FSL3D

Owner's Manual
Pegasus Touch 3D Printer

R0.1 – May 4, 2014
(work in progress)

http://fsl3d.com

Contents

Introduction

Thank you for your purchase of a Pegasus Touch Laser 3D Printer by FSL3D. It is our wish that this product adds value to your business or hobby activities for years to come. Please take time to read this manual in its entirety to safely use your device to its full potential. For more information and products, please visit http://fsl3d.com.

Icons Used in This Manual

This icon marks ***Warnings and Cautions***. Please pay special attention to information associated with this icon.

The ***Wing*** icon is used to indicate information that will help you operate more efficiently.

Part 1: Safety

Overview

To ensure a safe working environment, it is necessary to treat the printer and accessories with care. Please carefully read all instructions before attempting to operate your 3D Printer.

Use only printing materials from FSL3D or approved partners. Use of other materials may damage your machine or void your warranty.

Modifying the printer without FSL3D's approval will invalidate the warranty and may pose a health hazard.

Never attempt to operate your Printer with the lid open or attempt to override the safety interlock system.

When you receive your Printer, please carefully inspect it for any shipping damage and contact us immediately via email if there are any issues—please include your unit's serial number and photos of the problem.

⚠️ *Caution* – Modifying the machine or overriding the safety interlock may result in hazardous laser radiation exposure.

Laser safety

The standard reference for laser safety is the American Standard for the Safe Use of Lasers, Z136.1-2000, developed by the American National Standards Institute (ANSI). This reference is the basis for many of the federal regulations for laser and laser system manufacturers, and for the Occupational Safety and Health Administration (OSHA) laser safety guidelines. It contains detailed information concerning proper installation and use of laser systems. While the ANSI standard itself does not have the force of law, its recommendations, including warning signage, training, and the designation of a laser safety officer, may be compulsory under local workplace regulations when operating laser systems above Class I. It is the operator's responsibility to ensure that the installation and operation of the Full Spectrum Laser Hobby Advanced Laser System is performed in accordance with all applicable laws. Copies of ANSI Standard Z136.1-2000 are available from:

Laser Institute of America
12424 Research Parkway, Suite 125
Orlando, FL 32826
(407) 380-1553

Never remove any of the case panels of the Printer. Removal of case panels will expose you to danger and void your warranty. Overriding the interlock system can expose you to Class 3B Laser Radiation.

The Pegasus Touch 3D printer is a Class 1 Laser System. The Printer case has a safety interlock switch that deactivates the laser if the cover is opened during operation, and no special precautions are necessary to operate the unit safely.

200mW CW MAXIMUM
405nm

Compliance Statement

The Pegasus Touch 3D printer is a Class 1 Laser Product, as defined in International Standard IEC 60825-1.

Pegasus Touch complies with 21 CFR 1040.10 and 1040.11, the Federal Performance Standards for Light-Emitting Products, except for deviations pursuant to Laser Notice No. 50, dated June 24, 2007. The Center for Devices and Radiological Health of the US FDA issued Laser Notice No. 50 to permit manufacturers to classify and manufacture their products in accordance with the International Standard.

21 CFR 1040 and IEC 60825-1 require that certification, identification and warning labels be placed on laser products. Reproductions of the labels found on the Full Spectrum Hobby Advanced Laser System follow, with locations specified:

1. Certification/Identification Label. This sticker is located on the rear of the machine. Any updates to the information (date of manufacture and manufacturer address) are added as adhesive overlays.

Full Spectrum Laser LLC
6216 S. Sandhill Rd.
Las Vegas, NV 89120 USA

FSL3D

Model Number:_____

Serial Number:_____

Date of Manufacture:_____

Class 1 Laser Product

General Precautions

Please follow the instructions below.

Work Area

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- The Printer must be installed on a level surface to prevent spillage of resin. The resin may spill out during the lift cycles if the surface is uneven.
- Always use a 9"x14.5" wide cutting board (eg Amazon ASIN# B00E4WRVTI) or other drip protector when removing the build head. Otherwise Resin may drip over the front of the printer.
- Never remove the build tray without first removing the build head. Otherwise Resin may drip from the head down onto the internal components of the printer.
- The Printer must be installed in a location away from direct sunlight or intense artificial light sources.
- The work area should be kept at or slightly above room temperature (21°C / 70°F).
- The printer itself emits no fumes and the resin contains zero volatile organic compounds. However, isopropyl alcohol is commonly used to finish prints so an area with good ventilation is recommended.

Resin

FSL3D photopolymer resin is a mild irritant: treat it with the same care as you would any household chemical and follow standard safety procedures and FSL3D handling instructions.

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- Only use resin from FSL3D or approved partners. Using 3rd party resin may damage your machine and void your warranty. In addition, the RetinaCreate software end user license is valid only when used with materials from FSL3D or approved partners
- Wear protective gloves when handling the resin; goggles are also recommended if there is a risk of splashing.
- Resin is **not** edible in liquid or solid form.
- Liquid and solid forms of resin are **not** approved for use with food or drink.
- Liquid and solid forms of resin are **not** tested or approved for use in medical applications.
- Do **not** mix the resin with any substances.

- Please refer to Appendix G for information on handling, storage, properties, and an outline of Material Safety.
- Material Safety Data Sheets for each color are available on the web: http://fsl3d.com/support.

The resin is light sensitive so avoid long exposure to strong artificial lighting or sunlight.

- The transparent yellow cover is designed to block laser radiation, but strong exterior light may enter and cure the resin. It is important that the unit be kept out of direct sunlight or high-intensity artificial light.
- Do not pour used resin back into the original bottle to avoid contamination. It is safe to store resin in the build tray for a period of 24hrs or less between prints. For periods >24hrs, we recommend the build tray should be emptied and the resin should be filtered and placed in a light-proof container; amber Nalgene Lab Bottles work well.
- We recommend colored resins be gently stirred with a spoon for 5 minutes before use if left sitting for more than 7 days due to possible pigment settling.
- All Resin should be stored in a cool dry place.
- Please refer to Appendix G for information on handling, storage, properties, and an outline of Material Safety of the resin.

Isopropyl Alcohol

Isopropyl Alcohol (IPA) is commonly used to remove uncured resin to finish parts (see Part 4: Finishing Steps). FSL3D does not manufacture or sell IPA. Standard 99% IPA is available from Amazon or your local grocery/convenience store. Please read and follow all usage and safety instructions provided with the IPA that you purchase.

- Good ventilation is strongly recommended.
- Keep away from fire, heat, or sparks
- Containers should be kept closed or covered when not in use
- Always follow instructions provided from your IPA supplier. Consult the provider for more information.

