FILAMENT INNOVATIONS

INDUSTRIAL & LARGE-SCALE 3D PRINTERS

BUILT IN PENNSYLVANIA

BFP-ICARUS-TYPHOON

Gen 4 Manual-V1.0 (8/29/20)

Table of Contents

Introduction

To our newest Filament Innovations customer,

Congratulations on owning your very own BFP-ICARUS 3D Printer! These 3D Printers are built to fill a clear need in the 3D Printing sector: large-scale, high-flow, and reliable machines. These 3D Printers combine the latest technology and hardware into one unit. By using this unit, you are supporting American business and manufacturing, while helping to push innovation in numerous fields such as medical research, education, manufacturing, and rapid prototyping.

Filament Innovations is dedicated to making sure that your experience with our 3D Printers goes smoothly. Extra support is always available through these easy methods:

Website: https://filamentinnovations.com/pages/support

E-Mail: information@filamentinnovations.com

Phone/Text: (610)640-5699

Tech Hours: M-Th: 8:00am – 5:00pm EST

F: 8:00am – 12:00pm EST

We thoroughly hope you enjoy using your Filament Innovations 3D Printer. Please remember your machine was built by hand via trained individuals in Pennsylvania – supporting American Manufacturing.

Welcome to Industry 4.0!

Happy printing!

The Filament Innovations Team

Quick Fact Guide

The following quick fact guide will give you a brief overview of your printer and its components.

Machine Size:

ICARUS Size:	47 x 29 x 72 (in)
Right Door Swing:	27 (in)
Front Door Swing:	37 (in)
Weight:	400 (lbs)

Print Envelope:

ICARUS Print Area:	405 x 356 x 890 (mm)
	15.95 x 14.01 x 35.04(in)

Mechanical Components:

X, Y and Z Motion:	HiWin Linear Rail and C7 Precision Ballscrews
Motors:	CNC Grade Stepper/Servo Hybrid NEMA23s for X, Y, and 10:1 Geared NEMA23s for Z
Hotend Nozzle (mm):	0.60, 0.90, 1.20, 1.80, 2.50
Filament Diameter:	2.85mm

Electronic Components:

Wall Power:	110VAC
Minimum Breaker:	15A
Amperage Draw:	13A
System Voltage:	
Printer Electronics:	24VDC & 48VDC
Heated Bed:	110VAC
LEDs:	24VDC White and Blue
Camera:	Wyze IP/Internet Webcam
Motherboard:	Duet 2 Wifi with Duet Expansion Board
Screen:	PanelDue7i and Microsoft Surface

Quick Start Guide

The following guide allows you to check and monitor the progress of setting up your ICARUS unit.

1. Remove the four L-brackets from the bottom of the printer that attach it to the crate. Adjust the casters, so the wheels are on the pallet.
2. Remove the machine from the pallet by gently rolling it off and move the machine to the general area where it will be used.
3. Remove the shrink wrap from the machine and open the main door. Inside the printer, please remove your included CW-3000 water chiller, filament and any other boxes you see. Check under the blue bearing plate for boxes.
4. From the back of the printer, connect the two water lines to the back of the chiller, it does not matter what hose goes into what port. Pour roughly 1.75 gallons of blue windshield washer fluid into the chiller **(fluid not supplied)**. Plug the CW-3000 water chiller into the back of the printer with the power switch on. The chiller turns on with the printer.
5. Plug the 110VAC cord into the wall which is located on the rear right of the unit, twist the red emergency stop clockwise to disengage it, and flip the red toggle switch. The unit should now be powered on and you will hear a series of beeps when the chiller turns on. If you do not hear these beeps, please be sure the chiller switch is on and plugged in.
6. From the touch screen, temporarily disable to WiFi by pressing:

   Console > Keyboard Icon  *> Type "M552 S0" > Enter* ↵

   Note: This step is not relevant if you have the CAT5/6 version.
7. From the touch screen, select and run the following macro by pressing the Macro button:

   Macro > "Bed Leveling" > "Mesh Bed Leveling - RT"
8. Connect to a Wifi Network (page 21). Check that you can connect to the Duet Web Control interface afterward (detailed in this manual). Install the webcam, if desired, following the instructions from the Wyze Cam app on your phone or tablet.
9. Install the slicer profiles from the website and – *HAPPY PRINTING*

Unboxing

The BFP-ICARUS 3D Printer ships in a wooden crate, weighing between 500 - 550 lbs. The crate dimensions are as follows:

ICARUS-X Crate Size: 52 x 40 x 76 (in)

Using the tools and instructions listed below, you should be able to easily remove your ICARUS from the palette and remove the shrink wrap. The unboxing process will require two people.

Required Tools Not Included for Unboxing

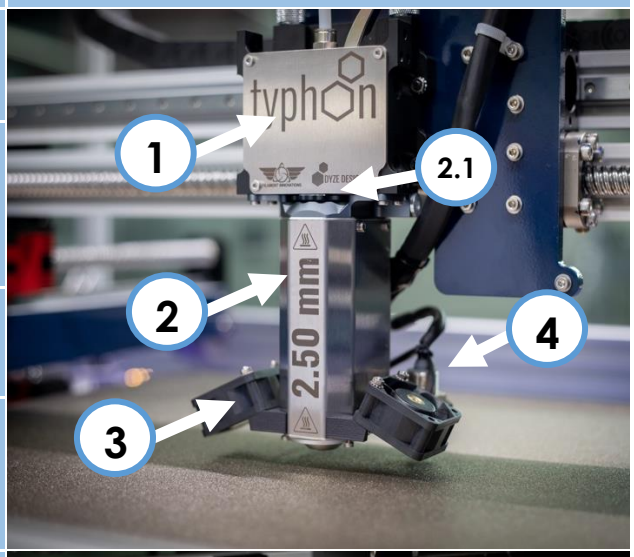
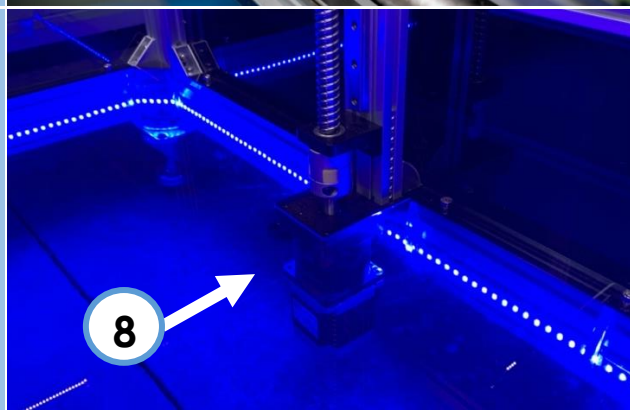
- Powered Drill with a #2 Philips bit
- Crowbar or Hammer
- Basic metric Allen key set
- 19 mm or adjustable wrench

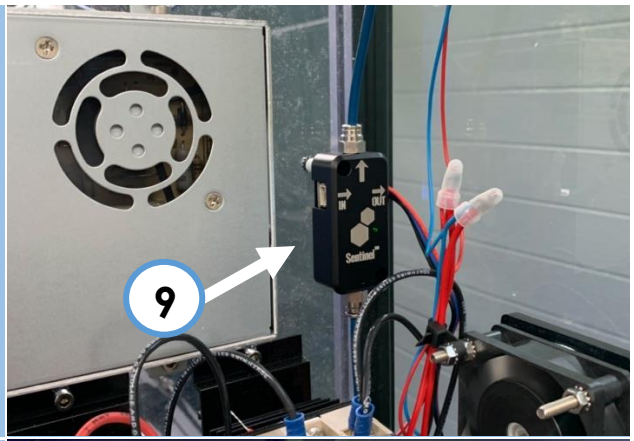
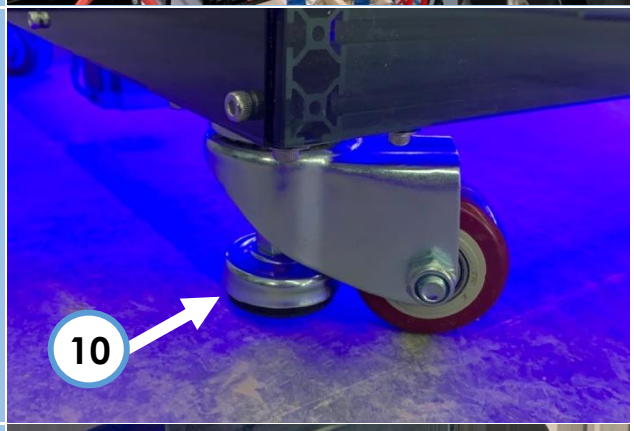
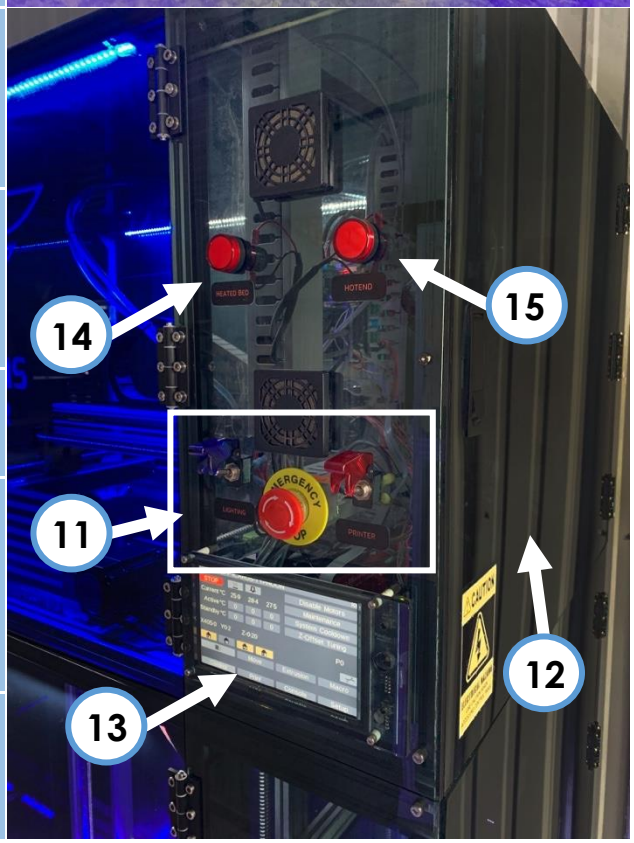
Steps for Unboxing

