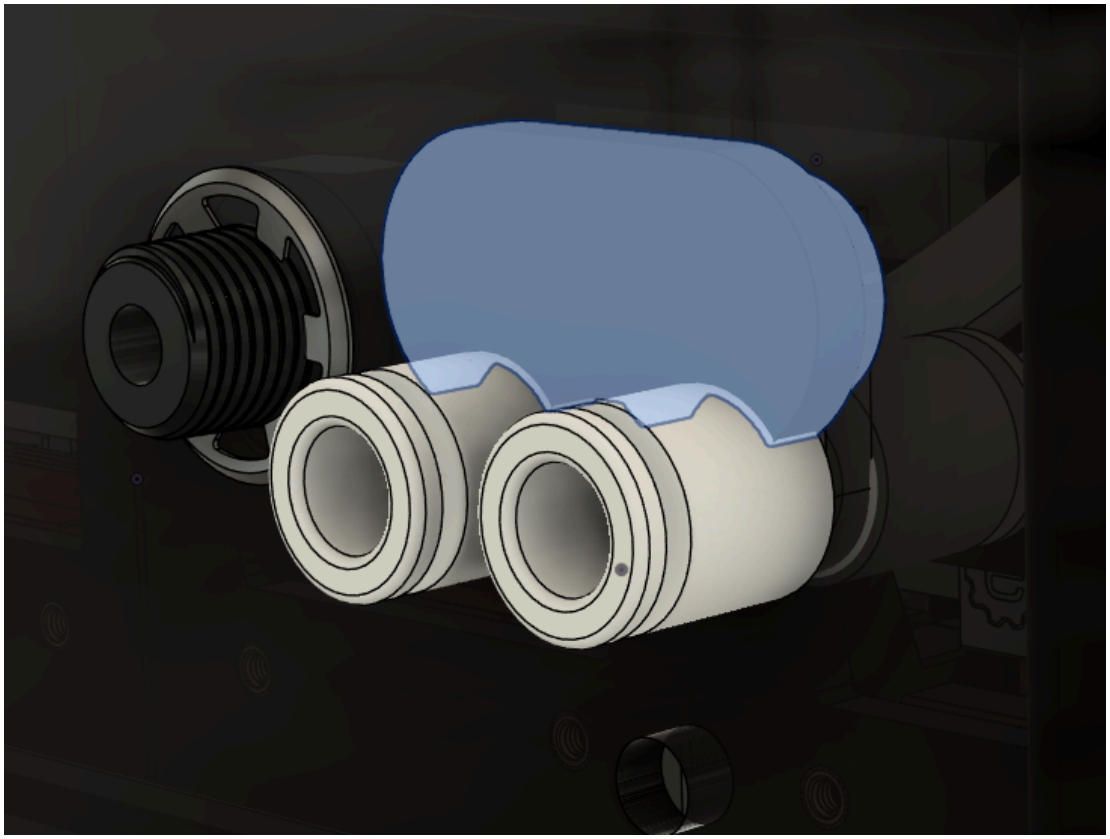
Guide each tube down and through the dedicated space to the left of the tool dock.



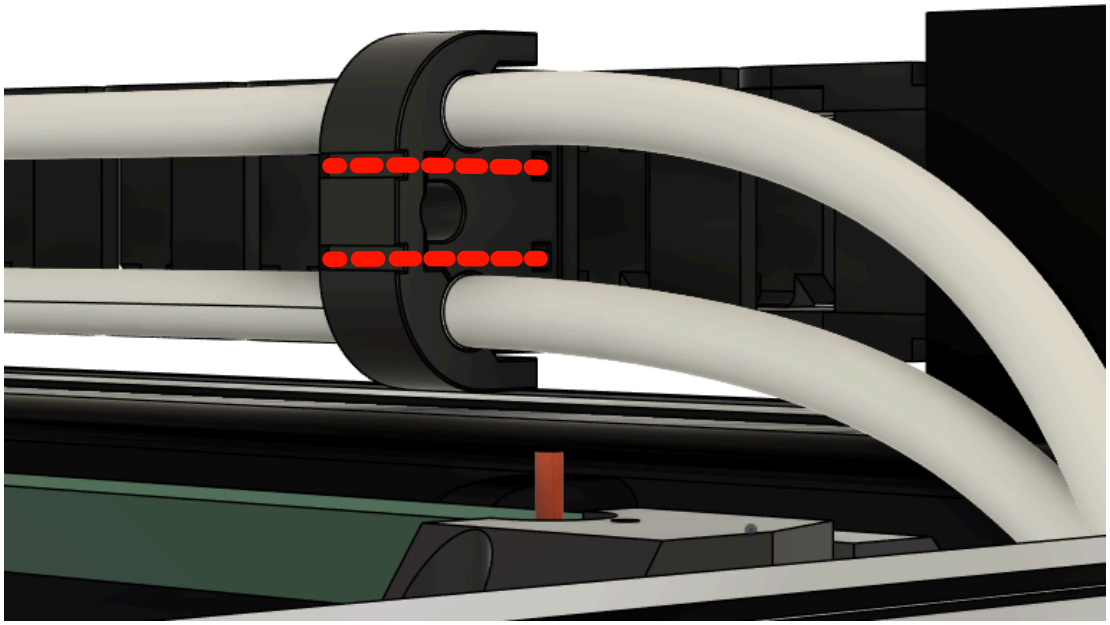
Each fitting will pass through the top of the keyhole slots and then downward into their seated position.



