LiAir 250

UAV LIDAR System User Guide

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About This Guide

This document is a general introduction and operation guide for GVI's LiAir 250 lightweight UAV LIDAR mapping/survey systems.

As we continue to update and improve the product, you may find some differences between the contents of this document and your LiAir 250 system. We will diligently update this guide as the product changes.

Please check with GVI for the latest release of this guide and contact GVI support at suppprt@greenvalleyintl.com if you have any questions.

Content

1. Read This First

Important Notices

STOP! PLEASE READ THIS SECTION CAREFULLY BEFORE USING THE PRODUCT!

- LiAir 250 systems use Class 1 (IEC60825-1:2014) eye-safe laser sensors. If you have any concerns, please contact GVI for details.
- System operator must be at least 18 years old.
- Tampering with the product is strictly prohibited and will void the Product Warranty. Any repair, modification, or upgrade must be performed by GVI technician or authorized service provider.
- Do NOT use any power supply outside the specified voltage range. Incorrect voltage supply may cause permanent damages to the integrated instruments and other hazards. Damage caused by the use of unauthorized power supply are not covered by your warranty.
- System safe operating temperature: **-10℃ to + 40℃**.
- STOP using the product and contact GVI support immediately if there is any visible damage or if persistent system warnings or alarms are observed. Failure to do so may result in permanent damage to the LiAir 250 system.
- This product is NOT water-proof. Do NOT operate in rain or snow. Water damage is NOT covered by the Product Warranty.
- This product is a high-precision mapping and surveying instrument that must be handled with care. Damages caused by improper handling of the product are not covered by your warranty.
- Properly disconnect all batteries, antennas, and cables after use.
- This product should by stored and transported in the protective case provided by or authorized for use by GVI.
- Clean the product thoroughly after each use. Use only proper cleaning agents for scientific instrument. Do NOT use water.
- When not in use, store the product in a cool and dry environment.

There may be additional notices and warning in other parts of this document. Please read them carefully and follow the instructions.

2. Brief Introduction of LiAir 250 System

2.1 About

LiAir 250 UAV LIDAR system is a newly designed, light-weighted and fully integrated device developed for multi-rotor aerial platforms. It is well-performed to acquire 3D data and generate highly accurate DEM & DSM product. Additionally, LiAir 250 can provide high-accuracy point cloud of different environments for the users in various industries, e.g. surveying, forestry, power line inspection. For more information on suitable mounting solutions, it is well-welcomed to contact GVI for details.

2.2 System Basics

LiAir 250 is comprised of multiple systems. Its main components include:

- Laser Scanner (LIDAR sensor)
- GNSS (Global Navigation Satellite System)
- IMU (Inertial Measurement Unit)
- System Control and Storage Unit
- Power Supply and Management Unit

The GNSS unit and IMU unit together form what is often referred to as the POS Module.

2.3 System Principles

- In operation, the System Controller receives and executes operational commands while controlling the measurement instrumentation required for UAV-LIDAR data collection.
- The POS Module (GNSS and IMU) determines LiAir 250's position and attitude.
- The precise coordinates of each data point measured by the Laser Scanner is calculated based on the laser's distance and angular measurements, together with its registered POS data.
- Laser data are saved to the SD card (System Control and Storage Unit) of the laser scanner for download after data collection.

2.4 Technical Specification

Table 2-1. LiAir 250 Specifications

LiAir 250 SPECIFICATIONS	
Scan Range	0.3~250 m@ Reflectance ≥ 60%
Eye Safety Class	Laser Class 1 (IEC60825-1:2014)
System Accuracy	± 5 cm
Scan Accuracy	± 15 mm
Field of View (FOV)	up to 360°
Max. Effective Measurement Rate	up to 100,000 meas./sec
POS System Performance (after post-processing)	Attitude: 0.006° (1σ) Azimuth: 0.019° (1σ)
GNSS	GPS, GLONASS, GALILEO, BD
Voltage	14.2~32 V DC
Memory Space	128 G
Typ. Power Consumption	30 W
Working Temperature	-10℃~40℃
Storage Temperature	-40℃~55℃
Dimension	1105 * 145 * 148 mm
Weight	3.78 kg (Camera involved)
Camera	Selectable (visit chapter 3.1.4 for detailed information)