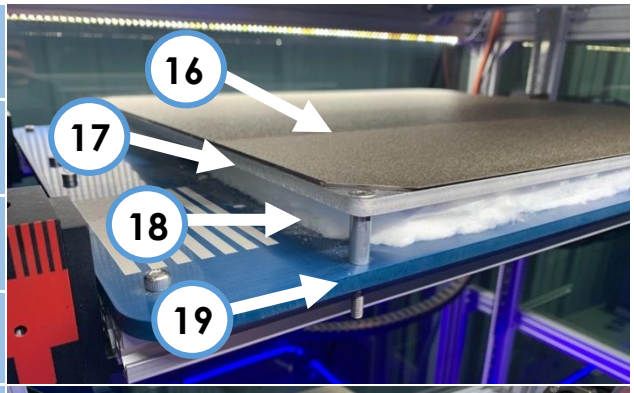
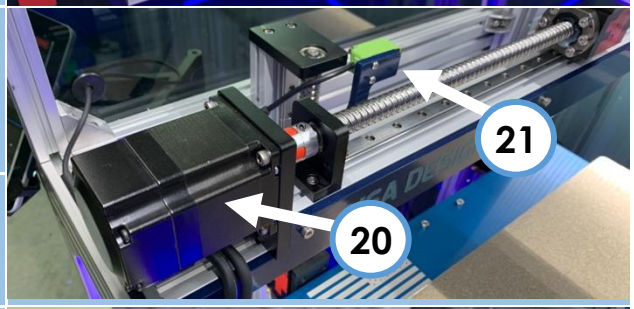
1. To remove the outside panels, use a crowbar or hammer to remove the staples around the outside of the box.
2. Once the panels are removed, use a hammer or crowbar to remove the wooden frame around the printer.
3. Once the crate is open, locate the metal L-brackets securing the printer to the pallet. Remove the pallet side of the bracket using a drill and the printer side using a number 4 Allen key
4. Use the 19 mm wrench to raise the stabilizer feet so the wheels are touching the floor of the crate.
5. You and another person can now remove the printer from the crate by carefully rolling it off. The printer should still be in the shrink wrap at this time.
6. Move the printer approximately where it will be operated and remove all the shrink wrap from the machine. After the shrink wrap is removed, move the printer into its final position. As a reminder, the filament chamber is on the right side of the machine and needs an additional 27 inches to open properly.

Component Names and Locations

Before we go any farther, let us take a few minutes to understand the various components of your ICARUS unit. These components will be referenced later in the manual. At this time, the unit should NOT be powered on.

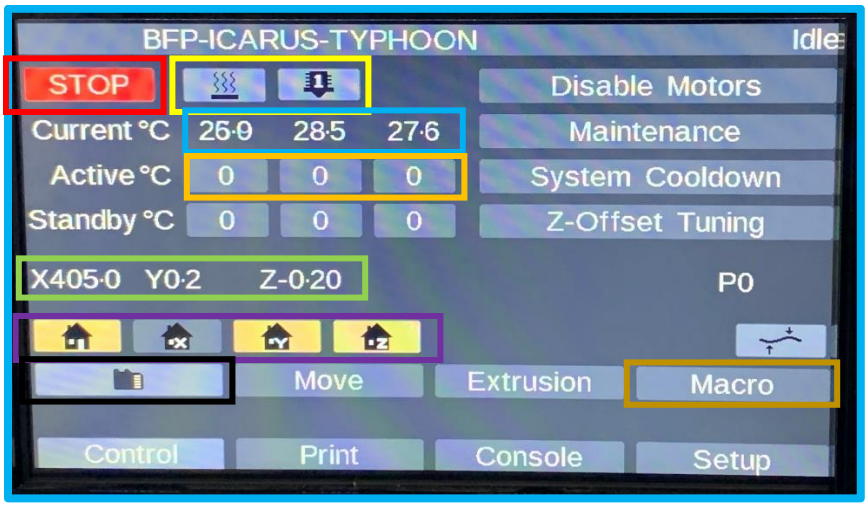
#	Component	Description	Image
1	Extruder	Stepper motor that pushes filament through the hotend.	
2	Heatcore	Interchangeable heater assemblies with different nozzles sizes. Able to be swapped out with dial indicated with 2.1.	
3	Part Cooling Fans	Fans that cool the part during printing	
4	Inductive Probe	German designed sensor that detects the distance from the nozzle to the bed – teal tip.	
5	X-Endstop	Sensor that detects the x home position of the printer.	
6	X Motor	Stepper motor responsible for moving print head assembly left to right.	
8	Z Motor	One motor on each side controlling up and down movement of the bed. These have a 10:1 gear box on them to increase power. There are four of these.	

9	Filament Sensor	Detects when filament has run out. This is found in the control case on the right side.	
10	Casters	Allows the printer to roll or be locked in place with retractable feet. The feet can be raised and lowered by rotating the leveling feet.	
11	Switch Panel	Controls the printer power: See the *Powering the Printer On* section to see what each control does.	
12	Control Case	Houses all of the electronics for the printer. This includes power supply, duet board, relays, and cooling fans.	
13	Duet 2 Wifi Screen	The interface used to interact with the printer.	
14	Heated Bed Indicator	Red indicator light that turns on when the heated bed is above 40C. The Print Plate should not be removed if this light is on	
15	Hotend Indicator	Red indicator light that turns on when the hotend is above 40C.	

16	Print Plate	Removable print surface for easy remove prints.	
17	MIC6 Plate	The plate that is heated by the heated bed.	
18	Insulation	Retains heat from the heated bed.	
19	Base Plate	Creates a stable base for the print bed.	
20	Y Motor	Stepper motor responsible for moving print head assembly front to back. There is one on the left and right of the machine.	
21	Y Endstop	Sensor that detects the y home position of the printer. There is one on the left and right of the machine.	
22	Microsoft Surface	Assists in operating the machine from the Duet Wifi Control Screen as well as performing onboard slicing using Simplify3D.	
23	Filament Chamber	Holds up to six spools of filament. Use the top right spool holder to feed filament into the machine.	

Touchscreen Interface

The BFP-ICARUS is equipped with a 7" PanelDue7i LCD touchscreen from Duet3D and a Microsoft Surface to easily interact with the printer. In this section, we will cover the basics required to understand how to operate your printer using the touchscreen. For more in depth documentation, refer to the [Official Duet3D Documentation]



Red: Software controlled emergency stop.

Yellow: Heated Bed (Left) and Hotend (Right) icons.

Blue: Current temperature in Celsius.

Orange: Temperature the printer is set to.

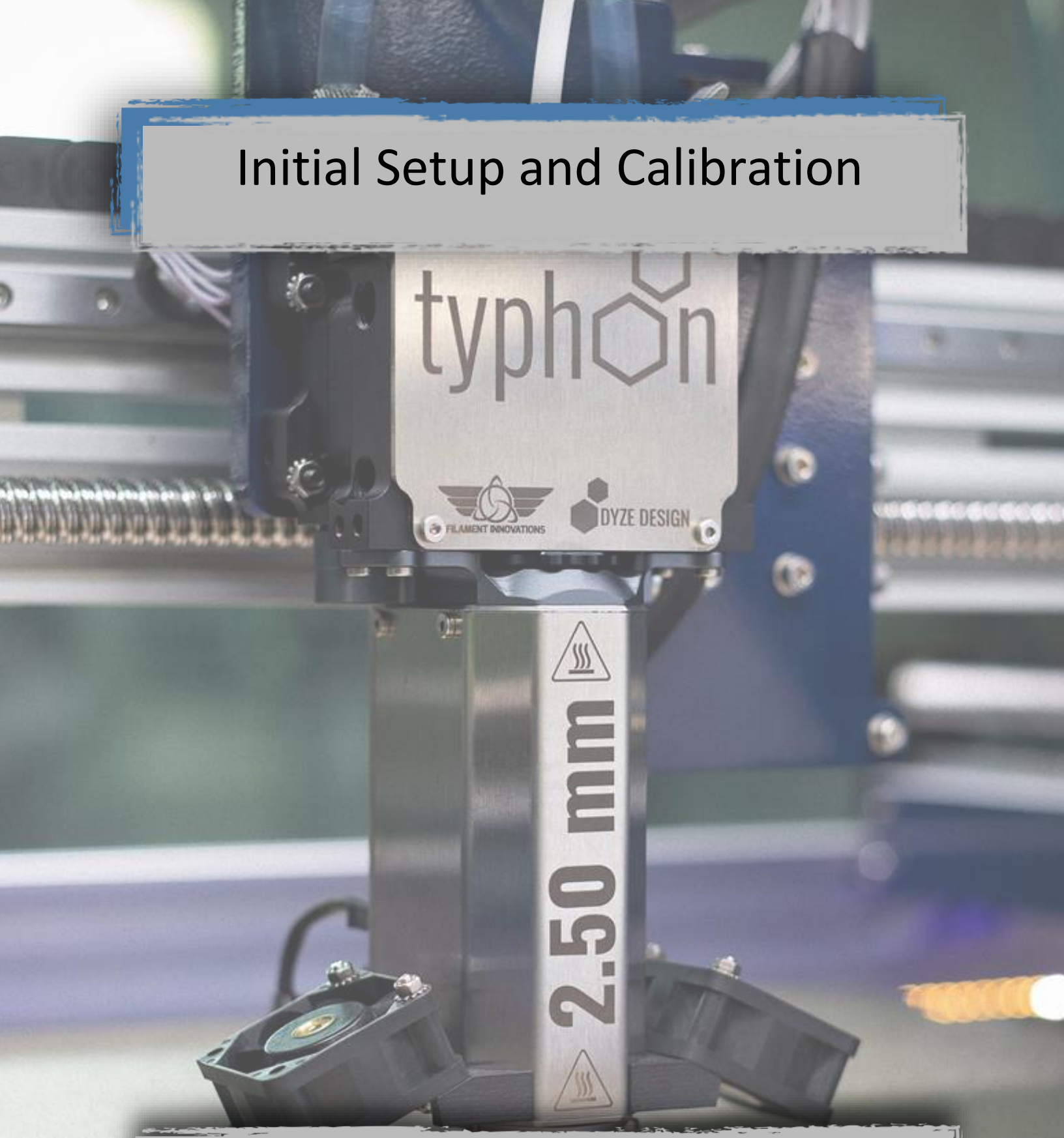
Green: Current position of the X, Y, and Z axis in millimeters.

Purple: Home command for each axis. The left icon is a Home All. to home all three axes. You must Home All before attempting to use the Move commands. You can individually home each axis with the other three buttons.

Black: All gCode files for printing that are stored on the onboard 4 GB MicroSD card. These gCode files are loaded via the Duet Web control interface on a computer browser.

Brown: The Macro button is used to store custom commands that can be written and stored via the Duet Web control interface. Some basic Macros are included to help with setup.

