

HOW TO PROCESS MULTISPECTRAL IMAGERY WITH CORRELATOR3D™

1 Overview

Correlator3D™ supports multispectral sensors that produce unregistered bands, often generated by cameras using separate imagers and lenses that are not mechanically aligned. The software automatically registers these bands during tie point extraction.

This guide provides a step-by-step overview of processing multispectral imagery in Correlator3D, including project setup, reflectance calibration, DSM/DTM generation, mosaic creation, optional pansharpener, and exporting products. By following these steps, users can achieve accurate band registration and generate reflectance maps and vegetation indices for applications in agriculture, environmental monitoring, and remote sensing.

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2 Project Setup

To begin processing multispectral imagery, create a new project in Correlator3D tailored for unregistered bands. This ensures proper organization and alignment of multi-band data.

1. Open Correlator3D and select "New Project."
2. In the project creation wizard, choose the "Unregistered bands" option to enable automatic band registration during processing.

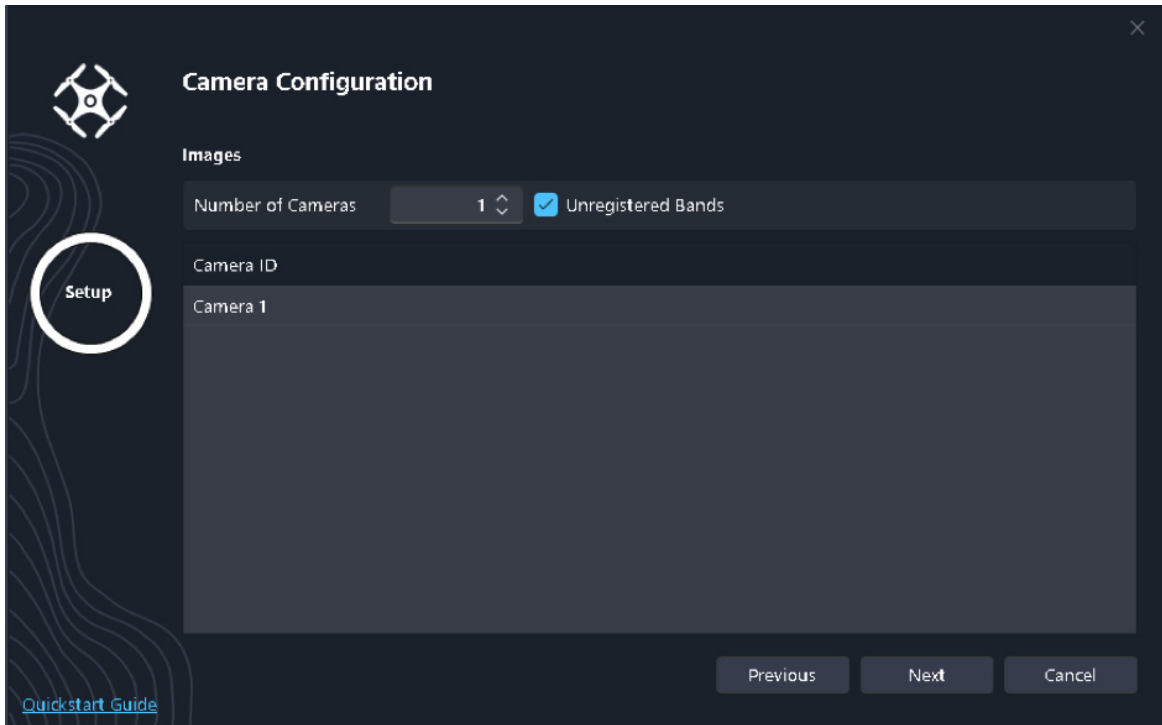


Figure 1: Unregistered bands option of the camera configuration.

Then, all images must be imported from the multispectral sensor. The software automatically organizes them into a table, where each row corresponds to a frame and each column represents a band (e.g., red, green, blue, near-infrared). Alternatively, images can be imported band by band. Correlator3D will prompt you to add them to an existing band or create a new one.