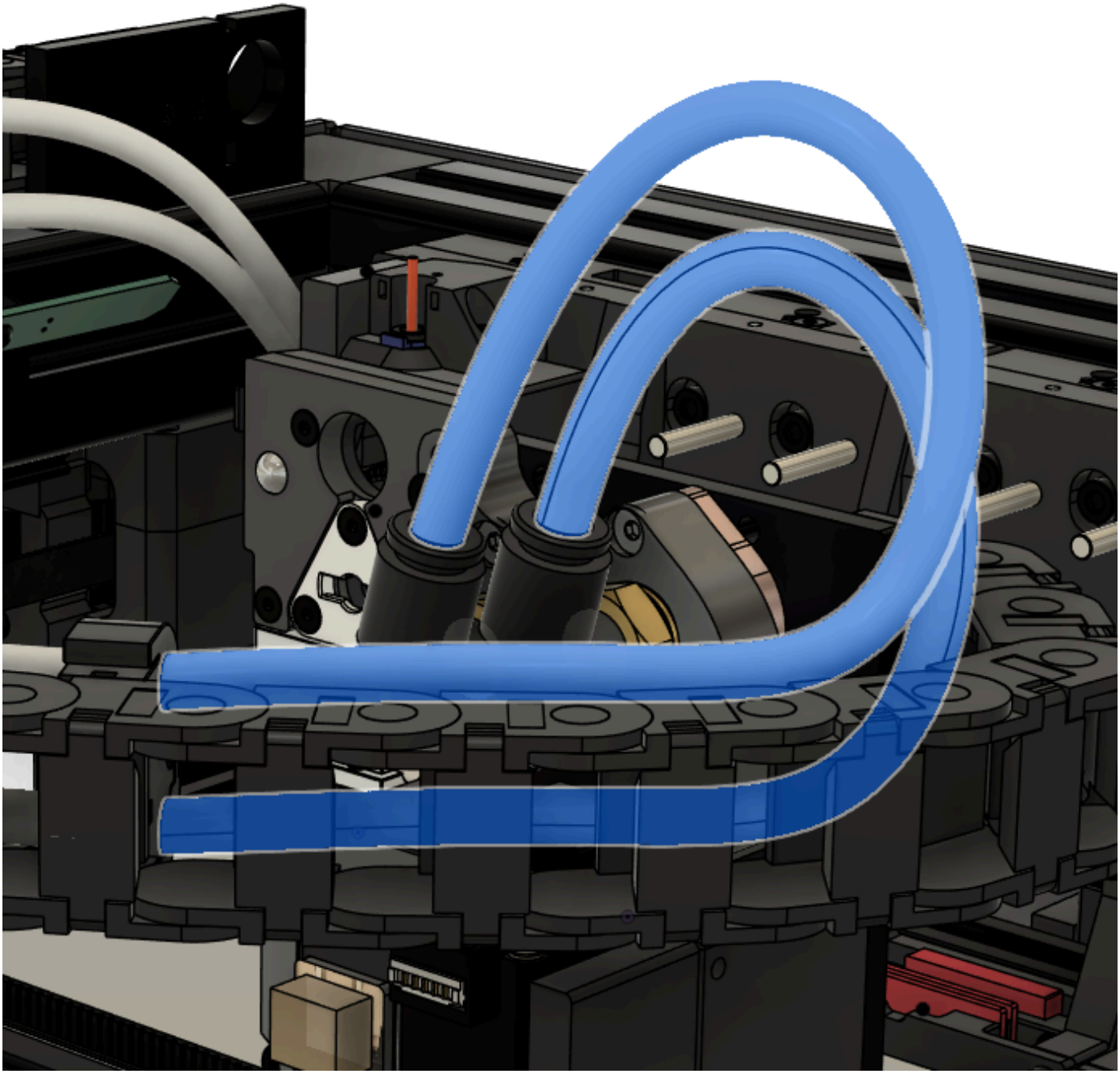
Locate Print_HosePlug_Front and insert into the empty space of the keyhole to secure the coupler fittings in place.



