

Digital Fabrication

3D printing, laser cutting and CNC.

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Overview

What the area is for, equipment at a glance and who the Area Champion is.

Digital Fabrication Overview

Digital Fabrication covers the machines that turn a computer design into a physical part: **3D printers**, the **laser cutter** and **CNC**. The 3D printers live in the print lab; the laser and CNC are in the laser/CNC shop.

3D printing and laser cutting are **self-serve once you have been trained**.

Equipment at a glance

The current list of equipment, with locations and which machines need training, is in **Atlas**: <https://atlas.waukeshamakers.com>.

The 3D printers with maintenance pages in this book are:

- Original Prusa MK4
- Original Prusa i3 MK3S+
- Bambu Lab X1 Carbon with AMS 2 Pro and AMS
- Anycubic Kobra 2 Max

Pages in this book

- **Digital Fabrication: Fusion 360 Cheat Sheet**: the basics of designing parts in Fusion 360
- **Digital Fabrication: Laser Cutter**
- **Digital Fabrication: Laser-Safe and Prohibited Materials**
- Maintenance checklists for each 3D printer in the **Maintenance** chapter

Before you work here

- **Get trained** on each machine before you use it. See **Training and Certification: How Certification Works**, and check your certifications in Journeyman at <https://journeyman.waukeshamakers.com>.
- **Never leave the laser unattended** while it is running.

- **Only cut approved materials** on the laser. See **Digital Fabrication: Laser-Safe and Prohibited Materials**.
- **Fumes**. See **Shop Safety: Air Quality**.
- **Inspect before use**. See **Training and Certification: Pre-Use Inspection**. If a printer or the laser is not working right, tag it and report it: see **Shop Safety: Tagging a Tool Out of Service and Reporting It**.

To be confirmed: whether members supply their own filament and laser stock or the shop provides some, and how members send jobs to the printers. See also ****Facility Operations: Consumables****.

Learning to design

New to 3D design? The **Fusion 360 Basics** class walks you through your first model. The class outline and handout are in **Classes and Instructors: Fusion 360 Basics**, and the cheat sheet is in this book.

Area Champion

To be confirmed: who the Digital Fabrication Area Champion is and how to reach them. See ****Volunteer Runbooks: Area Champions**** for what Area Champions do.

Fusion 360 Cheat Sheet

A quick reference for designing parts in Autodesk Fusion 360. This is the handout from the **Fusion 360 Basics** class; see **Classes and Instructors: Fusion 360 Basics** for the class itself.

The core workflow

This is the process you will repeat for almost everything you build:

1. **Sketch** a 2D shape on a plane or face.
2. **Extrude** it into 3D (add material).
3. **Sketch** on a face of your 3D object.
4. **Cut** to remove material (extrude inward).
5. **Fillet** to round edges and finish.
6. Repeat steps 3 to 5 to add detail.

Keyboard shortcuts

Shortcut	Action
S	Search bar (find any tool by name)
L	Line
C	Circle
R	Rectangle
D	Sketch Dimension
E	Extrude
F	Fillet
Q	Push/Pull
M	Move/Copy
Ctrl+Z / Cmd+Z	Undo

Tip: press **S** and type the name of any tool. It is the fastest way to find anything.

Mouse navigation

Action	Control
Orbit	Middle mouse button
Pan	Shift + middle mouse button
Zoom	Scroll wheel
Reset view	Click the house icon on the view cube (top right)

Practice project: phone stand

The class project. Dimensions are included so you can rebuild it at home.

Step 1: Base

1. **Create Sketch** on the XZ plane (the floor).
2. Draw a **Rectangle**: 70 mm x 80 mm.
3. **Finish Sketch**.
4. **Extrude** (Symmetric): 10 mm.

Step 2: Back support

1. **Create Sketch** on the back face (the 70 mm x 10 mm face).
2. Draw a **Rectangle** from the top-left corner: 70 mm wide x 60 mm tall.
3. **Finish Sketch**.
4. **Extrude**: 10 mm (away from the base).

Step 3: Phone slot

1. **Create Sketch** on the top face of the base.
2. Draw a **Rectangle**: 50 mm x 4 mm, positioned 5 mm from the back wall.
3. **Finish Sketch**.
4. **Extrude** as **Cut**: -8 mm (leaves a 2 mm floor).