Part 2: Getting Started

Overview

The following section is a brief guide to getting up and running.

Setup of the Pegasus Touch usually takes less than 10 minutes, but there are a few things to take care of before it arrives:

- Install RetinaCreate software
- Prepare your work area
- Purchase 99% IPA for cleaning of parts
- Purchase protective gloves. Disposable nitrile gloves work well.
- Purchase cleaning and removal tools
- Save the box and packaging! It is necessary for shipping if your unit requires repair or warranty service.

Unpacking

Once your Pegasus Touch has arrived and you have removed the unit from the box, you will notice that the accessories and starter resin are shipped inside the build area of the machine. You will need to do the following to prepare the machine (wire cutters or scissors required):

1. Remove all wrapping and packaging material from the exterior
2. Cut the zip ties holding the resin and cables to the Z (vertical) spine of the machine
3. Cut the zip tie restraining the vat holder
4. Remove the foam padding from the vat holder
5. Remove the resin
6. Remove the power brick and Ethernet cable
7. Remove the resin tray.
8. Check that the resin tray is clean and all plastic wrap is removed.
9. Inspect the interior and exterior of the printer for damage

Parts and Accessories

The Pegasus Touch includes the following parts and accessories. Please make sure they were shipped with your machine. If anything is missing, please email support.

Table 1 - Packing List

Part	Quantity
Pegasus Touch 3D printer	1 pc
Build Platform with Thumbscrew	1 set
Resin tray (vat)	1 pc
Power cable	1 pc
Ethernet cable	1 pc
500mL Starter Resin	1 bottle

Additional Recommended Tools

FSL3D recommends the purchase of a number of tools for removing prints from the build plate, cleaning prints, and filtering resin. Some of these tools are sharp and can pose a danger if used improperly. The resin can be slippery so it is important to be aware of your grip and directions of motion when removing parts from the build plate. Always take care when removing parts from the build platform and handle tools in a safe manner.

FSL3D recommends the purchase of the following additional accessories for print finishing available at Amazon.com and other suppliers:

Part removal:
- Nitrile or dishwasher gloves(eg Amazon B004E3LN96)
- 9"x14.5" Wide Cutting Board (eg Amazon B00E4WRVTI)
- Steel paint scraper as a chisel: eg Tooluxe 6-in-1 Painter's Tool (Amazon B000VOK13Q)
- Flush cutters: eg Xuron 170-II (Amazon B000IBSFAI)

- Rubber mallet (to tap the steel paint scraper), eg Home Depot #31030.

Part finishing
- 1-2L glass container for soaking finished parts in IPA: eg Amazon B0000CFG5I
- 2.5 ounce spray bottle: eg Amazon B000NJHNLW
- Tongs: eg Amazon B00004OCK1
- Tweezers: eg Amazon B00BG8WW2Y

Unpacking

- Unwrap machine and inspect for damages
- Cut zip ties holding the VAT holder
- Cut zip ties holding the resin and accessories and remove resin/accessories from printer

Setup

Make sure that your printer is on a level surface, away from direct sunlight, and in a temperature-controlled location. After removing all accessories from the interior of the machine and ensuring it is clean, it is time to connect to your machine.

1. Connect the Ethernet port of the machine to a free port on your internet router using the supplied Ethernet cable.
2. Ethernet is the preferred interface but USB PC connection (requires microUSB cable, not supplied) and WiFi (requires dongle, not supplied) are also supported. You may also load jobs via USB key. Refer to instructions at the user forums at http://fsl3d.com/forums for more information.
3. Plug the power adapter into a convenient mains power outlet.
4. Plug the DC barrel connector into the power port on the machine.
5. The machine should boot within 90 seconds.

The Pegasus Touch can get print data from one of five sources:
1. Over Ethernet from the RetinaCreate job preparation and machine management software.
2. From a USB flash drive.
3. Over WiFi (requires optional Tenda W311M USB WiFi dongle, not supplied, eg Amazon B006GCYAOS)

4. Over USB cable (requires microUSB cable, not supplied, eg Amazon B004GF8TIK)
5. Directly from the FSL3D Model Marketplace.

1	Cover
2	Touchscreen
3	Front Panel
4	Case
5	Power and Data Ports

Figure 1 - Exterior View

1	microUSB Client (for PC USB Connection)
2	USB Host (WiFi, Drive)
3	Ethernet (Data)
4	Power (DC 24V 2.5A, IN)
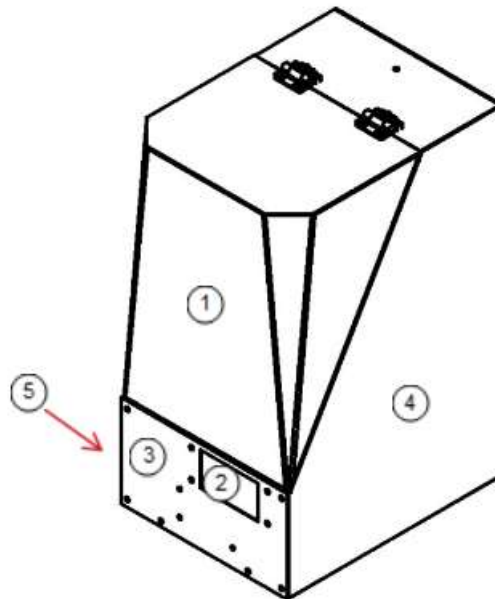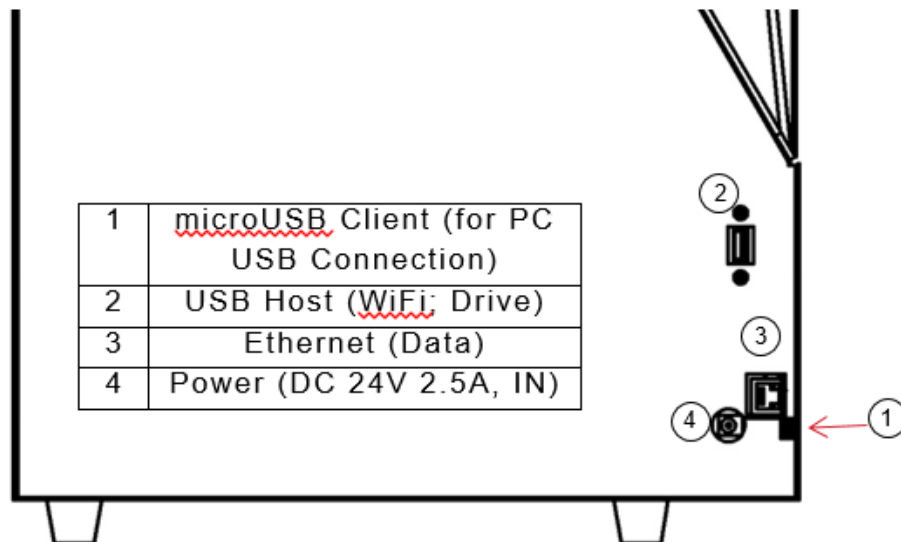
Figure 2 - Connections