Important: Ensure all bands contain the same number of images to maintain frame consistency across the dataset. Mismatched frames can lead to registration errors and incomplete outputs.

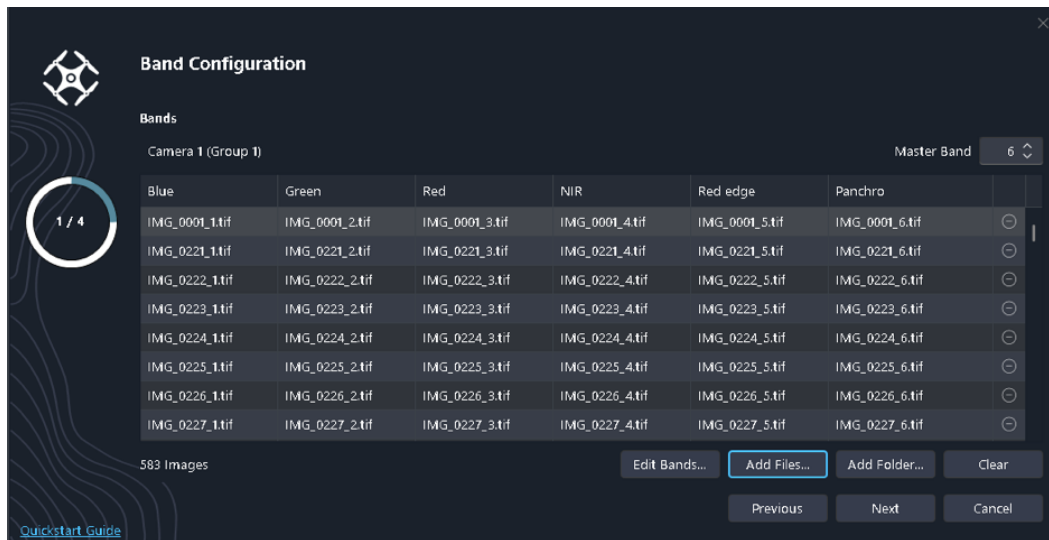


Figure 2: Project creation with unregistered bands selected.

Once the images have been imported:

1. Use the "Edit bands..." button to rename bands (e.g., "Red," "NIR") and reorder them for logical workflow.
2. Select a master band, which serves as the reference for registration. This band carries greater weight during DSM generation and influences overall alignment accuracy.
3. Click "Next..." to import exterior orientation (EO) data, such as GPS positions and orientations from the sensor.

If EO data is embedded in image metadata (e.g., EXIF), Correlator3D will detect it automatically. For external EO files, ensure they match the image filenames and include coordinates (X, Y, Z) and optional angles (omega, phi, kappa).

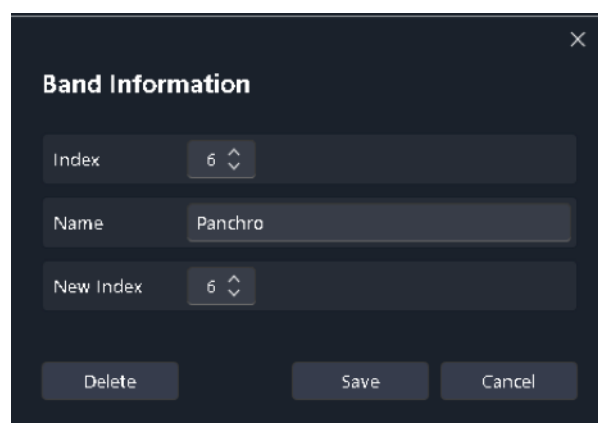


Figure 3: Edit band dialog.

3 Reflectance Calibration

Correlator3D can compute calibrated reflectance values for each image and embed them into the calculated orthophotos, enhancing accuracy for mosaics and indices. Reflectance calibration accounts for atmospheric effects and sensor variations, producing physically meaningful data. This step is particularly useful for quantitative analysis in vegetation health or soil mapping.

