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WORKING WITH COLORIZATION

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Using this manual

Hovermap is a powerful system that can be used as a Lidar mapping payload but also as an advanced autopilot for drones. It is therefore recommended to read the user manual thoroughly to make use of all its capabilities in a safe and productive way.

Disclaimer and safety guidelines

This product is not a toy and must not be used by any person under the age of 18. It must be operated with caution, common sense, and in accordance with the instructions in the user manual. Failure to operate it in a safe and responsible manner could result in product loss or injury.

By using this product, you hereby agree that you are solely responsible for your own conduct while using it, and for any consequences thereof. You also agree to use this product only for purposes that are in accordance with all applicable laws, rules and regulations.

The use of Remotely Piloted Aircraft Systems (RPAS) may result in serious injury, death, or property damage if operated without proper training and due care. Before using an RPAS, you must ensure that you are suitably qualified, have received all necessary training, and read all relevant instructions, including the user manual. When using an RPAS, you must adopt safe practices and procedures at all times.

Warnings

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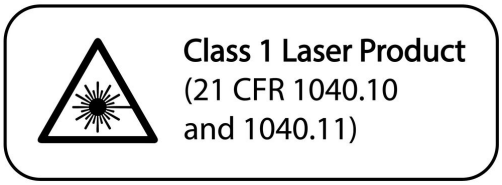
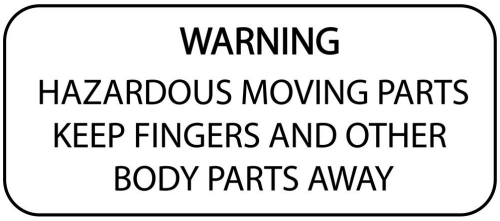
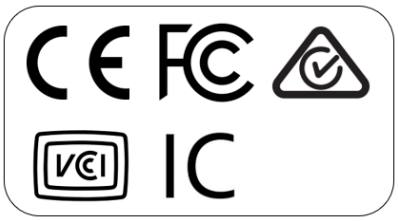
- Always be aware of moving objects that may cause serious injury, such as spinning propellers or other components. *Never* approach a drone while the propellers are spinning or attempt to catch an airborne drone.







Contents

1. Introduction

The colorization feature allows point clouds to be colorized by merging LiDAR scan data with video recorded by a calibrated GoPro camera mounted to Hovermap.

2. Concepts

Hovermap colorization is delivered as a complete hardware and software solution.

- **Camera**: A GoPro is supplied with the colorization option, with a memory card and USB cable for data transfer.
- **Camera mount**: A rigid mount is installed that allows the camera to be installed and removed in a repeatable fashion.
- **Calibration:** Factory calibration is performed on your Hovermap to ensure alignment between LiDAR data and video recording.
- **Software:** The latest version of Emesent Aura.
- **License:** A valid Colorization license.

3. Requirements

- Factory-installed and calibrated camera hardware
- Emesent Aura
- Updated license dongle for colorization
- Hovermap scan file
- GoPro video file

4. Scanning Tips and Techniques

There are a number of considerations that will improve the quality of the colorization.

- Follow the recommended settings for your GoPro.
- Ensure that the GoPro lens is clean and free of dust and other material.
- Only points that fall into the camera's field of view will be colored.
- Keep the Hovermap still for the first 10 seconds after the LiDAR starts to spin, then perform at least three vigorous side-to-side synchronization rotations.
- If using a GoPro Hero perspective camera, we recommend using a "painting" motion to capture as much of the area as possible.
- Minimize vibrational movement to avoid blurry video frames. Move slowly and avoid sharp turns and jerky movements.
- Keep your scanning distance to around 20 m / 65 ft. If you go further than this, the matching of the pixels and points deviates, and you will see a slight decrease in quality.
- It is important to have sufficient lighting in the area being colorized. While Hovermap can operate in complete darkness, the GoPro requires adequate lighting.
- Spend time on subjects to be colorized to improve colorization quality.
- For the best results, make sure to capture each object in the scene from multiple angles using the GoPro camera.
- Limit any movement of objects in the scene being captured, including people walking through the frame.
- Avoid tampering with, or removing, the GoPro mounting bracket. Its exact position has been accounted for during the calibration process.
- Only use colorization when necessary as scanning and processing colorized scans can take longer than a normal scan.
- Each GoPro is calibrated to a specific Hovermap. Do not use a GoPro that has not been calibrated to your Hovermap. Contact your local reseller or Customer Success if you need a new GoPro.
- To help keep your scans and videos in sync, hold your phone in front of the camera after starting the scan and the recording to capture the name of the current scan in the Hovermap web UI.

5. Setting up the GoPro

Before using the colorization software, make sure the GoPro is up to date and video capture settings have been set in the required configuration.

5.1 Pair the GoPro camera

The **Quick** app allows you to start and stop recording remotely. This can be useful in some situations where the camera and Hovermap must be started from a distance.

The steps vary depending on the camera model. The following instructions only apply to the MAX, Hero 8, and Hero 7 models. Refer to the GoPro Support page for other camera-specific pairing instructions.

1. Put your camera in pairing mode:
    a. Power on your camera by holding down the **Mode** button.
    b. Open the utility drawer by swiping from the top to the bottom of the touch display, then select **Preferences**.
    c. Select **Connections** > **Connect to GoPro App**.
2. Open the Quik app:
    a. Select the GoPro icon in the top left corner and tap **Connect a GoPro**.
    b. The app will search for and display a list of cameras. Select your camera.
    c. Select **My Camera is On** and tap **Pair Camera**.
    d. When you see the message that your camera has been found, tap **Connect camera**.
    e. Enter a name for the camera or leave the default name.
    f. When you see the message that your camera is ready, tap **Let's Go**.