1	Thumbscrew
2	Tray (Vat)
3	Build Plate
4	Tray Holder
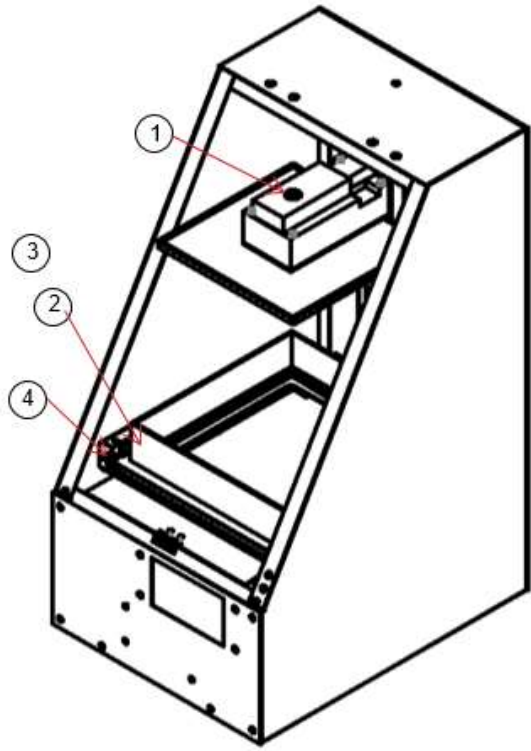
1	X Galvo
2	Y Galvo
3	405nm Laser
4	First Surface 45 degree mirror
5	VAT leveling screws
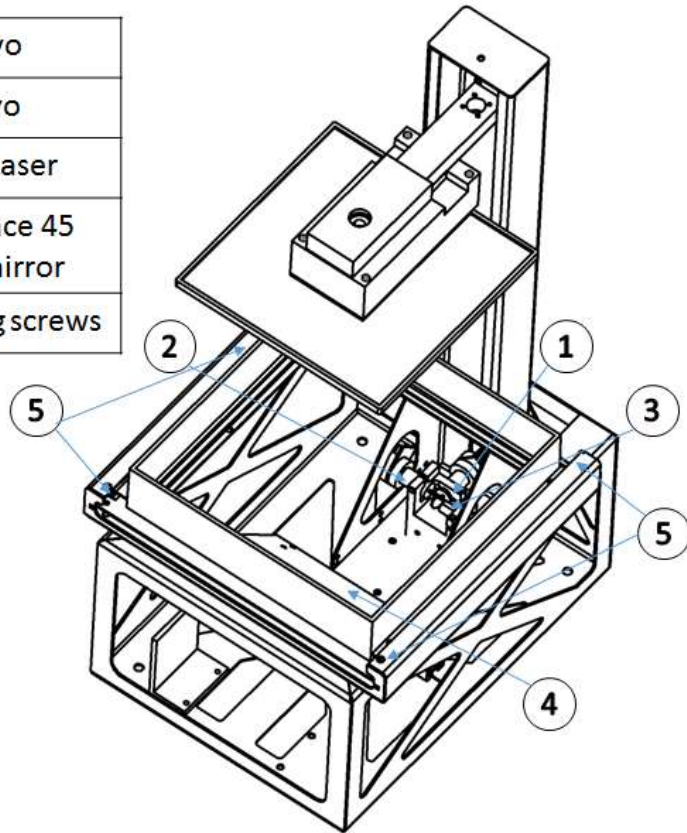
Figure 3 - Interior View

Build Tray (Vat) Reference Drawing

Vat Retaining Locating Holes

PDMS Fill Line

Max Fill Line

Min. Fill Line

DETAIL A
SCALE 2 : 3

⚠
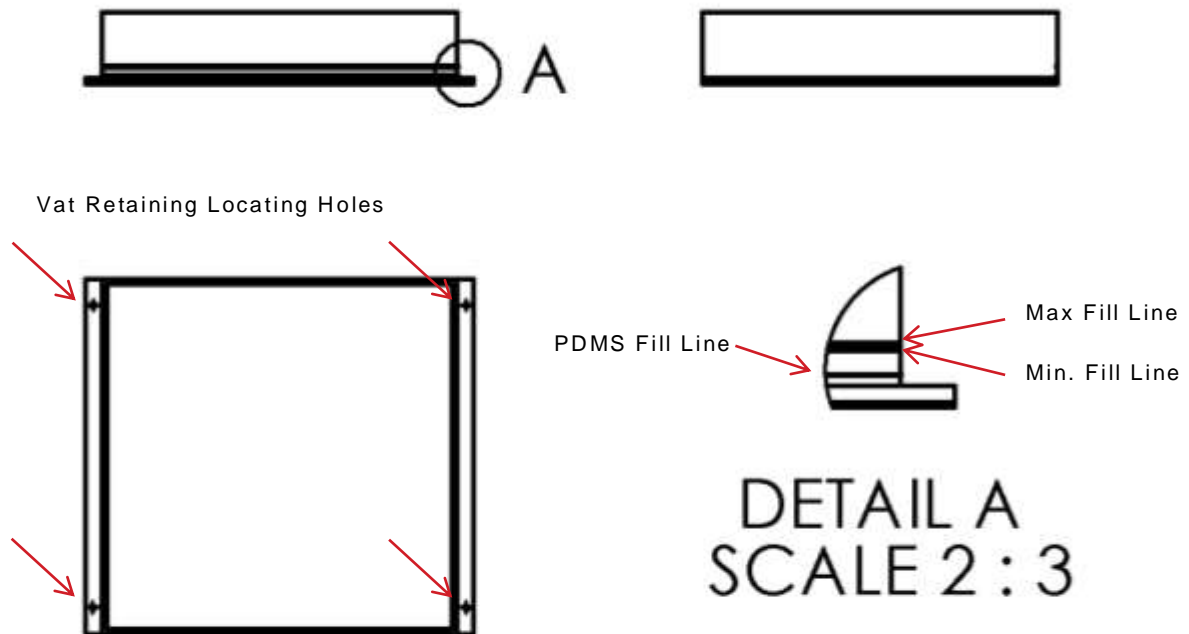
- Never remove the VAT without first removing the build head. Otherwise resin will drip onto the internal components of the printer.
- Pull the tray horizontally to remove
- Push back on the VAT to return to the printer until you feel the click
- Pour resin into the tank. Use only FSL3D approved resin; otherwise, your machine may be damaged and warranty voided. In addition, the RetinaCreate software license is valid only with use with materials from FSL3D or approved partners.
- Be careful not to exceed the maximum fill line to avoid spillage while printing
- If more resin is needed while printing, you can always pause the printer and pour more resin. Press the pause button on the LCD screen or simply open the lid to pause the print.

