AiDEN

User Manual

Ver 1.2

Table of Contents

Revision History

Revision	Date	Description
Ver 1.0 Ver 1.1 Ver 1.2	Aug. 05. 2024 Nov. 11. 2024 Jan. 08.2025	Initial release Add Appendix Change Operating Frequency on Technical Specification

Introduction

AiDEN, developed by Nearthlab, Inc., is an autonomous drone that enables the safe and effective inspection of reconnaissance, surveillance, public safety, and infrastructure. By pressing a button, AiDEN starts an autonomous visual inspection and recognizes obstacles. All the features and systems of AiDEN make it possible to go beyond high quality and collect image data of uniform quality.

The following table describes the guide of AiDEN by each chapter:

Contents	Description
Precautions	Describes the safety and precautions of AiDEN.
Package Contents	Describes the package contents.
Hardware Preparation	Describes the hardware Installation and settings for flight.
AiDEN Flight Guide	Describes the basic knowledge of AiDEN and how to control.
Flight Environment	Describes the mission concept and procedures of AiDEN for wind turbine inspection.
AiDEN Application Guide	Describes the using AiDEN Application.
Technical Specification	Describes the basic specifications of AiDEN.
Proprietary Notice	Describes the intellectual property rights of Nearthlab.

Precautions ⚠️

The precautions in this document affect your safety and legal rights and responsibilities. Read the entire document carefully to understand and ensure proper configuration before use. Failure to follow the instructions and warnings in this document may result in product damage or severe injury.

- The aircraft is not waterproof. DO NOT fly in rainy or snowy weather.
- Ensure the pilot is sufficiently trained and fully aware of using this product.
- DO NOT use this product for illegal or inappropriate purposes.
- The rotating propellers can cause severe damage and injury. Always fly with caution.
- Ensure that all other parts are installed before inserting the batteries.
- Ensure that the propellers and motors are installed correctly before each flight.
- Ensure the remote controller and the aircraft batteries are fully charged before the flight.
- Only use the batteries provided by Nearthlab as the power supply.
- DO NOT remove any glued-in screws.
- Maintain a safe distance from people, buildings, high-voltage power lines, tall trees, water, and other hazards when flying the aircraft.
- DO NOT overload the system.
- DO NOT go near or touch the motors or propellers when spinning, as this can cause severe injury.
- Ensure that all parts are in good condition before each flight. DO NOT fly with worn or damaged parts.
- Disconnect and remove the batteries during transportation to avoid damage or injury.
- Ensure all the cameras, sensors, and vision system lenses are clean and dust-free.
- DO NOT fly under the influence of alcohol, drugs, or any substances that may impair your cognitive abilities.
- Ensure to comply with the local regulations and policies of the corresponding country.
- DO NOT rely on only the camera view but always maintain a visual line of sight with your eyes on the aircraft.
- DO NOT fly the aircraft in an environment with substantial electromagnetic interference.
- DO NOT charge or discharge the battery near flammable materials.
- All safety guard blocks must be assembled during transportation to avoid damage or injury.
- Drone must be packed in the dedicated carrier during transportation.
- DO NOT expose the drone and batteries under direct sunlight when it is not flying.

Package Contents

Ensure all the items are included in your package.

- TN-7227 Case

- AiDEN Aircraft

- Remote Controller

- Battery

- Battery Charger

- USB Charger for the Remote Controller

- Spare Propellers (x2)

- Propeller Lock

- AC Cable for the Battery Charger

- Lens Cleaning Kit
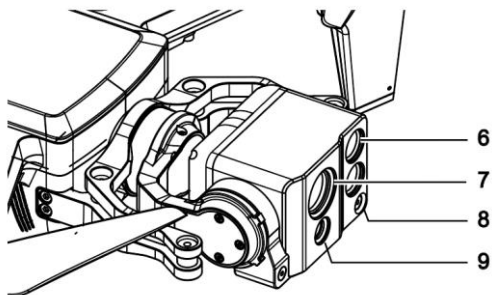
- Propeller Replacement Tool