Step 4: Fillet

1. Select **Fillet** (or press **F**).
2. Click the top edges of the back support; radius **5 mm**.
3. Optionally fillet the bottom edges of the base: **3 mm**.

Dimensions reference

Feature	Size
Base	70 x 80 x 10 mm
Back support	70 x 60 x 10 mm
Phone slot	50 x 4 mm, 8 mm deep cut
Fillets	5 mm (top), 3 mm (bottom)

Stuck? Check here first

Problem	Fix
Can't see my sketch	Click the Home icon on the view cube
Extrude is grayed out	Click Finish Sketch first
Extrude didn't cut	Undo, redo the extrude, and change Operation to Cut
Sketch lines are still blue	Add dimensions to fully constrain the sketch (it still works if you don't)
Can't select a face	Zoom in and hover until the <i>face</i> highlights, not an edge
Model disappeared	Check the eye icons in the Browser panel (left side)

What to learn next

1. **Components:** organizing multi-part models.
2. **User Parameters:** named variables for dimensions.
3. **Patterns:** repeating features in circles or grids.
4. **STL Export:** File, Export, STL, so you can 3D print your design.

Resources

- **Product Design Online** (YouTube): beginner-friendly Fusion 360 tutorials.

- **r/Fusion360**: a Reddit community for questions and inspiration.
- **The makerspace**: come in and practice, and ask in #general on Discord if you get stuck.

Equipment SOPs

One page per tool. Reading an SOP does not replace training or certification.

Laser Cutter

Reading this page does not replace training. You must be checked off on this tool before using it.

The laser cuts and engraves sheet materials using a focused beam. It is self-serve once you have been trained.

To be confirmed: the full operating procedure (model, startup, focusing, job setup, ventilation, shutdown). Only the rules below are sourced so far. The machine's details are in Atlas: <https://atlas.waukeshamakers.com>.

Certification required

Yes. See **Training and Certification: How Certification Works**.

The rule posted on the machine

Never leave the laser unattended while it is running. Stay with the machine for the whole job, watching it, not just in the room. Lasers can set the material on fire, and a small flare-up becomes a real fire within seconds when nobody is watching. If you need to step away, pause or stop the job first.

Before you start

- Do the general checks in **Training and Certification: Pre-Use Inspection**.
- **Check your material.** Only cut materials on the approved list, and never cut anything you cannot identify. See **Digital Fabrication: Laser-Safe and Prohibited Materials**.
- Make sure the exhaust or filtration is running. See **Shop Safety: Air Quality**.
- Know where the nearest fire extinguisher is. See **Shop Safety: Fire Safety and Hot Work**.

- Clear scraps and leftover pieces out of the bed.

While it runs

- Watch for flames. A brief flicker at the cut point can be normal; sustained flame is not. Stop the job if flames persist.
- Do not open the lid or defeat any interlock while the laser is firing.

When you are done

- Wait for the smoke to clear before opening the lid.
- Remove your parts and all scraps from the bed. Small scraps left behind are a fire hazard for the next job.
- Report any problem; see **Shop Safety: Tagging a Tool Out of Service and Reporting It**.

Maintenance

Routine maintenance procedures and checklists.

Prusa MK4 Maintenance

Regular maintenance checklist for the **Original Prusa MK4** (Nextruder). It follows Prusa's own guide: [Regular printer maintenance \(MK4/S, MK3.9/S\)](#).

How often

Interval	What
Before every print	Some items; see Prusa's guide linked above
Every 200 print hours	Axes (rods and bearings), belts, fans and the Nextruder (sections 2 to 8)
Yearly, or every 600 to 800 print hours	Electronics check (section 9)

Supplies

- Prusa Lubricant ([Prusa Lubricant Applicator Set](#))
- Isopropyl alcohol (IPA) and paper towels
- Compressed air, small brass brush, tweezers, toothpick
- Allen keys, needle-nose pliers
- Acetone (Smooth PEI sheet only)

Do not lubricate the Z-axis lead screws or trapezoid nuts. Do not open the Nextruder gearbox unless Prusa support asks you to; the primary gear and idler bearings need no lubricant.

1. Before you start

- Note the print hours and firmware version so they can be logged with the maintenance.
- Unload filament.