Initial Setup and Calibration



All ICARUS units ship pre-assembled and calibrated; however, users should follow the steps outlined in this section to ensure the printer remained in calibration during transit to its operating destination.

Powering the Unit On, Off, and Troubleshooting

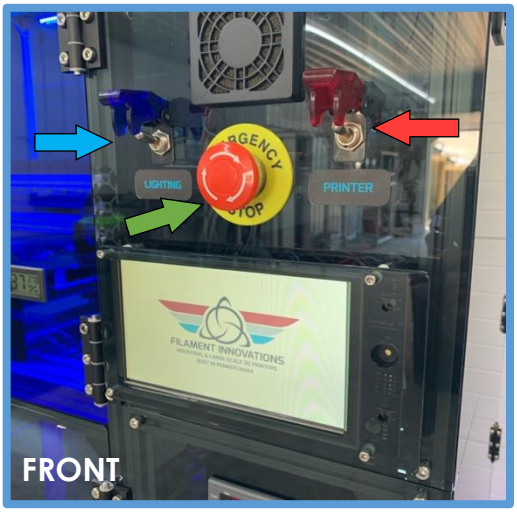
Your printer has come with the following tools and accessories:

Accessories

- Filament
- CW-3000 Water Chiller
- Desiccant Dryer for Filament Chamber
- Wyze IP/Internet WebCam
- PTFE Oil for Linear Rails
- White Lithium Grease for Ballscrews

The ICARUS printers run on 110 VAC power, standard USA household electricity – the unit needs a 15A circuit for operation. The switches on the front of the control box are responsible for turning on and off the printer. As a reminder, the function of each control is listed below.

- **Red Toggle Switch:** Controls power to the printer (Red Arrow)
- **Blue Toggle Switch:** Controls internal LED lighting (Blue Arrow)
- **Emergency Stop**: Kills all power in case of emergency. If pressed, turn the button clockwise to disengage. (Green Arrow)
- **Main Power Plug**: Plug for 110 VAC power cord. (Yellow Arrow)



Steps for Turning on your ICARUS

1. Use the supplied 110 VAC power cord to plug the printer into a wall outlet. The unit should be on a minimum 15 amp breaker; however, we suggest a 20 amp breaker.
2. Ensure that the emergency stop is disengaged - turn clockwise to disengage the button.
3. Flip the red toggle switch to turn on the printer. At this point the screen, water chiller, and the cooling fans on the control box should turn on. You may also turn on the LED's using the blue toggle switch.

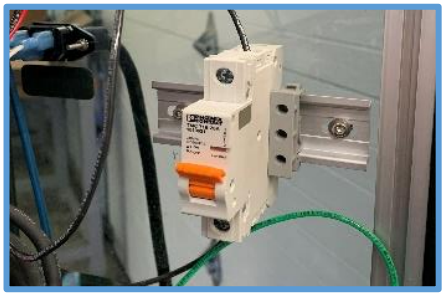
Steps for Turning off your ICARUS

1. Press the *System Cool Down* button on the home screen to turn off the heated bed and hotend.
2. Wait for the red Heated Bed and Hotend indicator lights to turn off.
3. Flip the red toggle switch down to power the unit off.

Troubleshooting the Power

The BFP-ICARUS is a straight forward machine to power on and off, however there may be times when troubleshooting may occur.

- 20amp Breaker – A breaker is located inside the control box, on the bottom right. If the unit does not turn on, there may have been a power surge on the electrical line the printer is plugged into. Please check to see if the breaker has a green(off) or red (on) color on it. If it is green, please flip the breaker to power the unit back on



- Emergency Stop – Is the emergency stop pressed in? This will cut power immediately to the unit. Turn this clockwise to disengage it.
- Power Plug – Please check that the plug is fully inserted into the control case on the back of the machine.

CW-3000 Water Chiller

The Gen-4 ICARUS is water-cooled and we include the CW-3000 water chiller to keep the Typhoon high-flow extruder operating at the appropriate temperatures, between 18C and 28C.

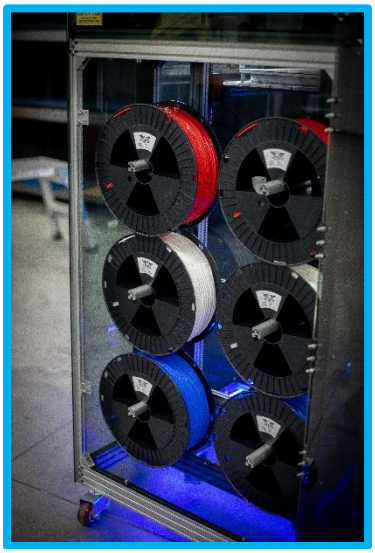
IMPORTANT – FROM THIS STEP FORWARD - IF THE MACHINE IS ON, THEN THE CHILLER NEEDS TO BE ON. ALWAYS LEAVE THE CHILLER SWITCH TO THE "ON" POSITION AS THE POWER IS DERIVED FROM THE PRINTER ITSELF. THE CHILLER WILL TURN OFF WHEN THE POWER TO THE PRINTER IS TURNED OFF. THE CHILLER WILL BEEP MULTIPLE TIMES WHEN TURNED ON.

Please note – you will need to source 2 gallons of blue windshield washer fluid. This is commonly sold at any general store or automotive store.

1. Place the water chiller next to the machine and connect the two water lines coming out on the back. It does not matter which line goes into the Input line or the Output line. Secure these lines to the chiller using the included clamps.
2. Fill the reservoir (located on the top of the chiller), with roughly 1.75 gallons of windshield washer fluid.
3. Plug the power cord into the chiller. The power for the chiller is taken from the power cord hanging from the back of the printer.
4. With the two hoses connected, the reservoir filled, and the power cord plugged in, flip the power switch on the chiller. If the printer is powered on, the water chiller will beep a few times and fluid will flow. Check the Typhoon connections for any leaks. If the chiller does not turn on, check that the power cord is plugged, the chiller is turned on, and the printer is on.

Filament Chamber

The Gen-4 ICARUS has a dedicated filament chamber, capable of holding six filament spools, each 2.3kg in size.



Please place the desiccant dryer on the bottom of the filament chamber. This will help keep moisture out of the chamber and the filament dry. Using the included power cord, please dry the desiccant dryer every two weeks, or as needed. The orange beads, located inside the dryer, will turn green when the device needs to be recharged. Please check it weekly and charge as needed.

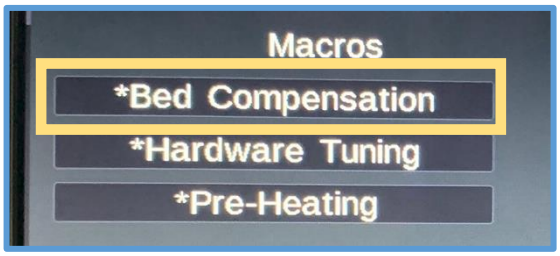
Bed Height Adjustment and Automatic Leveling

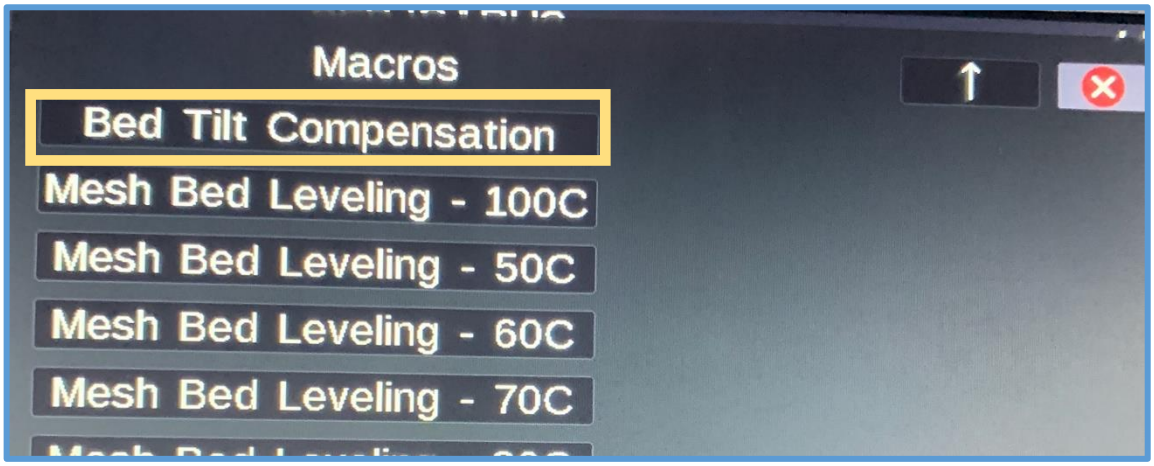
Keeping a level bed is critical for accurate 3D Printing. Every ICARUS unit comes equipped with mesh bed leveling to ensure a flat bed. Even though your bed leveling, and Z-offset is factory set, it is important to check that no damage occurred during shipping.

Steps for Checking Bed Height and Leveling

1. Every Gen-4 ICARUS unit ships with four Z axis ballscrews, which replace the need for manual tension springs. These ballscrews will automatically level the plate in four corners. Every ICARUS ships within 200-300 micron bed variance.
2. Use the *Home All* button to home the X, Y, and Z axes. The printer axes will now start to move. This is shown in yellow
3. Navigate to the Bed Tilt Compensation macro by going to:

   Macros > Bed Compensation > Bed Tilt Compensation





Automatic Bed Leveling and Baby Z Stepping

3D Printing requires a very flat bed and surface for large, successful prints. Because of this, we have included two forms of bed leveling for your machine. This section of the guide is to inform you of what these two bed leveling options do.

Inductive Probe: This durable and extremely accurate German designed sensor is responsible for detecting the metal print plate to allow for the following functions to be run. This sensor can be found on the hotend with the circular green cap at the bottom where it senses.

Tilt Compensation: Prior to every print, the ICARUS will automatically perform a Tilt Compensation which probes each corner of the print bed. The software will automatically calculate the deviations of the bed and independently adjust all four Z motor ballscrews to level the bed to ensure your print bed is flat every time.

Mesh Bed Leveling: Changes in bed temperatures from printing with different filaments will slightly affect the levelness of the bed. A Mesh Bed Compensation is a 5 minute Macro that will probe the bed at numerous points, twice, and create a virtual height map of the bed. It is found under:

Macros > Bed Compensation > "Mesh Bed Leveling".

Run this macro every time you load a new filament to ensure a proper print surface. There are presets from 50C through 100C bed temperature, choose the temperature that best suits your printing needs. Our ICARUS units come pre-calibrated with a mesh variance under 300 microns.