3.LiDAR System

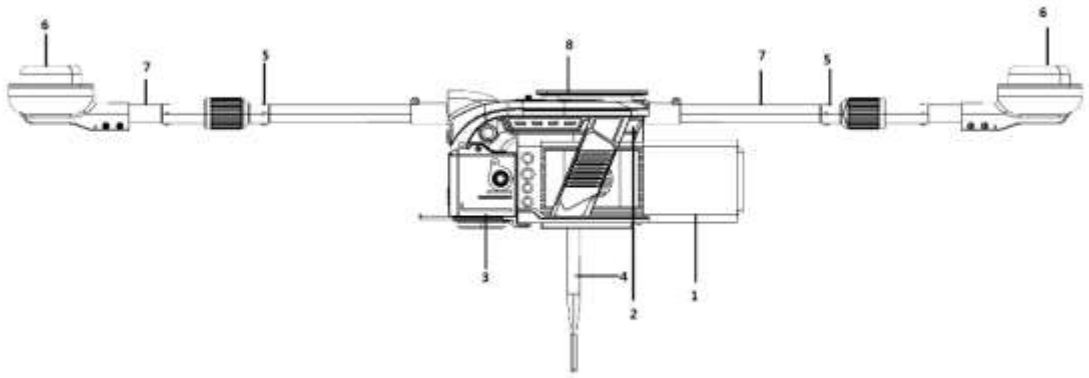

Figure 3-1 Components of LiAir 250

1. Laser scanner
2. Control and Storage Unit
3. RGB Camera Module (selectable)
4. ANT Rod Antenna (for communication with Ground Computer)
5. Folding Antenna Arm Joint
6. GNSS Antenna
7. Antenna arm
8. Payload Mount

3.1 LiDAR System Components

3.1.1 Position and Orientation System (POS)

The airborne Position Orientation System (POS) is an inertial measurement unit (IMU) and Global Navigation Satellite System (GNSS). POS systems are used to accurately determine system velocity, position, and attitude values at specific moments in time.

a) Global Navigation Satellite System (GNSS)

Global navigation satellite system, or (GNSS) on LiAir 250 supports, mainly includes GPS, GPS (the U.S.), Galileo satellite navigation system, (Europe), BeiDou Navigation Satellite System, (China), and GLONASS (Russia). The GNSS of LiAir 250 includes the aviation GNSS antenna and the base station antenna.

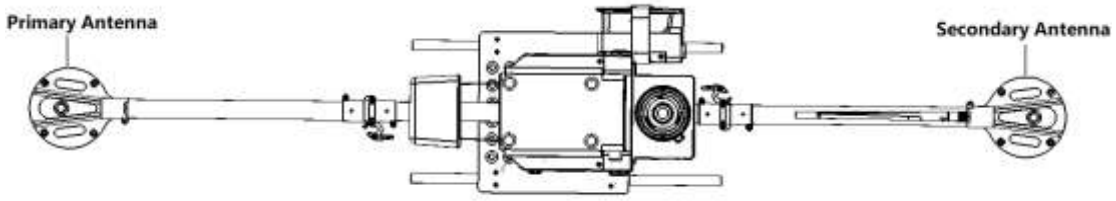

Figure 3-2 Dual Antenna Schematic Diagram of LiAir 250

b) Inertial Measurement Unit (IMU)

Inertia measurement unit, or IMU, consists of a high-accuracy three-axis gyroscope and a high-accuracy three-axis accelerometer. It is the benchmark center of the LiDAR system. Its role is to get the position and orientation information without external reference data.

The LiAir 250 integrates a 3-axis MEMS (Micro-Electro-Mechanical System) gyroscope, 3-axis MEMS accelerometer and dual GNSS/BD receivers into one system, the POS system. Together the POS system components gather multi-reference parameters that provide accurate, effective and reliable navigation data by optimization algorithm of integrated navigation system.

Specification of IMU:

Table 3-1. IMU Specifications

Horizontal Positioning Accuracy (RMS)	Single Point L1/L2	1.2 m
	SBAS	0.6 m
	DGPS	0.4 m
	RTK	1 cm +1 ppm
Measurement Frequency	IMU	125 Hz
	GNSS	20 Hz

Gyroscope Type		MEMS Gyroscope	
Temperature		Operating: -40 ℃ ~ +65 ℃ Storage: -50 ℃ ~ +80 ℃	
Humidity		95% NC	
Dimensions		152 × 142 × 51 mm	
Weight		540 g	
Input Voltage		+10~+30 V DC	
Power Consumption		6 W (Max)	
	Positioning Accuracy (m) RMS Horizontal/Vertical	**Speed Accuracy（m） RMS Horizontal/Vertical**	**Orientation Accuracy (°) RMS Roll/Pitch/Heading**
RTK	0.020 / 0.030	0.020 / 0.010	0.015 / 0.015 / 0.035
SP	1.000 / 0.600	0.020 / 0.010	0.015 / 0.015 / 0.035
PP	0.010 / 0.020	0.020 / 0.010	0.005 / 0.005 / 0.017

Note: Please DO NOT install antenna or coaxial cable while using the IMU in the storm environment.

3.1.2 Laser Scanner

The laser scanner is the core component of the LIDAR system. The transmitter of the laser scanner transmits an ultrashort pulse. It hits the target object and be reflected diffusely. Then the receiver receives the echo. With the time difference between the pulse transmitting and receiving, the distance from the laser scanner to the scanned object can be calculated.