Build platform

- Always place a 9"x14.5" cutting board over the VAT before removing the build platform to avoid resin drips over the front of the machine.
- To remove the build platform loosen the large thumbscrew enough so the build head slides out. It is not necessary to fully remove the hand screw. Apply a downward pressure to slide the build plate out.
- Always make sure to remove the platform before the resin tray to avoid the resin dripping into the printer.

Double Check

Please double check the list below before you proceed to next steps
- Are all tapes and films removed from all the printer parts?
- Are the resin tray and the build platform securely installed?
- Is resin filled to maximum fill line? Do not overfill the resin.
- Is the printer well connected to the power outlet?
- Is the printer connected to your computer with the Ethernet cable, USB cable or wirelessly?

RetinaCreate (software) Installation

Download the latest software from http://fsl3d.com and follow the onscreen instructions. Ensure you read, understand, and agree to the terms in the End User Licensing Agreement. Remember that the RetinaCreate software license is valid only when used with printers and materials from FSL3D or approved partners.

Part 3: Printing

Add a model

Open RetinaCreate and select Add Model under the Scene menu. Load the model you want to print. RetinaCreate supports .stl and .obj files. The box with grid lines on the bottom in the middle of your screen represents the build platform the printer. RetinaCreate will place the model in the middle of the grid when you add a model. Keep in mind that the build platform is upside down in the printer.
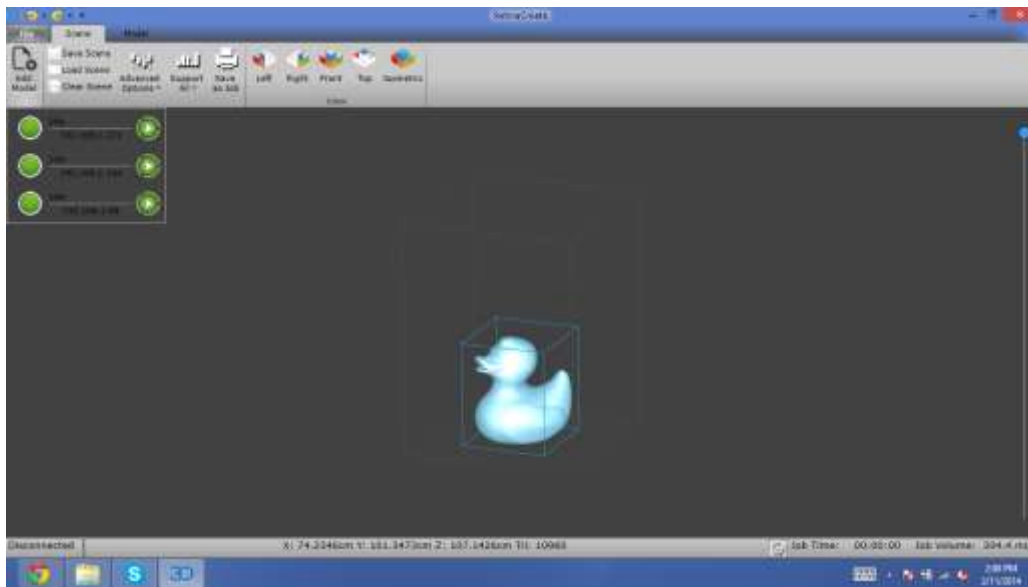
View Control

Zoom In/Out with a Mouse

Roll up the mouse wheel to zoom in and roll down to zoom out

Change View with a Mouse

To change the view, right click anywhere on the screen and move the mouse around.

Move the mouse to the left to rotate in clockwise and the right to rotate in counter-clockwise.

Drag the mouse down to achieve top view and drag up to achieve the bottom view.

Pan

To move the screen view as a whole, press down the mouse wheel and move the Mouse around.

Moving and Orienting Models

Moving and Sizing

Click on the model and you will see red, green, and black arrows surrounding the model. Red and green arrows are to move the model in the direction where they are pointing to. Left click on the arrows and drag to move the model. The black arrow on the top of the model pointing upward is to change size of the model. Left click on the arrow and drag up and down to increase or decrease the dimensions of the model.

Orienting

The curved bars attached to the arrows are to change the model's orientation. Green, Red, Blue bars represent Y, X, Z axis respectively. Left click and drag vertically the Green and the Red bars to change X, Y orientations of the model. Left click and drag horizontally to change Z orientation of the model.
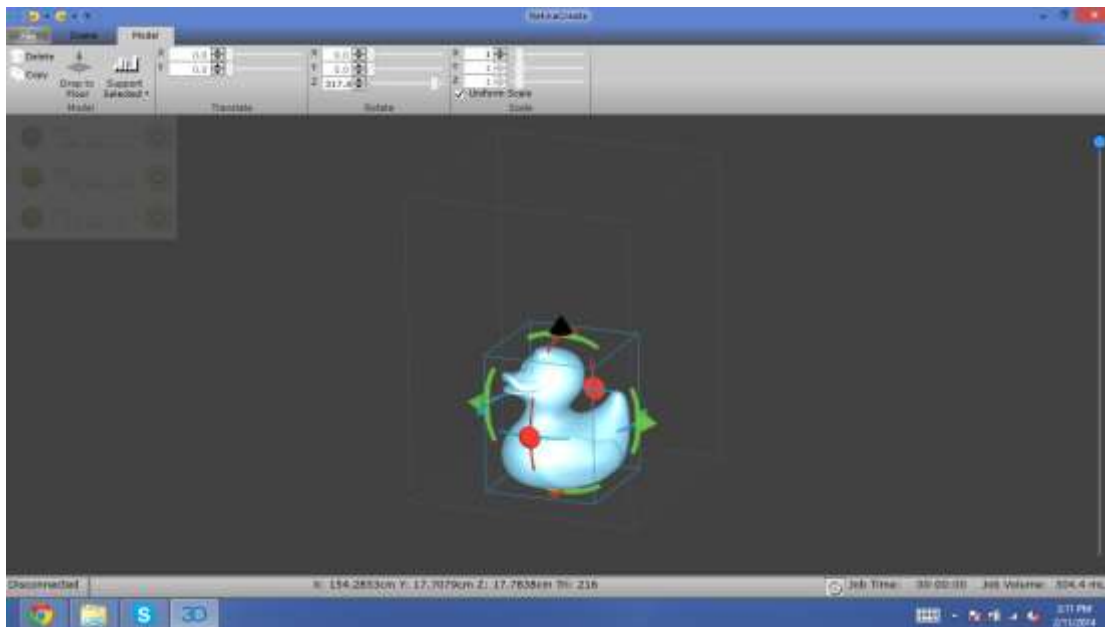
Generate Supports

