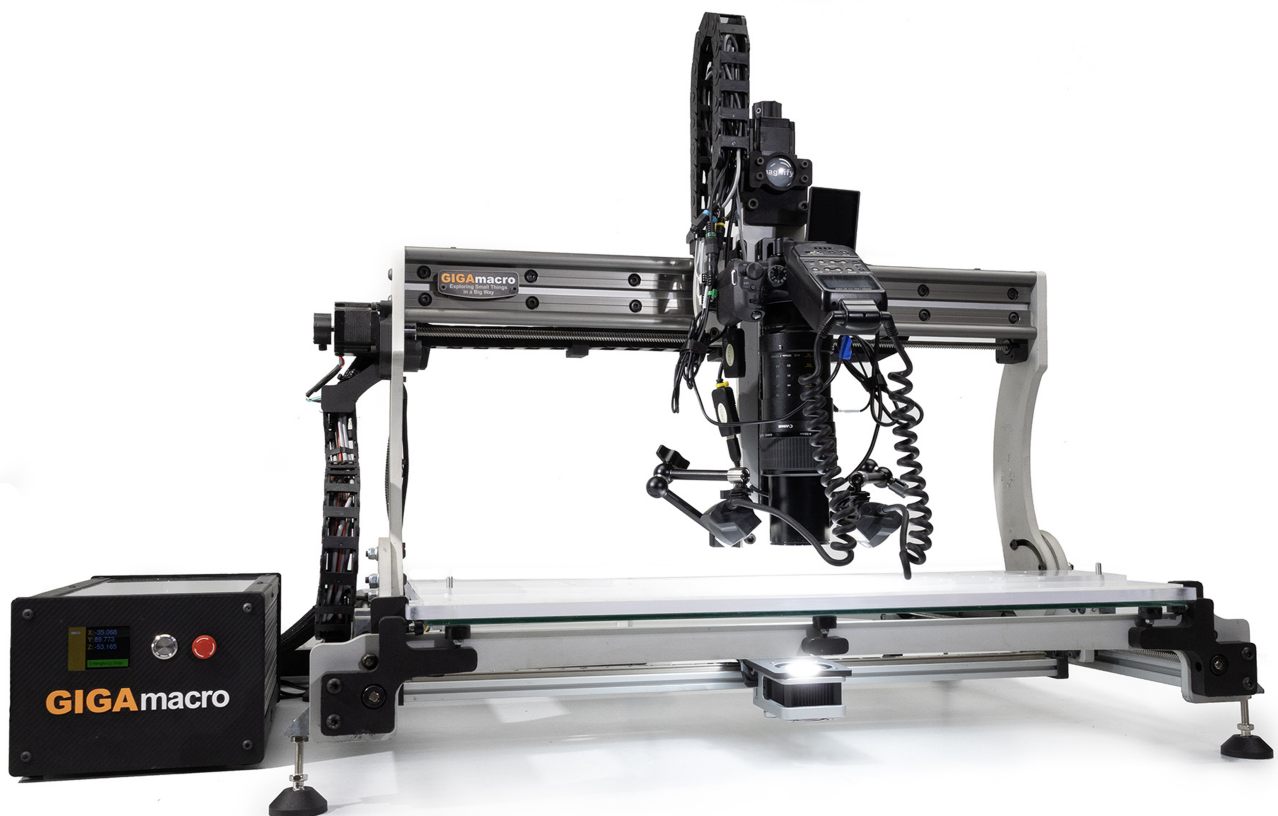


GIGAmacro Magnify2 Operation & Workflow Guide

GIGAmacro™ **Exploring Small Things in a BIG Way**



magnify²

Operation & Workflow Guide

Published by: GIGAmacro, 128 Ebbetts Pass Road, Vallejo, CA 94589, USA
+1 415 841 3322 (Pacific time zone)

Author: Graham Bird / Gene Cooper

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Suggestions, improvements and updates to: web@gigamacro.com>

TIP

Tips and hints are indicated like this.

WARNING

Warnings are indicated like this.

! IMPORTANT

Critical or important items are indicated like this.

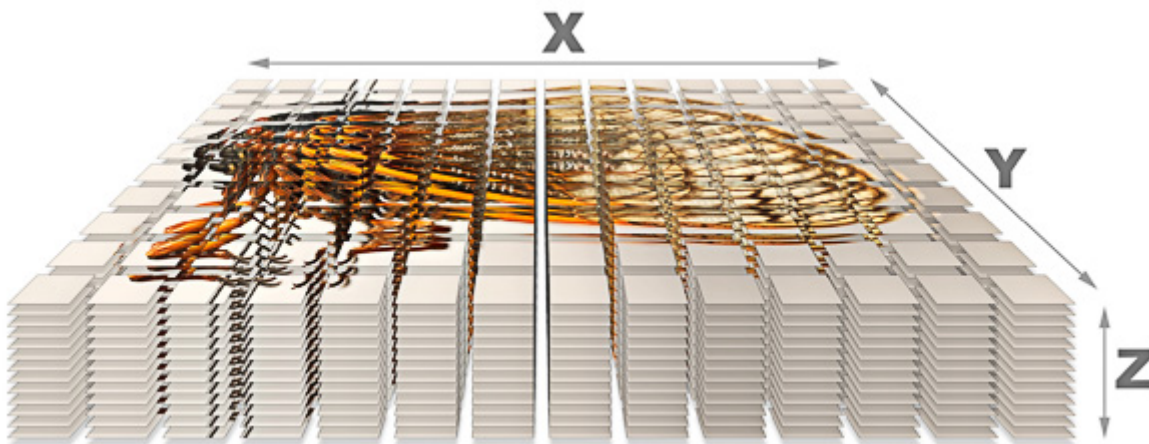
Introduction

The GIGAmacro Magnify² makes it easier than ever to produce your own gigapixel macro images of a subject or specimen. We have simplified and streamlined the production workflow, though producing the very best image requires practice, skill and attention to detail.

We recommend that you become thoroughly familiar with the hardware and operations and study the user guides for both [Zerene Stacker](#) and [PTGui](#) and try a few practice runs before starting important work.

How to make GIGAmacro Images

Gigapixel macro images are constructed from many hundreds, or more often, thousands of individual photographs. These photographs are captured using the Magnify² and then digitally combined to create a seamless gigapixel image. In this process, you will digitally combine the photographs using the "Stack & Stitch" methodology. First you will "stack" the individual photographs from each XY location to increase the depth of field and then "stitch" the resulting composite images together to create an ultra-high resolution, deep-focus image.



Focus Stacking

Focus stacking is a technique which combines multiple photos taken at different focus distances to give a resulting image with a greater depth of field.

We use [Zerene Stacker](#), one of the best focus stacking software packages available, in the Magnify² system.

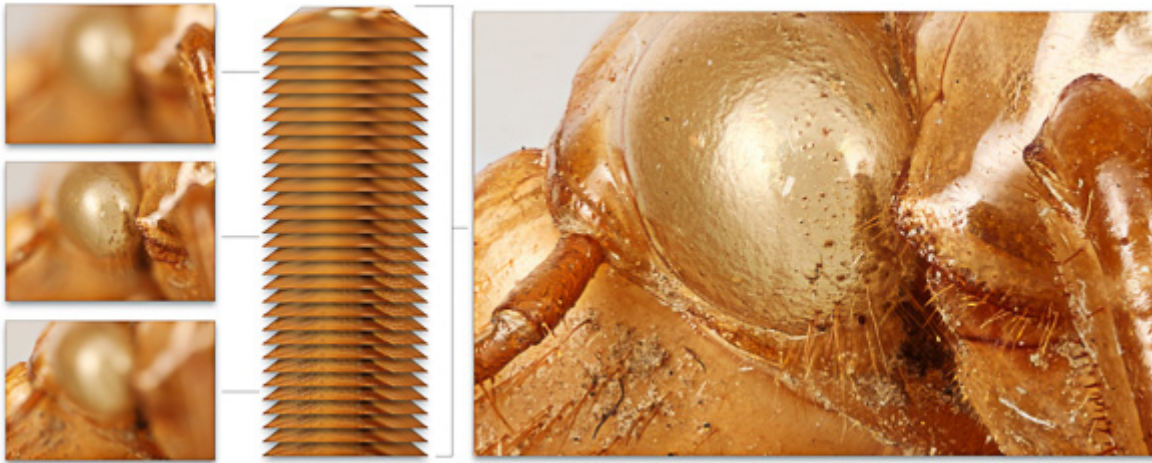


Image Stitching

Image stitching or photo stitching is the process of combining multiple photographic images with overlapping fields of view to produce a segmented panorama or high-resolution image. PTGui is one of the most advanced and powerful professional stitching software packages available. [PTGui](#) is included with the GIGAMacro Magnify2 system.



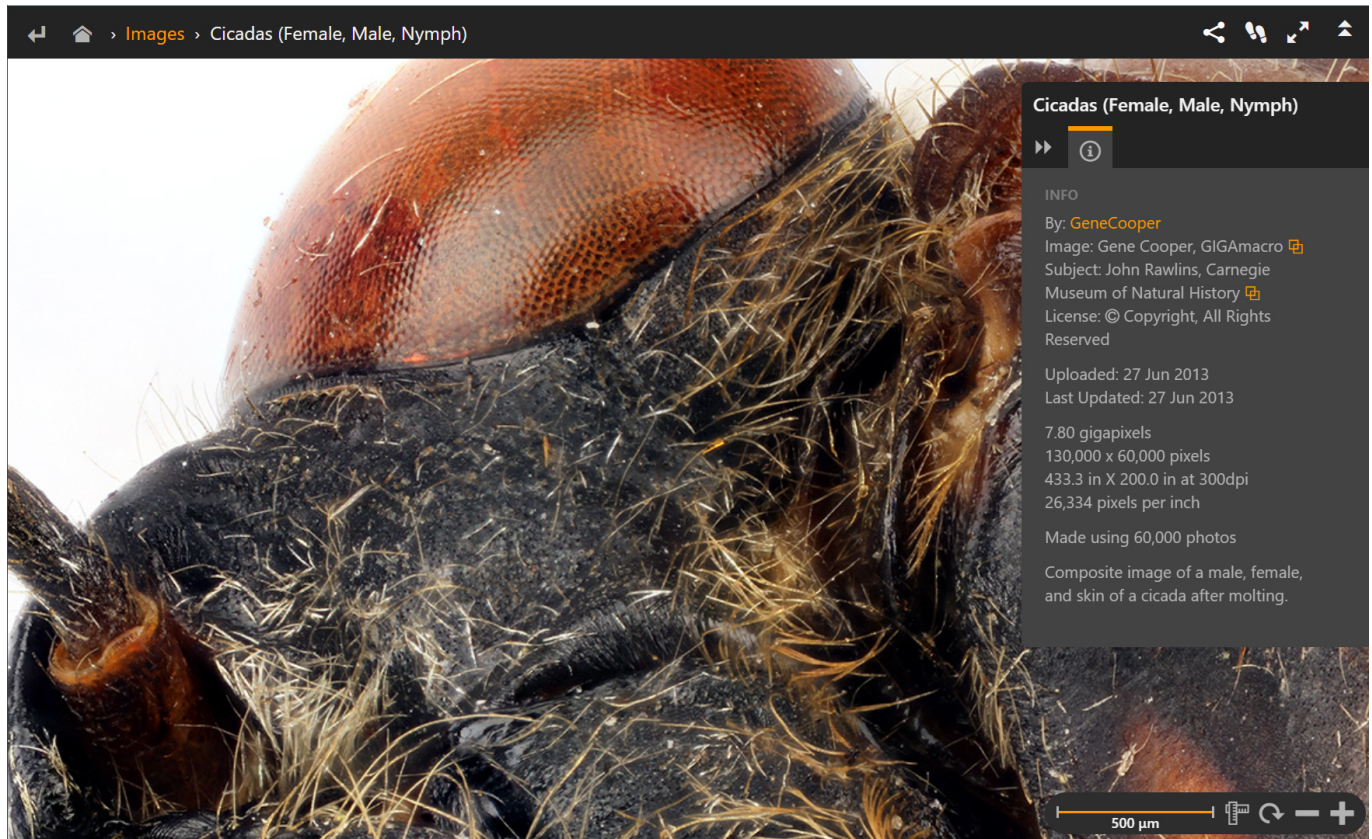
Viewing Images

The final GIGAMacro image can be explored using the GIGAMacro Viewer, which has been designed specifically for gigapixel imagery.

GIGAMacro Viewer makes use of tiled-image viewing technology, similar to that used in mapping web sites. This technology allows for extremely large images to be viewed online in a browser on any computer or mobile device that is connected to the internet.

The GIGAMacro Viewer can be used for sharing, analyzing, and comparing multiple GIGAMacro images. It is specifically designed for high-resolution macro and micro photography.