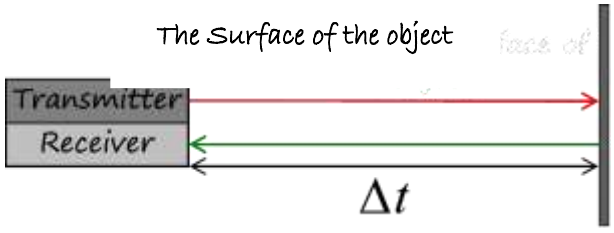

Figure 3-3. The Principle of Laser Scanner

The formula of the distance calculating: $S = \frac{1}{2} \times c \times \Delta t$

In the formula , S is the distance from the laser scanner to the scanned object, c is the light speed, and the Δt is the time difference between the signal transmitting and receiving.

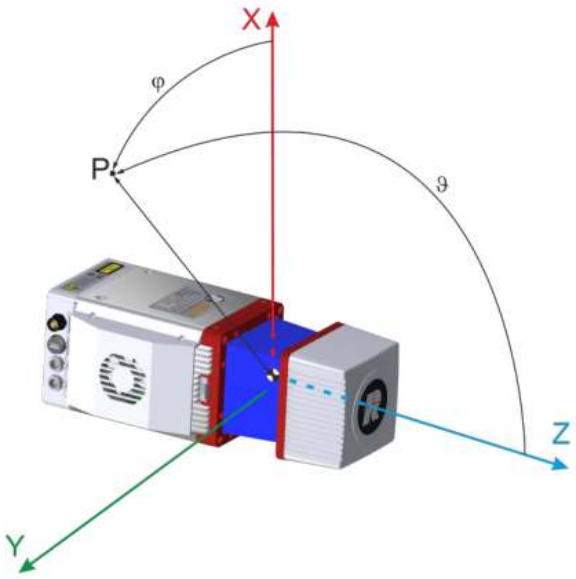

Figure 3-4. mini VUX-1UAV Laser Scanner

Mini VUX-1UAV is a light-weight laser scanner designed especially for UAV. The speed of data acquisition is high based on waveform digitalization and real-time waveform processing. What's more, 360° scan can be performed through rotating mirror to get entire data of the surroundings. In addition, multi-target detection is allowed, and there is up to 5 return waves of each laser beam.

Table 3-2. Specifications

LiAir 250 SPECIFICATIONS	
Scanning Mechanism	Rotating Mirror
Scan Range	0.3~250 m @ Reflectance ≥ 60%
Scan Accuracy	± 15 mm
Repetitiveness Precision	10 mm
Measurement Frequency	10 Hz ~ 100 Hz

Angular Measurement Resolution	0.001°
Max. Effective Measurement Rate	up to 100,000 meas./sec
Field of View (FOV)	up to 360°
Eye Safety Class	Laser Class 1 (IEC60825-1:2014)
Memory Space	32 GB SDHC/SDXC card
Communication with External Devices	WLAN IEEE802.11
GNSS Interface	Serial RS-232 interface for data string with GNSS-time information, TTL input for 1PPS synchronization pulse
Input Voltage	11~34 V DC
Power Consumption	16 W @ 100 scans/sec
Operation Temperature	-10℃~40℃
Storage Temperature	-20℃~50℃

Note: The ports of miniVUX-1UAV are on both sides of the device

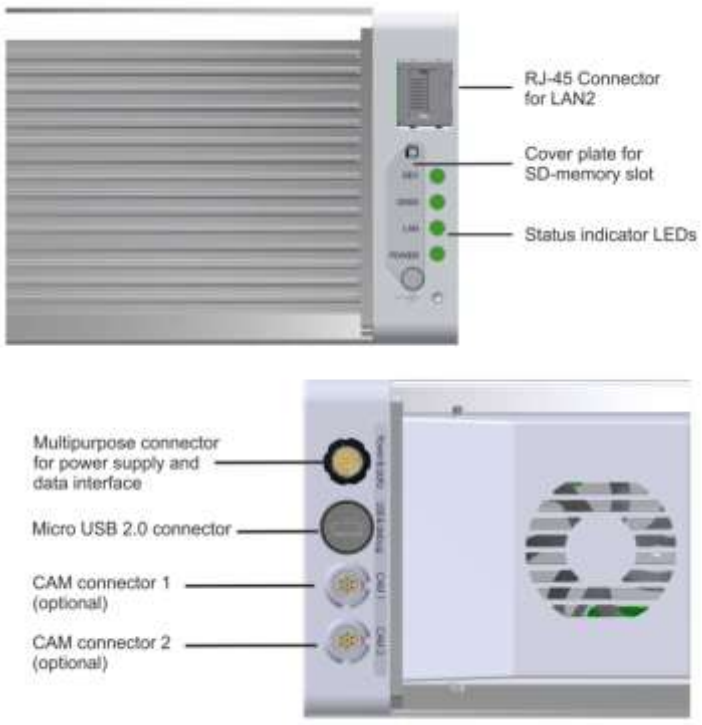

Figure 3-5 Ports of miniVUX-1UAV

Connector for LAN: This port is used to configure the hardware system and download the data from the memory of the device.