Supports are important for a successful print, especially for models with overhangs. For now, you only have one model to print. Select Support All under the Scene menu. RetinaCreate will generate supports with a base for your model. The drop-down menu will be covered in depth in Part 6.
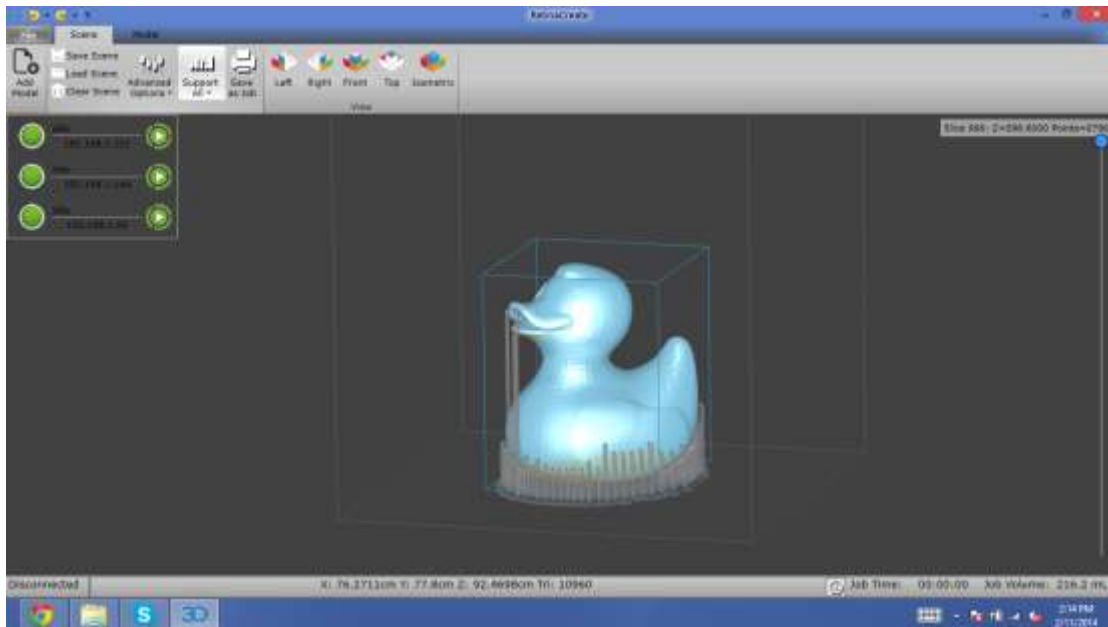

Manual Support Modification

- Clicking on a support will select it; selected supports are highlighted in red.
- Press the delete key to manually delete the selected support.
- Left-click on a support and hold the left mouse button to drag the support.
- Hold down the CTRL key and click on the model to add supports

Print

RetinaCreate displays the connected printers on the upper left hand side of your screen. You will see green circles, the word 'Idle', and the printer's IP when the printer is ready. Click the green circle with a triangle to start printing. RetinaCreate will transfer the model to the printer. The number of slices transferred will be shown on the bottom of your screen. Please do not disconnect the cable or close RetinaCreate before it says 'All Transferred'.

If you are printing a big model and need more resin while printing, simply click pause button, pour more resin in the tank, and restart the printing.

Part 4: After Printing

Removing the Build Platform

- When the model has finished printing, wait at least 10 minutes to allow excess resin to drip out before opening the lid
    - Insert a 9.5"x14.5" cutting board and lay it on top of the VAT. Always insert the cutting board before removing the build platform to avoid dripping resin inside the machine.
    - Remove the build head as described Part 2: Build platform.
    - Rotate the platform to face upward or hold a container under the platform to catch any resin.
    - Scrape excess resin off the build platform into the tray before transferring to the finishing station.
    - Make sure you keep the cover closed to protect the resin from external UV light.

Finishing Steps

General Steps

- Transfer the platform to your self-prepared finishing station.
- Use the corner of the paint scraper to release some part of the base of your model, then remove the whole model. The scraper may be sharp. Please be careful not to hurt yourself. Sometimes you may find it useful to use a rubber mallet in conjunction with the scraper to work the part off.
- To rinse excess resin from the model, fill your container with 99% isopropyl alcohol (IPA) and place your model inside. Let it soak for 15 minutes. You may try holding the model with tongs and swirling the model inside the container filled with IPA to work out any loose resin. We recommend you cover the container with a plate to prevent excessive evaporation of the IPA.
- Take the model out of the IPA using the tongs after soaking for 15 minutes.
- Remove the supports carefully.
    - Use the flush cutters to snip away supports or chisel them away with the paint scrapper + rubber mallet.
- Put the model on some paper tissue to dry.

- - ○ You may use 220-1500 sandpaper to sand away any unwanted marks after the model is fully dry.
    - ○ Clean sanding dust with isopropyl alcohol.
    - ○ You may want to clear-coat or paint the model as desired.
  - Wash the build platform with isopropyl alcohol. Allow to dry. You want to wash the platform right away after each print. Leaving it in the air will make it very hard to clean later.
    - ○ You don't need to wash the platform if you use the same resin for your next prints. In this case, please put the platform back in the printer right away.

Post-curing

- Printed objects are by design cured to about 90% strength to extend the useful life of the non-stick layer of the VATs
- To cure fully, you may place the models in sunlight after cleaning them
- Placing models in sunlight to cure may cause the models to turn slightly yellow as sunlight contains a wide spectrum of light that breaks down color additives in the resin
- Alternatively to preserve the best color (or transparency) of the model, cure the model under a 285nm UV light source eg Phillips 325126 bulbs (Amazon B00172Y0H4). After it is cured under 285nm light, give it a anti-UV clear coat such as Krylon 1305 to best preserve color (Amazon B00397STRW).