- User Manual

Hardware Preparation

This chapter describes the features and installation of AiDEN and contains diagrams of the aircraft and remote controller with component explanations.
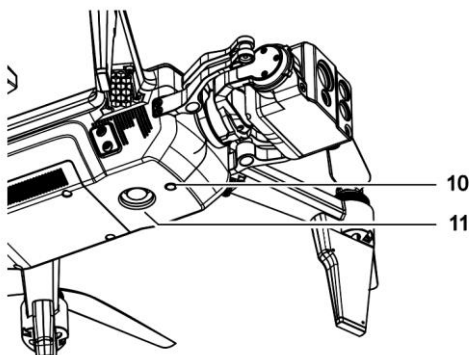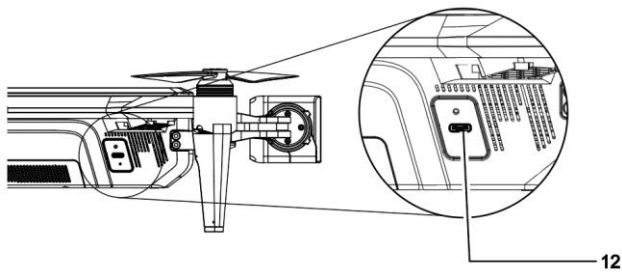
AiDEN Components
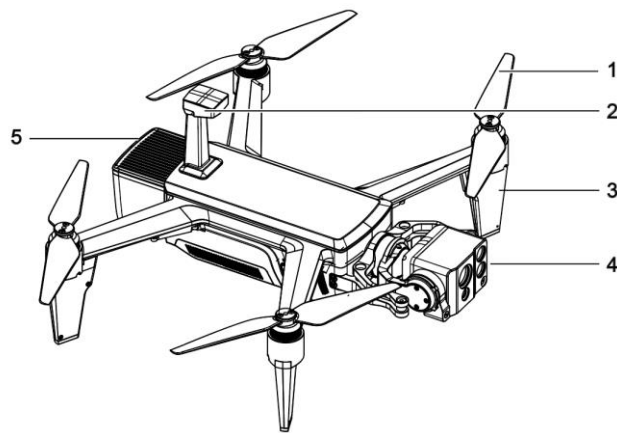
1. Propellers
2. GPS
3. Landing Gears
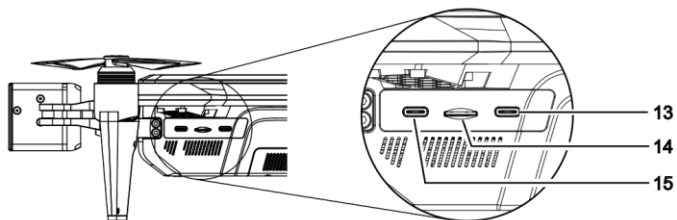4. Payload
5. Battery

6. LRF (Laser Range Finder)
7. IR CAM
8. Stereo Vision
9. EO CAM

10. Tracking CAM
11. FAN (Air Blow)
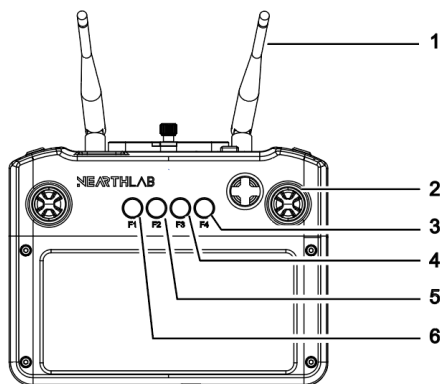
12. Voxl Debug Port

13. USB Host Port

14. SD Card Camera Data

15. FC Debug Port

Remote Controller Components
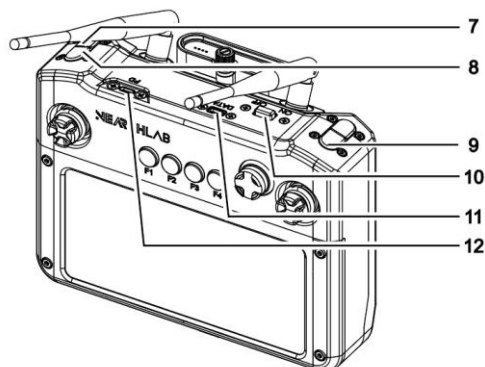

1. Antenna

2. Control Stick

3. Manual Mode

4. Disarming

5. Arming

6. Auto Mode

7. (L1) Gimbal Pitch Up

8. (L2) Gimbal Pitch Down

9. (R2) Photo Shooting
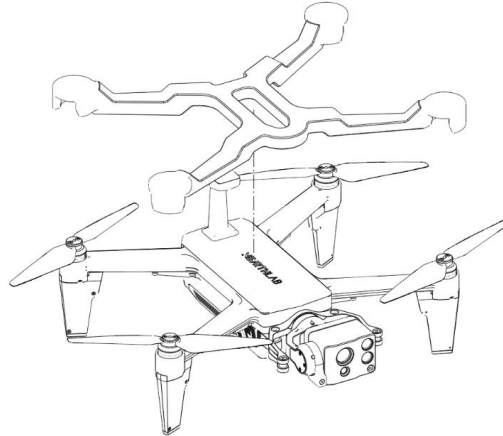
10. On/Off Toggle

11. Data Output Port

12. Power Input

AiDEN Preparation

The following procedure describes the AiDEN installation and preparation for the flight.