Reflectance can be calibrated using:

- A sun sensor to measure irradiance during acquisition.
- Calibrated reflectance panels placed in the scene.
- A combination of both for improved precision.

In the case of reflectance panels, if a panel file is available, it can be added through the following steps:

1. In the project layer tree, expand the Reflectance Panels section.
2. Import an existing panel file (.crp format) containing reflectance values for each band.
3. Files can be added, edited, or removed as needed.

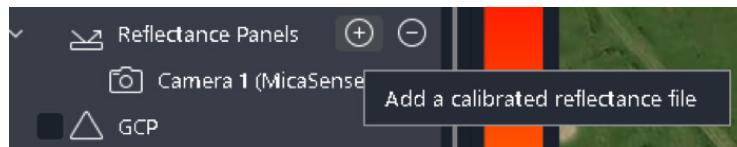


Figure 4a: Calibrated reflectance file (crp) in the project tree.

If no panel file exists, then:

1. Manually add reflectance panels by selecting "Add a panel to the camera" in the project layer tree".
2. Link panels to corresponding images by marking their locations in the imagery.
3. Input known reflectance values (e.g., 0-1 scale) for each band from panel specifications.

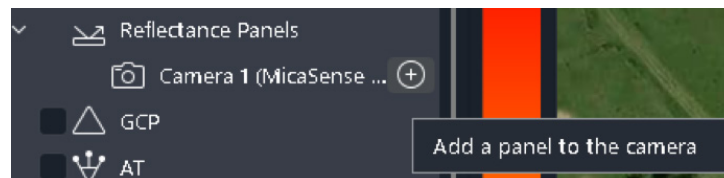


Figure 4b: Manual add of a reflectance panel.

×

Calibrated Reflectance Panel

Add a calibrated reflectance panel by specifying an ID, the camera used for the acquisition, the

Information

ID

Start

Camera

Camera 1 (MicaSense RedEdge-P)(CAM_001) ▾

6 band(s)

Images

Name	Band	Reflectance
IMG_0001_1.tif	Blue ▾	0.551
IMG_0001_2.tif	Green ▾	0.55
IMG_0001_3.tif	Red ▾	0.549
IMG_0001_4.tif	NIR ▾	0.54
IMG_0001_5.tif	Red edge ▾	0.549
IMG_0001_6.tif	Panchro ▾	0.549

Add Images...

Clear

Next

Cancel

Figure 4c: Reflectance values of individual spectral bands.

4 Processing Workflow

With the project created and optional reflectance information set up, the usual workflow can then be followed:

- Run aerial triangulation to extract tie points and register bands automatically during bundle adjustment. The master band selected during the project creation will be used as reference when registering with the other bands.
- Generate a DSM. The default optimal resolution of the DSM will be calculated using the master band resolution. If the multispectral sensor includes a higher-resolution panchromatic band set as master band, it will be used to generate a higher-resolution DSM. The resolution should be adjusted based on project needs (e.g., 5-10x GSD for efficiency).
- Extract a DTM if needed.
- Generate orthophotos. If reflectance information needs to be calculated, select the option “Use Calibration Panels” or “Use Sun Sensor”, or both. Enable the option “Pansharpening” if a panchromatic band is available and if pansharpening is required.
- Create a mosaic. It will be generated with all the spectral bands, same bit depth as the raw images, and reflectance information