- Clear any maintenance warning on the screen and note what it said ([Maintenance warning reference](#)).

2. General cleaning and hotend

- Brush or vacuum debris from the frame and under the heatbed.
- Heat the nozzle to 250 °C for 3 to 5 minutes, then scrub old plastic off with a brass brush. Keep the brush off the hotend cables.
- Let it cool for about 10 minutes, and confirm the temperature on the display before touching it.

3. Hotend thumb screws and nozzle seating (printer off and cold)

- Hand-tighten the hotend thumb screws (no tools).
- Confirm the nozzle has **no vertical play** and the heater block **does not rotate**.
- If a Nozzle Adapter is installed, confirm the nozzle is not lowered or loose ([Nexttruder V6 Nozzle Adapter](#)).

4. Smooth rods and bearings (X, Y, Z)

- Roll each rod between your fingers to feel for grooves or scratches.
- Wipe each rod clean with a paper towel.
- Apply a small amount of Prusa Lubricant and run each axis end to end several times.
- Only if an axis still feels rough: remove the bearings, clean them with IPA, and regrease the inside with a small amount of Prusa Lubricant. A printable [LM8UU bearing greasing adaptor](#) makes this easier.

5. Belts and pulleys

- Remove debris around the pulleys and belts.
- Confirm each pulley set screw is tight on the **flat** of the motor shaft.
- Pluck the X and Y belts: they should give a low bass note.
- Measure and adjust tension per [Adjusting belt tension \(MK4/S, MK3.9/S, MK3.5/S, MK3/S/+\)](#), which covers the frequency method used on the MK4. Note the upper, lower and Y readings.

6. Fans

- Hold each propeller still and blow it out with compressed air. Never blow air into a running or free-spinning fan.
- Remove plastic threads with tweezers.
- Never bypass the fan RPM check. A slow fan throws an error on purpose.

7. Nextruder (drive gear area)

- Lift the idler nut and swing the idler out.
- Clear filament dust from the primary gear grooves through the side access hole (compressed air, brass brush or toothpick).
- Close the idler and reset the tension.
- If extrusion or hotend problems persist, see [Changing or replacing the Nextruder hotend](#) and [How to rebuild the Nextruder hotend](#).

8. Print sheets

- Clean each sheet with IPA; use dish soap and warm water for a deeper clean ([Print surface preparation](#)).
- Acetone only on the **Smooth** sheet, never on Textured or Satin. Never use alcohol or acetone on the PA Nylon sheet ([Flexible steel sheets guidepost](#)).

9. Electronics (yearly, or every 600 to 800 hours)

- **Power off and unplug** the printer.
- Check and reseat the connectors on the xBuddy board, Loveboard, heatbed, PSU and xLCD.
- Confirm screw-terminal connectors are fully tight.
- For Molex connectors, press the latch before pulling.

10. Firmware

- Update to the latest stable MK4 firmware if it is behind (download from Prusa's MK4 firmware page; install from a USB drive).

11. Recalibrate

- Run **Selftest / Calibrations & Tests** from the printer menu.
- Run the **Loadcell Test (Control > Calibration & Tests > Loadcell Test)**. If it fails, see [Loadcell troubleshooting](#); overtightened Nextruder bolts are a common cause.
- Confirm **Input Shaper** is enabled and that the slicer uses the Input Shaper profile ([Input Shaper article](#)).
- Print a small test part. The first layer is auto-calibrated by mesh bed leveling through the load cell, so just inspect it.

Afterwards

Record anything you found, what you did about it, and whether follow-up is needed. If the printer is not safe to use, tag it out of service: see **Shop Safety: Tagging a Tool Out of Service and Reporting It**.

Prusa MK3S+ Maintenance

Regular maintenance checklist for the **Original Prusa i3 MK3S+**. If there is more than one MK3S+, go through the whole checklist for each printer. It follows Prusa's own guide: [i3 Printer Regular Maintenance](#).

