Laser Cutter
Camera Calibration
Thunder Nova 24 & Nova 51


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Camera

Thunder Laser Camera

- The primary use of the camera is to help you align your design to one or more workpieces.
- The camera superimposes an image of the laser bed in LightBurn, which allows you to align your design to match your workpiece(s).
- You should assume that the person before has changed settings and that you should test the current camera focus, calibration and alignment before starting. BUT you don't necessarily have to redo the setup every time. Only if the camera has been moved should the focus, calibration and alignment be necessary.
- If it isn't correctly calibrated, you need to go through the focus, calibration and alignment process using the wizards, which requires a printed sheet of paper and material to run the calibration on. Both should be in the space, instructions provided in this slide deck.
- If engraving a design, it can be helpful to make your engraving larger than the piece you are engraving on so that it still works even if you don't have to have the design lined up perfectly.
- Always use the "Frame" function prior to pressing Start to make sure your design is lined up to your material as perfectly as possible.
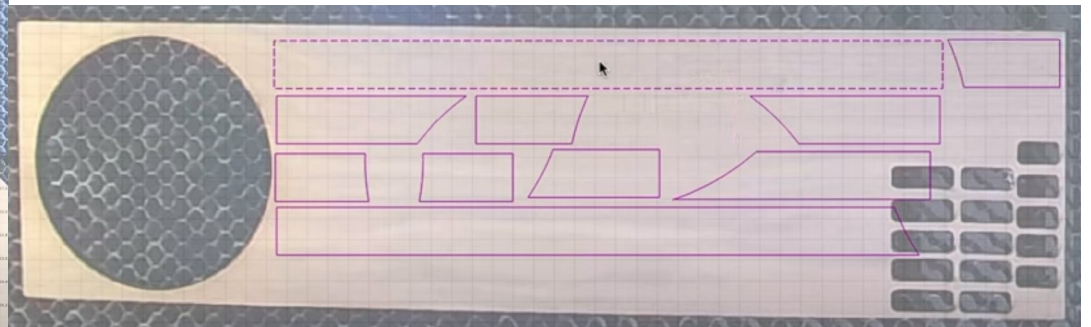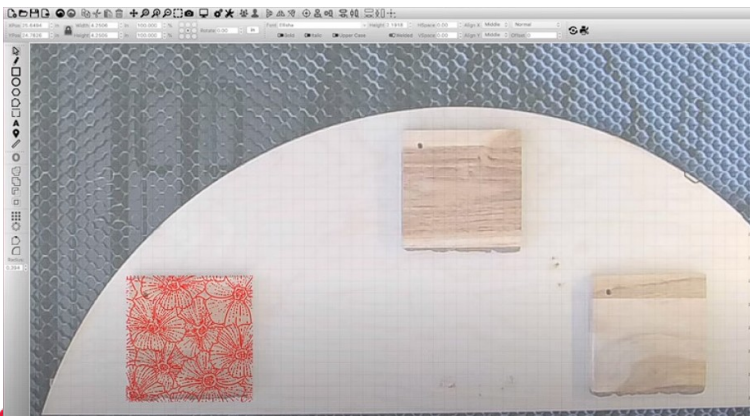
Camera Control Window