Repair Imperfect Prints

Follow instructions below to repair imperfect models. Repair can only be done when the model came out nearly perfect but with small holes or broken parts.

- Prepare: a toothpick, resin, natural sunlight (or a 405nm laser point), 220-1500 grit sand paper
- Dip the toothpick in the resin and fill the hole completely with the resin. Try to be accurate in order to reduce sanding later on. Do the same to glue parts and put them together.
- Leave the model in the sun to cure. You may use a laser point which is faster.
- Once fully cured, sand the bump to smooth the surface. Wash with IPA to clean any dust.

Part 5: Touch Screen Interface

The Pegasus Touch comes equipped with a touch screen interface on the front of the machine. From this screen you can monitor prints, pause and stop prints, configure network settings, calibrate the printer, and print models directly from the FSL3D App Store. The screen will also provide you with critical information such as lid open warnings and resin refill warnings.
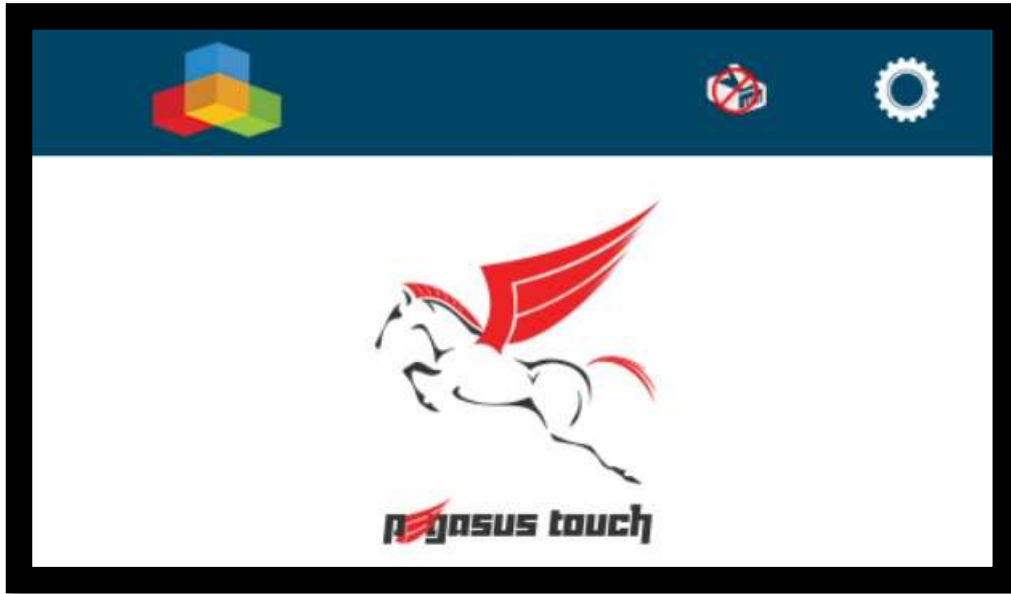
Figure 5-1: The Pegasus tough home screen. The top left icon opens the FSL3D App Store. The ethernet icon in the top center-left opens up the network configuration window. The gear in the top right opens up the calibration screen.

Print Monitoring

When the printer is in an active print job, a screen is displayed which animates the print job. In the bottom left of this screen, the elapsed time and expected total time are displayed. Then it lists how many slices are left to print out of the total number of slices.

Figure 5-2: An image of the Pegasus Touch Screen During Printing.

Pause/Play and Stop

The user can pause, resume, and stop jobs by pressing the two buttons in the top right of the screen. When the stop button is pressed, the printer will cease lasing and slowly raise the build platform up to where the head can be safely dismounted.
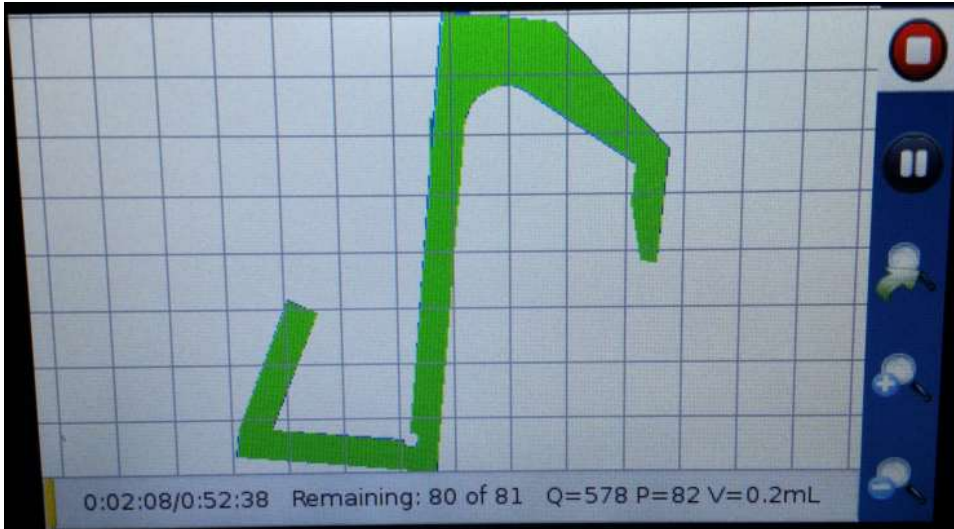
Network Settings

The printer can be wirelessly connected to your home network using a USB wifi dongle. The wifi settings can be input directly from the printer via the network settings menu.

To access the network settings, tap the ethernet or wifi connectivity icon in the top center-left of the home screen.

Calibration

WARNING: Misuse of the Calibration Screen can permanently damage your printer. Generally, you should not have to use the Calibration Screen unless directed to by FSL3D customer support.

The printer's laser can be recalibrated manually. A printable calibration sheet file is available at fsl3d.com. This sheet consists of a collection of twenty-five dots the span the build area of the Pegasus Touch. To perform calibration, print the calibration sheet and cut out the square region which fits into a resin vat. Place the sheet in a resin vat and optionally tape it in place. Insert the resin vat into the printer and close the printer's lid.

Next you will need to steer the laser to each of the 25 calibration points in the proper order. Turn on the laser by pressing the "Laser On" button in the top right. The laser should glow brightly on the inserted sheet of paper. Pressing "Laser Hold" will dramatically reduce the brightness of the laser and may help you to more accurately position the laser on the calibration points. To steer the laser, use the 9 directional buttons in the center-right of the calibration screen. In order to traverse the laser across the build area, it will be necessary to utilize the three laser step sizes available in the bottom right of the calibration screen. Steer the laser to the center of each of the printed dots and press the "Add Point" button. Once the 25 points have been added, press the "Accept" button to compute and store a new calibration table. This will overwrite the previous calibration table. Press the "Close" button when finished or to cancel calibration.