SD-memory Slot: This slot is used to place the SD card for data storage. 64 GB SD card is inserted by default

Status indicator LEDs: These LEDs are used to show the working status of the LiDAR system. Please see the Status Indicator LEDs table below to understanding the status and meanings.

Connector for power supply and data interface: This port is used to power the device, download the data, synchronize the GNSS signal, etc.

Micro USB 2.0 connector: This port is used to connect USB device.

CAM connector: This port is used to connect to the camera to output the power, GNSS information, and trigger time.

Status Indicator LEDs:

Table 3-3. Specifications of Indicator LEDs

Indicator	Status	Meaning
DEV	green steady green flashes	No error Boot sequence
DEV	blue steady	Storage media is busy do not remove
DEV	red steady red fast flashes	Warning is pending Error is pending
GNSS	green steady green flashes	GNSS synchronized Lost synchronization
GNSS	red steady	Not synchronization to GNSS
GNSS	off	GNSS syncing is disabled
LAN	green steady green flashes	Connected/ DHCP Client Connected/ Static IP
LAN	blue steady	Connected/ DHCP Client
LAN	red steady red flashes	Connected/ No IP address Connected/ IP config error
LAN	off	Not connected
POWER	green steady	Power supply ok
POWER	red steady	Voltage too low or current too high

3.1.3 Control and Storage Unit

Main functions of the control and storage unit includes:

1. Receiving the commands from the computer and executes the commands
2. Controlling and coordinating each sensor to work properly
3. Storing the data. The 128 GB SD card inside is used to store the data of IMU, camera, and device log.

Figure 3-6 Ports and Panels of Control and Storage Unit

1. Indicator LEDs: These LEDs are used to show the work status of the sensors of the device. These LEDs include IMU indicator LED, laser scanner indicator LED, camera indicator LED and data quality assessment (DQA) indicator LED.
2. Port for power source of laser scanner: The control system of the device powers the laser scanner via this port with the power cable, which is shown as follow.

Figure 3-7 Power Cable of the Laser Scanner

The status and the meanings of the indicator LEDs are shown in the table below:

Table 3-3 Specifications of Indicator LEDs

Indicator LEDs	Light Status	Status Description
IMU	Flashing once per sec	IMU's initial alignment (initializing)
	Steady light	IMU's initial alignment (completed)
	Off	Power down
LiDAR	Flashing once per sec	LIDAR is unsynchronized
	Steady light	LIDAR is synchronized
	Off	Power down
CAM	Flashing once per sec	Camera is in self-calibration
	Steady light	Self-calibration completed
	Off	Power down
DQA	Flashing once per sec	In calculating
	Steady light	Good data quality
	Off	Poor data quality

3.1.4 Integrated Camera

LiAir 250 is equipped with a modified Sony A6000 RGB camera. The specifications of the camera are shown in the table below:

Specifications of Camera:

Table 3-4 Specifications of Camera

Model	SONY A6000
Image sensor format	APS-C format (23.5 * 15.6 mm)
Lens	16 mm fixed focal length lens
Effective pixels	24.3 MP (megapixel)
Sensor type	COMS
Exposure mode	Fixed distance interval/Fixed time interval
Weight	315 g

3.2 Radio Station

LiAir 250 LiDAR system is equipped with radio station, which is used to establish communication between the ground control device and the LiAir 250 system. When the working temperature is higher than 35℃,the built-in radiator fan will work. And with the use of external power supply, safety will increase.

3.2.1 Brief Introduction of Radio Station

Figure 3-8 Radio Station

1. Serial port: The port is used to connect radio station and computer.
2. Working Status Indicator LEDs: The system works properly, when the light status shows solid blue.
3. External power source port: This port is used to connect with external battery
4. Antenna port: This port is used to connect with antenna.
5. Rod Antenna (interior screw waviness)
6. Fan radiator

Specification of radio station:

Table 3-5 Specifications of Radio Station

Voltage	12 ~ 30 V
Current	0.3 A @ 12 V DC
Power Consumption	3.6 W
Fan Radiator Working Temperature	35 ℃
Dimension	116.5 * 88 * 43 mm

Note: the radio station cannot be exposed to the high temperatures. Otherwise it may cause permanent damages to the radio station.