Baby Step: To ensure you get the perfect first layer every print, the Duet system allows you to move the print bed up or down at the beginning of a print to account for small variations in bed leveling from normal use. When a print is started, a button on the lower right of the touchscreen called "Baby Step" will allow you to adjust the spacing of the print head to the print bed in 0.02mm increments. The ***two arrows pointing together will raise the print bed*** to the nozzle. The ***two arrows pointing away will lower the print bed*** from the nozzle.

Moving the Printhead

The print head can be moved using the *Move* tab on the touchscreen. After selecting the *Move* button on the home screen on the touchscreen, the *Move* window appears. This gives a variety of options for moving the printer a certain number of millimeters in all directions.

The printer must be homed before it can be moved manually. If a move button is pressed without the printer being homed, an error message will appear. This is necessary to prevent damage to the machine by moving the printer too far in one direction.

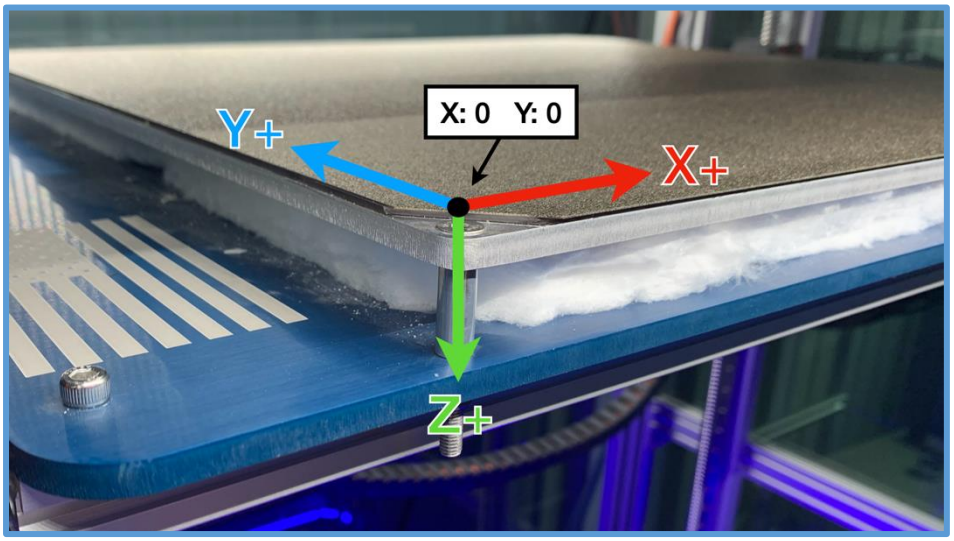
Moving in the X and Y Direction

The X and Y direction moves the **PRINTHEAD**. Once the printer is homed, it can be moved in the X and Y direction freely without fear of moving the printer too far in either direction.

Moving in the Z Direction

The Z direction moves the **BED** up and down. ***More caution must be given when moving in the Z direction because it is possible to ram the bed into the nozzle which can SEVERELY damage the machine***. Take extra caution when moving the Z axis. The negative Z buttons move the print bed **UP** while the positive Z buttons move the print bed **DOWN**.

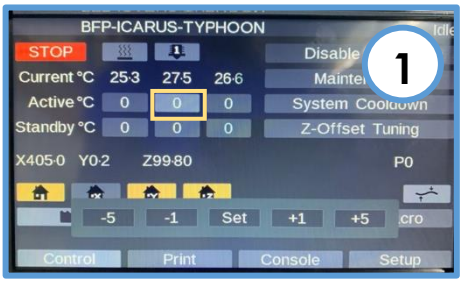
The diagram below shows what the positive direction of movement is for each axis. The origin of the x and y axis of the printer is in the front left.



System Preheating

In order to preheat the entire system, the desired temperature needs to be set for the hotend and heated bed individually. Other than preheating for a print, the heated bed must be preheated for Mesh Bed Leveling, and the hotend must be preheated when changing filament. For more information about preheating instructions when changing filament, see the next section *Filament Loading*.

Steps to Preheating the Bed and Hotend



1. Press the temperature button in the "Active" row for the hotend.
2. Use the + and – buttons to select the desired temperature and then press the "Set" button.

3. Initiate the heating process by pressing the hotend icon. The active temperature fields should turn red, and heating should begin.
4. The same process is followed for preheating the heated bed. Press the temperature button in the "Active" row for the heated bed, set the desired temperature, and press the heated bed icon to initiate the process.

Alternative Method for Preheating

There are also Macros made for system preheating ABS, ASA, Nylon, PETG, PLA, TPU and more. When one of these is engaged, the system will heat the heated bed first and then the hotend. Find these under

Macros > "Pre-Heating"

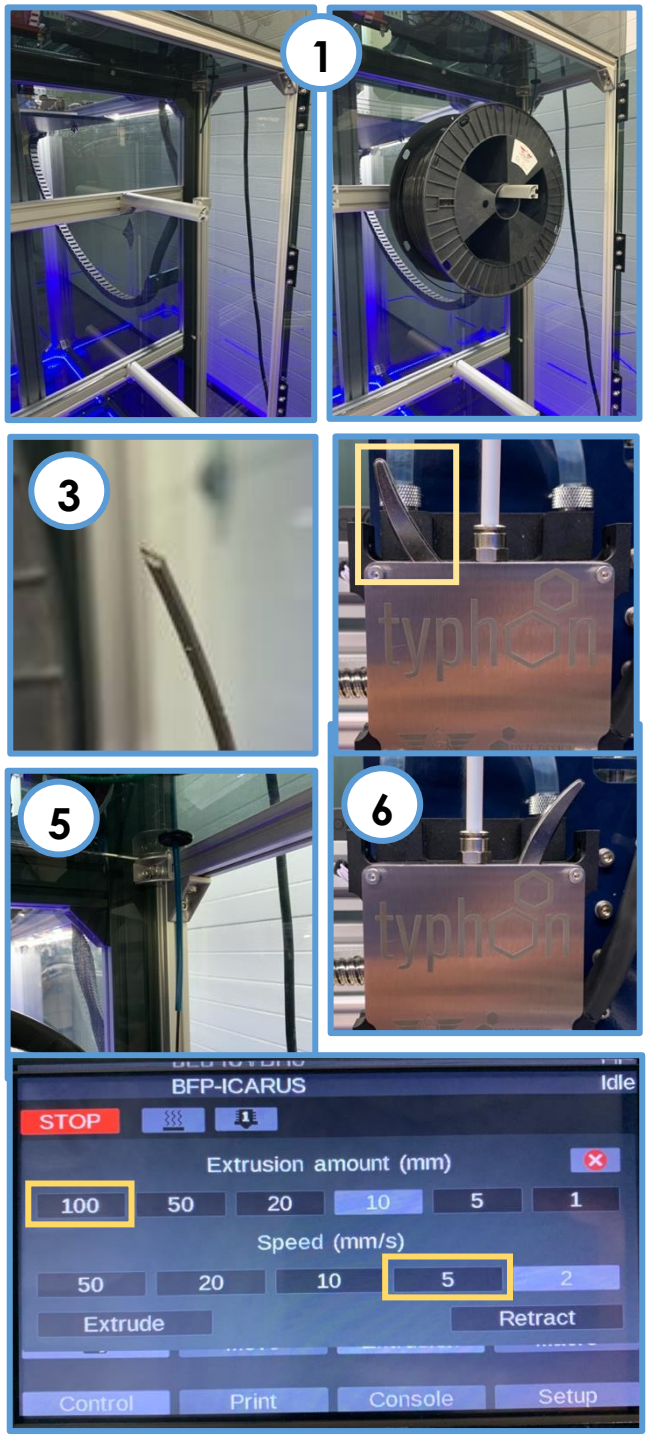
Always print at the manufacturer's suggested temperatures. Our preheating macros should be treated as guidelines for that polymer.

Filament Loading

To begin printing with your printer, or to change filament, it is important to know how to load filament into your ICARUS. Follow the two guides below for Loading Filament for the First Time and *Changing Filament*.

Loading Filament for the First Time

1. Put the desired spool of filament on any of the filament holders in the filament chamber.
2. Preheat the hotend to the correct temperature for that filament.
3. Cut the end of the new filament at a 45 degree angle to allow it to more easily be fed through the tube.
4. Push the lever on the extruder to the left – this opens the extruder. Image 4 shows the open extruder position.
5. Start feeding the filament through the tube, through the sensor, and continue feeding it until you feel it stop – it has now entered the extruder.
6. With the hotend heated and filament in the extruder, release the filament lever by pushing it back to the right – this engages the extruder. Image 6 shows the extruder in the closed position.
7. On the Duet Screen, press the Extrusion button to extrude 100mm of filament at 5mm/s – twice – so you extrude 200mm of filament. If the extruder does not move, then press the Home All button to home all the axes as a safety precaution and repeat this step.



Steps to Changing Filament

1. Preheat the hotend to the correct temperature. If you are switching between different materials (i.e. PETG to PLA), it is suggested to load the filament at a temperature between the two ranges. This will soften the PETG enough for getting it out of the hotend and the PLA will not be burned when you load it.
2. Push the lever on the extruder to the left and engage it into place with the lock knob.
3. Remove the existing filament by spinning the spool backwards. You can also remove the white PTFE tube, at the connector on the hotend, if it is easier to pull the filament directly out of the extruder.
4. Once the old filament has been pulled out of the tube, put the new spool of filament on and follow the filament loading steps from the prior section.
5. When printing, immediately after changing the filament, remember to preheat the hotend and heated bed to the appropriate temperature for the new filament.

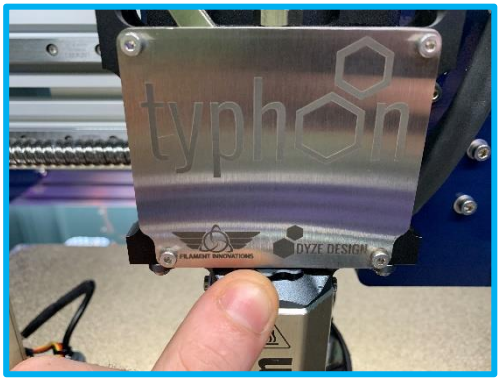
Changing Heatcores (Nozzles)

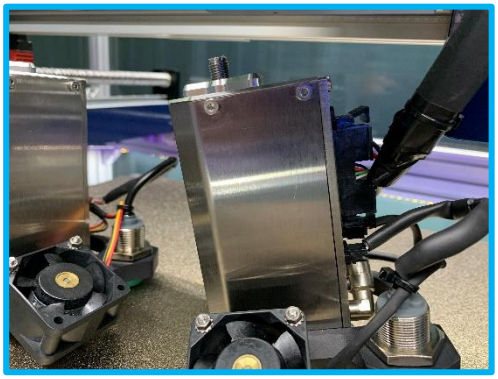
The Typhoon extruder comes with quick swap heatcore (nozzle) assemblies. One of the benefits of this system is how easy it is to swap heatcores.