- The Camera Control Window does not always appear automatically in LightBurn. To open the Camera Control Window go to Window>Camera Control.
- If you don't see the Camera Control Window after the above, look for a tab on the right hand menu underneath where Cuts/Layers normally are.
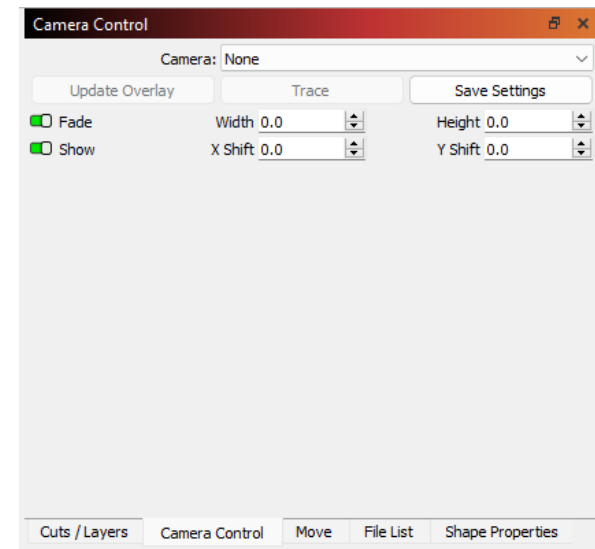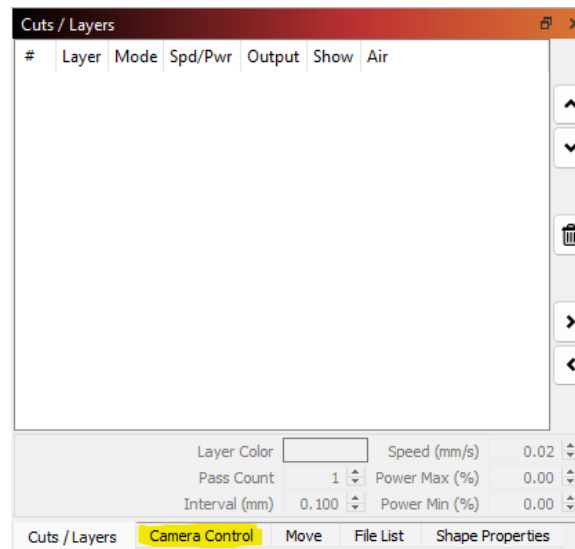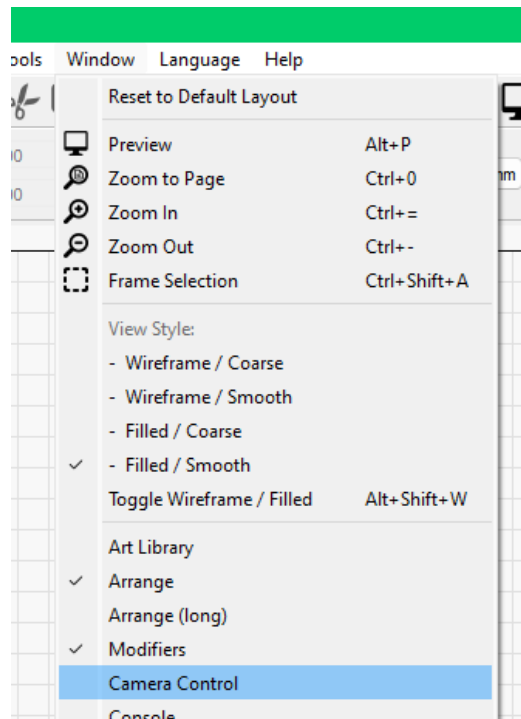
Checking Camera Calibration

Before completing the camera calibration steps, you can check whether or not the camera is already calibrated correctly by completing the following steps:

- Ensure the 2" lens is installed.
- Go to Window >Camera Control to show the Camera Control menu on the right side of the screen if it is not already there.
- Use the drop down list in the Camera Control window to select "Lightburn Camera".
- Right click on the Camera Control Window and click "Import Camera Settings".
- From the "Thunder Laser Default Preferences" folder on the desktop, import the file named "NOVAXX-Camera Calibration-YYYY-MM-DD" where XX is either 24 or 51, and YYYY-MM-DD will be the date the last calibration was completed. The same folder is on both machines.
- Place a square or rectangular piece of work material with known dimensions on the honeycomb.
- Focus the lens to your workpiece (height/Z). Leave the machine lid up.
- In the Camera Control Menu, click "Update Overlay". This will insert a picture of the laser bed into LightBurn.
- Draw a square/rectangle the same size as your workpiece.
- Move the square/rectangle to over top of the workpiece, so that it is aligned as closely as possible. If you move the workpiece, click "Update Overlay" to update the image.
- Use the "Frame" function and the laser will trace your square/rectangle, on the workpiece. Depending on your project, this does not have to trace absolutely perfectly.
- If you find that the frame accurately traced the outside edge of your square/rectangle, workpiece, the camera calibration and alignment are correct and you can start your project.
- If you find that the imported camera settings are close but you want to dial them in closer, complete the camera focus, calibration and alignment steps below.
- If you find that the imported camera settings are way off, complete the calibration and alignment steps below and inform the laser stewards.