     * Note: Prepare the aircraft and remote controller and then turn on the aircraft in order.

1. Take the aircraft from the case and put it on flat ground.
2. Remove the prop-lock and put the prop-lock back to the case.

3. Check whether the propellers, gimbal, motor, and arms work properly.
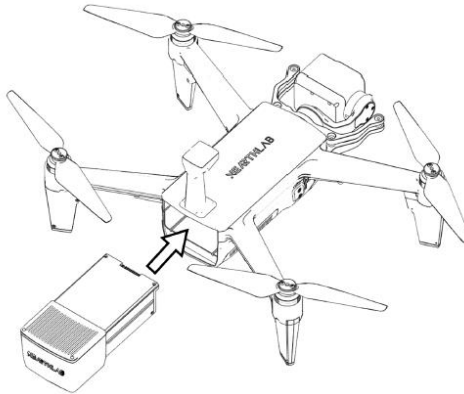4. Check the memory card is inserted with enough capacity.
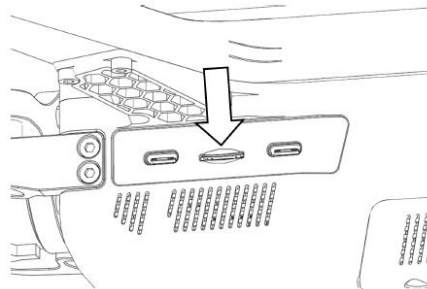
5. Place the aircraft on the take-off point.

AiDEN Execution

* **Note**: Prepare the aircraft and remote controller and then turn on the aircraft in order.

1. Install the battery to the battery slot of the aircraft. The power will turn on when the battery is installed.


2. The system will take a minute to boot and check the connection between the remote controller and the aircraft by looking at the signal on the top right side of the application screen.
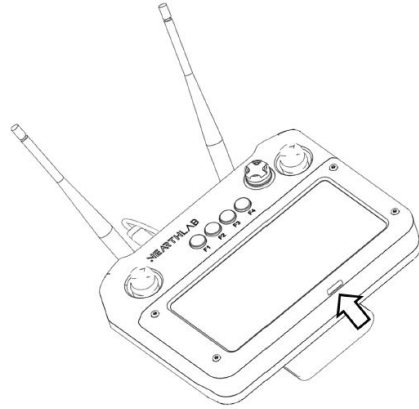
Remote Controller Preparation

The following procedure describes the remote controller preparation.

* **Note**: Prepare the aircraft and remote controller and then turn on the aircraft in order.

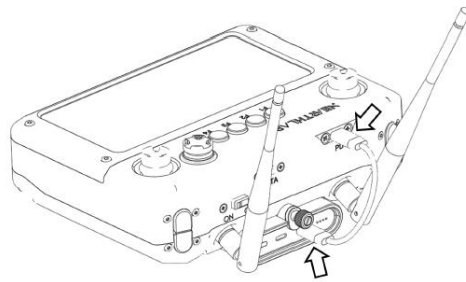1. Take the remote controller from the case.
2. Unfold the antennas.
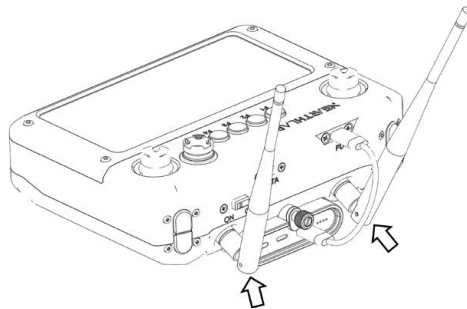
3. Press the power button for about three seconds to turn on.
4. Connect the power cable to the remote controller.

5. Turn the power toggle on at the top and check the ethernet device is recognized.

6. Run the AiDEN application.

7. When the mission is complete, disassemble the aircraft and the remote controller in reverse order.

AiDEN Flight Guide

Flight Modes

The user should acknowledge about the different flight modes.

P (Positioning) Mode

P mode is called positioning mode which controls the aircraft to maintain a precise position and navigates to the desired location. It utilizes a combination of GPS and INS sensors for more accurate positioning to support and stabilize the flight.

The P mode is suitable for easy RC mode, where the roll and pitch sticks control the aircraft's acceleration in the left and right and forward and backward directions, and the throttle controls the rate of ascent and descent. P mode is suitable for basic manual flying.

RTH (Return-to-Home) Mode

RTH is also known as return-to-home mode, and it is used in an emergency like failsafe work. Within an emergency, the aircraft changes to RTH mode and returns to its home position, where it took off. With the RTH mode, the aircraft safely flies on an unobstructed path to the designated home point so that it can land.

The followings are the condition of failsafe work:

- Disconnected from GCS or Application for more than 0.5 seconds: Hovering
- Disconnected from GCS or Application for more than 5 seconds: RTH or landing
  * **Note**: The RTH flight performs differently by the production procedure.