Figure 5-3: The calibration screen.
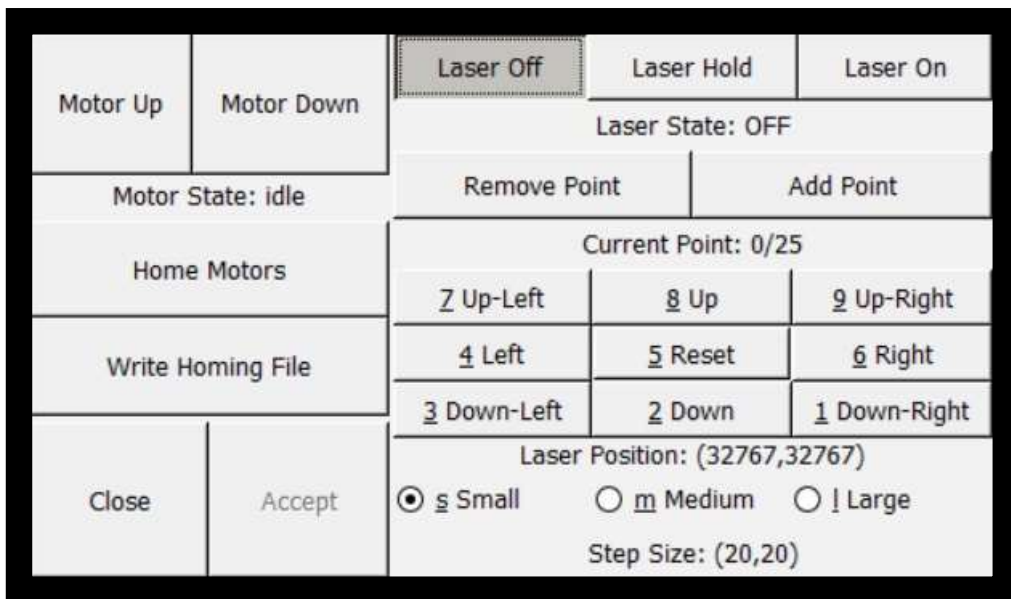
FSL3D App Store

The FSL3D logo in the top left of the home screen is a button which opens up the FSL3D App Store. You can only connect to the app store with a working internet connection. From the FSL3D App Store, you can browse printable models and print directly from the web. Models in the FSL3D App Store have been tested and should successfully print on your Pegasus Touch printer.

Part 6: RetinaCreate

Overview

RetinaCreate is an easy to use program for preparing 3D models for printing on your Pegasus Touch. RetinaCreate is intended only to facilitate printing objects--it is not a general purpose 3D editing program. It includes basic 3D manipulation tools for part placement, orientation, and size. RetinaCreate uses the standard .STL file format produced by many 3D programs such as Blender, ZBrush, AutoDesk Inventor, Solidworks, etc.

Models may contain defects such as holes that prevent them from being printed. For advanced 3D editing and repair features, consider using 3rd party 3D preprocessing software such as the freely available MeshMixer (www.meshmixer.com) or NetFabb Private/Professional (www.netfab.com). Both of these programs will allow you to repair broken .STL files before printing.

Scene

Add Model

Will add desired model on the grid lines within the black background, the workspace.

Scene > select Add Model > select .stl or .obj file > open

Save Scene

Will save the whole scene including the supports and advanced options

Scene > select Save Scene > save

Load Scene

Will load the whole scene including the supports and advanced options

Scene > select Load Scene > select a Scene File (.fslscene) > open

Clear Scene
   Will delete the whole scene but test patterns remain
   Scene > select Clear Scene

Support All
   Will automatically support all the models in the scene.

Generate Base Only - The program creates a flat base with the model without any cylinder supports. The base will be attached to the given model.

Clear All Supports - The program removes all supports on every models that is place inside the grid line 3D-space, this includes any cylinder column and flat base supports. However, if you choose to left click with your mouse on a specific model and click on this function, it will only remove that specific model supports.

Analyze Only - The program will highlight areas that need supports for a successful print out of your model. These highlighted areas will be color yellow and red. As matter of fact, the red area must have support for a successful print out.

Save as Job - The program will save your scene.

Part 7: Maintenance

Pegasus Touch Laser 3D Printer Care

To keep the body of Pegasus clean, use microfiber cloth to wipe the outside. If you want shine for the cover, use products specifically recommended for acrylic (ex. Novus #1). Avoid products that contain ammonia (ex Windex).

Please DO NOT clean the cover with isopropyl alcohol since it will cause permanent damage to the acrylic.

Never remove the build platform without first placing a 9.5"x14.5" cutting board on top of the vat to prevent resin drips.

Never remove the VAT before removing the build platform to prevent resin damage to the mirror or galvanometers.

Wipe mirrors only with a dry microfiber cloth . Never attempt to clean the galvo mirrors or the first surface 45 degree mirror with any solvents or other liquid solutions as these will leave some streaking and your print performance will degrade. You may use first contact polymer solution to clean mirrors when extremely dirty (http://www.photoniccleaning.com/). Follow all manufacturer instructions when using first contact polymer.

Removing cured pieces from failed prints

In case of a failed print, you will need to remove cured resin remnants from the build tray. Lightly run a soft rubber spatula across the bottom surface of the tray to find the pieces and dislodge them. Tweezers are never a good idea because the sharp tips can damage the silicone release layer.

Transportation

To transport the printer, please follow the instructions below.
- Clean excess resin from the build platform with isopropyl alcohol and paper towels.
- Wrap the build platform in plastic wrap and reattach to the printer.

- Clean the resin tray as instructed in next part, wrap the tray and put it back in the printer. Use a zip tie to secure the VAT holder to the magnet switch bracket to prevent it from moving during transport. If you do not secure the VAT holder, the VAT may be damaged.
  - Lower the build platform by manually turning the Z lead screw all the way down until it presses against the VAT.
- Position the protectors or scoring cardboard over the front edges, and bind in place using plastic wrap.
- Rebox the printer and accessories in the original package as they were when you received them.

Resin Care

Handling

- Please wear protective gloves when handling resin. If you get any on your skin, wash thoroughly with soap and water immediately. The resin can cause mild skin irritation.
- Never ingest resin nor use print parts for that purpose.
  - Never pour resin back into the original bottle to avoid contamination. Keep unused resin in the VAT or pour it out into a secondary dark bottle and store in a dark cabinet.
- Cured resin is safe to touch and handle without gloves or other protection.
- Refer to Appendix H for chemical information.