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Focusing the Camera

- In the Camera Control Window on the right side, select the LightBurn Camera and then un-dock the Camera Control Window and enlarge it so that you have a large image window on your screen.
- Ensure the 2" lens is installed. Raise the head/lense/nozzle all the way up.
- Autofocus the bed with nothing on the bed, so that the honeycomb is the surface it auto focuses to.
- Place the eye chart print out on the bed.
- Turn off Auto Exposure on the camera control window.
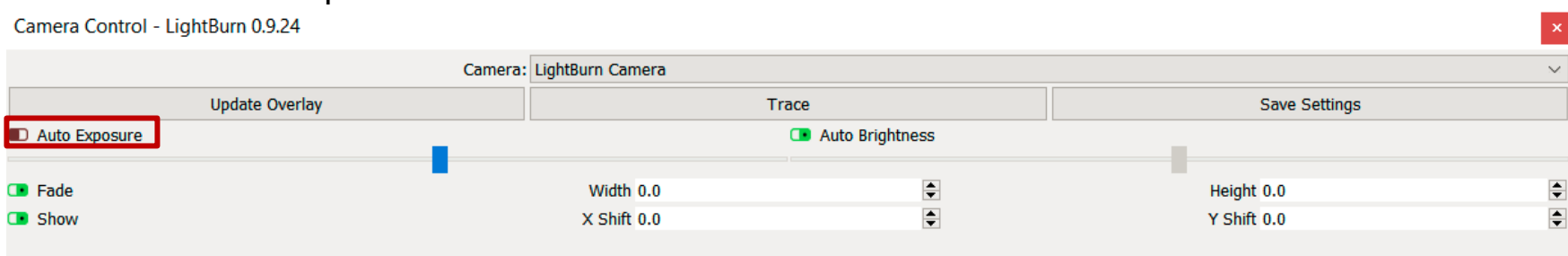
- Adjust the focus by turning the black protruding lens on the camera in small steps until the most crisp image is achieved. It never gets crystal clear, just go for the clearest setting.
- Turn Auto Exposure back on.
- The camera is now focused.
- Link to instructions with additional photos.
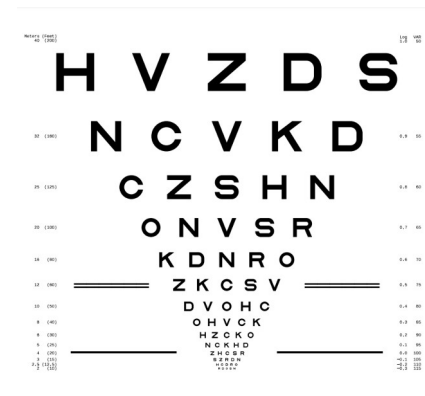
Auto Calibrating the Camera