3.2.2 IP Setting Up

Figure 3-9 Connecting Radio Station to a Computer

1. Please turn off WIFI first
2. Connect the radio station and the computer via a USB cable, wait for the indicator LEDs to work.
3. Navigate the network settings on the tablet. Set the IP address to the following values (as is shown in the graph):

    - IP address: 192.168.1.66

Figure 3-10 Reference of Interface Settings

Note: IP address should be changed if it is used for the first time. And IP address should be inputted in the form of 192.168.1.xx, however, please do not use number 7, 8 or 88 for the last two digits.

3.3 GPS Base Station

The main function of the GPS base station is to position the same point in order to get high-accuracy location of single point. And all the information recorded will be used as a reference for difference. The GNSS base station consists of GPS antenna, GPS receiver, and a power source.

3.3.1 Brief Introduction of GPS Base Station Receiver

Figure 3-11 GPS Base Station Receiver

1 – Power Port (9-30V, 0.3A@12V): This port is used to power the base station.

2 – USB Port: This port is used to connect with computer for the data transfer purposes.

3 – System Status Indicator LEDs: This indicator LEDs show the working status of the base station.

4 – RTK Button: Not effective for LiAir 250.

5 – Save Button: This button is used to start/stop the base station data collection.

6 – RTK Antenna Port

7 – GNSS Antenna Port: This port is used to connect with the GNSS antenna with feeder cable.

8 –RTK Rod Antenna

Base Station Indicator LEDs

Table 3-6 Specifications of Indicator LEDs

LED Icon	Light Status	Status Description
	Solid **red**	Base station power supply is normal
	Flashing **red**	Base station power supply is low
	Solid **blue**	Recording base station data
	Flashing **blue**	Internal data storage failed to mount. Remaining storage space is low (less than 1 GB remaining)
	Off	Not recording base station data
	Solid **green**	RTK connection established
	Flashing **orange**	Locating satellites
	Solid **orange**	Satellite positions locked

Base Station Specifications

Table 3-7 Base Station Specifications

System Performance	**Signals**	GPS: L1, L2, L2C, LC GLONASS: L1, L2, L2C BDS: B1, B2 GALILEO: E1, E5a, E5b, ALtBOC, SBAS, QZSS, L-band	
	Horizontal positioning accuracy	Single point L1	1.5 m
		Single point L1/L2	1.2 m
		SBAS	0.6 m
		DGPS	0.4 m
		RT-2	1 cm + 1 ppm
		Initial time	< 10 s
		Initial reliability	> 99.9%
	Direction finding accuracy	0.2/m	
	Data update rate	Raw data	Up to 50 Hz
		Position data	Up to 50 Hz

	First position time	Cold start	< 50 s
		Warm start	< 35 s
Dimensions and electrical parameters	**Dimensions (mm)**	130 × 90 × 32	
	Weight	300 g	
	Input voltage	12 V	
	Consumption	4 W	
Communication Port	**Download**	USB	
Operating Environment	**Temperature**	Working temperature	-40℃ - +75℃
		Storage temperature	-40℃ - +85℃
	Relative humidity	95% no condensation	

3.3.2 Base Station Operation

3.3.2.1 Data Collection Steps

Figure 3-12 GPS Base Station Setup

1. Connect the Base Station with provided GPS Antenna and an External Power Source as shown above.
2. Power on the Base Station.
3. Wait for Base Station to initialize. Once completed:
   a.  Battery signal light is steady.
   b.  Save signal light is off.
   c.  RTK signal light is steady.
   d.  GPS satellite signal light is solid.
4. Press and hold 

for more than one second and then release. The save indicator will turn solid blue and the data will start recording to the Base Station's internal storage device.
5. After LiAir data collection is complete, press and hold 

for more than one second. The save indictor will turn off and data will stop recording to the Base Station's internal storage device.
6. Power off the system.

3.3.2.2 Download Base Station Data

Figure 3-13 Connecting Base Station to a Computer for Data Download

1. Connect the Base Station to a computer via provided USB cable.
2. The computer should recognize Base Station as an external disk.
3. Copy the project's Base Station data file into designated subfolder.

Note: The Base Station's data files (.log) are named based on UTC time, e.g. 20170810063808.log.

4. Data Acquisition and Download

4.1 Data Acquisition

1. Set up the base station in an open area to get high positioning accuracy. And please navigate chapter 3.2.2.1 for more details about data collection.

2. Mount the payload on to the UAV and connect with each other using the device Power Cord.

3. Connect the radio station and the computer via a USB cable, wait for the indicator LEDs to work. And please navigate chapter 3.2.2 for more details about IP setting up.

4. Launch LiAcquire software, and click the 

icon to establish the communication between the computer and the LiAir system

5. Click the 

icon to set up the collection parameters.

1) There are two modes to choose for data collection: Auto Mode and Manual Mode.