How often

Interval	What
Every couple hundred print hours	Cleaning, axes, belts, extruder, fans, sheets (sections 2 to 7)
Every 600 to 800 print hours, or at least yearly	Electronics check (section 8)

Supplies

- Prusa Lubricant ([Prusa Lubricant Applicator Set](#)). Acceptable alternatives per Prusa: Super Lube synthetic grease, GLEIT-μ HF 400, Mogul LV 2-EP. Avoid very high viscosity grease.
- Isopropyl alcohol (IPA) and paper towels
- Compressed air, small brass brush, tweezers, cotton swabs
- Allen keys, needle-nose pliers
- Acetone (Smooth PEI sheet only)

Do not lubricate the Z-axis lead screws or trapezoid nuts. Prusa explicitly warns against this.

1. Before you start

- Note the print hours from **LCD > Statistics**.
- Unload filament.
- Note the firmware version under **LCD > Support** (you will compare it in step 10).

2. General cleaning

- Brush or vacuum filament bits, dust and broken supports from the frame and under the heatbed.
- Heat the nozzle and brush off old plastic with a brass brush. Keep the brush off the thermistor and heater wires.

3. Smooth rods and bearings (X, Y, Z)

- Roll each smooth rod between your fingers and feel for grooves or scratches. Note any damaged rods.
- Wipe each rod clean with a dry paper towel.
- Apply a thin film of Prusa Lubricant to each rod and run the axis end to end several times ([Prusa maintenance tips guide](#)).
- If an axis still feels rough, remove the bearings, clean them with IPA, and grease the inside with a pea-sized amount ([bearing maintenance article](#)).
- Check that the X-carriage-back screws and Y-bearing U-bolts are snug but **not overtightened**. Overtightening deforms the bearings and scratches the rods.

4. Belts and pulleys

- Clear debris from the belt pulleys and idlers.
- Confirm each pulley grub screw is tight against the **flat** of its motor shaft.
- Pluck the X and Y belts: they should give a low bass note.
- Check **LCD > Support > Belt status**. Target values are **260 to 290**.
- Adjust if out of range: [Adjusting belt tension \(MK4/S, MK3.9/S, MK3.5/S, MK3/S/+\)](#).

5. Extruder (Bondtech gears and idler)

- Open the idler door (one screw on the MK3S+).

- Cover the PTFE tube entry with a cotton swab, then clean both Bondtech gears with a brass brush, rotating a few degrees at a time through a full turn. Blow out the debris.
- Verify the drive gear is aligned with the filament path and its grub screw is tight ([Checking/re-aligning the Bondtech gear](#)).
- Confirm the idler shaft and bearing spin freely.
- Optional: a tiny amount of non-oil grease on the **outward-facing gear teeth only**. Keep it off anything that touches filament.
- Check idler screw tension: the head should be roughly flush with the extruder plastic ([Idler screw tension](#)).

6. Fans

- Hold each propeller still and blow out dust with compressed air. Never spin a fan with air.
- Remove plastic strings with tweezers.
- Confirm the hotend fan and the print (part cooling) fan both spin freely by hand.

7. Print sheets

- Clean each steel sheet with IPA; use dish soap and warm water for a deeper clean.
- Acetone only on the **Smooth** PEI sheet, never on Textured or Satin ([Flexible steel sheets guidepost](#)).
- Note any sheets with gouges or worn coating.

8. Electronics (every 600 to 800 hours, or at least yearly)

- **Power off and unplug** the printer.
- Inspect cables for pinching, rubbing or worn insulation, especially the heatbed cable bundle.
- Blow dust out of the Einsy electronics enclosure.
- Gently tug-test the PSU and heatbed power connectors, and retighten any terminal screws that move ([Einsy RAMBo wiring reference](#)).

9. Nozzle

- Inspect the nozzle for wear (rounded tip, enlarged hole) or damage.
- Replace it only if print quality stays poor after everything above ([Changing or replacing the nozzle](#)).

10. Firmware and slicer

- Update to the latest stable MK3S+ firmware if it is behind ([How to update firmware MK3S+](#)).
- Confirm the shop computers have a current [PrusaSlicer](#).

11. Recalibrate

Prusa recommends recalibrating after maintenance.

- Run **Selftest** from **LCD > Calibration** (fans, axes, heaters).
- Run **XYZ calibration** if bearings, rods or the frame were disturbed ([XYZ calibration MK3/MK3S](#)). If the nozzle catches the paper, the SuperPINDA may need to be lowered slightly.
- Run **First layer calibration** and set Live Z for each sheet in use ([Basic calibration articles](#)).
- Print a small test part and inspect the first layer.