5.2 Update the camera firmware

Make sure the camera firmware is updated to the latest version. The Quick app automatically notifies you of firmware upgrades. Follow the on-screen instructions as shown below to upgrade the camera firmware.

> **Note**
> Some other applications may cause the update process to fail due to bluetooth conflicts. Please close other applications whilst configuring the GoPro for the first time.

5.3 Adjust the camera settings

1. Make sure that the GoPro general settings are correct. These settings vary depending on the camera model. Refer to https://4999118.hs-sites.com/en/knowledge/gopro-settings-for-colorization for the specific settings to be used.
2. Once you have configured the settings, **Accept** all changes and **Save** settings into the **Custom** profile.

6. Hardware Setup/Mounting

Emesent or an authorized service agent will supply and install the GoPro mount for your Hovermap. The following instructions are provided in cases where you need to remove and reinstall the mounting system.

> **Important**
> To provide the colorization capability, the Hovermap and the GoPro camera are factory calibrated to become a matched pair. If a different camera or mounting system is employed, they must be recalibrated. Contact your local reseller or Customer Success to have a recalibration done.

> **Warning**
> Removal and reinstallation of the GoPro colorization mount may cause calibration issues and should be avoided unless absolutely necessary. Recalibration may be required. We suggest conducting a test colorization scan after removal and reinstallation of the mount.

6.1 Mount the camera

1. Mount the camera bracket to the Hovermap unit using the four supplied screws. The front end of the bracket should be facing toward the Hovermap LiDAR.

> **Note**
> It is recommended to apply a small amount of Loctite 222 to all of the screws.

2. Once attached, lift the blue retention latch on the camera bracket then insert your GoPro camera. Insert the camera with the main screen facing away from the Hovermap LiDAR.

3. Pull the retention latch down to secure the GoPro in place. Ensure it is sitting securely. It should not be able to move laterally when in the mount.

> **Note**
> The GoPro will record video upside down when Hovermap is mounted on a drone or handle. This is intentional.

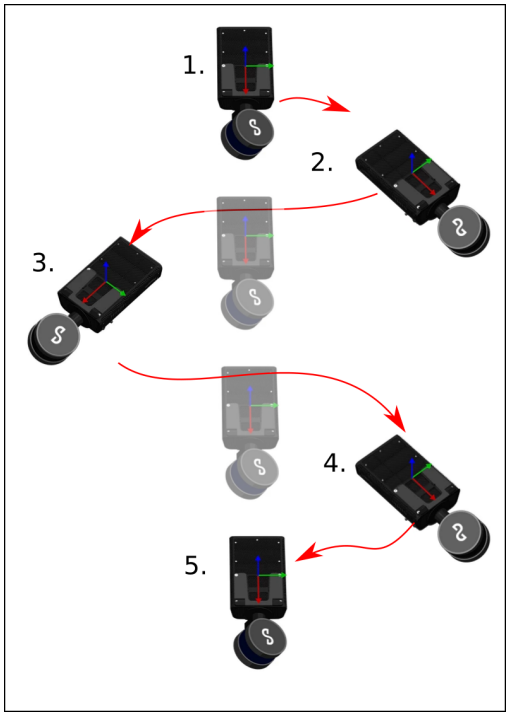
7. Scan Collection

This section details how to start/stop a scan including the remote start and stop procedures.

7.1 Start scanning

1. Press **Record** on the GoPro and **Start** on Hovermap at the same time.
2. Allow Hovermap to remain still for at least 10 seconds after the LiDAR starts spinning (about five slow green pulses).
3. Perform at least three vigorous side-to-side synchronization rotations.

> **Note**
> Rotate the Hovermap around the Z-axis to the sides by approximately 60 degrees, as shown in the following image. The rotation must generate a substantial angular motion (avoid slow rotations).



7.2 Remotely start the camera (optional)

> **Note**
> Even though the scan/recording has been remotely started, it is still necessary to complete the side-to-side synchronization step for optimal results.

To remotely start the recording using the GoPro App:

1. Open the **Quick** app on your tablet or smartphone.
2. **Connect** to your GoPro.
3. Press the middle circle button to **Start** recording.

> **Note**
> Immediately start the Hovermap scan after starting the recording.

To remotely stop the recording:

1. Re-open the **Quik** app.
2. Press the middle circle button to **Stop** recording.

> **Note**
> Immediately stop the Hovermap scan after stopping the recording.

7.3 Stop your scan

Press **Record** on the GoPro and **Stop** on Hovermap at the same time.

> **Note**
> The timing does not need to be exact.

1. While the Hovermap dataset is processing to generate the point cloud, begin gathering the corresponding video from the GoPro memory card.
   a. Insert the supplied USB-C to USB data cable into the GoPro and your computer.
   b. Navigate to your GoPro. Video files are located in **GoProMTP Client Disk Volume\DCIM\100GOPRO**.
   c. Copy the scan video file into the Hovermap scan folder.

> **Note**
> Files can also be transferred by removing the memory card, and inserting it into, a Micro SD card reader connected to your computer.

> **Note**
> For longer scans, the GoPro may split the recording into multiple video files. Ensure all relevant files are copied to the scan folder.

> **Warning**
> If the GoPro has split the video captured into multiple files, ensure that the file sequence (by filename) is not lost if renaming the video files.

2. Wait for all video files to be transferred and for the initial point cloud processing to complete.

8. Process your Hovermap dataset

Go to the *Colorization Workflow* section in the Emesent Aura user manual for more information on processing your colorized dataset.

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