Please be sure the filament is removed from the Typhoon before going any farther and the heater temperature is below 100C to prevent burning of your hands.

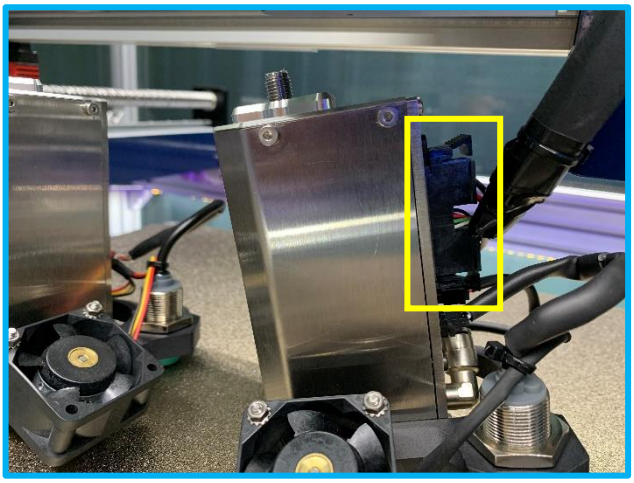
1. Move the Typhoon to a place where it is easy to handle and lower the bed (Z Axis) 50mm.

2. Locate the thumb wheel and turn it counterclockwise until the entire heatcore separates from the extruder.

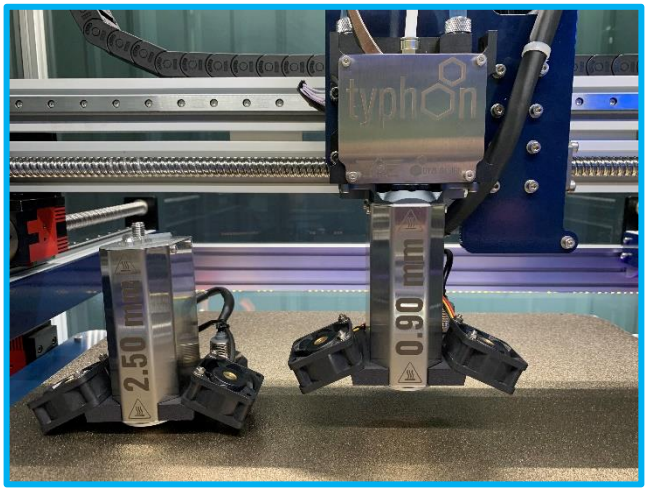




3. Unplug the bulkhead connector on the back of the heatcore assembly be squeezing the plastic tabs down, on each end of the connector.

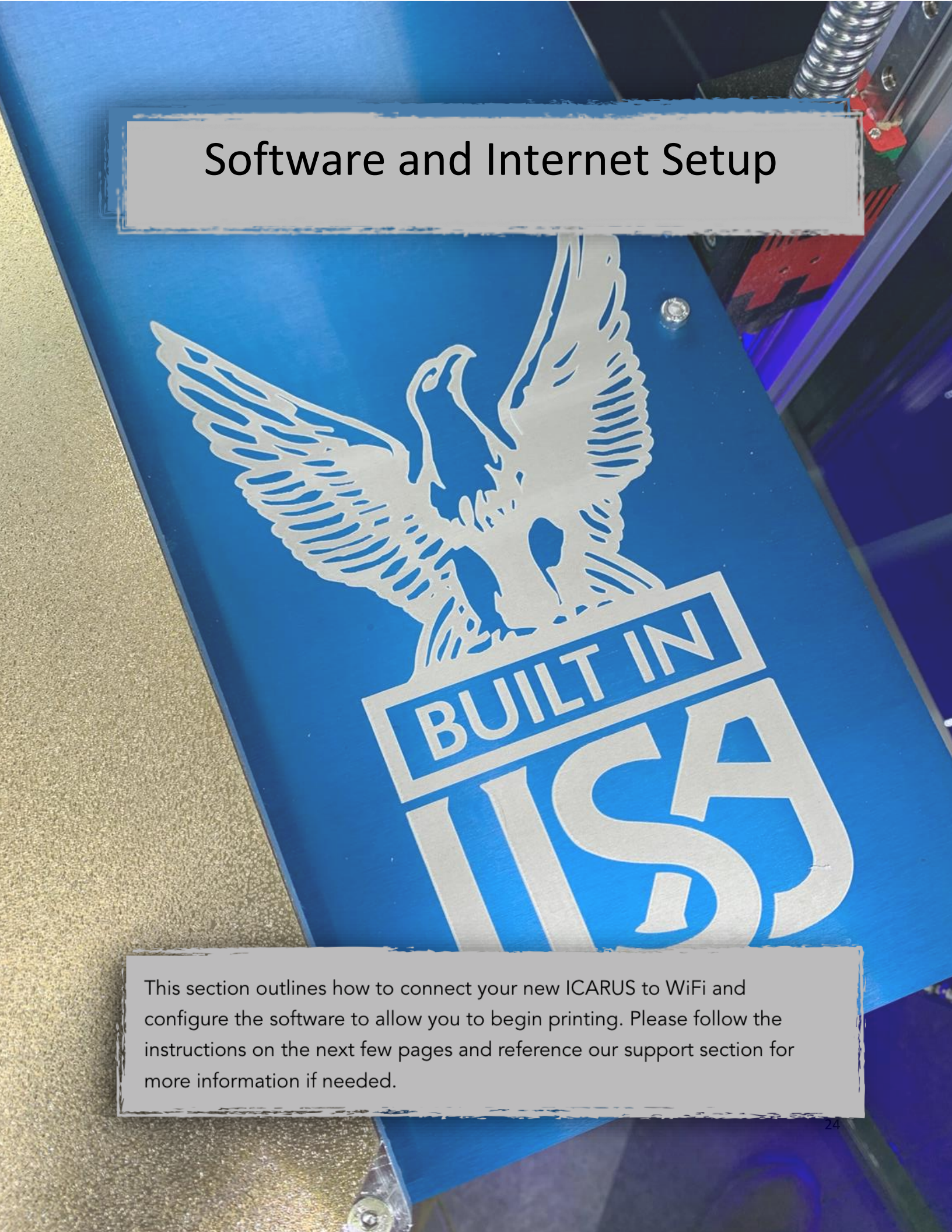


4. With the new heatcore assembly in hand, reverse steps 3 and 2. Plug the bulkhead connector into the new heatcore and turn the thumbwheel clockwise to tighten it to the extruder.



5. **CRITICAL** – Run the Z-Offset tuning macro to re-calibrate your Z-Offset and enter the new value into the config.g file.

Software and Internet Setup



This section outlines how to connect your new ICARUS to WiFi and configure the software to allow you to begin printing. Please follow the instructions on the next few pages and reference our support section for more information if needed.

WiFi Connectivity

The Duet2 WiFi board comes with built in WiFi connectivity for 2.4 GHz networks (it will not work on 5 GHz networks). Since initial connectivity tests are performed before the unit is shipped, all that needs to be done is to type in your SSISD and Password for your WiFi network. If you have the version that utilizes a CAT5/6 connection, please visit this link here and go directly to Step 8.

Steps to Directly Connect your Printer to WiFi

1. Press the Console button on the touchscreen.

4. Enter the following command to temporarily disable the built-in WiFi card:

   M552 S0

5. Enter your wireless network's name and password exactly as shown below by using the on-board keyboard feature. Be sure to enter your own network name and password where you see **NetworkName** and **Password** – the quotation marks must stay. This command is case sensitive. Press enter to send the command.

   M587 S"NetworkName" P"Password"

   Example: M587 S"FilamentInnovations" P"3dprinter"

   In the event that your network name and/or password are too long to display on the screen, there is a USB cable included inside the Duet Wifi box you can use to enter the Wifi settings from your computer. Open the control case and look for the mini-HDMI port located on the bottom left of the board. You will need the Machine Control panel in Simplify3D to communicate with the board. If you are doing this from a computer, the machine should be powered off at this time. This is covered in detail here: Advanced Wifi Setup

3. Next, type the following command to have the printer try to connect to the internet. Press enter to send the command.

   M552 S1

4. After about thirty seconds, you will see a message on the LCD screen indicating whether or not the WiFi connection was successful. If it was successful, you will see a message like the following:

   WiFi module is connected to access point NetworkName, IP address 192.168.1.239

5. Log onto a computer and ensure it is connected to the same WiFi network as the printer. Type the IP address of your printer (the number similar to 192.168.1.239) into an internet browser from a PC, laptop, or the included Microsoft Surface.
6. From your web browser, you will see Duet Web Control and be able to send gCode files to your printer for wireless printing.
7. If you received an error message, try typing the network name and password again, and be sure you are not trying to connect to a 5 GHz network. Additional support can be found in Helpful Links and Resources.

   NOTE – If your Duet Wifi board suddenly cannot connect to your network, then it is likely your router assigned a new IP address to it. From the Duet Screen, go to the Console, type in **M552,** press the enter key, and in a few seconds the new IP address will be listed on the screen.