Afterwards

Record anything you found, what you did about it, and whether follow-up is needed. If the printer is not safe to use, tag it out of service: see **Shop Safety: Tagging a Tool Out of Service and Reporting It**.

Bambu Lab X1C and AMS Maintenance

Maintenance checklist for the **Bambu Lab X1 Carbon** printer and its two filament units, the **AMS 2 Pro** and the original **AMS (Gen 1)**. It follows Bambu Lab's guides:

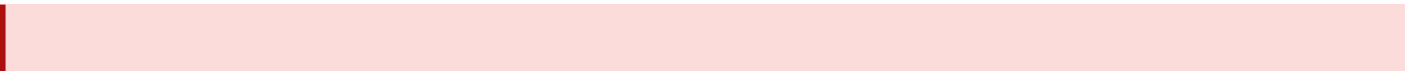
- [Bambu Wiki: X1 Basic Maintenance](#)
- [Bambu Wiki: AMS Basic Maintenance](#)
- [Bambu Wiki: AMS 2 Pro hub](#)
- [X1 Series Regular Maintenance Manual \(ManualsLib copy\)](#)

How often

Interval	What
Every 3 to 5 days if ABS is printed often	Clean the Micro Lidar window
Every 2 weeks	Check AMS desiccant and humidity
Monthly (every 5 rolls if printing ABS/ASA)	Clean carbon rods and re-tension belts
Every 2 months (monthly with abrasive filaments)	Replace AMS PTFE tubes
Every 3 months	Grease Z lead screws; replace the activated carbon filter under heavy use
As needed	Nozzle wiper, nozzle, silicone sock, build plates

Supplies

- IPA (90% or stronger) and lint-free or microfiber cloths
- Grease for the Z lead screws (Bambu suggests Super Lube 92003 or Lucas 10533, or the grease from the Bambu accessory box)
- H2.0 hex key and the X1 accessory box tools
- Compressed air, brass brush, tweezers
- Spare nozzle wiper, spare PTFE tube (4 mm OD), fresh desiccant if available



Do NOT grease the X-axis carbon rods. Grease causes abnormal resistance and makes cleaning harder; the bearings are self-lubricating. Power off and unplug the printer before any mechanical work.

X1C printer

1. Before you start

- Unload filament from the AMS units.
- Note the firmware versions (printer, AMS 2 Pro, AMS) in Bambu Studio or Bambu Handy.

2. General cleaning

- Vacuum or brush debris from the chamber floor, bed area and purge chute.
- Empty and clean the purge waste bin area.

3. Carbon rods and belt tension (do these together)

Procedure: [Bambu Wiki: Carbon rods clearance and cleaning](#)

- Loosen (do not remove) the four belt tensioner screws at the back of the printer.
- Press on the belts next to the toolhead and confirm the tensioners move.
- Wipe each X-axis carbon rod with IPA on a lint-free cloth. Repeat 2 to 3 times until the cloth comes away clean.
- Move the toolhead to the center of the build area and retighten the tensioner screws. This re-tensions the belts.
- With the printer off, move the toolhead by hand from corner to corner. Motion should be smooth with no grinding.

4. Z-axis lead screws (every 3 months)

- Wipe dust and plastic off all three Z lead screws.
- With the bed homed (at the top), apply a **thin** coat of grease.
- Lower the bed, apply another thin coat, and home again. Repeat a few cycles to spread it.

- Wipe off excess grease that builds up near the lead screw nuts. Too little is better than too much.

5. Nozzle wiper

- Check the wiper for filament debris and a damaged PTFE side. It must sit horizontal.
- Replace it if the plastic structure is deformed or cracked, or if it slips ([Bambu nozzle wiper part](#)).

6. Hotend and extruder

- Heat the nozzle and brush residue off the nozzle and heater block. Inspect the silicone sock and replace it if torn.
- Do a cold pull if there are any signs of partial clogging (see the X1 nozzle clog troubleshooting page on the [Bambu Wiki](#)).
- Inspect the nozzle tip for wear, especially if carbon fiber or glow-in-the-dark filaments have been run on the stock nozzle.
- Open the extruder idler and brush filament dust from the drive gears.

7. Micro Lidar

- Clean the Lidar window with IPA on a microfiber cloth.