You can upload images for free to our online viewer at <https://viewer.gigamacro.com/>

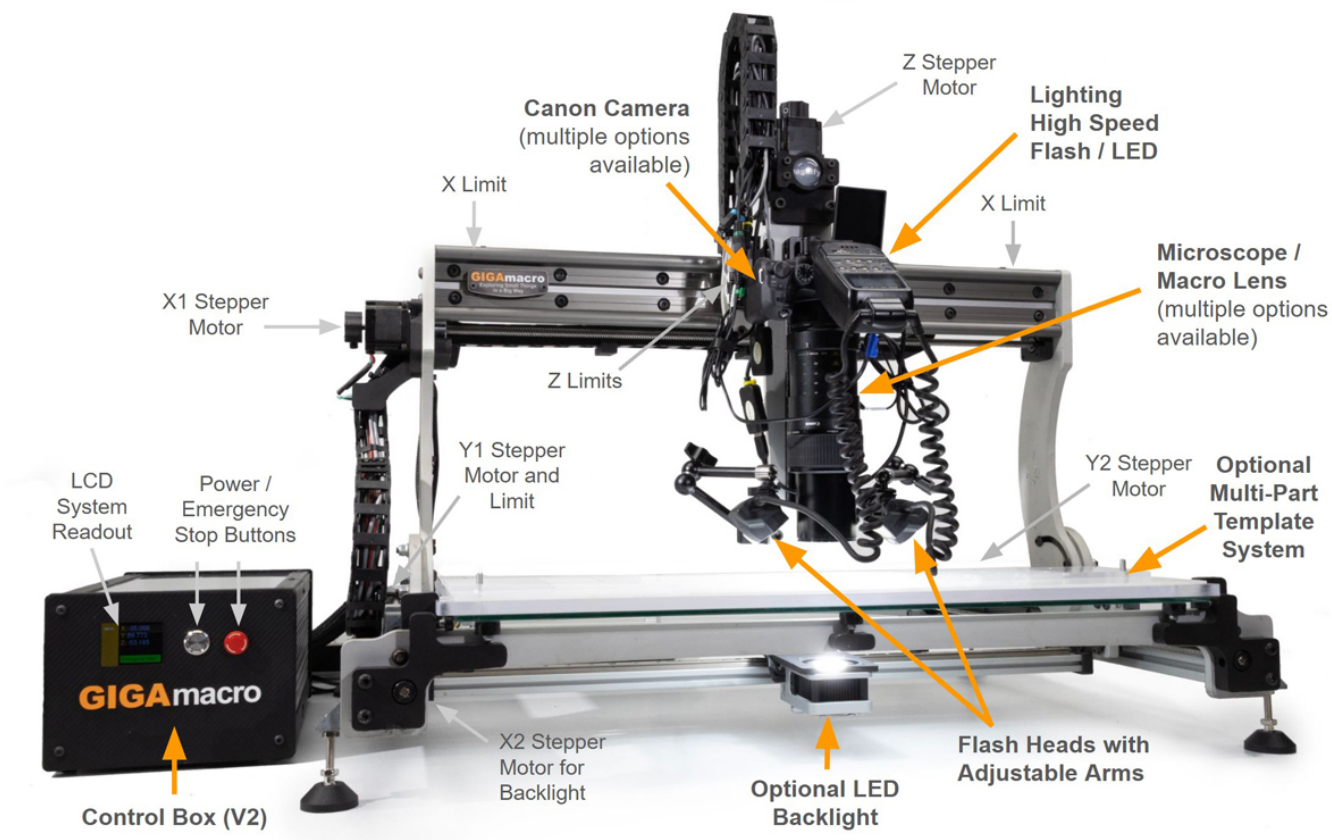


Using the GIGAMacro Viewer you can:

- Use the GIGAMacro Viewer in demonstration mode to show images automatically
- Use GIGAMacro images in your exhibits and/or your curriculum
- Make side-by-side comparisons
- Link GIGAMacro images together for synchronized movement
- Make layered comparisons of two images in "x-ray" mode
- Take measurements on an image
- Flip GIGAMacro images vertically or horizontally
- View in fullscreen mode
- Use and view GIGAMacro images on your own intranet or on internet website or cloud service
- Load GIGAMacro images from your local hard drive or cloud storage
- Load gigapixel images from a Zoomify or Gigapan tileset. Comments and notation ncan be added to Zoomify or Gigapan images in the GIGAMacro Viewer

Getting to Know Magnify²

The complete Magnify² consists of a Control Box, robotic camera rig, computer, camera(s), lens, and LCD screen. Specific parts of the Magnify² are labeled in the diagram below.

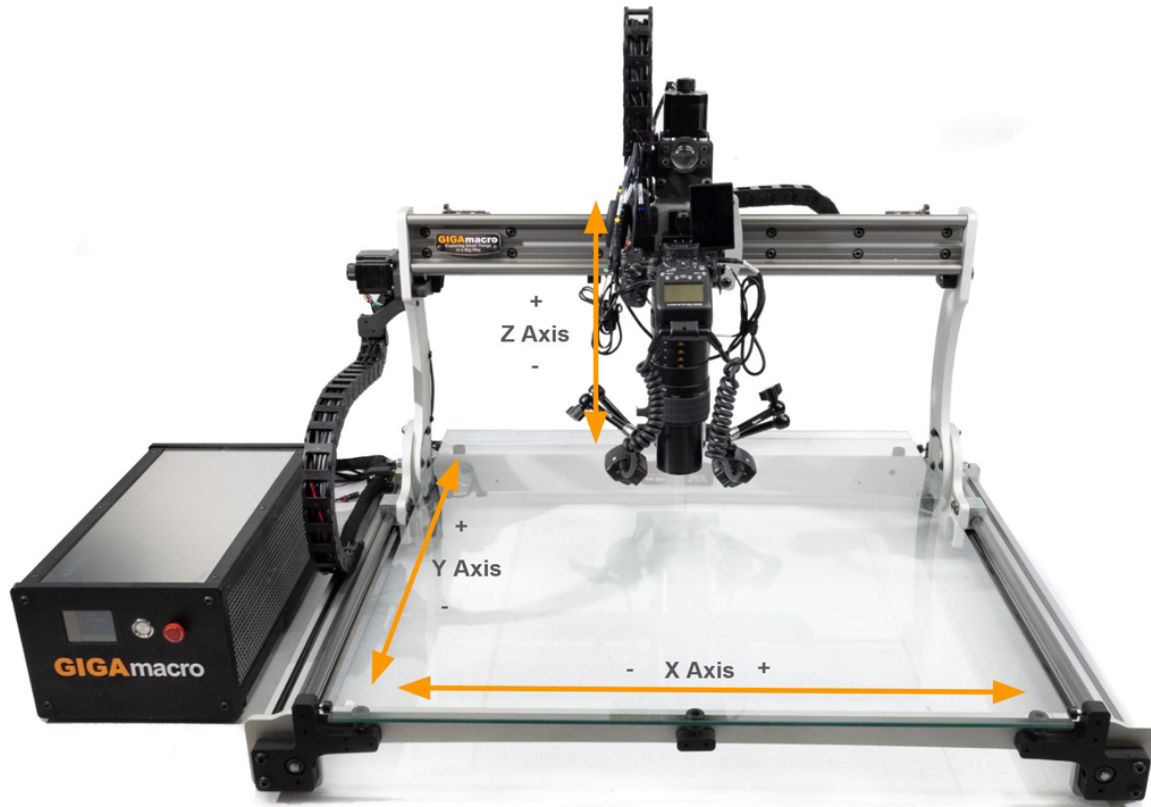


⚠ WARNING

It's important that you become familiar with the operation of the machine before using it.

Axis of Movement Overview

The Magnify² has three axes of movement: the X axis is left to right; the Y axis is back to front (labeled in GIGAmacro Capture as 'Top' and 'Bottom' respectively); and the Z axis, which moves the camera assembly, is labeled in the GIGAmacro Capture application as "High" and "Low".



! IMPORTANT

Even though there are limit switches on each axis that prevent movement beyond the specified range, it is possible to mount the camera **BELOW** the range limit on the Z axis. This means that a subject on the scanning table, or the scanning table itself, could be damaged if the camera is driven too far down. Take extreme care with positioning and the “LOW” control!

Control Box Overview

The Control Box is the main interface between the computer / software and the system. The Control Box should be located in a position that is convenient for quick access to the power switch and the red Emergency Stop button. The control box provides the following:

- Power to the camera, flash, optional backlight
- Power and control of the motors
- Sensing of limit switches
- Camera cable release trigger activation
- Emergency stop button
 - Pressing this immediately stops all movement of the rig.
 - Rotate the button clockwise to reset the emergency stop.
- Main power button
- LCD panel for feedback on system status



Camera Overview

The system is compatible with Canon DSLR and mirrorless cameras. Each camera is fitted with a custom power adapter to allow the system to turn the camera on and off automatically. The camera is pre-configured with the settings which are important for automated operation.

- Camera mode dial set to M (Manual Mode)
- Camera power switch is in the ON position
- Auto power off / power saving is disabled.
- Release shutter without card is enabled.
- For some lenses (such as Nikon Telecentric lenses), "Release shutter without lens" must be enabled as the lens does not communicate with the camera.

Lens Overview

A variety of Canon compatible lenses can be used with the system. The GIGAmacro capture software has presets for the most commonly used lenses. Below is a short list of the lenses typically recommended.

- Canon MPE 65mm. Magnification Range 1X to 5X. Overall well rounded and standard macro lens.
- Canon RF100mm. Magnification Range 0.1X to 1X. Excellent for large subjects
- Nikon TM Series Telecentric Lenses. Magnification Options 1X, 3X, 5X, & 10X. Excellent for non planar subjects, eliminate parallax error, and provides the highest quality imagery for accurate stitching
- Laowra 100mm Lens. Magnification 2X. Excellent alternate to Canon MPE65mm
- Laowra 25mm Lens. Magnification Range 2.5X to 5X. Excellent alternative to Canon MPE65mm

! IMPORTANT

When using the Canon MPE65mm lens, the lens barrel rotates to adjust the magnification. Over time, the barrel can drift and rotate out of the desired magnification setting. We recommend a piece of tape across the barrel to prevent drifting.

Lighting Overview

Flash based lighting (Canon MT-26EX) is provided with the system. The dual head flash allows for adjustment of lighting angles, high degree of adjustability of the light power, and a short burst of light which helps eliminate the effects of vibration on the photographs. A LED backlight option is available for lighting underneath the subject (transmissive) such as for microscope slides, geology thin sections, etc.

Canon MT26EX Flash Settings for GIGAmacro



Power Setting

1/16 or less

Use dial and SEL button to change power setting. This allows for a quick recharge of the flash between photos and reduces heat.

Manual Mode

Press Mode Button to Switch between ETTL and Manual

Additional Settings if Configuring a New Flash Unit (Custom Functions)

Press CFn Button to Change

1. Turn off Power Savings Mode
2. Turn off Beep / Sound

Software Overview

The system comes with the following software pre-configured and tested:

- DSLR Remote Pro: Used by Capture to communicate with the camera
- GIGAmacro Capture: The main software for setting up and capturing photos. Communicates with DSLR Remote Pro and the GIGAmacro Control Box.
- GIGAmacro Flow: Post processing software to manage and automate the processing of the imagery. Interfaces with the following programs that are installed on the standard system.

- Zerene Stacker: primary focus stacking software
- PT Gui: primary image stitching software
- Krpano: provides option to prepare the final images for viewing online
- AutopanoGiga: Alternate software for stitching.

! IMPORTANT

License information and keys for DSLR Remote Pro, Zerene, Pt Gui, AutopanoGiga and Krpano are stored on the computer in the following directory: C:\gigamacro\licenses. GIGAMacro Capture and Flow do not require license keys to run.

Workflow Overview

The workflow below may look, at first glance, a little forbidding! However a little familiarity and practice will enable you to quickly and accurately set up the system and produce gorgeous images.

There are three stages; **SETUP**, **CAPTURE**, and **PROCESSING** detailed below.

The longest part of the process by far is fully automated. The capture can take a few minutes or many hours, depending on subject size and final resolution, but the system can be left unattended to complete that task after setup. Stacking the images can also take time, but again the batch processing can run unattended once setup.

This guide assumes that the capture and the post-capture processing all take place on a single computer. However, especially in a high workload situation, it may be desirable, or even necessary, to have a second (optional) computer system to perform post-capture processing. We can advise you on the specification for such a system if required.

Setup Overview

- Start the GIGAMacro Capture program and DSLR Remote Pro
- Select the subject or specimen(s) to be photographed
- Prepare subjects for photography - this will vary depending on the type of object, its size, the number (you may choose to "template" multiple specimens), the background (neutral grey, white, black, or just glass).
- Decide on the resolution you want for your final image - remember high resolution images mean more photos, and smaller objects at high resolution means the largest number of photos.
- Check the camera, lens settings, and flash settings
- Position the subject, secure it if necessary

💡 TIP

Templates are available for a wide range of subjects such as microscope slides, geological thin sections, insects, etc. or custom templates can be custom built to your needs.

Capture Overview

- Set the capture parameters in GIGAMacro Capture for each specimen you want to photograph:
 - project name and additional metadata
 - lens magnification, field of view, and depth of field
 - boundaries
 - final exposure settings
- Adjust the lighting
- Make test exposure(s)
- Run the capture

Processing Overview

- Open GIGAMacro Flow software
- Select the Project(s) you want to process. Multiple Projects can be run in a batch.
- Select the presets / operations you want to run such as stacking, stitching, etc.
- Run the processing batch.

- Optional: Cleanup image in an editing program of your choice (for example Photoshop), if required

The Capture Process

Power Up the System: (power down in reverse order)

- Turn on mains power at the power strip
- Turn on the computer and screen
- Turn on the power switch on the Control Box
- Adjust the flash settings to M (Manual Mode) and adjust the power setting to 1/16 power or less (such as 1/32, 1/64, etc.)