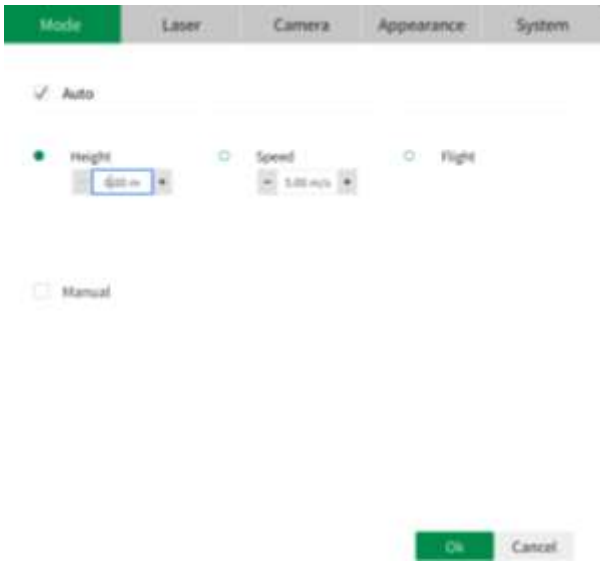

Figure 4-1 Auto Mode Settings

- **Auto Mode**

  After pressing "Start" button, IMU starts to work. Users could choose one mode from Height, Speed and Flight settings. If the system meets the setting requirements, camera data and LiDAR data will be recorded.

  Note: If the device does not include a camera module, users can select None for camera type. If the LiAir 250 contains a camera model, users can select it as needed.

  - **Height Mode Setting:**

    - If the user defined height (in meters) is < than 30 m, the laser scanner and camera (selectable) will start to work simultaneously.

- If the user defined height (in meters) is ≥ than 30 m, and the actual flight height is ≥ user defined value minus 5 meters, the laser scanner and camera (selectable) will start to work.
- If the user defined height (in meters) is ≥ than 30 m, and the actual flight height is ≤ user defined value minus 20 meters for more than 10 seconds, then stop scanning automatically.

- **Speed Mode Setting:**
  - If the actual flight speed in meters per second is ≥ user defined value, laser scanner will start;
  - If the actual flight speed in meters per second is < user defined value for more than 10 seconds, then stop scanning.
- **Flight Mode Setting:**
  - Users can set the starting and ending collection time via Flight Mode. The system will start scanning when received the command from Flight Mode. If the system missed the signal for more than 5 seconds, then it will stop scanning.

- **Manual Mode**

  Users can perform the flight plan manually via start button in Manual Mode interface.

  Note: please follow the Operational Instructions carefully, especially follow the operational order.

Figure 4-2 Manual Mode Settings

2) Setting the LiDAR scanning parameters via "Laser".

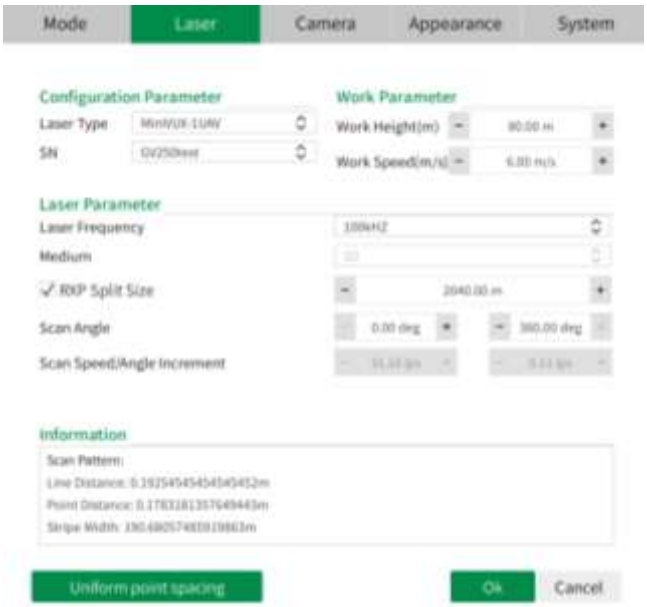

Figure 4-3 Laser Parameters Settings

a. Configuration Parameter: the parameters will be read via computers directly, including Laser Type and SN information.

- Laser Type: MiniVUX-1UAV is selected for LiAir 250.
- SN: LiDAR Serial Number.

b. Work Parameter: the parameters include the designed work height and designed work speed for the flight mission.