- LightBurn has step-by-step camera calibration and alignment wizards.
- Go to Laser Tools > Calibrate Camera Lens in LightBurn
- You can skip calibration by using a preset:
  - NOVA 24 Purcellville - Standard Lens - 8MP-W-85
  - NOVA 51 Leesburg - Fisheye Lens - 8MP-W-120
- If you choose this, you will proceed directly to Camera Alignment.
- LightBurn says that calibrating the lens manually may provide a more accurate calibration. The accuracy required will vary depending on your use case.
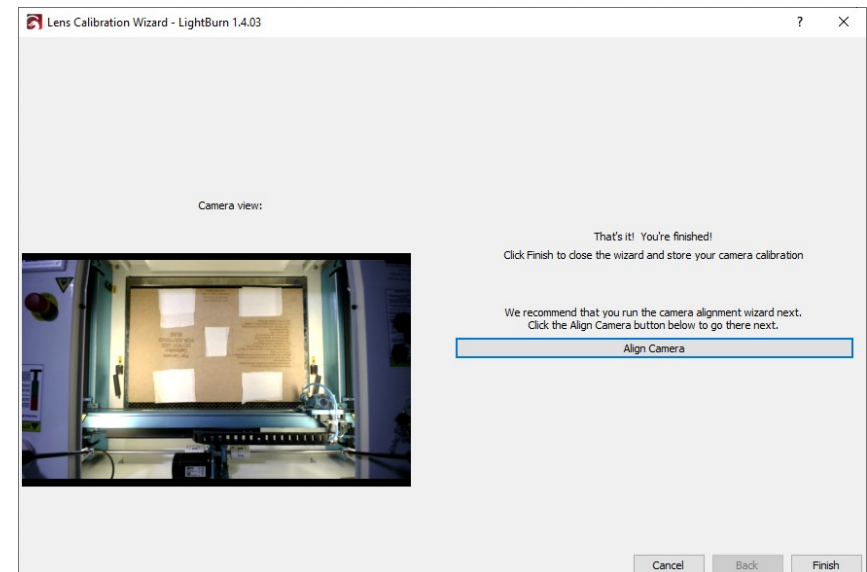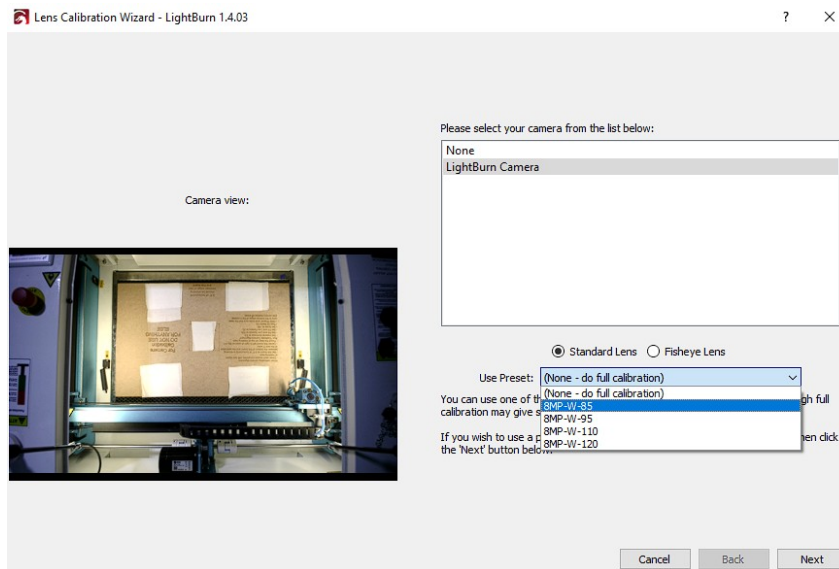
Manually Calibrating the Camera

- You will need a printed copy of the calibration page, which is a dot pattern. There should be a printed copy in each space, but if you can't find it, print this: https://raw.githubusercontent.com/LightBurnSoftware/Documentation/master/img/Camera/Calibration-Circles.png
- Put one or more pieces of blank material down to cover the entire honeycomb. There are pieces of hardboard in both locations for this. In Purcellville, you can use the back side of the camera alignment template. In Leesburg, there are two pieces of hardboard available. Use brown craft paper to cover the remainder of the honeycomb as necessary.
- Go to Laser Tools > Calibrate Camera Lens in LightBurn
- Select "Standard Lens" if using the NOVA24 in Purcellville or "Fisheye Lens" if using the NOVA51 in Leesburg
- Set "Use Preset" to "(None - do full calibration)" and click Next.
- Check that the slider next to "Honeycomb check enabled" is enabled/green.
- The wizard will show you where to put the calibration page relative to the bed. Once you have placed the calibration page in the location indicated by the wizard, press "Capture". Follow the instructions in the upper right corner of the wizard which say you should get a score of less than 0.3 to proceed.
- If you get a high score or the pattern cannot be found, make sure all of the honeycomb is covered, and move the paper slightly so it is closer to where the sample picture shows it should be.
- Once you have placed the calibration page in all locations and gotten a score of less than 0.3, the wizard will tell you that you have successfully completed calibration and will move on to alignment.
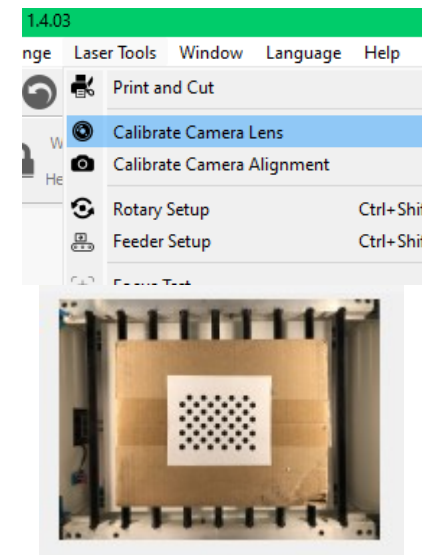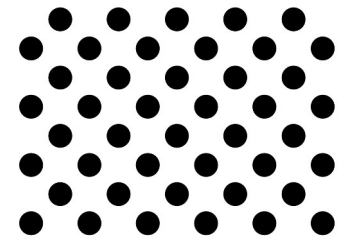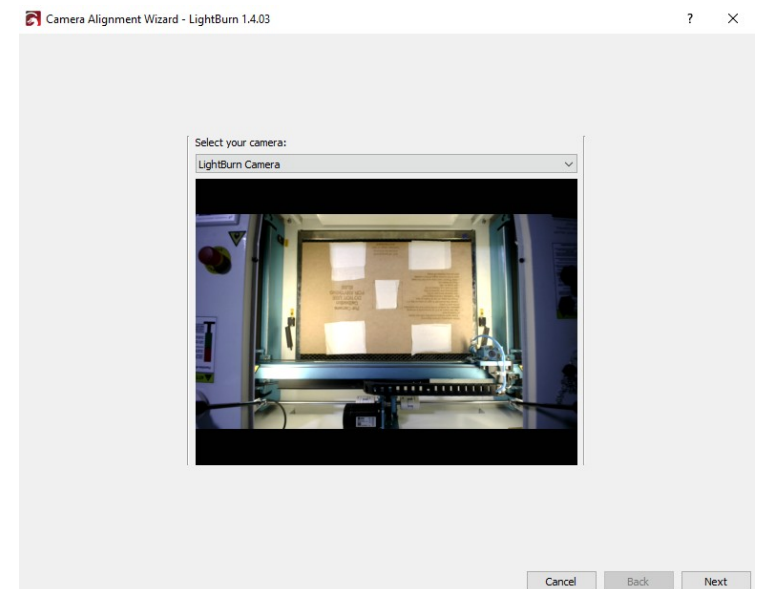
Camera Alignment