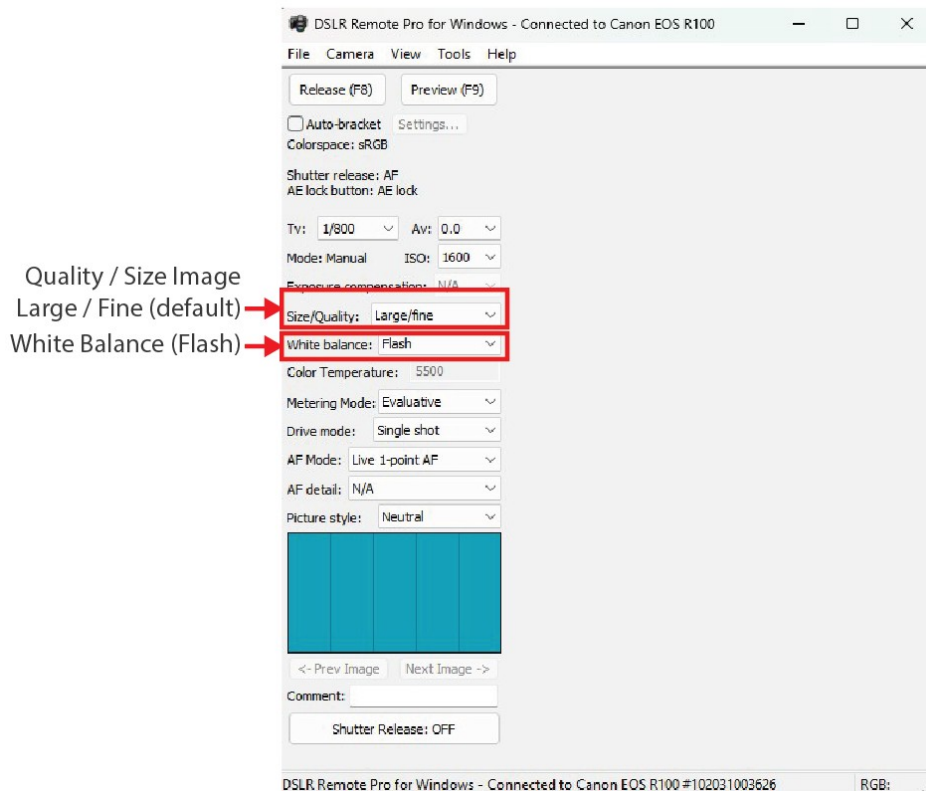
Launch Capture Software

The capture process uses two software packages that work in conjunction with each other:

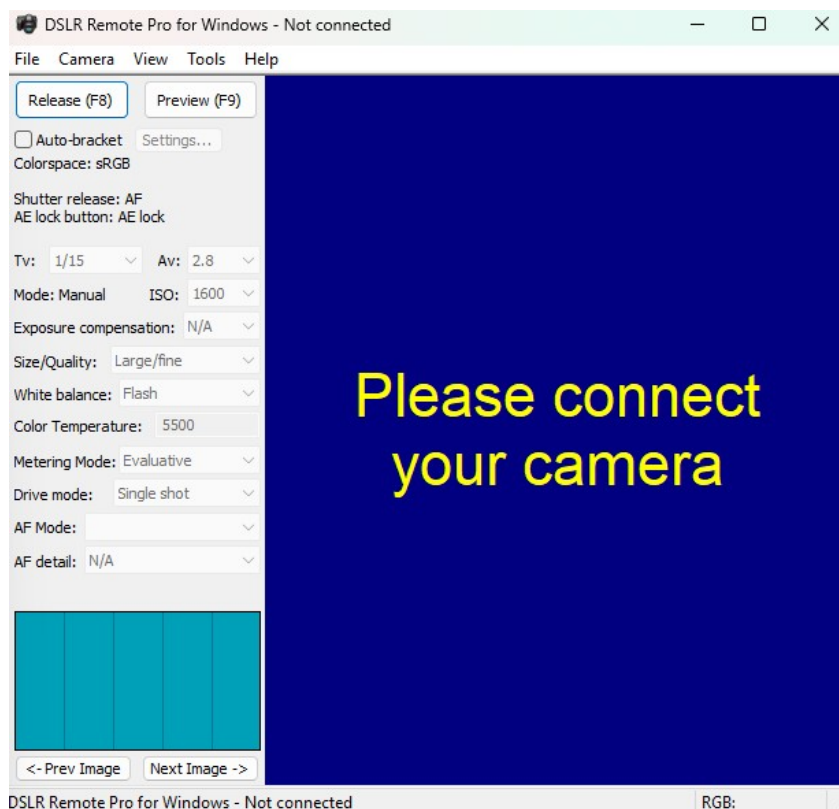
- DSLR Remote Pro (for camera control)
 - Click on the DSLR Remote Pro icon in the Windows Taskbar (see diagram below). The camera will show as "connected" at the top of the window once the application is open (if it doesn't show "connected" see the troubleshooting Appendix).
- GIGAMacro Capture
 - GIGAMacro Capture communicates both with the camera via DSLR Remote Pro and also manages positioning of the camera system on the rig in three-dimensional space.
 - Launch GIGAMacro Capture using shortcut on the desktop.

DSLR Remote Pro

GIGAMacro Capture controls the shutter speed, aperture, ISO, and location to save the images. However, the quality and white balance are set manually in DSLR Remote Pro. This setting is "sticky" and should only need updating if you wish to change the setting. See the diagram below.



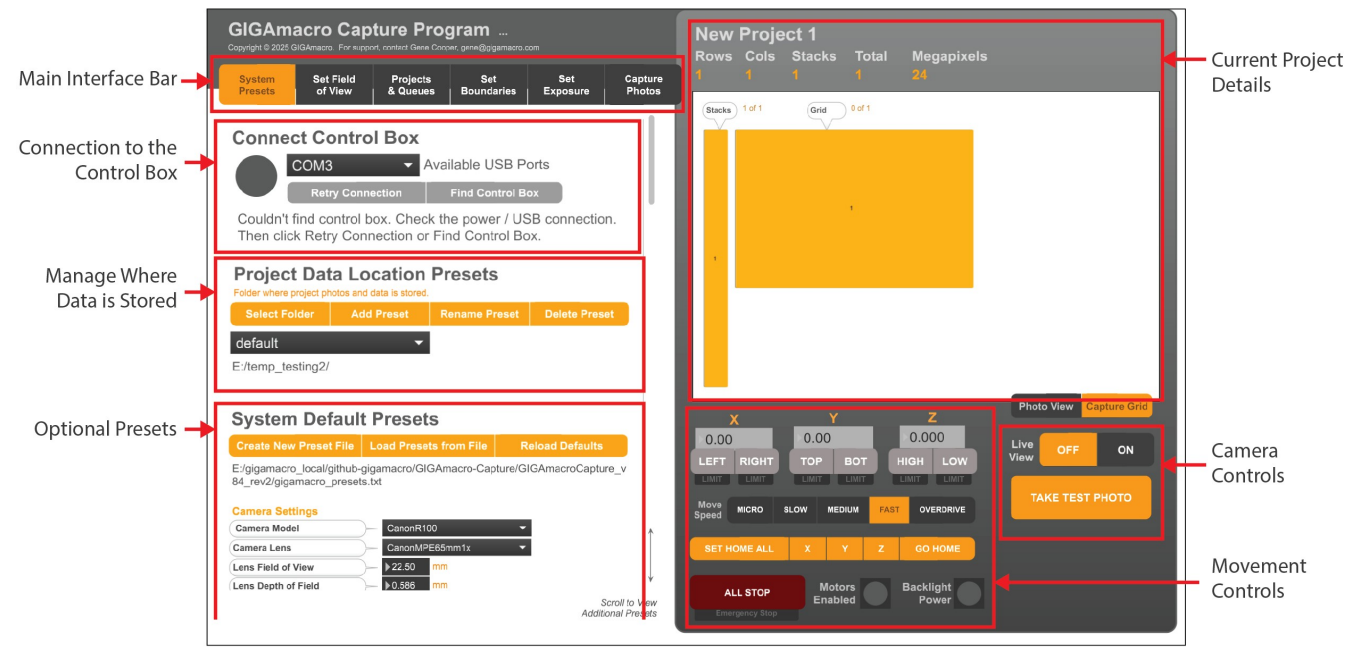
In the event that the camera does not connect a message appears.



This could be due to one of the following reasons:

- The usb cable (from the system cable harness marked yellow) is not plugged into the computer.
- The camera is not turned on.
- The control box is not turned on.
- The capture software is not connected to the control box.

GIGAmacro Capture Overview Diagram

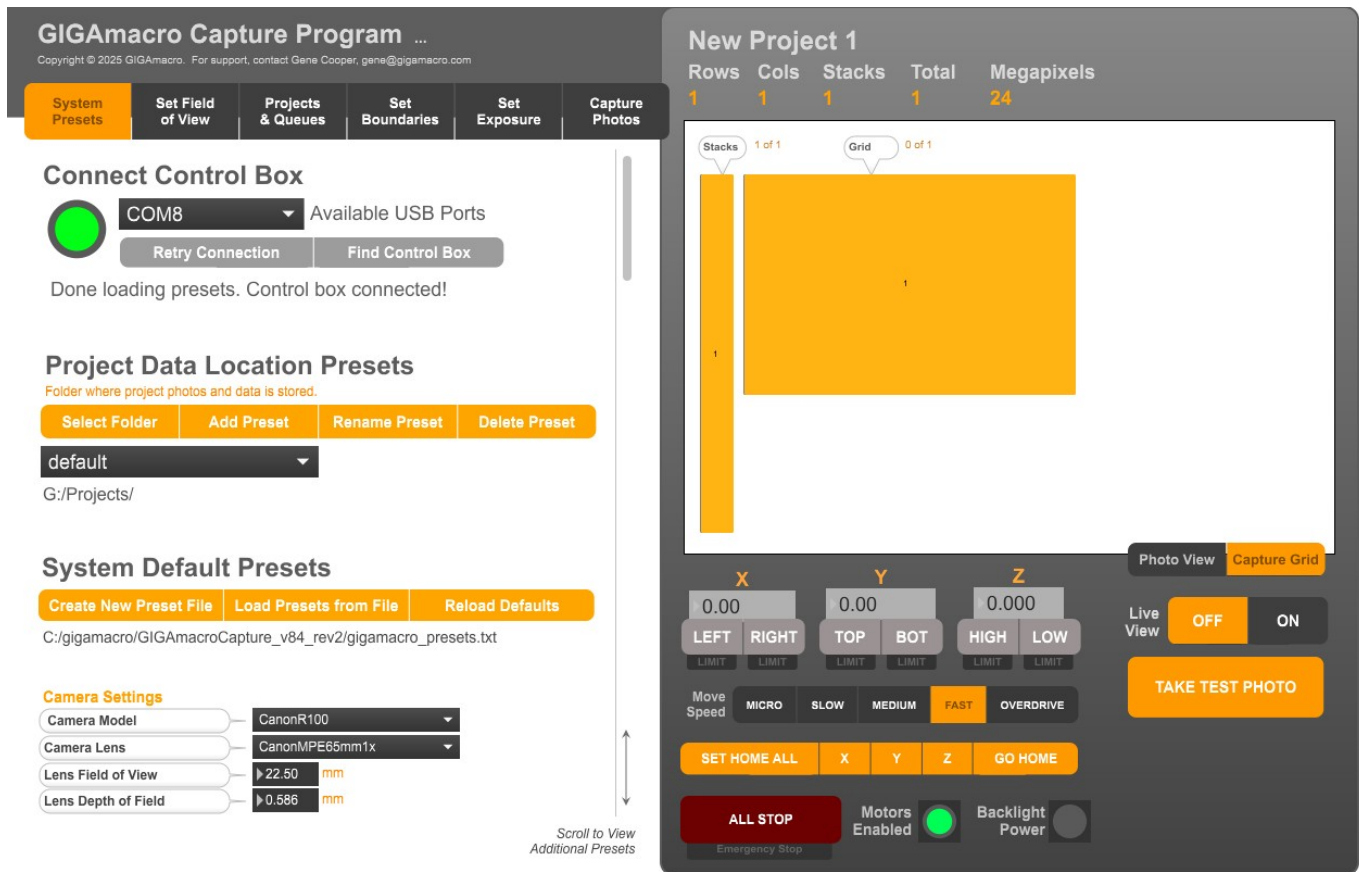


TIP

You can explore the GIGAmacro Capture screens and settings without being connected to the Magnify²: simply press the “Start Imaging” button and explore.

The System Presets Tab

Once GIGAmacro Capture is open, it will attempt to automatically connect to the control box. If successful, it will load the presets to the control box and the capture screen should show a green status.



If no connection or movement is possible, check all cables and repeat the process. In some cases, you can unplug the USB cable, wait 10-15 seconds, then plug the cable back in to reset the connection if necessary.

In the System Presets Tab you can also change the location of where data is stored and choose to adjust a variety of presets. When you change these presets, they are automatically saved. The most common presets that you may wish to customize are:

- camera model and lens
- exposure settings
- basic capture settings such as high speed mode, etc.