- Work Height (m): enter the designed work height for this mission (the flight height refers to the vertical distance of a UAV measured from land surface but not the mean sea level).
- Work Speed (m/s): enter the designed work speed for this mission.

c. Laser Parameter

- Laser Frequency: number of laser pulses per second, usually expressed in Hertz (Hz) or laser pulses per second. And 100 Hz (cannot be changed) is selected for MiniVUX-1UAV.
- Medium (Storage Mode): the collected LiDAR data can be stored in external SD memory card by default.
- RXPSplitSize:
  - If users select the "RXPSplitSize"' option, the operating system of LiAir 250 will generate several new files to store the data. And for each file, the maximum data size is 2GB.
  - If users unclick this option, the system will store all the data in one file.
  - Note: it is suggested to use "RXPSplitSize", if the data size is bigger than 2 GB.
- Scan Angle (Default): 0°~360°
- Scan Speed / Angle Increment (Default)

d. Information

- Line Distance: the distance between two scan lines.
- Point Distance: the distance between two scanned points.

- Strip Width: the width of LiDAR strip.

3) After setting the laser parameters, users can click "Camera" setting window. If the device does not include a camera module, users can unselect "Use" icon. If the LiAir 250 contains a camera model, users can set the time interval or distance interval.

- Time (second): enter the time interval, and "> 1s" is suggested, working frequency of camera is according to the set value of time interval.
- Distance (meter): enter the distance interval, working frequency of camera is according to the set value of distance interval.

Figure 4-4 Camera Parameters Settings

6. After setting all the parameters mentioned above, take a long press of  button on LiAir system to start collection. IMU will start to work immediately and if the system meets the setting requirements, camera data and LiDAR data will be recorded as well.

7. After finishing data collection, please take a long press of  button to stop collection.

Notes: please go into operational instruction for detailed information.

4.2 Data Download

4.2.1 Storage Location

LiAir 250 will automatically create a project for the mission in SD card of laser scanner and associated subfolders to store incoming data on LiAir 250's internal storage device. The organization structure of the project file is shown in the figure below.

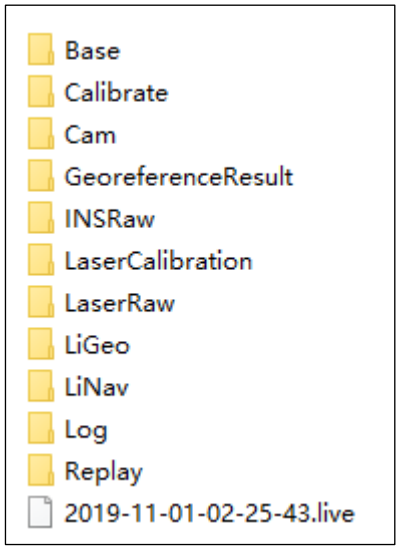

Figure 4-5 Project Folder Structure

Project folder is named with UTC Time, including:

- **Base folder** is used to store the ground GPS base station data.
- **Calibrate folder** is used to store calibrated files (*.cal). Please notice that: do not remove or delete this folder, otherwise, the performance of georeferencing will fail.
- **Cam folder** is used to store the information of exposure time, location, and attitude angles of each image (.cam). And the image needs to be moved to "Cam"-> "Images"-> "Cam1" folder copied from Camera's SD card.
- **GeoreferenceResult folder** is used to store the post-processed point cloud data calculated by the Georeference software.
- **INSRaw folder** is used to store the raw IMU data (*.imu).
- **LaserCalibration folder** is used to store the calibrated file of LiDAR (*.csv).
- **LaserRaw folder** is used to store the raw data of laser scanner's point cloud (*.rxp). After being post-processing, it is convenient for users to convert the data's format as needed.

- **LiNav folder** is used to store the intermediate file when processing the data of integrated navigation system. What's more, the finial-georeferencing results of POS data is suitable to be stored as well.
- **Log folder** is used to store the log information of the project showing detailed operation process.
- **Replay folder** is used to store the replay file of recorded trajectory and point cloud data, but only available to the specified device which supports real time display.
- ***.Live (project file)** is used to record the information of project organization, configuration values, etc.

4.2.2 Download LiAir 250 Data

1. Download the data via SD card

(1) Power off the LiAir 250 first and rotate the SD card panel in clockwise direction.

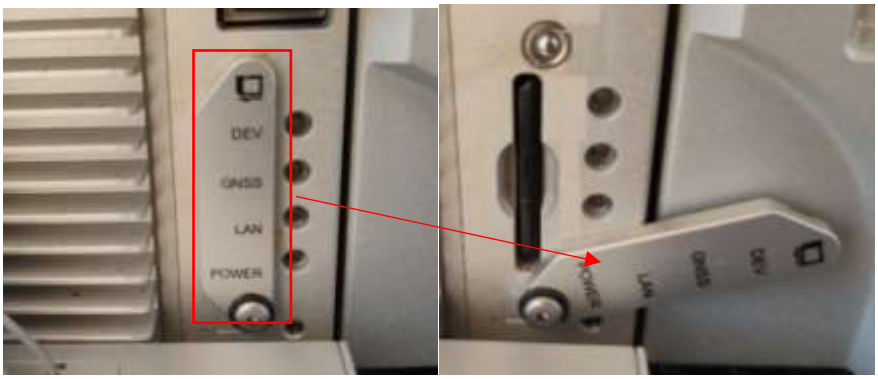

Figure 4-6 Clockwise rotate the panel SD card

(2) Take out the SD card and copy the data into the computer.