8. Activated carbon filter and fans

- Check the carbon filter. Replace it about every 3 months under heavy use ([Bambu Wiki: Replace the activated carbon air filter](#)).
- Blow dust out of the part cooling fan, auxiliary fan and chamber fan. Hold the blades still.

9. Build plates

- Wash each plate with warm water and dish soap, and dry it fully.
- Note any worn or scratched plates.

10. Cables and PTFE path

- Check the toolhead cable and flat ribbon cable for kinks or wear.
- Inspect the PTFE tube from the AMS hub to the toolhead for wear or kinks.

AMS 2 Pro and AMS (Gen 1)

11. PTFE tubes

- Inspect all AMS PTFE tubes (slot to hub, and hub to printer) for wear grooves, kinks or loose ends.
- Replace them about every 2 months under normal use, or monthly if printing abrasive filaments (carbon fiber, glow-in-the-dark).
- Confirm every tube is fully seated in its connector.

12. Feeders and filament path

- Remove any broken filament pieces from the feeders and hub. Pushing a good, non-brittle piece of filament through the first-stage feeder pushes debris out.
- Check the feeding funnels for wear. Replace them if badly worn and causing feed or retract errors.
- **AMS 2 Pro:** clean the filament hub per Bambu's hub cleaning guide ([AMS 2 Pro hub](#)). If a feeder needs replacing: [Replace feeder unit](#).
- **AMS Gen 1:** check that the spool rollers and support shafts spin freely, and clean dust off the rollers.

13. Desiccant and humidity

- Check the desiccant and humidity indicator in both AMS units. Dry or replace the desiccant as needed.
- Confirm the lids seal.

14. AMS test

- Load one spool in each slot of both units and run a load and unload on every slot.
- Run a short multi-material print that pulls from both AMS units.

15. Recalibrate the X1C

- Power on and run the full **Calibration** from the printer screen (bed leveling, vibration compensation, motor noise cancellation, Micro Lidar).
- Update firmware for the printer and both AMS units if they are behind.
- Print a small test part and inspect the first layer.

Afterwards

Record anything you found, what you did about it, and whether follow-up is needed. If the printer is not safe to use, tag it out of service: see **Shop Safety: Tagging a Tool Out of Service and Reporting It**.

Anycubic Kobra 2 Max

Maintenance

Maintenance and troubleshooting checklist for the **Anycubic Kobra 2 Max** (V-wheel gantry, belt tensioner knobs, auto leveling). Sources:

- [Anycubic Wiki: Kobra 2 Max Leveling Calibration Guide](#)
- [Anycubic Wiki: Kobra 2 Series Quick Start Guide](#)
- [Anycubic Wiki: Firmware update log](#)

History: this checklist was first written to bring this printer back into service, so it starts with a diagnosis step. Use that step whenever the printer is acting up; otherwise follow the routine schedule.

Confirm the model on the label on the back. This page is for the **Kobra 2 Max**. The older original Kobra Max is mechanically similar but its menus differ; see [Anycubic: Kobra Max hot end replacement](#).

Routine schedule

Interval	Task
Before each print	Clean the bed; check the nozzle for buildup
Monthly	Check eccentric nuts and belt tension; clean the V-slots
Every 3 months	Grease the Z lead screws; clean the extruder gears; blow out the fans
As needed	Nozzle replacement; firmware updates

Supplies

- Open-end wrenches (for the eccentric nuts), hex keys
- Isopropyl alcohol (IPA) and paper towels
- Light machine grease for the Z lead screws (PTFE-based, for example Super Lube)
- Compressed air, brass brush
- Spare nozzle (check the fit: Kobra 2 nozzles differ from standard Volcano nozzles), USB drive or SD card for firmware
- Known-good PLA

1. Diagnose (when something is wrong)

- Write down the symptom: will not power on, heater or thermistor error, leveling failure, poor prints, clog.
- Power on and note any error message.
- Heater or thermistor (NTC) errors usually mean a loose cable or a failed part. Reseat the connectors first (see the troubleshooting section of the [Quick Start Guide](#)).

2. Power off, unplug and clean

- Remove debris from the frame, bed and V-slot extrusions.
- Wipe the V-slot channels so the wheels roll on clean aluminum.

3. Frame and fasteners

- Check that the gantry uprights are square to the base and all frame bolts are tight.
- Shake the print head and the bed by hand to find any wobble.