⚠ WARNING

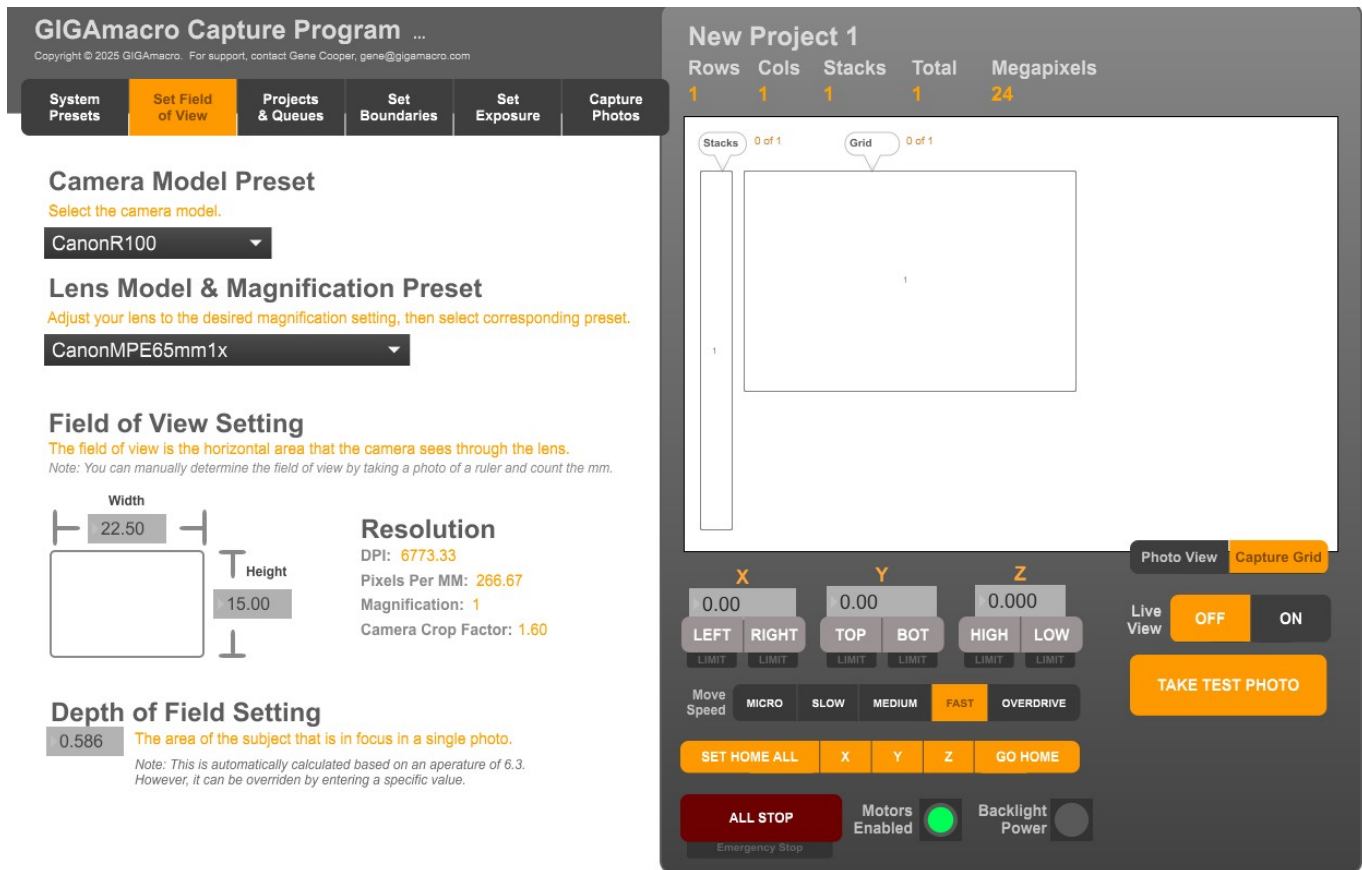
If you are not sure what specific presets do, please reach out to us for support.

The Set Field of View Tab

The next step is to set the camera, lens, field of view, and depth of field settings. This will determine the overall resolution and magnification of the final imagery.

Presets are provided for the most common cameras and lenses. When using the presets, the field of view and depth of field are automatically calculated. However, you can override this setting manually such as in the case where you want to use a very specific lens magnification that doesn't have a preset such as 1.3X for example.

- If setting the field of view manually, the best process is to simply put a ruler (mm) under the lens, turn live view on, and observe how many mm are in view. Then change the field of view setting to match.



The lens in the system is used as though it is a fixed-focus lens. The camera and lens are moved closer or farther from the subject in order to move the fixed-focus point to focus at a particular location. The examples here assume the use of the lens shipped with the standard system, the Canon MPE-65. If you use a different lens, the principles are identical although the lens controls may differ.

There is an important distinction between focus and magnification. Magnification is set by rotating the “ring” on the MPE-65 lens itself to adjust the magnification. It may seem as if you are changing focus when you do this, but in reality you are changing the magnification or “Field-of-View”. To change magnification rotate the adjustment ring on the lens.

To change focus, position the camera and lens closer or farther from the subject using the GIGAmacro Capture controls to move the rig **HIGH** or **LOW**. Coarse adjustment can be achieved by adjusting the quick release plate which holds the camera.

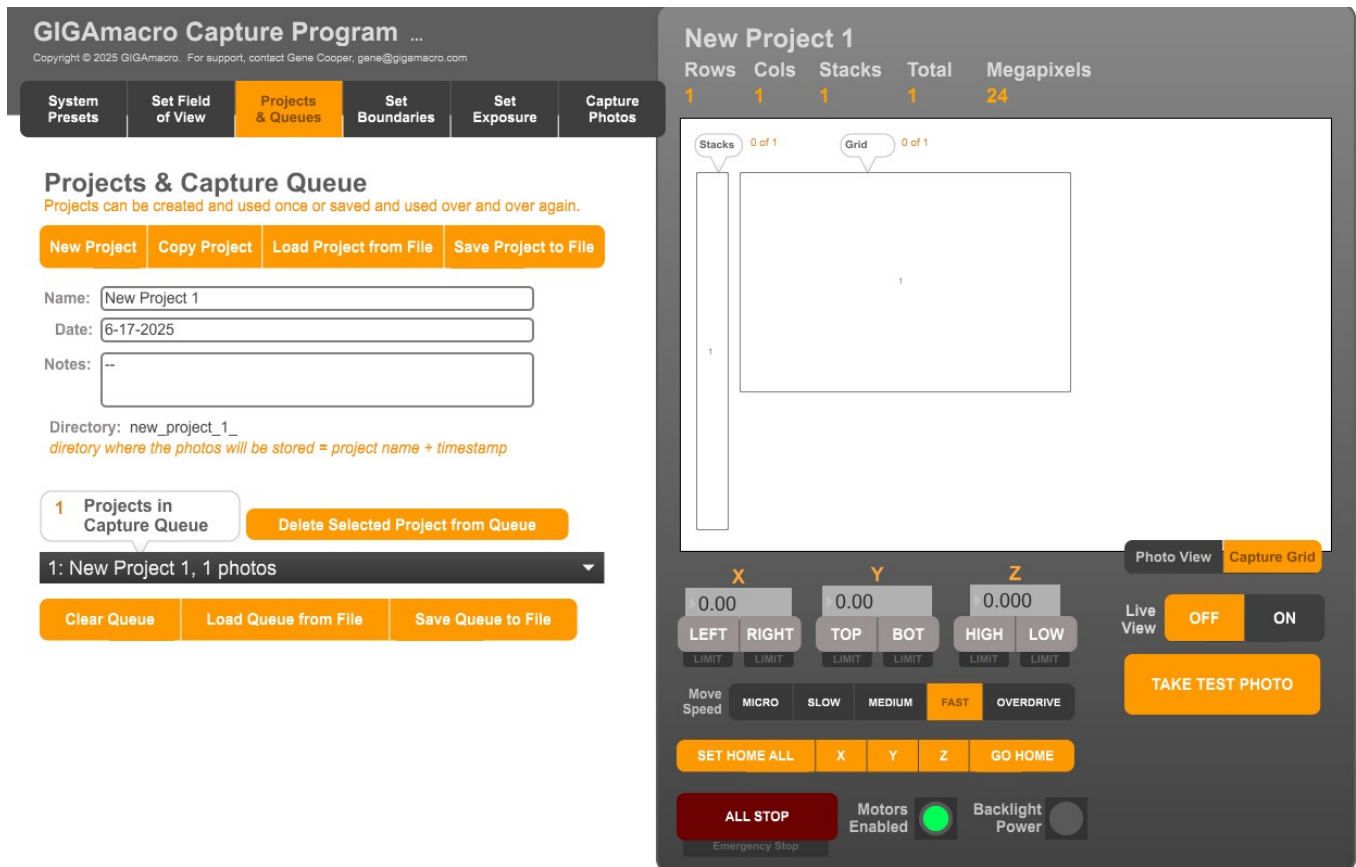
⚠ WARNING

The camera model and physical lens settings must match with the settings in capture. For example, if the Canon MPE65mm lens is set to 2X, the capture software should also be set to the same setting. If there is a mismatch, then there will likely be errors in the final image and post-processing steps.

The Project & Queues Tab

The Projects & Queues tab allows you to save, load, and reuse both individual projects and entire Queues (queues are collections of projects, used, for example, with the [GIGAmacro template system](#)) when capturing a batch of images.

This tab is where you name the project and enter details and metadata of the subject, who ran the project, etc. The project name also defines the name of the directory where the images will be stored.



By default, a new blank project is created when you start capture. Begin by changing the name of the project and entering in any details. This additional information is stored as a metadata text file along with the photos and can be accessed later.

Position the Subject and Camera

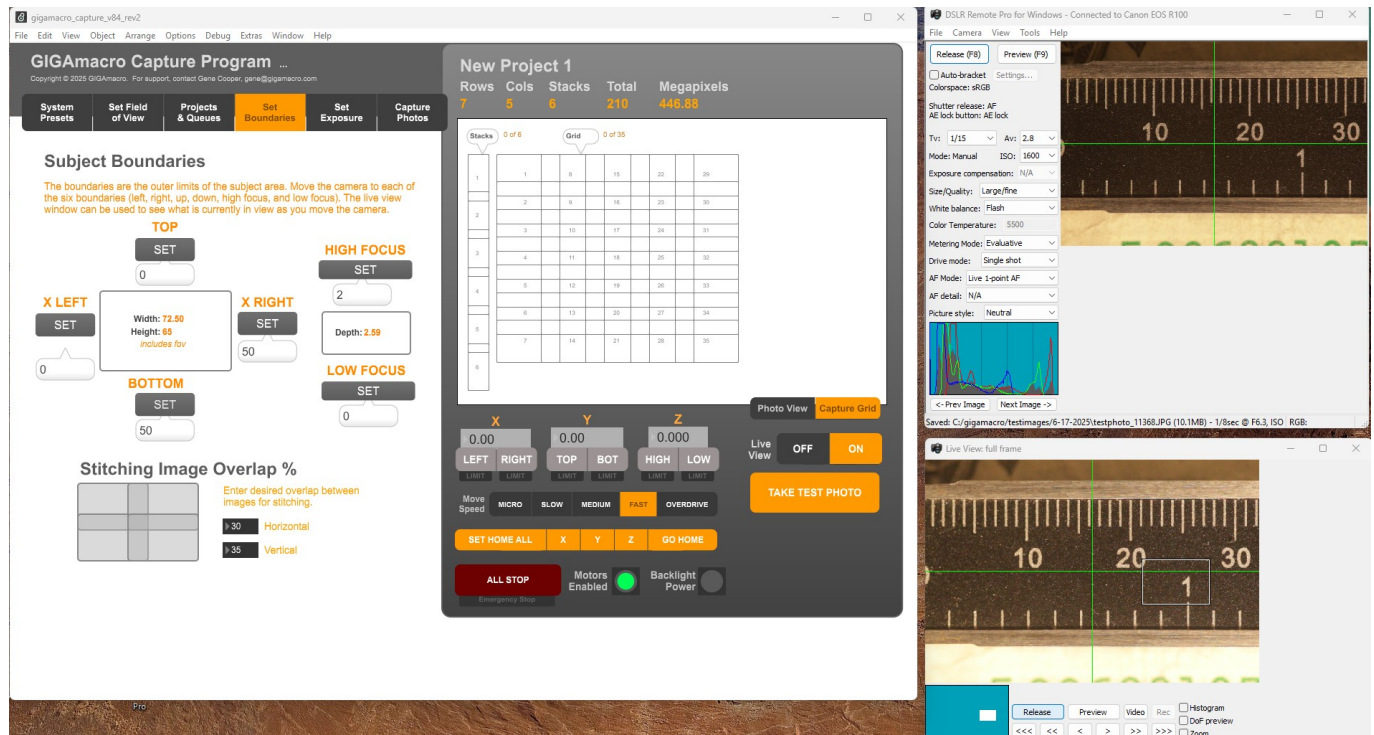
Before settings the boundaries, position the subject in the center of the imaging area and determine the best orientation for it. The final image can be rotated and adjusted later, but it is always best to start with a centered and well positioned subject. Use the GIGAmacro Capture software controls to position the camera directly over the subject.

Turn Live View on and then use the movement controls to adjust the position.

There are three ways to change the position:

1. Use the left, right, front, back, high, low buttons to position the camera.
2. Type in a number in the x, y, or z boxes to go to a specific position.
3. Ctrl + Left-Click on a location in the photo in the Photo View to go to that position. This only works once you have taken a photo and it is displayed in window.

For optimal setup, arrange the DSLR Remote Pro Window, Capture Window, and Live View Window so that all can be viewed at once. If desired, a second monitor can be setup to provide more screen area to utilize.



The Set Boundaries Tab

The boundaries are the outer limits of the subject (or part of the subject) being photographed.

1. The live view window can be used to see what is currently in view as you move the camera. Click the LiveView "On" button to see the real-time view from the camera.
2. Move the camera to each of the six boundaries (left, right, top, bottom, high focus, and low focus) and press the appropriate "Set" button to 'lock' each boundary in turn.
3. The number of columns, rows, and stacks will be calculated as you set each boundary.

GIGAmacro Capture Program ...