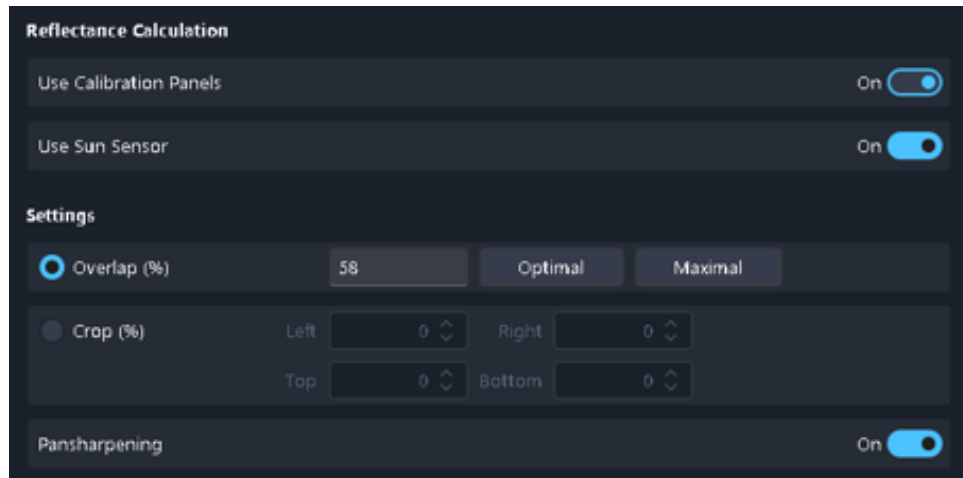


Figure 5a: Reflectance calculation and pansharpening options of the orthorectification dialog.

Properties		□	⚙	×
Resolution	0.024 m			
Band count	5			
Bit Depth (bits)	16			
Location	F:\SIMAACTIVE\Demo_Data\...			
Created	6/17/2025 4:11:29 PM			
Reflectance	Yes			

Figure 5b: Sample multispectral mosaic properties.

5 Pansharpening

If the multispectral sensor includes a higher-resolution panchromatic band, pansharpening can be applied during orthophoto generation to enhance the spatial resolution of the lower-resolution bands. In this case, the panchromatic band is fused into the other bands and thus not included separately in the orthophotos.

Users should keep in mind the following considerations:

- Pixel values are modified, potentially affecting reflectance accuracy slightly.
- For index calculations based on ratios between bands (e.g., NDVI), the pansharpening effect cancels out, so these indices retain their integrity but do not gain in precision.
- All bands are automatically upscaled to match panchromatic resolution during ortho generation, ensuring no net resolution loss even without pansharpening.

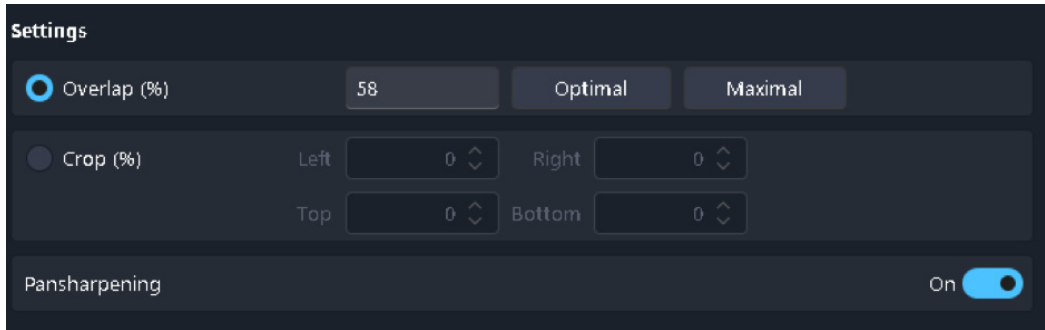


Figure 5c: Pansharpener option in the orthorectification dialog.

6 Exporting Mosaic

Once a mosaic has been generated, Correlator3D allows users to export several types of products: standard mosaics, calibrated reflectance maps, and vegetation index. Export Products. The results can be from the “File” menu, by selecting “Export” and then “Mosaic”. The user can then select the mosaic type: standard mosaic, reflectance or index. If a standard mosaic is selected, the user has the option to select the spectral bands to incorporate in the output.