4. V-wheels and eccentric nuts

Loose or worn wheels are the most common cause of Kobra problems.

- Lower the X-axis module (pull the belt) and check the Z-axis V-wheels for slipping.
- For any loose carriage (Z, X print head, Y bed), turn its eccentric nut with an open-end wrench in **small** steps until the wheel just stops spinning freely under your finger, without

binding.

- Every wheel should touch the extrusion; none should be so tight that it flat-spots.
- Look for cracked, flat-spotted or worn wheels and report them for replacement.

5. Belts

- Inspect the X and Y belts for fraying or missing teeth.
- Anycubic's method: turn the X/Y tensioner knob **fully clockwise**, then back it off **two turns** counterclockwise.
- Confirm the pulley grub screws are tight on the motor shafts.

6. Z-axis lead screws

- Wipe the lead screws clean.
- Apply a thin coat of light grease, run Z up and down to spread it, and wipe off the excess.
- Confirm both Z sides move together, so the gantry stays level.

7. Extruder and hotend

- Heat the nozzle and brush off old plastic.
- Open the extruder and clean filament dust from the drive gears.
- Do a cold pull, or replace the nozzle, if extrusion is weak or blocked.
- Check the heater cartridge and thermistor wires at the hotend for damage.

8. Fans and wiring

- Blow out the hotend and part cooling fans. Hold the blades still.
- Inspect the print head cable and bed cable for wear at the bend points.
- With the printer unplugged, reseal the main board connectors (heater, thermistor, motors, endstops and probe).

9. Bed surface

- Clean the PEI spring steel sheet with IPA, or dish soap and water if needed.

- Clean debris off the bed underside and the magnet surface.

10. Firmware

- Check the installed version against the [Anycubic update log](#) and the Kobra 2 Max firmware page. Only flash official Kobra 2 Max firmware.

11. Calibration

Per the [Anycubic leveling calibration guide](#):

- **Position calibration:** Tools > Control > Module Calibration > Position Calibration. Jog the nozzle to the center of the calibration module, then save.
- **Auto leveling:** Tools > Control > Auto Leveling, with the bed heated.
- **Z-offset:** print a first-layer test and adjust the Z-offset until the line is slightly squished.
- Print a small test part.

12. If it still will not level or print

- Re-check the eccentric nuts and belts (sections 4 and 5). Anycubic attributes most leveling problems to loosened parts.
- Check the probing and offset switch area for dust (a community-reported fix for the Kobra 2 family; see [Anycubic Kobra 2 leveling issues fix](#)).
- Record the problem. If a part has failed, the printer may need a support ticket with Anycubic.

Afterwards

Record anything you found, what you did about it, and whether follow-up is needed. If the printer is not safe to use, tag it out of service: see **Shop Safety: Tagging a Tool Out of Service and Reporting It**.

Materials

Which materials are safe for the laser and other machines, and which are prohibited.

Laser-Safe and Prohibited Materials

Some materials are perfectly safe to laser. Others release toxic or corrosive gases, damage the machine, or catch fire easily. **If you cannot identify a material, do not put it in the laser.**

To be confirmed: the approved materials list for WMI's laser. What a laser can cut depends on its type and power, so check with a trainer before cutting anything not on that list.

Never laser these

Material	Why
PVC and vinyl (including vinyl sheet, many faux leathers, some foam boards and records)	Releases chlorine gas, which is toxic and corrodes the machine.
Anything containing chlorine	Same reason as PVC.
Polycarbonate (Lexan)	Catches fire and discolors rather than cutting cleanly.
ABS	Melts rather than cuts and gives off harmful fumes.
Fiberglass and carbon fiber	The resins give off harmful fumes.
Coated or mirrored materials you cannot identify	Coatings may contain any of the above.

Usually safe, if the machine is set up for it

These are commonly laser-cut or engraved. Ask your trainer which ones apply to our machine and what settings to use.

- Natural wood and plywood
- Paper and cardboard

- Cast acrylic
- Vegetable-tanned leather
- Natural fabrics such as cotton and felt

Whatever the material

- Never leave the laser unattended. See **Digital Fabrication: Laser Cutter**.
- Make sure the exhaust or filtration is running. See **Shop Safety: Air Quality**.