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System Presets
Set Field of View
Projects & Queues
Set Boundaries
Set Exposure
Capture Photos

Subject Boundaries

The boundaries are the outer limits of the subject area. Move the camera to each of the six boundaries (left, right, up, down, high focus, and low focus). The live view window can be used to see what is currently in view as you move the camera.

TOP
SET
0

X LEFT
SET
0

X RIGHT
SET
50

BOTTOM
SET
50

HIGH FOCUS
SET
2

LOW FOCUS
SET
0

Width: 72.50
Height: 65
includes fov

Stitching Image Overlap %

Enter desired overlap between images for stitching.

30 Horizontal
35 Vertical

New Project 1

Rows	Cols	Stacks	Total	Megapixels
7	5	6	210	446.88

Stacks 0 of 6
Grid 0 of 35

1	1	8	15	22	29
2	2	9	16	23	30
3	3	10	17	24	31
4	4	11	18	25	32
5	5	12	19	26	33
6	6	13	20	27	34
7	7	14	21	28	35

X 36.67
LEFT RIGHT
LIMIT LIMIT

Y 0.00
TOP BOT
LIMIT LIMIT

Z 0.000
HIGH LOW
LIMIT LIMIT

Photo View Capture Grid
Live View OFF ON
TAKE TEST PHOTO

Move Speed MICRO SLOW MEDIUM FAST OVERDRIVE
SET HOME ALL X Y Z GO HOME
ALL STOP Motors Enabled Backlight Power

💡 TIP

Setting the high and low focus can be challenging. Choose the areas of the subject that you think are the highest and lowest and then move the camera to focus those areas to set the boundaries.

💡 TIP

LiveView turns OFF each time you change a setting on the camera or in Capture. Simply turn LiveView on again to resume real-time image viewing.

Set the Lighting & Exposure

Correct exposure is one of the keys to great images and though this guide will not cover digital photography technique in depth (we'd advise you to work with someone who does have some photography expertise, or learn the basics yourself), we'll mention some important considerations.

- You will use flash, the Canon MT-26EX Twin Lite, to light the subject.
- Each time the flash is switched on, it sets the Mode to ETTL (that cannot be changed, unfortunately); you will need to change it to Manual and set the power. 1/64 power is a good starting point for your trial exposures.
- Each flash-head can be positioned independently to light the subject.
- Use standard photography techniques to light your subject well: side or raking light to bring out detail, diffused lighting from above to flatten or evenly illuminate the subject.

The three settings that impact the lighting the most are:

1. The power setting on the flash itself.
2. The distance from the flash to the subject. We typically recommend 3-6 inches.

- The ISO exposure setting. Higher settings such as 1600 can have some degree of noise in the image although likely minimal with modern cameras. Lower settings require more light from the flash.

💡 TIP

Always use the lowest ISO that achieves the exposure you want.

To dial in the best exposure:

- Test a test photo in capture. Evaluate the histogram displayed in DSLR Remote Pro.
- Adjust lighting and/or ISO and/or diffusion
- Make a another test photo and repeat until you have the best result.

GIGAmacro Capture Program ...
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System Presets | Set Field of View | Projects & Queues | Set Boundaries | **Set Exposure** | Capture Photos

Adjust Lighting & Set Exposure

Before you begin the capture process, take test photographs and adjust the lighting as needed. Use the histogram on the photo view to review the exposure.

Final Exposure Settings

Shutter Speed: 1/200 (1/125 or 1/250 recommended)

Aperture (F-Stop): 6.3 (6.3 or 8.0 recommended)

ISO: 100

Live View Settings

Shutter Speed: 1/20

Aperture (F-Stop): 2.8 (2.8 recommended)

ISO: 1600

New Project 1

Rows	Cols	Stacks	Total	Megapixels
7	5	6	210	446.88

Stacks: 0 of 6 | Grid: 0 of 35

1	1	8	15	22	29
	2	9	16	23	30
2		10	17	24	31
3	4	11	18	25	32
	5	12	19	26	33
4		13	20	27	34
5	6	14	21	28	35
	7				
6					

Photo View | **Capture Grid**

Live View: OFF | ON

TAKE TEST PHOTO

Move Speed: MICRO | SLOW | MEDIUM | **FAST** | OVERDRIVE

SET HOME ALL | X | Y | Z | GO HOME

ALL STOP (Emergency Stop) | Motors Enabled (ON) | Backlight Power (OFF)

You can see the GIGAmacro [Diffuser](#) option on our [web](#). You may also wish to use GIGAmacro [Cross Polarizing](#) to help with lighting.

💡 TIP

Two key tips: light drops in intensity as you move the light farther from the subject as per the inverse square law. Shadows and detail are “sharper” when lights are positioned farther from the subject; shadows and detail are “softer” when lights are positioned close to the subject.

**

Additional Notes on Photo Quality

To conserve disk space and speed post-capture processing we ship your camera set to JPEG LARGE FINE quality. We have found that the simplicity of capture and processing of JPG photographs is sufficient in the vast majority of circumstances. However, if you wish to use the RAW format to allow a more precise and in-depth control over post-capture processing, for example for color balance, you may do so; the additional processing steps required are beyond the scope of this guide; see our web or contact support.

Take plenty of test photos of different areas of your subject to evaluate the best lighting and exposure conditions.

Note these key concepts about exposure settings:

- Use the histogram to evaluate the exposure and use conventional digital photography practices to avoid under- or over-exposing your photograph. Remember that you should evaluate both the lightest and the darkest part of your subject (at the selected Field of View) to select the "right" exposure.
- Shutter speed should be kept between 1/60 and 1/200. Shutter speeds above 1/200 may not sync correctly with the flash, resulting in an image with a dark "stripe" along the long edge of the frame.
- Aperture (or fstop) should be kept between f/5.6 and f/8. A lower number for your aperture (larger opening) will result in a shallower depth of field and will require more images in each focus stack. A higher number will result in greater depth of field and will require fewer images.

💡 TIP

If you are an experienced photographer, you may be tempted to use a smaller aperture to get maximum depth of field. However, a smaller aperture will also result in more diffusion - making images appear softer. There is a 'sweet spot' for each lens and GIGAmacro's research shows that the best trade-of is using apertures between f/5.6 and f/8 for the standard MPE-65.

The Capture Photos Tab

The Capture Photos tab allows you to run the automated capture process and select options for the capture(s).

1. Select the first project in the capture queue.
2. Select Options:
 - **Camera Bypass:** This allows you to cycle through the capture without taking any photos. When selecting this option, first turn live view on, then set a small delay such as 0.25 seconds, then click the start / stop button.
 - **High Speed Mode:** With this option, you can take photos much faster. Here are the differences between normal capture and high speed capture:
 - **High Speed Mode:** (typically ~ 2500 to 3500 images per hour)
 - Uses the cable release to trigger the camera.
 - Relies on a fast transfer of images between the camera and computer. Other running processes on the computer may impact the speed.
 - Initially saves photos to a temporary high speed folder and then sorts and moves the images to the project folder.
 - Requires a 0.75 second delay to allow for the flash to recharge.
 - **Normal Speed Mode:** (typically ~ 1000 to 1500 images per hour)
 - Uses the DSLR Remote Pro software to trigger the camera via USB.
 - Computer can run any other processes or programs simultaneously while a capture is running.
 - Saves images directly to the project folder.
 - **Starting Position:** The initial position to start with the capture. We recommend leaving this as is when running captures. However, it can be used to restart a capture at a particular position when required by typing in the number of the location and clicking Start.
 - **Delay:** This is an optional delay that can be used to slow down the capture and allow time for the flash to recharge. Typically only needed if using high speed mode.

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System Presets

Set Field of View

Projects & Queues

Set Boundaries

Set Exposure

Capture Photos

Capture Photos

Select the project(s) you wish to start with, review the capture settings, then start!

1 Project(s) in Queue

1: New Project 1, 210 photos

Directory where images are saved to:

Camera Bypass

High Speed Mode

Start / Stop

Starting Position

Delay

Capture Status

Project selected, ready to go.

Capture Rate: --

Elapsed Time: --

Time To Go: --

New Project 1

Rows 7

Cols 5

Stacks 6

Total 210

Megapixels 446.88

Stacks 0 of 6

Grid 0 of 35

Photo View

Capture Grid

Live View

OFF

ON

TAKE TEST PHOTO

SET HOME ALL

X

Y

Z

GO HOME

ALL STOP

Motors Enabled

Backlight Power

As a capture progresses, the capture grid will show the progress as well as the time elapsed and remaining.

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System Presets

Set Field of View

Projects & Queues

Set Boundaries

Set Exposure

Capture Photos

Capture Photos

Select the project(s) you wish to start with, review the capture settings, then start!

1 Project(s) in Queue

1: New Project 1, 210 photos

Directory where images are saved to:

Camera Bypass

High Speed Mode

Start / Stop

Starting Position

Delay

Capture Status

Move complete, ready.

Capture Rate: calculating...

Elapsed Time: < 1 minute

Time To Go: calculating...

New Project 1

Rows 7

Cols 5

Stacks 6

Total 210

Megapixels 446.88

Stacks 1 of 6

Grid 5 of 35

Photo View

Capture Grid

Live View

OFF

ON

TAKE TEST PHOTO

SET HOME ALL

X

Y

Z

GO HOME

ALL STOP

Motors Enabled

Backlight Power

Grab a coffee, when the capture finishes, you can start the post-capture processing steps!

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 TIP

You can pause the capture at any point. Click the Start / Stop button to stop the capture at any point. Click the Start / Stop button again to resume.

File Folder and Naming Convention

The photos that are captured are organized and placed in folders. These are located in the data location folder specified in the presets in GIGAmacro Capture.

- Each project captured has a folder with the name you gave to the project, with date and time appended. Such as "Example_Project_1_05-15-25_12-01-01".
- Sub-folders inside the Project folder contain each of the original sets of photos. These folders are named as follows: col_xxxxx_row_xxxxx.
 - There will be a folder for each row (Y) and column (X) in your project. Each folder for an XY position will contain the stack of photos needed to give sharp focus for the whole depth of the subject, as you selected by setting the high and low boundaries. The number of folders is equal to the number of positions in your complete mosaic (X by Y).
 - Inside each sub-folder, the individual photos are stored for the (Z) stack at that location in the mosaic. The illustration below shows this diagrammatically.
- A metadata file called capture_metadata_xxx.txt contains the original metadata and capture details for the project.
- After focal stacking, a folder called "stacked" will be added containing the focal stacked images.
- After image stitching, a folder called "stitched" will be added containing the final stitched image.

Folder Structure

Name	Di
col_0001_row_0001	6/
col_0001_row_0002	6/
col_0001_row_0003	6/
col_0001_row_0004	6/
col_0001_row_0005	6/
col_0001_row_0006	6/
col_0001_row_0007	6/
col_0001_row_0008	6/
col_0002_row_0001	6/
col_0002_row_0002	6/
col_0002_row_0003	6/
stacked	6/
stitched	6/
autoprocess.txt	4/
capture_metadata_04-15-2024_16-35-03.txt	4/
zerene_batch_script_gigamacro_04-15-2024_16...	4/

A Folder Stack



Post Processing

Once the capture is complete you are ready to process the photos. This is the magic that combines all of the photos into a single, seamless, gigapixel macro image. A program called GIGAMacro Flow is used to help automate the post-processing of the imagery. However, each step can be done manually (stacking and stitching) if you want greater control or happen to be bored.

GIGAMacro Flow Software and 3rd Party Applications

GIGAMacro Flow helps to manage the collection of projects, identify which projects are done with processing, and works dynamically with 3rd party programs to execute a variety of post-processing tasks. The 3rd party software that Flow works with includes:

- Zereine Stacker: Used for focal stacking the imagery. (<https://www.zereneystems.com>)
- PT Gui: Used for stitching the final image and combines the columns and rows of images into a single seamless image. (<https://www.ptgui.com>)
- Krpano: Used for prepping or "tiling" the final image for online viewing. (<https://www.krpano.com>);