Secure the tubes to the (5) Line Holders installed onto the drag chain in the 'Electronics Mounting' guide using (2) tie-wraps along the path shown in RED.

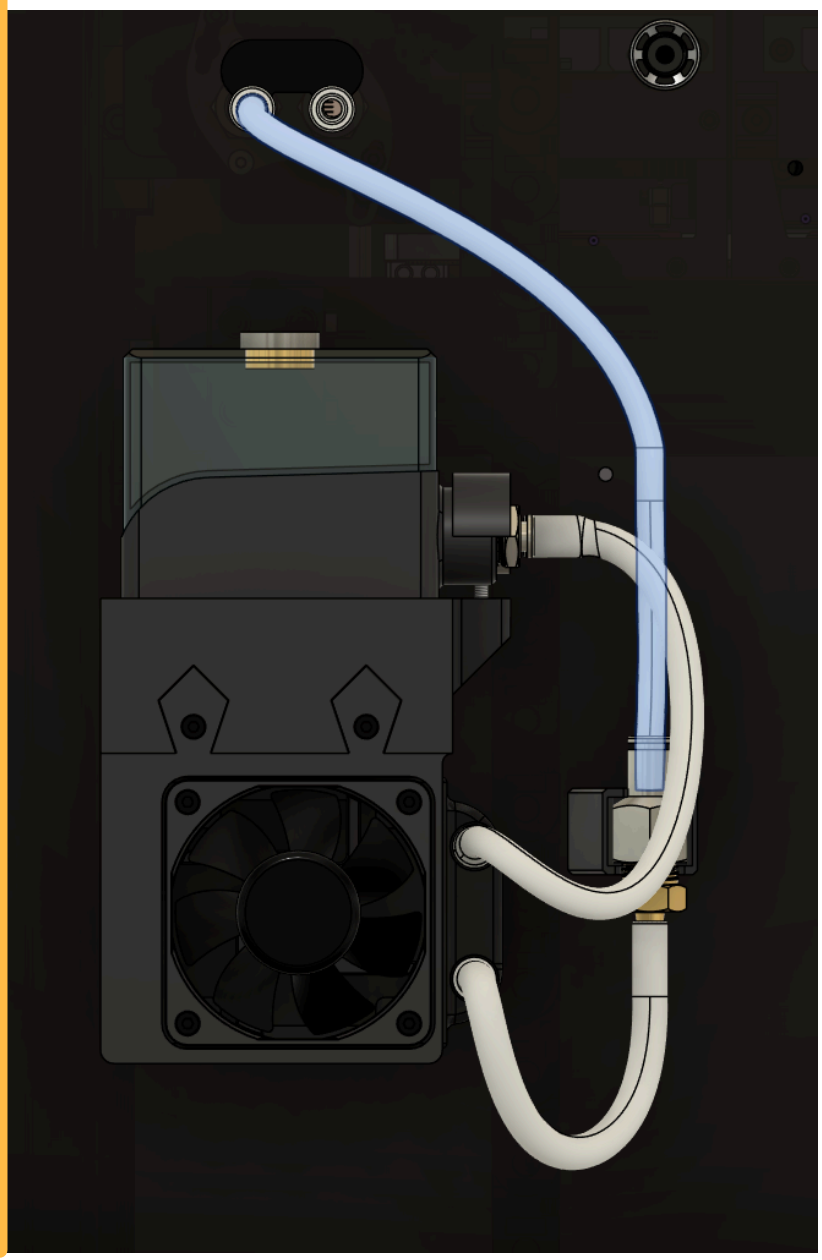


Insert the remaining ends of the tool head tubes into the water block elbow fittings