- The alignment wizard requires a piece of material to cut a test pattern into.
- Go to Laser Tools > Calibrate Camera Alignment if you didn't go there automatically after calibrating the camera lens.
- Choose "Camera is over the work area, in a fixed position."
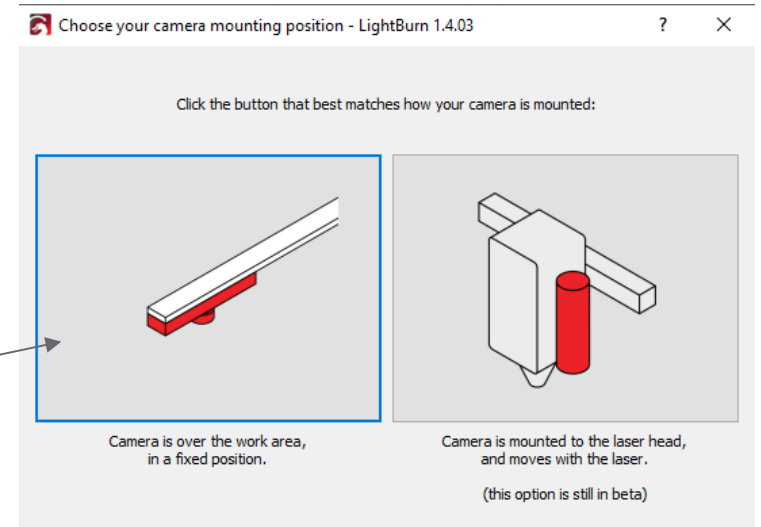
- Select "LightBurn Camera". You will see a picture of the laser bed. Press "Next".