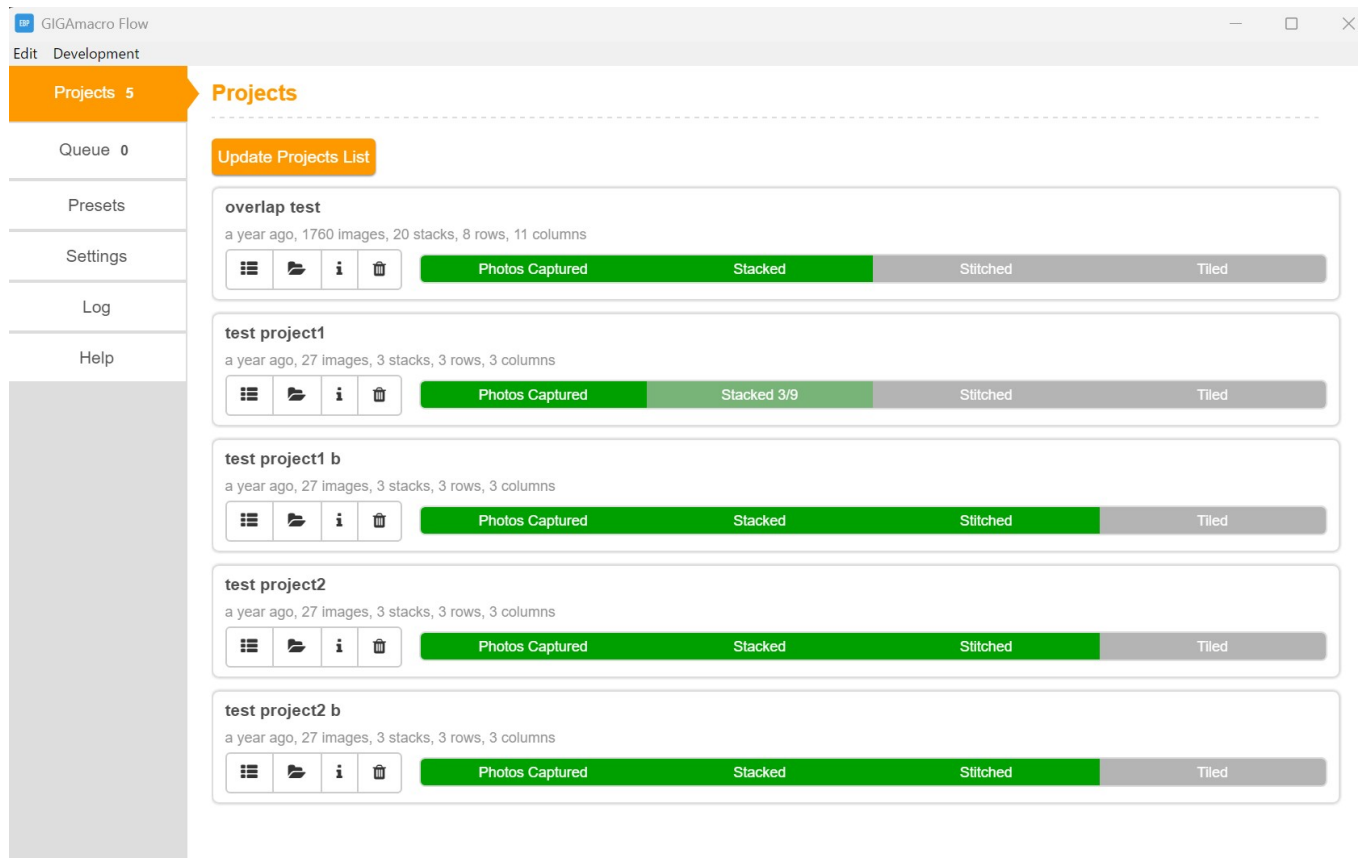
Additional software:

- AutopanoGIGA is an excellent image stitching software. Although the company is no longer active, you can use the software for your advanced stitching needs.
- Adobe Photoshop is a useful (optional) package for image cleanup, however it is not shipped as part of the standard system. (<https://www.adobe.com/Photoshop>)

The GIGAMacro Flow Projects Tab

Open the application **GIGAMacro Flow**.

Once open, if settings are already configured, you'll see a list of Projects that are available for post-processing. The information in this section will show which Projets are captured, which are stacked, stitched, tiled, and can provide a quick overview of basic information about each one.



For each Project, you select the project for processing. Click the file list icon (see image below) to add / remove each project to a "queue". Other icons allow you to:

- folder icon: opens the folder where the project is in Windows
- "i" icon: brings up some basic information about the project
- trashcan icon: prompts you to choose to delete the Project. **This is permanent!**

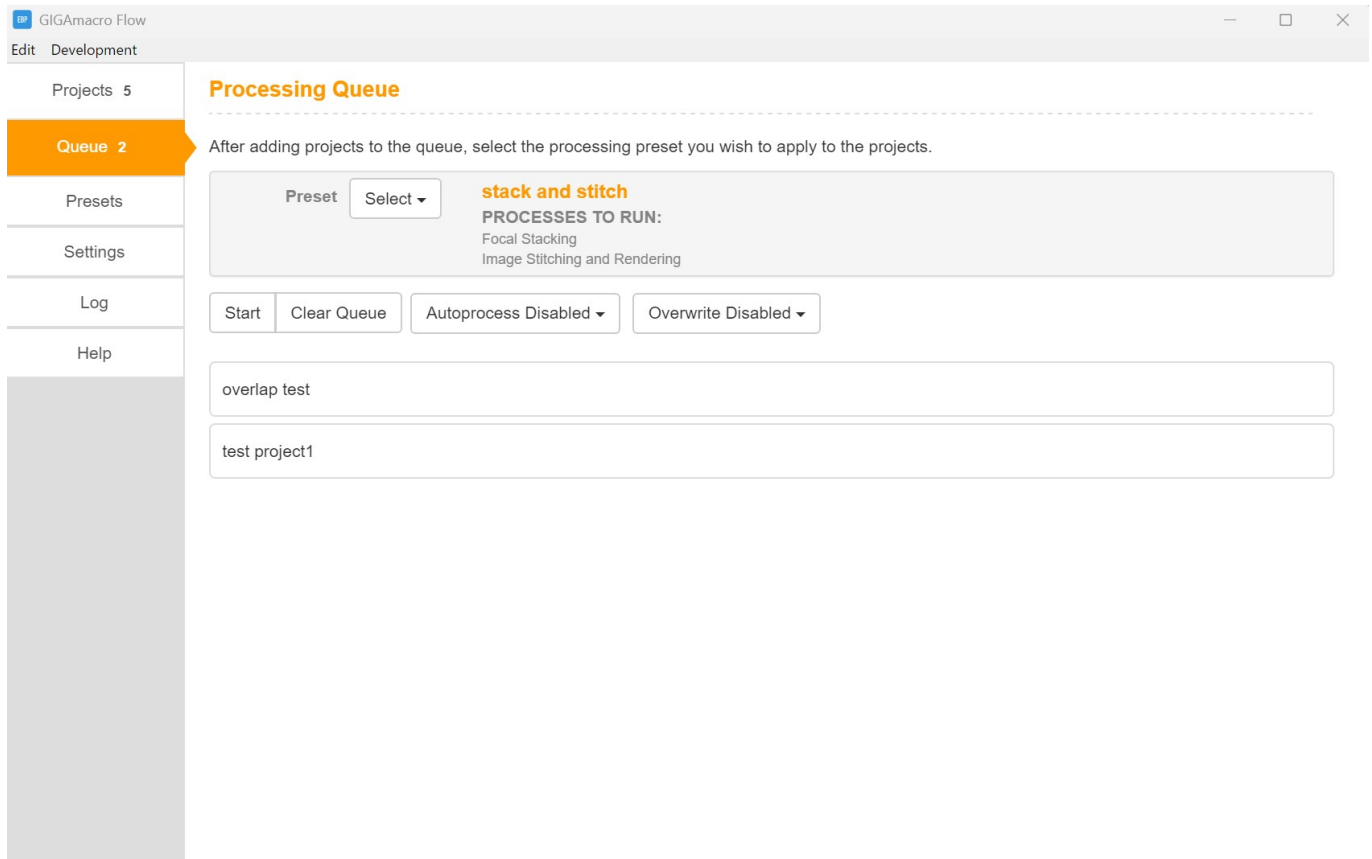


The GIGAmacro Flow Queue Tab

Once you have added a Project to the queue, you can select which processes you want to perform on the set of projects.

Select the desired preset, then click Start. Other options include:

- Clear Queue: Removes all projects from the queue.
- Autoprocess: If selected, then the flow software will "watch" for new projects to be completed in Capture and will automatically begin processing them.
- Overwrite: Select "Overwrite Enabled" if you have already stacked or stitched a Project but for some reason, may wish to re-process them with a different set of presets. This will then overwrite the older stacked, stitched, or tiled imagery.



The GIGAmacro Flow Presets Tab

To define presets, select from the options (see image below) available. You can create as many presets as you prefer.

For stacking, the following options are available...

- Enable or Disable Stacking
- Preferred Program: (currently only Zerene is available)
- Output Depth Map: This will output a standard image along with a grayscale depth map usually in tiff format.
- File Format: JPEG or TIFF
- Rotation: Use this option if the final stacked image needs to be rotated 180 degrees.
- Filename Format: Your preference on which format is preferred for the final stacked image names.
- Settings Priority: Workflow is preferred. If set to Capture, the system will use any post processing presets defined in the GIGAmacro capture program.

For stitching, the following options are available:

- Enable or Disable Stitching
- Preferred Program: (currently only PT Gui / PT Gui 11+ is available)
- File Format: JPEG, TIFF, or PSB (Photoshop Large format)
- Stitching Method:
 - Rough Align Only: Uses the project information to roughly place the images in the correct location.
 - Rough Align and Stitch: Use the project information to align the images then detect control points between images and attempt a full stitch of the images.

- **Optimize Rotation:** Select this option if you want PT Gui to attempt to slightly adjust the rotation of each image to fit more precise during stitching.
- **Image Orientation:** Use this option if the orientation of the images need to be changed from standard clockwise to counter-clockwise.
- **Image Rotation:** Use this option if the input images need to be rotated.

For tiling, this operation will break the final stitched image into a format similar to how a google map is delivered online, in small photos for each zoom level. This is useful if you are using the GIGAmacro viewer. The following options are available:

- **Enable or Disble Tiling**
- **Format:** Zoomify (the only option currently)
- **Tilesize:** 256 or 512 (256 is standard)

For Previews, this operation will make a series of small thumbnails of the final image.

For Archiving, this operation will MOVE the entire project folder (once processing is complete) to your designated Archive folder.

For Production, this operation will COPY processed images to a specified Production folder. Select the types of processed images that you would like to be copied.

GIGAmacro Flow Edit Development

Projects 5 Queue 2 **Presets** Settings Log Help

Processing Presets

Presets are processing steps to run on a project. Here you can choose the type of operations, programs to use, and what post-processing steps you would like to run. Once you have created the preset, you can then choose it when processing projects in the queue or using the auto process feature.

EDIT PRESET **+ ADD**

Preset Name:

Stacking

Preferred Program: Output Depth Map (takes longer):

File Format: Rotation: Filename Format:

Settings Priority:

Stitching

Program: File Format:

Stitching Method: Optimize Rotation:

Image Orientation: Image Rotation:

Tiling

Tile Format: Tile Size:

Previews Creates a set of preview images at low-resolutions.

Archiving Archiving will move the project files to the archive location in 'Settings'.

Production Select what content should be copied to production folder.

Stacked: Stitched / Rendered: Previews:

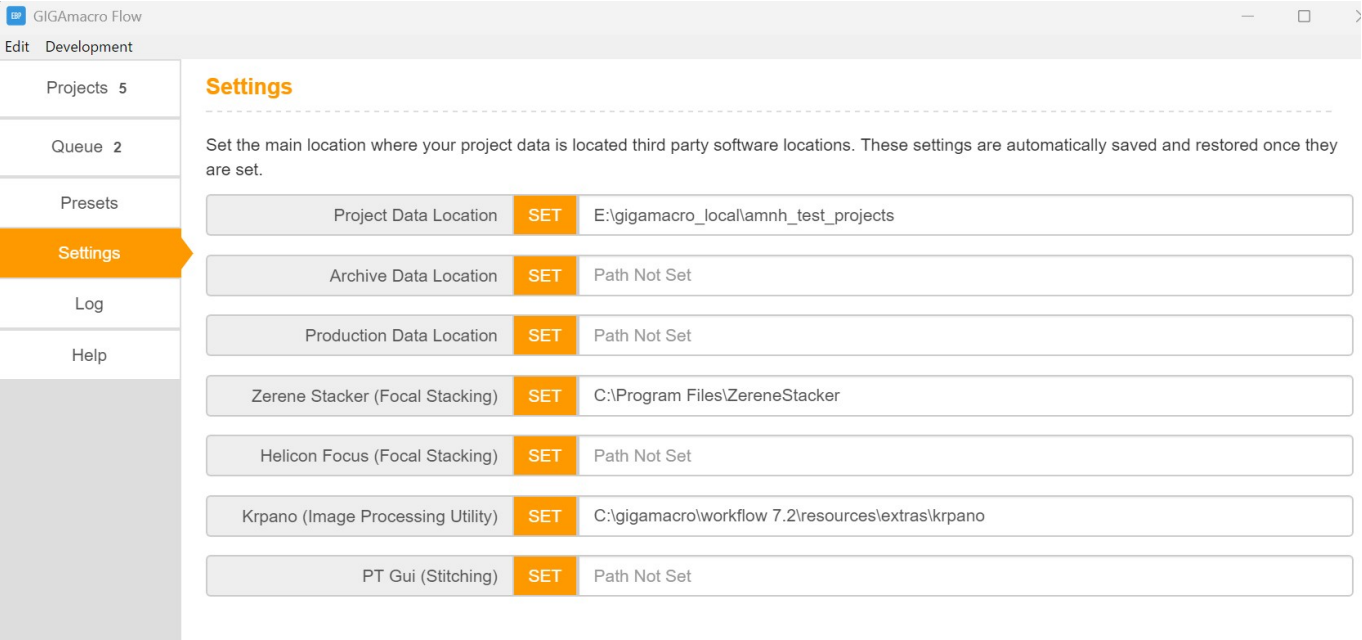
Tiled:

DELETE

The GIGAmacro Flow Settings Tab

The settings for Flow are pre-configured. However, if you need to change or adjust those settings, you can do so in the Settings tab.

- Project Data Location: This should be set to the folder where you save your projects during capture.
- Archive Data Location (optional): This should be set to a folder where you may wish to move old projects for archiving. All original data is kept in this instance.
- Production Data Location (optional): This should be set to a folder where you want the final results of your images to be copied to.
- Zerene Stacker: This should be set to the folder where Zerene stacker is installed. Typically under C:\Program Files\ZereneStacker.
- Krpano: This should be set to the folder where Krpano is installed. Typically under C:\gigamacro\workflow\resources\extras\krpano
- PT Gui: This should be set to the folder where PT Gui is installed. Typically under C:\Program Files\PT Gui.