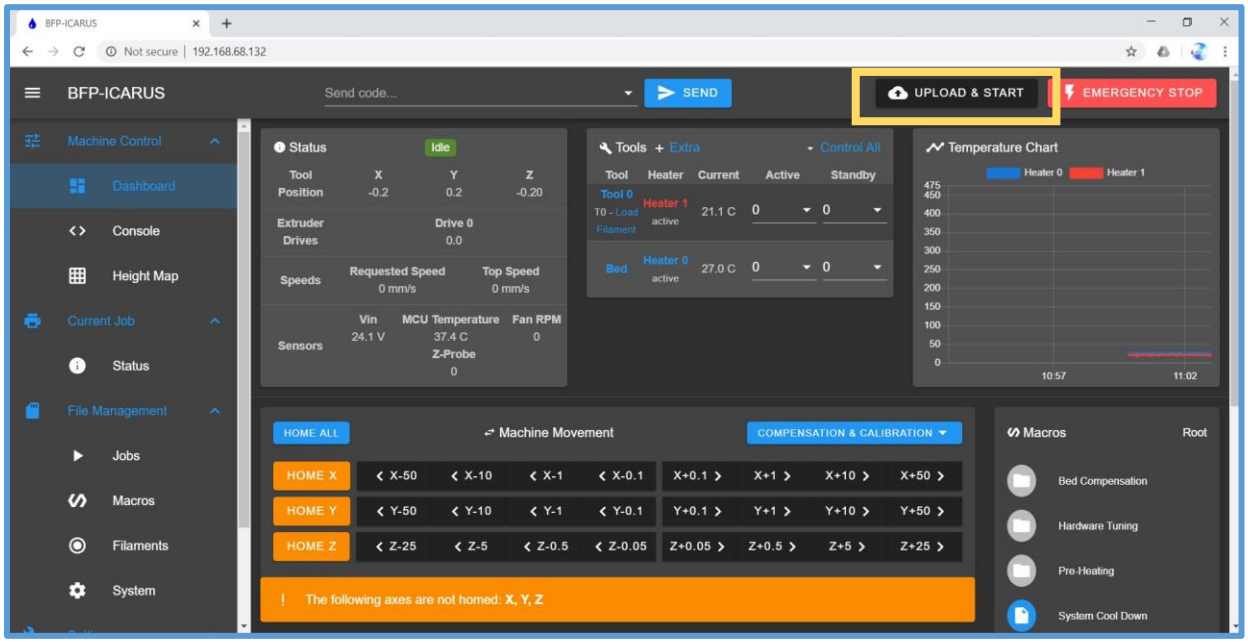
Connecting the Wyze Webcam to the WiFi Network

Every ICARUS comes equipped with a Wyze Webcam that is IP/internet enabled (2.4 GHz network only). Download the Wyze application to your phone to check in on your printer remotely, anywhere you are.

The Wyze setup process is done via the instructions that can be found in the box or on the smartphone app. Your camera is only powered on when the printer is powered on.

Duet Web Control

The Duet Web Control is designed to allow users to monitor their printer from an advanced web interface. After you connect the unit to the internet, you will get an IP address, and this will be entered into a browser to access the web interface. We recommend Google Chrome if you have access to it. If your unit is connected to the internet and the IP address entered is correct, you should see a screen like this on your computer. Duet Web Control runs great on the Microsoft Surface.



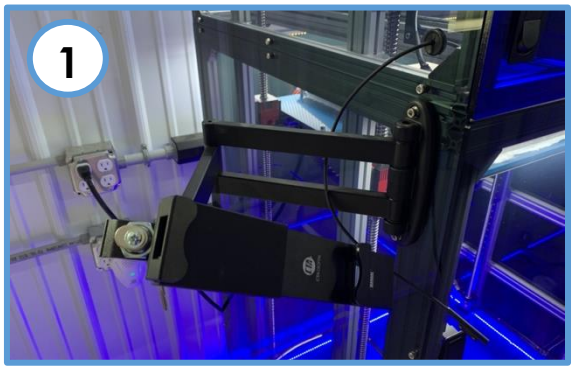
To upload and start your first print is very easy. Once you have sliced your STL file in Simplify3D and have generated your gCode file, select the *Upload & Start* (yellow box in the picture above) button to upload your file and your printer will automatically begin the printing process by heating the system – homing – leveling the bed – and printing!

Installing the Microsoft Surface

Every ICARUS is included with a Microsoft Surface to perform on-board slicing through Simplify 3D or control the printer through the Duet Web Control. Every printer has an articulating arm mounted on the printer. The following steps should be followed to mount the surface on the machine.

Mounting Microsoft Surface

1. Identify the location of the surface mount. There should also be a charging cable that comes out of the side of the machine. Verify the keys to lock the mount are also in the mount.
2. Verify that the mount is in the unlocked position. The adjustable slider should move freely.
3. Place the Microsoft Surface in the mount using opposite corners of the tablet.
4. Push the locking mechanism into place, and turn the key to lock the mount in this position.
5. Plug the charger into the side of the Microsoft Surface. Turn the Microsoft Surface on and follow the onscreen instructions to set-up the device.

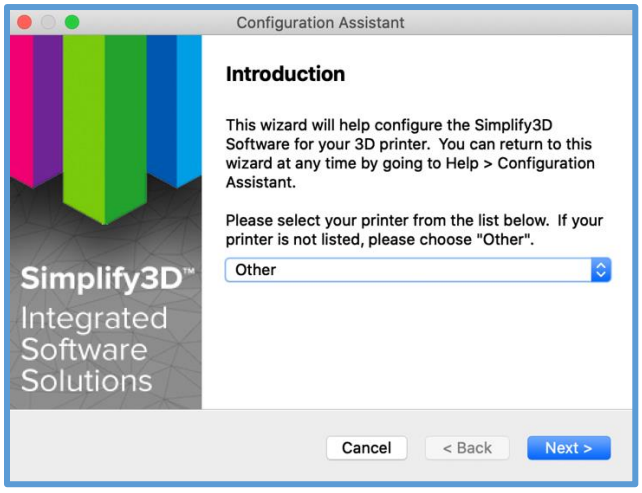


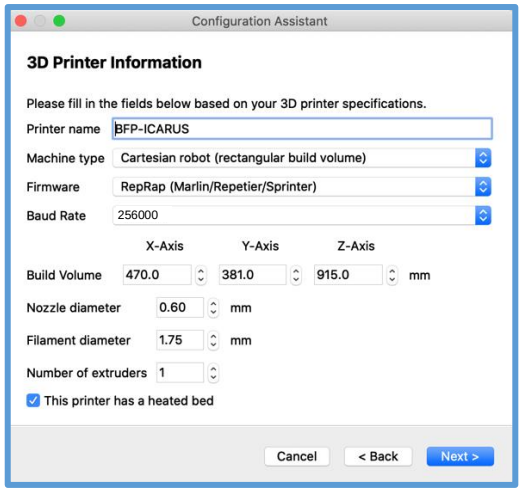
Software Slicers and Profiles

Steps for Setting up with Simplify3D

6. Open Simplify3D and log in using your personal credentials when the Simplify3D account was created.

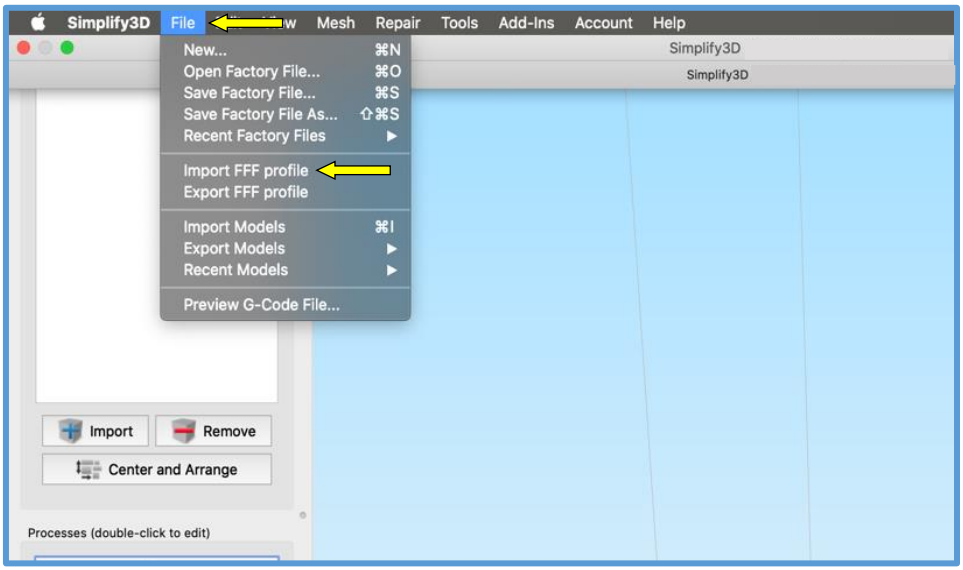
7. In the following window, select '*Other*' from the dropdown menu. Then, input the following information for your BFP-ICARUS 3D printer and click next to continue to the home screen on Simplify3D





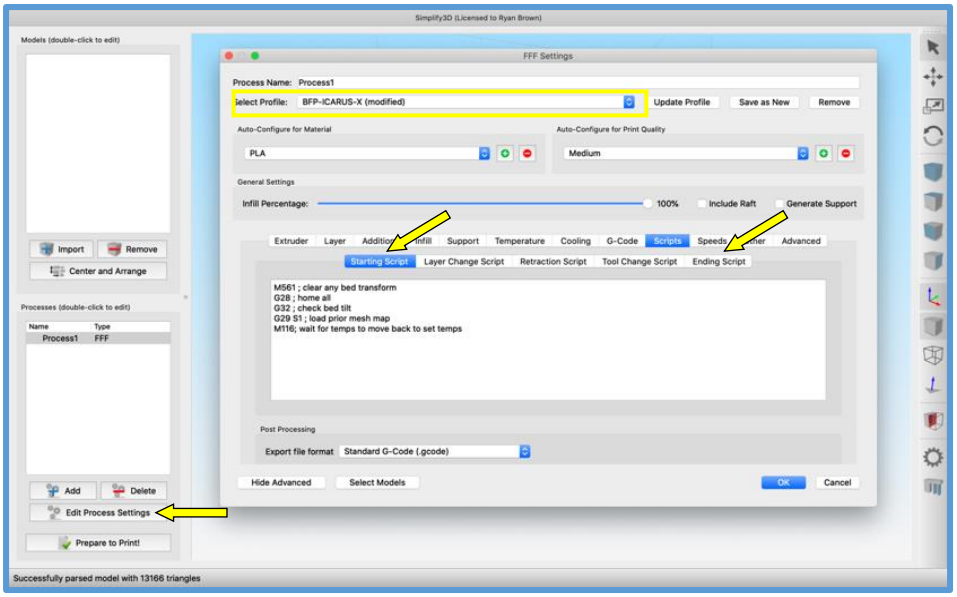
8. In Simplify3D, under the following extension, select the correct profile for your unit and import it.

   File > Import FFF Profile



9. Select the BFP-ICARUS from the drop down menu (yellow box) and check that the Start and End gCode sequences are correct under

   Edit Process Settings > Scripts



   If it is not, copy and paste the Start and End G-Code from the following page into the respective boxes.

Start G-Code

M561 ; clear any bed transform
G28 ; home all
G32 ; check bed tilt
G29 ; mesh map
M116 S5 ; wait for hotend and bed to reach temperature to 5 degrees

End G-Code

M104 T0 S0 ; turn off extruder
M140 S0 ; heated bed heater off
G92 E0.0000
G1 E-2.5000 F2100
G91 ; relative positioning
G1 E-1 F300 ;retract the filament a bit before lifting the nozzle to release some of the pressure
G1 Z+0.5 E-5 X-20 Y-20 F9000 ; move Z up a bit and retract filament even moree
G28 X0 ; move X min endstops so the head is out of the way
G90 ; absolute positioning
M84; disable motors
; music for the successful print
M400 ; Empty the movement buffer
M300 P200 S1000
G4 P201
M300 P200 S1250
G4 P201
M300 P200 S1100
G4 P201
M300 P200 S2000
G4 P201
M300 P200 S1500
G4 P201
M300 P200 S1000
G4 P201
M300 P200 S1300
G4 P201
M300 P200 S1000
G4 P201
M300 P300 S1500
M400 ; Empty the movement buffer

General Slicing Tips

Cooling: Printing without cooling is only possible with large parts. Thick and large layers take time to cool down, thus requiring you to reduce speed for small parts.