2. Download the data via Ethernet Cable

The method below shows how to transfer data from the LiAir 250 payload. This recommended method is to establish a connection between LiAir 250's internal storage device and directly to a computer via the provided LEMO to Ethernet Cable provided by GVI. And it is convenient for users to download the data at any time after completing the flight mission. The IMU file, cam file, log file will be automatically downloaded to the project folder in the SD card of the laser scanner.

(1) Connect the computer to LiAir 250 using the provided LEMO to Ethernet Cable.

Figure 4-7 Connection between the computer and LiAir 250

(2) Set up the Internet Protocol Version 4 (TCP/IPv4) Properties dialog window and change the IP settings to match those found in Figure 4-8 which mentioned before.

Figure 4-8 IP settings interface

(3) Launch LiAcquire, and click  icon, the "Download" interface will pop up. Users can select the data file and click the "Start" button to perform data download. And it will succeed after downloading 100%.

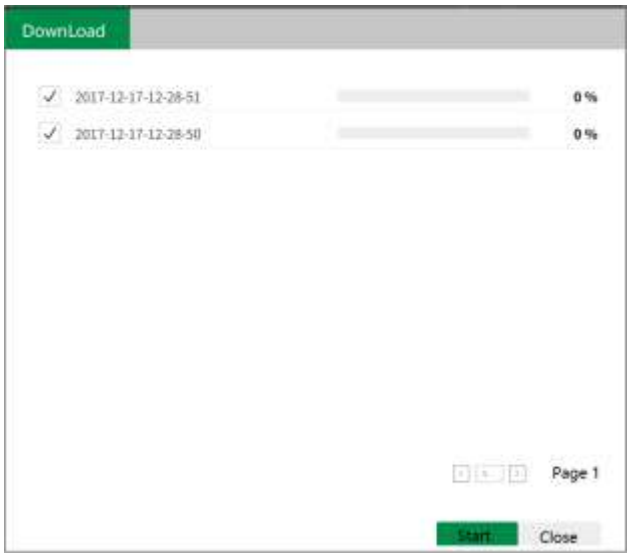

Figure 4-9 Data Download

(4) After downloading successfully, click the "Disconnect" button of LiAcquire. Save and close current project, and power off the LiAir 250 system.

And please check to make sure the downloaded data size is the same as the internal storage data size, if not, please redownload the data.

4.2.3 Download Camera Data

(1) Take out the SD card of camera.

(2) The computer will read the camera's SD card, and please go into the "Cam" -> "Images" folder which mentioned before in project folder, users need to create a new folder named "Cam1" in "Images" folder. And paste the images copied from camera's SD card into "Cam1" folder.

Figure 4-10 SD card of camera

Note: please do not cut any system files stored in camera's SD card. And users do not need to copy the self-calibrated images.

5. Special Notes

Here are some special Note to pay attention while operating LiAir 250. GVI has compiled these Note based on experiences and feedback from customers. The following points out details that seem small or insignificant but can, however, lead to issues that may be difficult or impossible to rectify post mission if left unchecked.

Operation Notice & Equipment Maintenance

- The LiAir 250 system integrates several high-precision instruments. Please handle with care.
- Avoid direct impact to the system. Always store all items properly in the protective case before transporting. Do not move or transport the system unprotected.
- This product should by stored and transported in the protective case provided by or authorized for use by GVI.
- Do NOT scratch the Laser Scanner Lens.
- Ensure the Laser Scanner Lens surface is clean before mission. Only clean the lens with special cleaning agents for high-precision measurement instruments and optics with soft cloth.
- Clean the product thoroughly after each use. Use only proper cleaning agents for scientific instrument.
- Pull the power off softly and properly disconnect all batteries, antennas, and cables after use.
- Please perform power-on test if the machine is not used for more than one month.
- Do NOT operate the system in raining or harsh environment outside its safe temperature range.
- System safe operating temperature: **-10℃ to + 40℃**.
- Storage temperature: **-20℃ to + 50℃**.
- This product is NOT water-proof. Do NOT operate in rain or snow. Water damage is NOT covered by the Product Warranty. When not in use, store the product in a cool and dry environment.
- Tampering with the product is strictly prohibited and will void the Product Warranty. Any repair, modification, or upgrade must be performed by GVI technician or authorized service provider.
- This product is a high-precision mapping and surveying instrument that must be handled with care. Damages caused by improper handling of the product are not covered by your warranty.