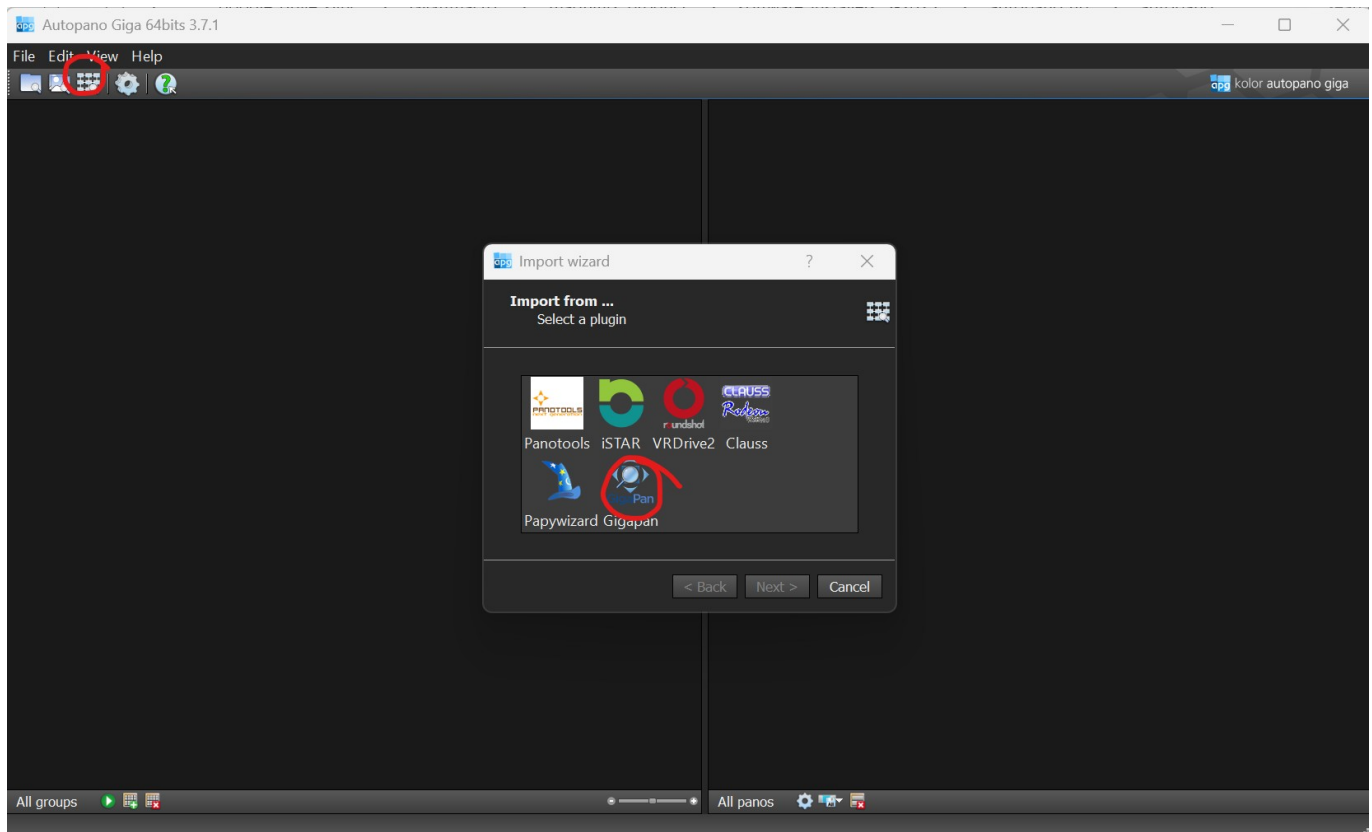


Manually Stitching Using Autopano GIGA

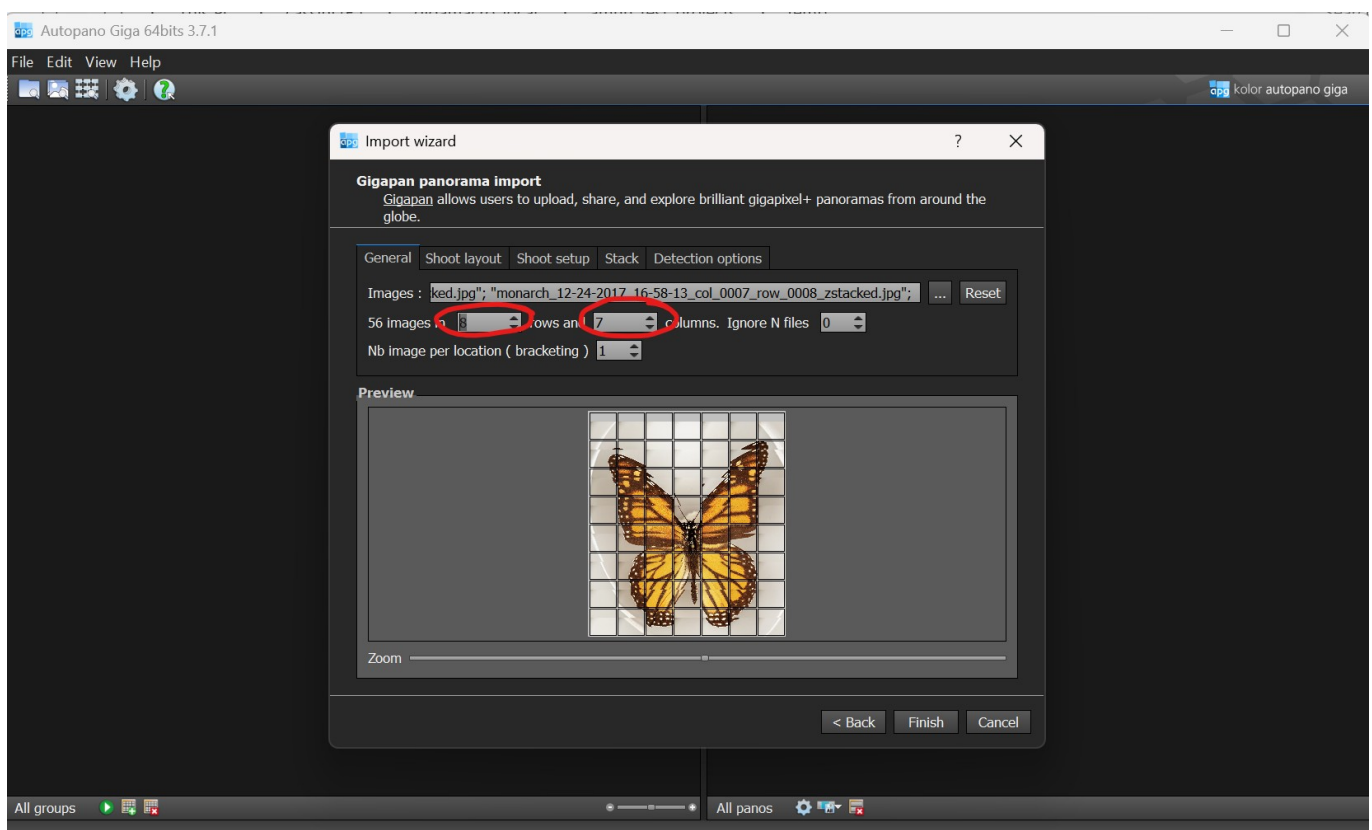
Autopano GIGA provides a number of tools and options for stitching that we have found to be very useful. However, since AutopanoGiga is not able to be automated with the workflow process, we use PT Gui as the standard stitching choice.

Import Images into Autopano GIGA

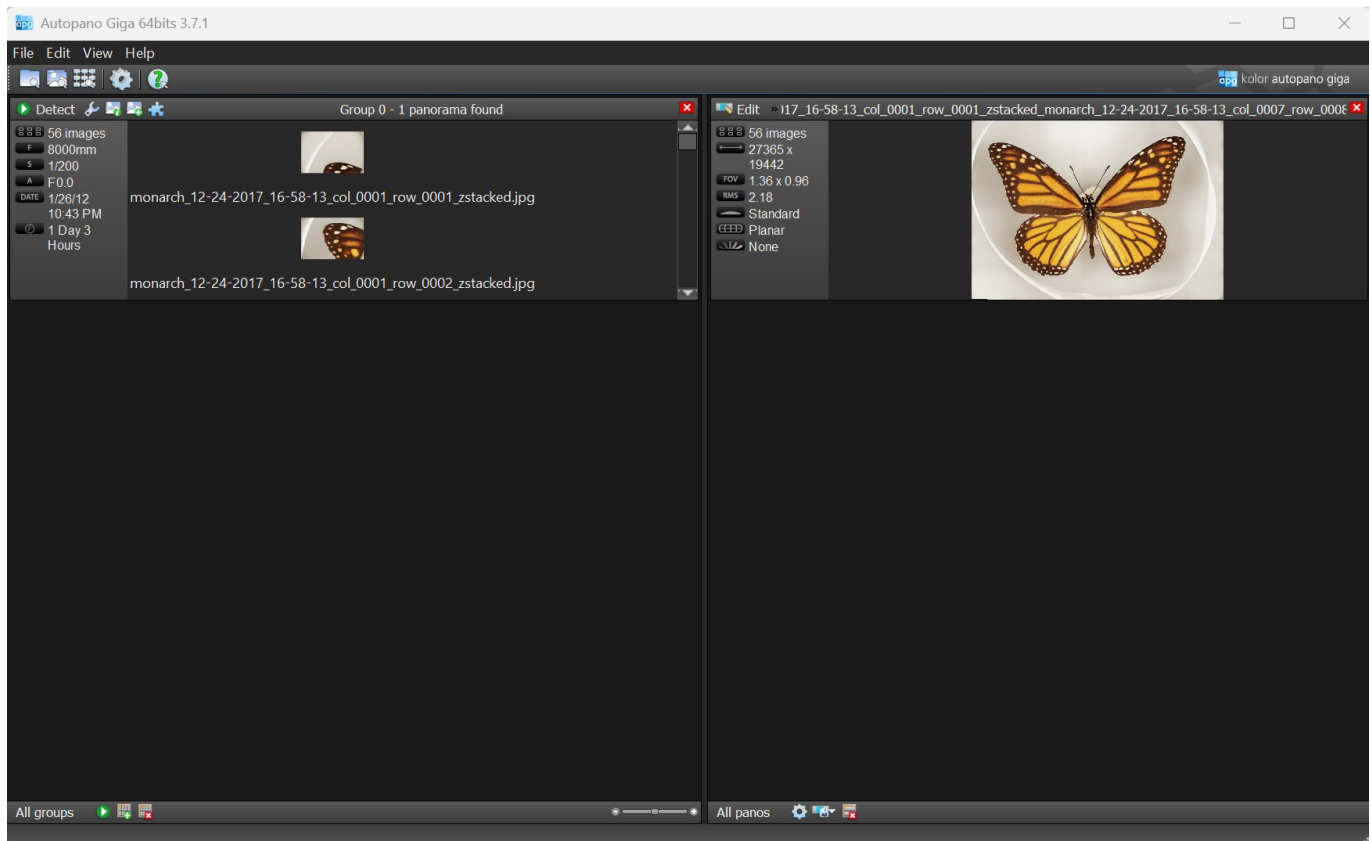
- Once open, choose the import icon at the top left.
- Then choose the format GigaPan in the center window and click "Next".



- When the dialog window appears, select the files that you want to stitch together.
- Rows and Columns:
 - Autopano will attempt to determine how many rows and columns there are.
 - Check to ensure that this is correct. Autopano often guesses incorrectly and reverses the row and column count.
 - Click the plus or minus buttons next to the rows / columns until the preview looks correct.
- When ready, click "Finish".