Camera Alignment - Your Material

- The larger your alignment material the better.
- Ensure the 2" lens is installed and raised all the way up.
- Place your material and focus the lens to your material.
- Set the "Material Thickness" to the thickness of your material.
- Set the line and fill speed and power relative to the material you are using for the alignment process. These should be engraving power/speed settings.
- "Scale" refers to how far apart the alignment registration marks will be made. Make it as large as your material can accommodate. The larger the more accurately you can align the camera.
- Click the "Frame" button to outline the test pattern to make sure it is as large as possible and aligned to your material.
- When ready (compressor on, exhaust on, etc.) press Start to engrave the alignment jig.
- After engraving, DO NOT MOVE THE ALIGNMENT JIG!
- When the jig is done engraving, press "Next".
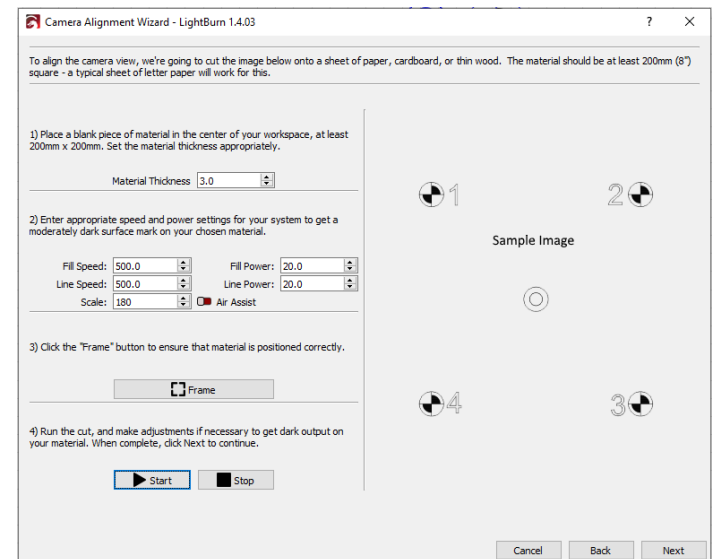
Camera Alignment - Makersmiths Template

- If you are using the provided alignment material, place two layers of masking tape over each square (5 of them) as indicated on the template.
- Set the speed, power and scale settings as they are printed on the template. These vary between the NOVA24 and NOVA51.
- Place your material on the work surface in the location per the instructions printed on the template. The location varies between the NOVA24 and NOVA51.
- Install the 2" lens and raise it all the way up.
- Focus the lens to the template.
- Click the "Frame" button. If aligned correctly, the laser should frame on the outside edges of the masking tape covered areas in the four corners.
- When ready (compressor on, exhaust on, etc.) press Start to engrave the alignment jig.
- DO NOT MOVE THE ALIGNMENT JIG AFTER ENGRAVING!
- When the jig is done engraving, press "Next".
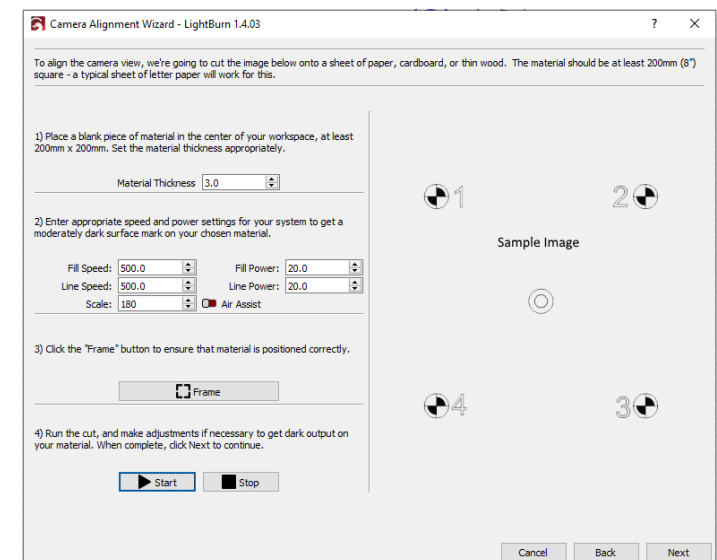
Camera Alignment