Filament: Typhoon is designed and tested for 2.85mm filament. Never use "real" 3.00mm filament.

Print Speed: Slicers allow you to change speeds for the infill, inner wall, outer wall, etc. Please make all these values the same.

Retraction Vertical Lift: Set vertical lift to at least your layer thickness. For layers of 1.00mm, lift a minimum of 1.00mm. Slicers are not yet optimized for large prints. Many over-extruded sections will be noticeable. Lifting the head will prevent any collision with the printed part.

Wipe: Wipe nozzle to at least the line width. For a line width of 3.50mm, wipe 3.50mm or greater.

Temperature: Start at the low end of the suggested print temperature and adjust from there. The elongated melt zone of the Typhoon allows the filament to be exposed to more heat and will flow better at lower temperatures. For example, our PETG is commonly printed at 240C with standard extrusion, but we found 215C was optimal with a 2.50mm nozzle.

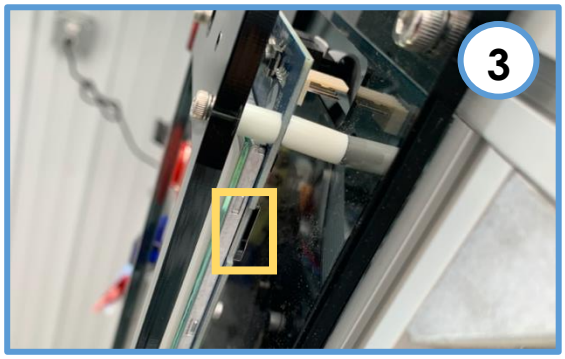
Flow Rate/Extrusion Multiplier: This setting will fine tune the amount of filament being pushed into the melt zone. It is not uncommon to have to decrease this value below 1.00, or 100%. This setting should be adjusted to fine tune the dimensional accuracy of the printed lines. It is not uncommon to have a flow rate value between 0.80-0.97 with the Typhoon.

Offline File Uploading and Printing

Every Touchscreen is equipped with a MicroSD port which allows for offline printing. The following guide details how to print via this method.

Steps for Setting up Offline Printing

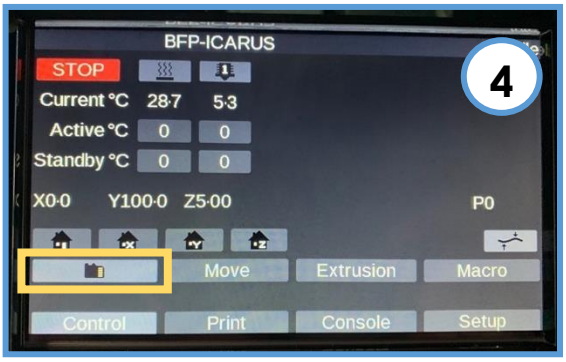
1) Acquire a MicroSD card (this is not included, or an SD card with a MicroSD to SD extender). Verify that the card is formatted as a FAT32 by inserting it into a computer and checking the properties of the card. If it is not, format it as a FAT32 card.



2) Upload the desired *.gcode* file(s) from Simplify3D to the SD card.

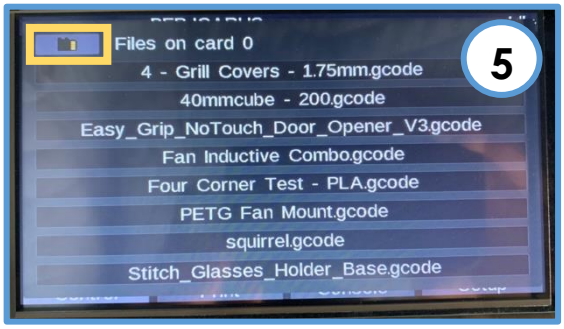
3) Plug the MicroSD card into the MicroSD card slot on the bottom of the touchscreen. When the card is inserted, the metal contacts of the card should be facing you.

   If you are using an SD card and a MicroSD to SD extender, plug the extender into the printer and the SD card into the other end of the extender.

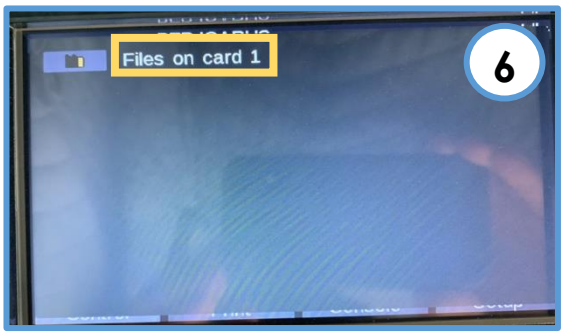


4) Press the SD icon on the main screen of the touchscreen. This will bring up the files on SD Card 0, NOT the files on the card that was just inserted.

5) Press the SD icon in the top left of the screen to bring up the files on SD Card 1, the MicroSD card that was just inserted into the screen.



6) The screen should now display all the files on the inserted MicroSD card. Choose a file to print.



Maintenance and Support

Filament Innovations is proud to make printers built in the USA! As a result, this section will include support tailored to make your experience with your ICARUS a great one. The following pages contain important information about maintenance and getting support for your 3D printer.

General Maintenance

This section will cover general maintenance of your printer to ensure it remains in great shape. Your ICARUS unit needs very little maintenance, but as with any machine, some maintenance is required to keep it in optimal condition.

General Cleaning

Debris, such as filament pieces, should be removed from the machine weekly. The most common places to look are on the print bed, the aluminum plate the print bed is on, and the bottom acrylic piece of the printer. It is essential to remove all debris from the ballscrews.

Oiling and Lubrication

Lucas White Lithium Grease, available on Amazon, will work to reduce any friction inside of the ballscrew nut. A good amount should be applied around on the ballscrew near the carriage. Use the move commands on the touchscreen to run the carriage through the grease. It is best to be sure there is always a white coating of grease on the entire ballscrew assembly.

In order to optimize the movement of the printer components, 3-IN-ONE PTFE Lubricant, which can be found on Amazon, should be applied in small amounts once a week to the linear rails on the X,Y, and Z axis.

Acrylic Cleaning

In order to maintain the stunning, polished look of your ICARUS, we recommend cleaning the outside acrylic panels as needed. To do this, use only cleaners designated for acrylic. We recommend applying Rolite, which can be found on Amazon, with a microfiber cloth.

CAUTION:

NEVER use rubbing alcohol, Windex, or cleaners containing Ammonia to clean acrylic. It will crack!

Plate Prep and Use

The print plate surface has a powder coated surface which makes it extremely durable; however, the print plate is classified as a consumable item and is good for approximately 300 prints before it needs to be replaced. Prints are easily removed when the plate reaches room temperature and is cooled down.

A quick cleaning of the plate should occur before every print using 91% or higher isopropyl alcohol using a spray bottle.

CAUTION:

NEVER remove, bend, or flex a print plate while it is HOT! Failure to do so could burn your hands, damage the print, and damage the plate.

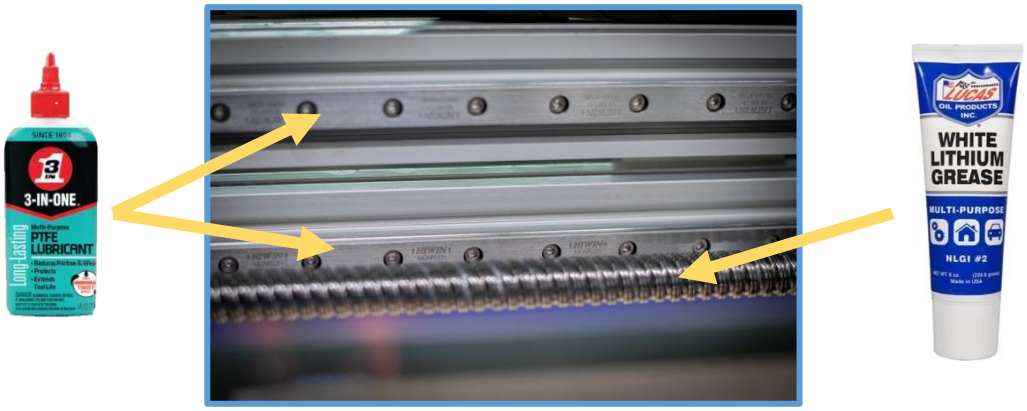
ONLY clean the plate with 91% or higher isopropyl rubbing alcohol. Failure to do so could cause prints not to stick and damage the plate.

Do NOT apply the rubbing alcohol with a towel or cloth. If you drag the towel across the plate, the textured surface will break the towel down and remnants will be stuck to the bed. Use a spray bottle to apply it and let it dry.

Maintenance Macro

A macro is included on the machine in order to grease the ballscrews and oil the rails on the x, y, and z axes. Follow the on-screen instructions once the macro is run. It is located in:

Macros > Maintenance



CW-3000 Water Chiller

The water chiller should be drained and fresh fluid added roughly every three months. This will prevent any unwanted buildup from entering the water chiller, the lines, and the Typhoon.

Typhoon Greasing

The Typhoon is an industrial FDM extrusion system, thus additional care is needed, when compared to standard extruders and hotends. The Typhoon has multiple gears that need white lithium grease applied to it every three months. You can use the same white lithium grease for this as we use for the ballscrews. We will be updating this manual with pictures shortly

It is a great idea to do change the fluid in the water chiller and grease the Typhoon gears, at the same time, every three months.

Z-Offset Tuning

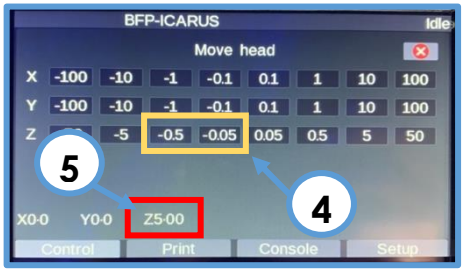
The Z-Offset is the space between the nozzle and the print platform after your 3D Printer has homed itself. The Z-Offset tells the printer to raise the build plate until the nozzle touches the build plate. A Z-Offset calibration ***NEEDS*** to be performed when the extruder carriage is modified (new nozzle installation, replacement Z senor, general hotend maintenance, etc). *Before you do this, please clear the bed plate of any prints you may have and remove any filament hanging off the nozzle.*

Steps to Set/Adjust Z-Offset

1 Press Z-Offset Tuning button on the main screen. This will home the printer, perform a bed tilt, and move the printer to the center.