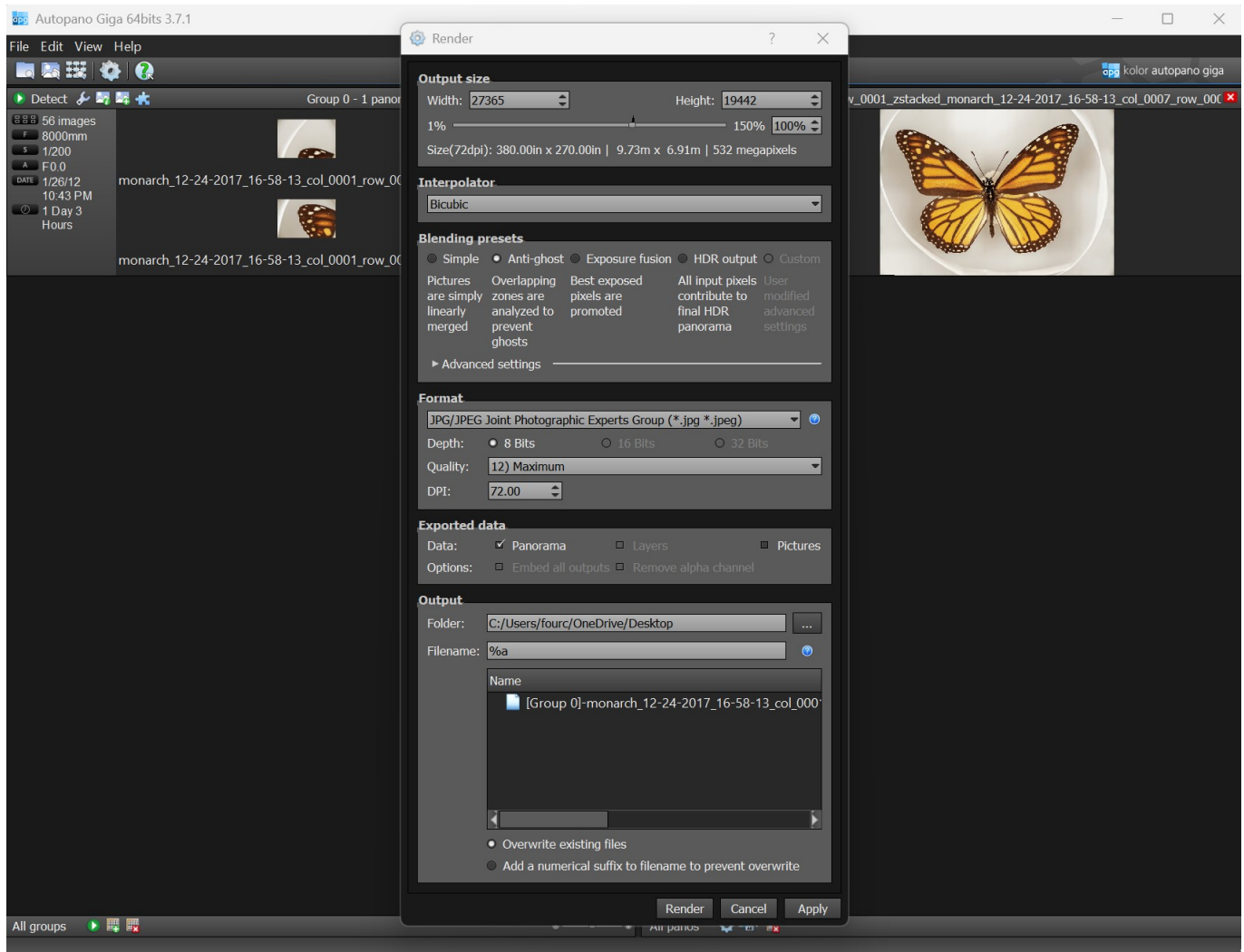
AutopanoGiga will then attempt to stitch the images together. A result will be displayed on the following screen (see image below).



At this point, you may choose to leave the stitched image as is or you can choose to "edit" the image and modify how it stitched the images together. If you are satisfied, then click the "Render" icon above the stitched image. The render window will display a variety of options. Most of these options can be left as is. The main items to check are:

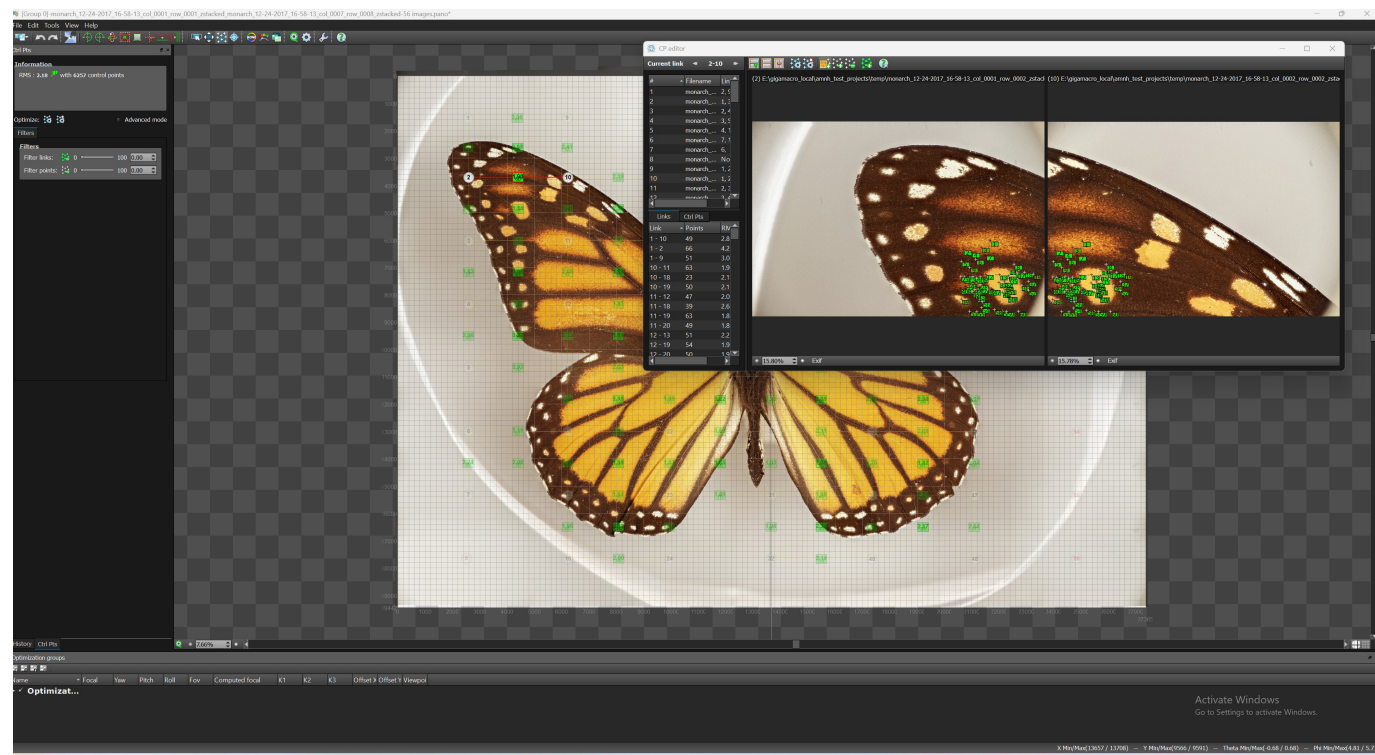
- file format you wish to use for the final image
- name of the image and location where you want to save it

Once done, click "Render".



If you choose to edit the stitched image, you can click the "edit" button above the image preview. At this point you are not editing the final image, but you are editing how the images fit together as well as other options such how the image is cropped, rotated, etc. Consult the Autopano help for advanced tips and information or contact us for support.

Below is an example of how the control points for each image can be viewed and edited.



Next Steps

From here you can advance to the next level by implementing templates, using additional options such as cross polarizers, etc. We are here to help with that and typically recommend scheduling online training with us to go over the specifics of these operations and customize them to your particular needs.

Thank you and reach out to us at support@gigamacro.com or contact Gene Cooper at 707-319-9310, gene@gigamacro.com

Appendix: Troubleshooting

No Power to Magnify²

- Switch off Control Box and disconnect power
- Check all connections on the back of the Control Box are correctly located (check color codes)
- Reconnect power cord and switch on Control Box.
- If using the GIGAmacro V2 Control Box, check the fuse at the rear of the control box where the power cable plugs in.

One (or more) Magnify² axis doesn't move.

- Check connector cables (see 'No Power', above) +
- Check that each axis is not at the extreme end of its travel.
- Check the limit switches - there are six switches, each should have a small red light. Two are on the gantry, two on the Z axis and two on the left hand (from the front) side of the Magnify²
- Check that the Emergency Stop button is NOT pressed (rotate clockwise to release)
- Restart GIGAmacro Capture software.
- Restart the computer.

Noise when Magnify² is moving.

- Check that nothing is obstructing the physical movement of the system

DSLR Remote shows "Not Connected"

- Check that the USB cable is plugged into the camera, the USB connector on the gantry, and to the computer
- Check that external power is plugged into the camera
- Check that the camera is switched on
- Check camera LCD screen for errors
- Confirm in DSLR Remote Pro that Camera>Auto Reconnect is checked in the menu
- In DSLR Remote Pro Camera menu, click Connect Camera.

Camera connected, won't take a photo

- If using high speed mode, check that shutter rRelease cable is connected to the camera
- Check that camera is in Manual mode
- Check that focus is set to manual on lens (if appropriate)
- Click the 'Release' button in DSLR Remote Pro to test whether DSLR remote pro is able to take a photo directly.
- Check Capture presets (folder location for captured photos, etc.)
- Check camera LCD screen for error messages
- Check that you have sufficient disk space where your project is saved. If you are saving to a network drive check that it is connected and accessible.
- Check the lens settings to make sure they match the lens you are using.

Camera Flash not firing.

- Check that the flash control unit is correctly on the hot shoe, with locking ring finger tight
- Check that external power is connected to camera and to flash.
- Check that camera and flash switched on
- Check the USB cable (from camera to PC) and remote trigger cables are connected.

After all these checks, If none of the above solves your problem, please call GIGAmacro support at +1 415 841 3322, and / or email support@gigamacro.com.

Support is based in the US Pacific timezone (GMT -8 hours) and is available 9am - 5pm.

Appendix: Canon Camera Settings

This is a brief description of the recommended settings for Canon DSLR & Mirrorless cameras. The menu structure varies depending on the Mode Dial setting and is similar on all Canon models, with the more sophisticated models having many more settings.

Manual Settings:

- Use the dial setting on the camera to change to Manual Mode.
- If available, select Manual Focus button / dial.

Press the Menu button and check and set the following settings:

- Beep = Disabled
- Release shutter without card = Enabled
- Release shutter without lens = Enabled
- Power Savings / Auto Power Off = Disabled

Camera Settings that can be Adjusted in DSLR Remote Pro:

- Quality = LARGE FINE JPG
- White Balance = Flash

Appendix: DSLR Remote Pro Preferences & Settings

The GIGAmacro Capture software communicates to the Camera via DSLR Remote Pro. While many settings can be automatically set using the software, some need to be manually set.

Side Bar Camera Settings

- Quality = LARGE FINE JPG
- White Balance = Flash

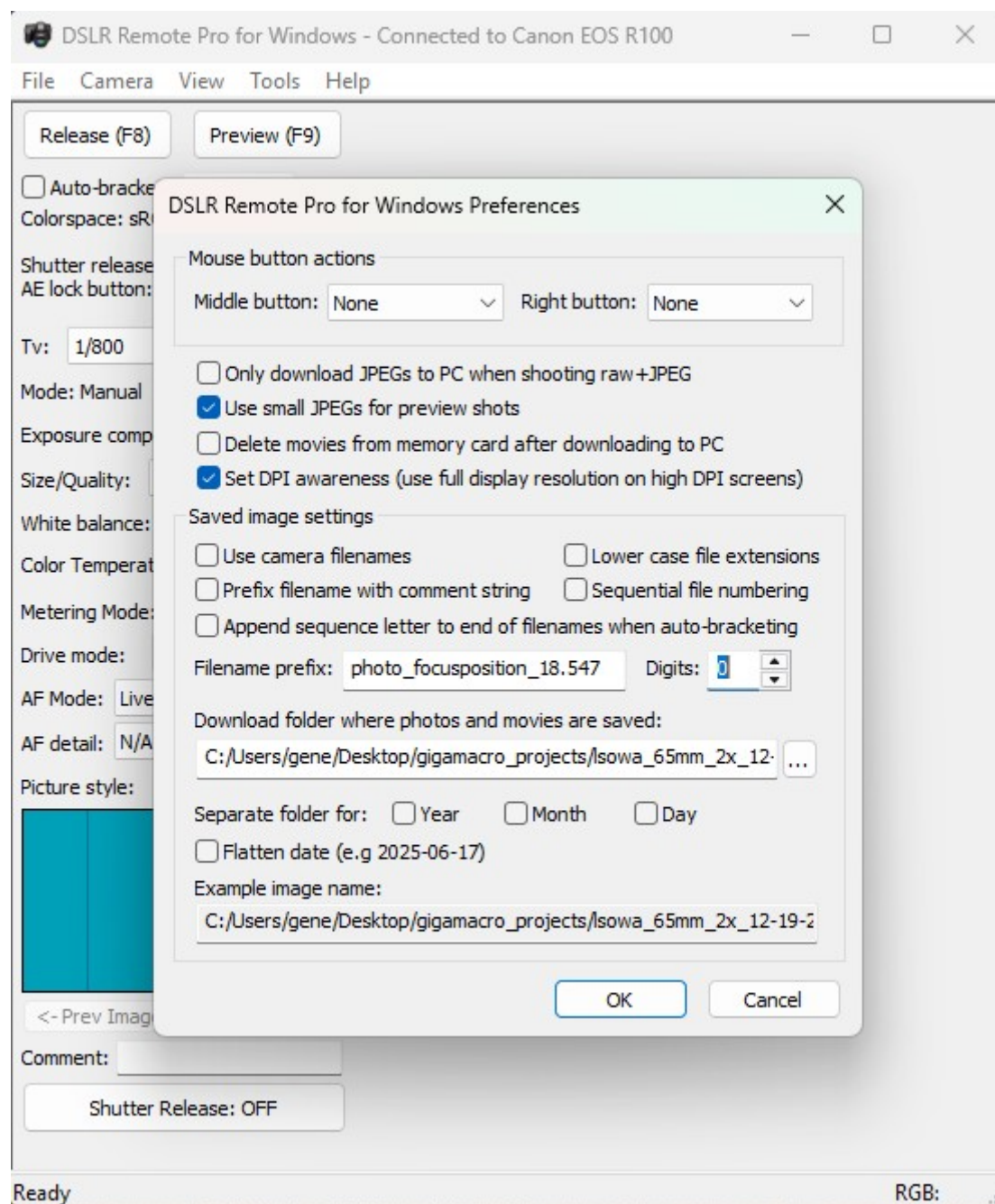
Camera Menu

- Select "Inverted"

Preferences

In the File menu, select Preferences:

If using Normal operation in capture, set the settings to the following (see below)...



If using High Speed operation in capture, set the settings to the following (see below)...