- Lift the lid of the laser.
- Click "Capture Image" on the left side of the wizard screen. You will get an image of the bed. It should show the whole bed, like the image provided on the bottom left of this slide.
- Click "Next"
- There are instructions on the top of this screen.
- You will left click and drag, and use the mouse scroll wheel to zoom in on the "1", then the "2" etc., clicking on the center of the registration mark each time until all four are complete. You will see a small red crosshair. If you click in the wrong location, you can either click again in the right location, or press "Undo Last" in the upper right corner to remove the last crosshair.
- Once you have added all of the crosshairs, click "Next" again and you have completed alignment.
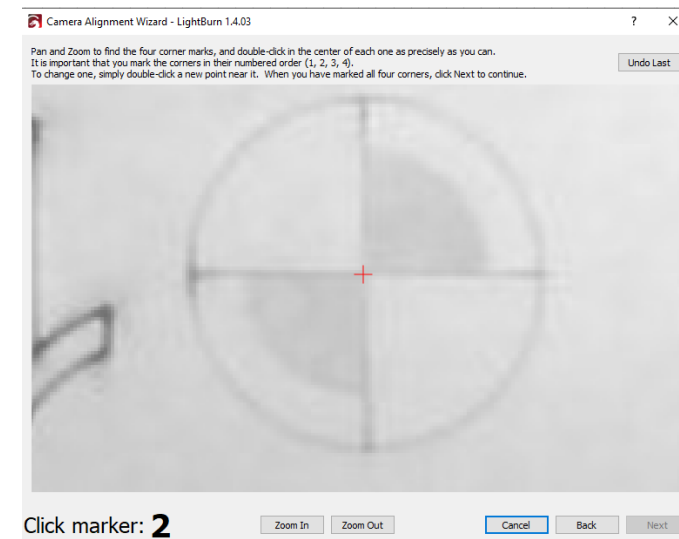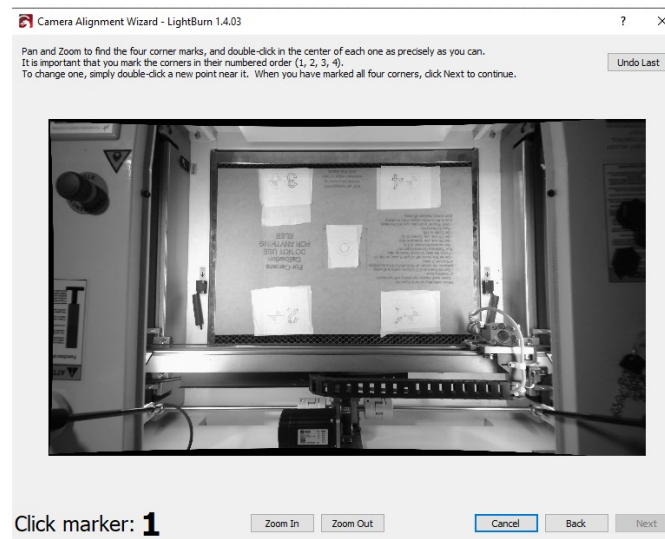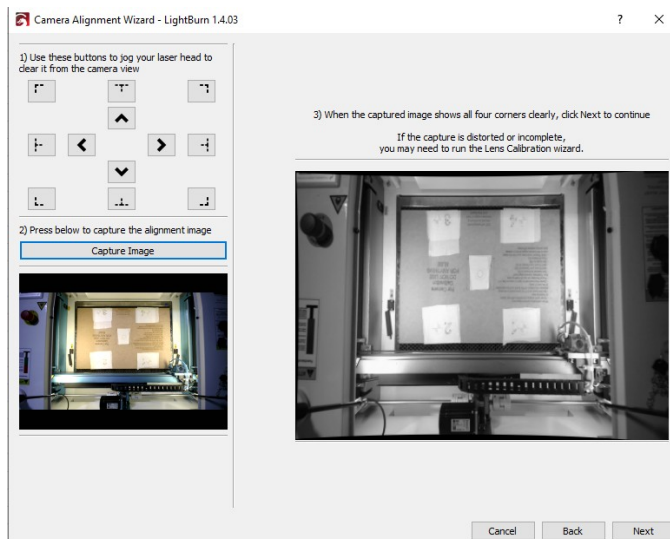
Using the Camera

- Once the camera is calibrated and aligned, you can use it to project an image of the bed into LightBurn and align your design to your work material.
- Using the camera forces you to use "Absolute Coordinates" as your "Start From" position.
- Place your work material on the bed and focus the 2" lens to it.
- Go to Window >Camera Control to show the Camera Control menu on the right side of the screen if it is not already there.
- Click "Update Overlay" in the Camera Control menu. This will update the workspace in LightBurn to include a picture taken by the camera.
- Move and size your artwork as necessary to align to your workpiece.
- Carry out the normal project review - check speed/power/interval etc. settings, turn on compressor and extractor as usual, etc.
- Press "Frame", either the square or circle version, to validate that your engrave/cut will be in the right place on your work piece.
- Press "Start" to run your project.