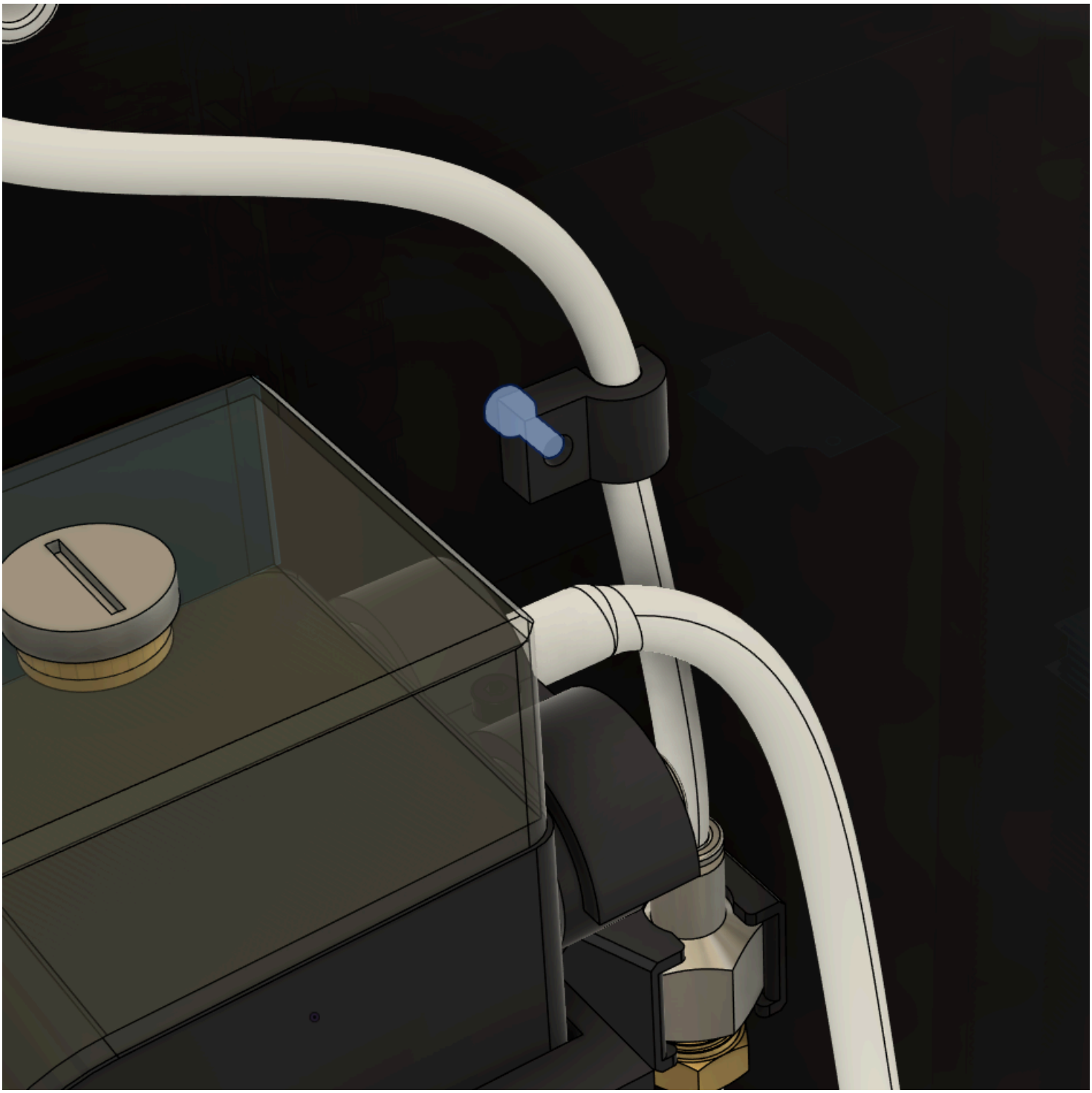
Locate Print_HosePlug_Rear and insert into the empty keyhole space to fully secure the coupler fittings

Prepare a length of nylon tubing and install between the conversion fitting and rear-most idle bar coupler.



Secure the previously installed tube to the left acrylic panel using (1) M3x8mm SHCS and a previously prepared WC_Retainer clip.

This fastener is fed through (and tightened) from the inside of the machine.



Prepare a length of nylon tubing and install between the forward idle bar coupler and rear-most tool head tube coupler.

Secure the tube to the left acrylic panel using (2) M3x8mm SHCS and (2) previously prepared WC_Retainer clips.

These fasteners are fed through (and tightened) from the inside of the machine.

Prepare a length of nylon tubing and install between the water pump and forward tool head tube coupler.

Secure the tube to the left acrylic panel using (3) M3x8mm SHCS and (3) previously prepared WC_Retainer clips.

These fasteners are fed through (and tightened) from the inside of the machine.

Does your machine look something like this?

You are finished with mechanical assembly and can move on to commissioning!