Refilling

- Pause the print
- Pour resin directly into the tray. Do not exceed the maximum fill line as it will spill and damage the printer while printing.

Spills

- Clean up immediately before it hardens.
- To clean printer body and mirrors: use isopropyl alcohol and paper towels, or clean microfiber cloths.
- Use only first contact polymer solution to clean mirrors - never clean the mirrors with solvents

- To clean up the cover: Never use isopropyl alcohol or solutions including IPA. use warm water and mild dish soap.

Storage

- Always store the resin in opaque bottles or under the printer cover. Natural light will cure the resin.

Reusing

- You can reuse the remaining resin in the tray, but do not return it to its original bottle since it may result in contamination. Keep it in the tray under the cover.

Disposal

- Cleaned parts and cured resin can be thrown away as normal waste. They are non-recyclable.
- Resin in liquid form must be cured before thrown away. Put the liquid in a clear plastic bottle or bag and use sunlight or UV lamp to cure.

Appendix A: Troubleshooting

Hardware

Issue: Machine does not recognize closed cover
Solution: Adjustment of the cover may be necessary. This can be accomplished with a set

Issue: Prints fail to adhere to build plate
Solution: The VAT levelling screws may need adjustment to ensure flat contact against the build VAT. Contact support for more information.

Software

Issue: Machine does not boot for more than one minute
Solution: Unplug power cable from machine (not at wall) for 5 seconds and plug back in.

Appendix B: Warranty Statement

FSL3D warranties the Pegasus Touch 3D Laser printer for a base period of 90 days. Extended warranty periods are available at the time of purchase.

Covered parts:

The following parts are covered during the warranty period: laser diode, galvos, motors, power supply, linear rails, electronics, touchscreen display

Not covered consumable parts:

The following parts are considered consumable and are not covered under any warranty and need to be replaced periodically:

a) Resin: Once cured, resin cannot be reused. However, uncured liquid resin can be reused for the next print. Do not return used resin to the original bottle to avoid contamination. Always store unused resin in a dark cabinet or bottle. Unopened unused resin carries a 1 year warranty and will be replaced free of charge if it cures in the bottle without light exposure (excludes shipping/handling charges).

b) VATs/Build tray: We estimate every 2-4L of resin the antistick surface of the VAT will be consumed and the VAT will need to be replaced. The antistick layer of the tray may begin to cloud after many prints. To limit this and extend the life or the tray, vary the printing location. You can buy replacement VATs from FSL3D.

c) Build platform: Constant removing parts from the build platform will eventually wear down the aluminum surface. We estimate it to last 10L or more of printing. You may want to consider spare build platforms if you print / change resin frequently. Spares platforms will allow to begin a new print immediately after the previous print.

d) 45 degree First Surface Mirror: This mirror should never wear out but if resin falls on it then it will likely need to be replaced unless cleaned immediately with first contact polymer solution (www.photoniccleaning.com).

Excluded Events:

The warranty is valid for normal use only and excludes Acts of God, user error and use outside of normal parameters.

Parts covered in spilled resin are considered user error and are not covered under warranty:

- Always ensure the printing surface is level as the resin can spill while printing.
- Never fill the resin past the fill line
- Always use a 9.5"x14.5" cutting board over the VAT whenever removing the build platform to prevent spills when removing the build platform.
- Always remove the build platform before removing the VAT to prevent drips from falling into the internal parts of the machine.

Return Policy

Products purchased directly from FSL3D:

Within the first 30 days, you may return the machine subject to a 20% restocking fee + shipping fees if the 3D Printer is opened due to the need to replace consumable items. If it is returned new, unopened or order cancelled, only a 5% restocking fee + shipping fees (if any) is applied. Consumable items (build plate, VAT, resin) may not be returned if opened. If unopened, they are subject to a 5% restocking + shipping fees.

Products purchased from other 3rd party distributors or resellers: review the 3rd party distributor/reseller return policy.

Shipping Expenses

Within the first 30 days, FSL3D will replace or repair any defective parts free of charge and pay for ground shipping of parts if you paid FSL3D for shipping on your order. Overnight shipping is available at extra charge. If you picked up in person or used your own shipping methods, FSL considers the parts to be sold FOB our warehouse and you must arrange your own shipping or pickup replacement parts as FSL does did not make the original shipping arrangements.

Outside the first 30 days, Full Spectrum Laser will replace or repair any defective within the warranty period free of charge but all shipping

charges to and from FSL3D are the responsibility of the customer. The warranty includes parts and labor only. Shipping of defective and replacement components to/from FSL3D is excluded by the warranty. The customer may arrange their own shipping or drop parts off to exchange parts at our warehouse free of charge. Typically Full Spectrum Laser has most replacement parts on hand for immediate shipment of under warranty parts.

Advance Replacement Policy

Within the first 30 days, FSL3D will advance replace any failed part free of charge

After the first 30 days, all defective parts must be returned to FSL postage paid for evaluation before replacements are issued unless otherwise authorized. FSL3D's warranty policy is to repair parts whenever possible and replacing them only if they are unrepairable. Thus, all warranty parts must be returned first to determine if they can be repaired.

Accuracy and Tolerance Statement

FSL3D makes no specific accuracy or tolerance guarantees but machines are designed with full end user calibration/adjustment. Users may self calibrate their machines to fine tune accuracy requirements. For details contact FSL3D tech support.

Appendix C: Pegasus Touch Specifications

- Technology: 405nm solid state diode laser cured liquid resin
- Average Laser Beam Spot Size: ~80um FWHM
- XY Position Control: 16 bit Digital to Analog Converter (DAC) to closed loop galvanometer (3 micron positioning resolution)
- XY Draw Speed: up to 10x faster than other consumer 3D printers, up to 3000mm/sec laser draw speed
- Z Motor Control: screw driven stepping motor (5 micron step resolution)
- On board computer: 1GHz processor with 512MB SDRAM for on board processing, 2 GB internal storage, 8GB microSD external storage
- Display: 4.3" LCD Color Touchscreen
- Interfaces: USB, Ethernet, WiFi (requires optional dongle), USB key
- Build Volume: up to 7"x7"x9" build area
- Dimensions: 11"x14"x22.5"
- Weight: 29lbs
- Power: 24V 2.5Amp external power brick (<75W total power draw)

Appendix D: Material Safety Data (resin)

(In progress)