2 Press the *Move* button.

3 Place a business card or paper of similar thickness under the nozzle.

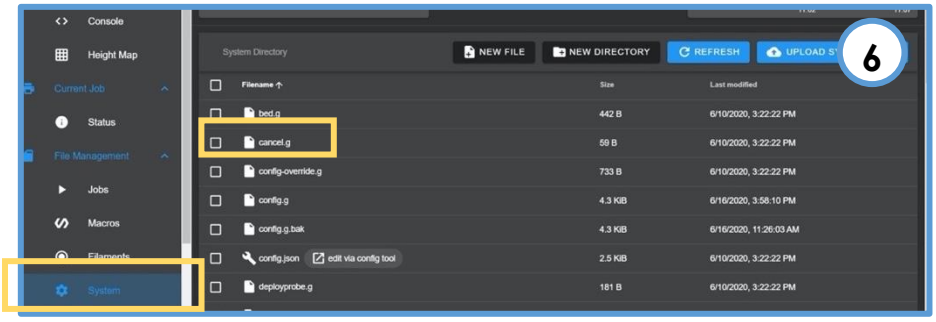


4 Using **ONLY the -0.5 and -0.05** (mm) options, raise the print bed until the business card just barely touches the nozzle. You should feel a slight tug on the business card when you try to drag it under the nozzle. ***CAREFUL! If you press Z-50 or Z-5 you will ram the print bed into the nozzle, causing serious damage to your printer.***

5 Locate the amount the bed has been moved, which is boxed in red in the image above. The Z value should be negative, but we will enter the number as a positive value. For instance, if the Z-value on your printer reads -5.50, we will enter it as 5.50.

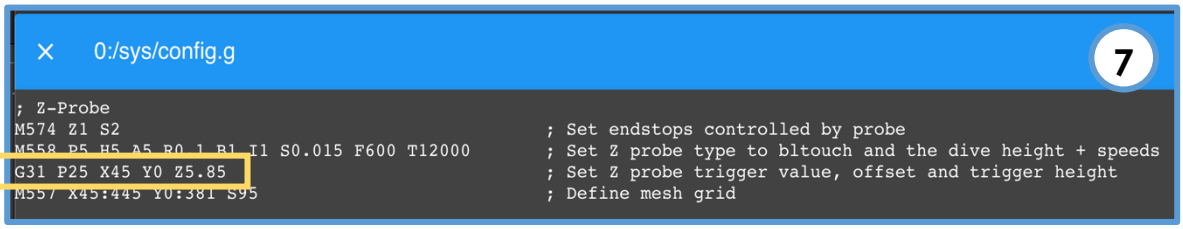
6. Using Duet Web Control from a computer or the included Microsoft Surface, navigate to the *config.g* file and open it

File Management > *System* > *config.g* > *Edit*



7. Find the *Z-Probe* section locate line that begins with G31. In the image below, locate Z5.85, which is our value, for this example. Your printer will have a different number here. Replace that number with the number you recorded in step 5. If you recorded 5.50, then the new line of code should read:

    G31 P25 X45 Y0 Z5.50



8. Select the Save button in the top right-hand corner and then *Yes* when you see the prompt asking you to restart the board. The system **MUST BE RESTARTED** for these changes to take effect and will restart if you select the restart option after you click Save from *config.g*.

Steps to Fine Tune Z-Offset After your First Print

1. During your first print, you may have to Baby Step the Z axis to get the perfect first layer. If you do, record the Baby Step Value that you used. Note: If the value is negative, be sure to record the negative sign.
2. Return to the *config.g* file and navigate to the same line of code adjusted in step 7 above. Record the Current Z-Offset.

    G31 P25 X45 Y0 Z5.50

3. Use the following formula to calculate your new Z-Offset Value

$$New\ Z\ Offset\ = (Baby\ Step\ Value \times -1) + Current\ Z - Offset$$

    As an example, if your Current Z-Offset was 5.50 and your Baby Step Value was -0.040, then your New Z-Offset would be

$$New\ Z - Offset\ = (-0.040 \times -1) + 5.50\ =\ 5.54$$

4. Update the config file with the New Z-Offset Value. Save the config.g file, and be sure that the system restarts.

    G31 P25 X45 Y0 Z5.54

Machine Maintenance Printout

Maintenance Guide:

Lucas – White Lithium Grease – Apply once a month for a healthy white coating to the ballscrews. Available from Amazon and local hardware stores.

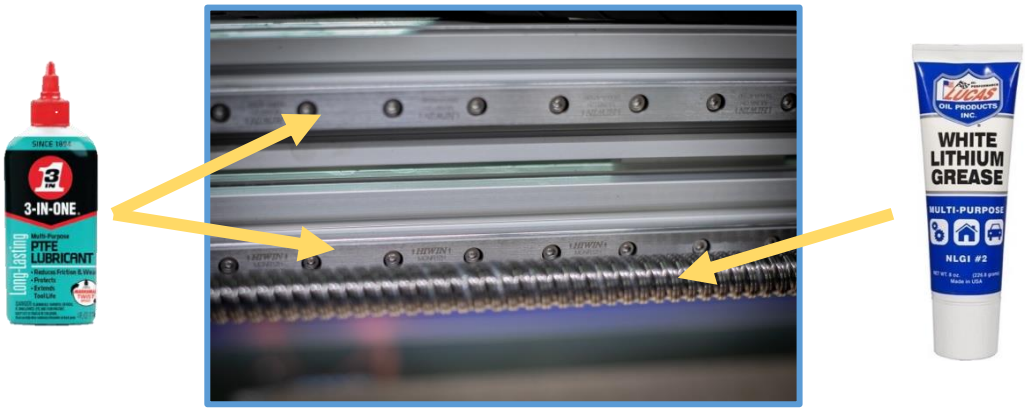
3-IN-ONE – PTFE Lubricant – Apply once a month to the linear rails generously and wipe off excess oil so it does not fall off the rail. Available from Amazon and local hardware stores.

Rolite – Acrylic Cleaner – Use as needed to clean the acrylic panels on the machine. Use this ***only*** with a microfiber towel as paper towels will scratch it.

Maintenance Macro:

A macro is included on the machine in order to grease the ballscrews and oil the rails on the x, y, and z axes. Follow the on-screen instructions once the macro is run. It is located in:

Macros > Maintenance



Helpful Links and Documentation

The 3D Printing community is like no other. There has been a tremendous amount of information released on 3D Printing over the years. Here are some helpful links and resources to help you be an expert.

- Updates and Profile Revisions: Filament Innovations

- Simplify3D Slicer and Printing Techniques: Simplify3D
    - Print Quality Guide and Slicer Tuning: Simplify3D
    - Perfect First Layer: Simplify3D

- Dyze Typhoon Engineering Documentation and Support
    - Dyze Typhoon Manual: Dyze Typhoon

- Duet 2 WiFi Support: General Support
    - Duet 2 WiFi Connection: WiFi Connection
    - Duet Web Control: Duet Web Control Information

Frequently Asked Questions (FAQ)

Do BFP-ICARUS 3D Printers use proprietary filament?

Absolutely not – you are free to use any 2.85mm filament. Because you may be printing larger scale items, we highly recommend using quality filament to ensure that large prints finish accurately.

What size nozzle is included?

Unless otherwise requested, all unit's ship with a 2.50mm heatcore for large prints.

Why are there two Y Endstops?

Every time you Home the Y axis (including with Auto Homing the entire printer), the two Y Motors will operate independently of each other. This helps to "tram", or align, the two Y motors together so your Y axis is never out of alignment.

What should I do if the aluminum bed does not look level?

The easiest way to level the bed is to run the Bed Tilt macro discussed earlier in this manual. This will probe the bed in four spots and then independently level the bed.

Why are my prints not sticking to the print plate?

Did you clean it with 91% or higher isopropyl alcohol? Is the bed temperature correct? Is the first layer too high off the print bed? You may have to print with an attached skirt to help with adhesion. You can also slow down the first layer. First layer speeds should usually be between 20-40mm/s pending the geometry of the part.

What temperatures are achievable?

The following are the temperature capabilities for the printer components:

Heated Bed:	120 °C
Hotend:	450 °C

Where can I find software updates?

We have the latest files on our website under the Support section. All updates are done through the Duet Web Control interface via Settings – Upload Files.

How can I tune the Z Height? My hotend is too high off the print bed and Baby Stepping isn't helping?

This manual includes a dedication section for tuning your Z-Offset. You will need to re-calibrate and set your Z height anytime you make any modifications to your hotend/extruder carriage. This includes nozzle changes, disassembly for cleaning, and general maintenance that removes the Z probe, hotend, or extruder.

Why did I receive a heater error?

As you use your printer, components break in and may need to be re-tuned for optimal performance. If you are receiving a heating error, either the heater is having a hard time heating up or the thermistor needs to be re-tuned to read the correct temperature. In our years of printing we have rarely seen a heater cartridge fail, but it is not uncommon to need to run a PID Tune to recalibrate the thermistor. Information on running a PID tune can be found here: PID Link. We recommend running both Typhoon heaters at 35% power, each.

Why is the printer not turning on?

Each unit has a 20amp breaker inside of the control box, located on the bottom right of the control box. Please check to ensure the breaker is on – this is indicated by red color on the front of it. If the front of the breaker is green, this indicates the breaker has tripped, and you can flip the breaker to the on position. Also check that the emergency stop switch is disengaged and the unit is plugged into the wall.

I am having a hard time loading filament, what can I do?

Check that the end of the filament, the part you are pushing through, is cut at a 45 degree angle. This angle helps guide the filament through the sensor and through the hotend. You can also remove the tube from the silver metal connectors by pushing the collar down and pulling the tube out.

The blue LED is on for the WiFi network, but I cannot connect to it through the Duet Web Control?

Sometimes a router will assign the unit a new IP address. Open the Console, type M552, and press enter – this command will show you the new address.

What is the warranty on the unit?

Every ICARUS unit has a one year hardware warranty from the date the unit is delivered to the customer – this only covers hardware defects – not user damage.

Please contact us through our **Contact Us** *page for additional support*

And don't forget, you can call or text us at 610-640-5699!

FILAMENT INNOVATIONS

INDUSTRIAL & LARGE-SCALE 3D PRINTERS

BUILT IN PENNSYLVANIA