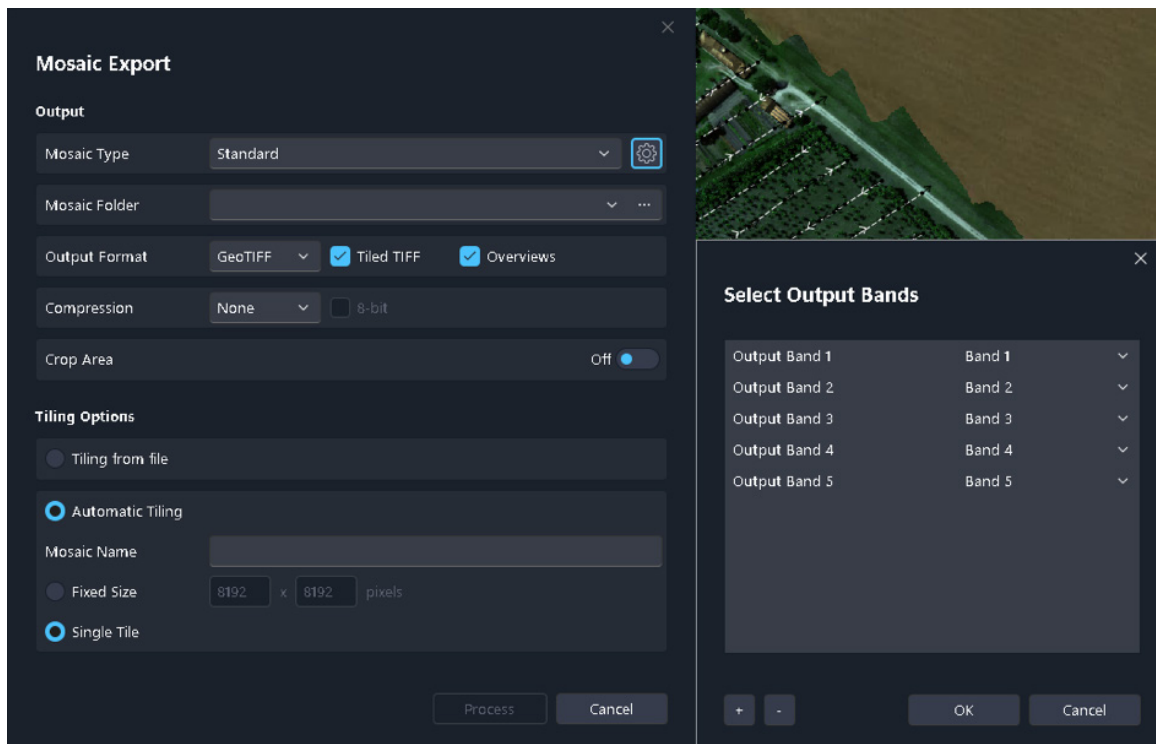


Figure 6a: Mosaic export dialog.

If the reflectance type is selected, the output mosaic will contain calibrated reflectance values for each pixel. The resulting reflectance map will be outputted as 32-bit floating point values ranging between 0 and 1, with undefined pixels set to -1. The map will contain as many bands as the input imagery. If an infrared band is available, it will also be outputted in the same file as 32-bit floating point values, corresponding to the temperature in Kelvin.

If “index” mosaic type is selected, users can export predefined indices such as NDVI, BNDVI, GNDVI, LCI, NDRE, SIPI, SIPI2, ARVI, GCI or NBR. Custom indices can also be specified through a formula. This formula supports different operations between the imagery bands, including addition, subtraction, multiplication and division. The resulting index can be outputted either as a floating point value or following a color map. The color map is defined by the number of classes (colors), as well as the bounds of the index.

If reflectance information is available, it will be used to calculate indices, thus providing even more accurate maps. Reflectance information is only available for multispectral projects for which the sun sensor and/or calibrated reflectance panels were used during orthorectification.



Figure 6b: Example of a colorized infrared (CIR) mosaic in Correlator3D.