Once the aircraft enters failsafe, RTH mode is performed automatically and returns to its home position. RTH mode performs in the following order:

- Elevate an altitude
- Move directly forward to the home point
- Descend an altitude
- Landing

Flight Environment

For an operation, the following environmental requirements must be met:

- Do not operate the aircraft in adverse weather conditions including but not limited to rain, snow, and fog.
- The maximum allowable wind speed for flight is 12m/s including gust.
- The pilot must follow the guidelines/policies for the operation of aerial devices.
  - ex) US Federal Drone Law → Commercial Drone Rules (Part 107) → Section 107.51 Operating Limitations for small, unmanned aircraft suggest that drones should be flown with minimum visibility of 3 miles (4.8 km)
- Image quality could be compromised, if the camera heads against the sun - (Please refer to the image down below)
- Operating temperature: 0 ~ 35 ℃ (32 ~ 95℉)

AiDEN Application Guide

The AiDEN Application is designed to control AiDEN and all the necessary features that allow the performance of surveillance and patrol. The application is installed on the iPad at initial delivery.
The flight controller receives the time and date by GPS signal. The system compares the time and date of the iPad and the aircraft, and the application gets ready when the time is synchronized.
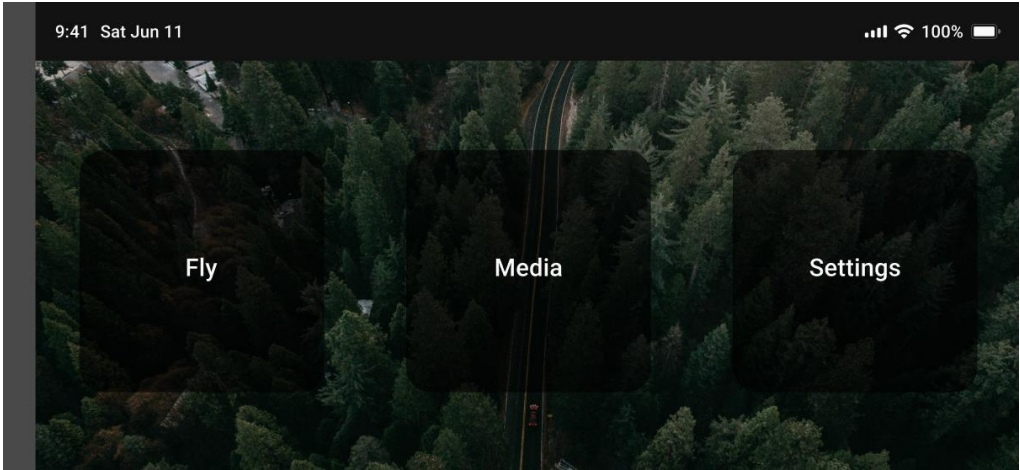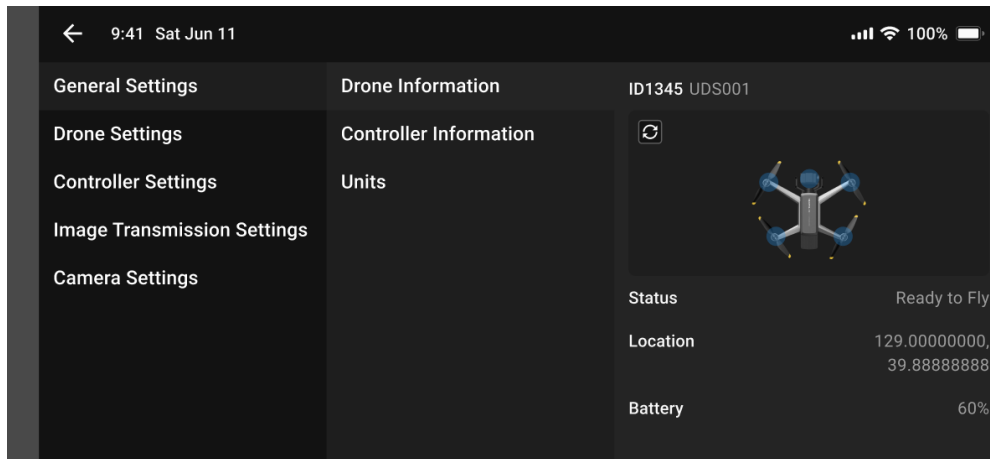

Menu	Description
Fly	Performs the autonomous patrol flight.
Media	Access into the data sources acquired during the flight.
Settings	The user can set the basic settings of the aircraft and inspection flight and the aircraft.

Settings

Press the '**Settings**' menu on the home screen and start the settings. The settings are saved automatically and applied.
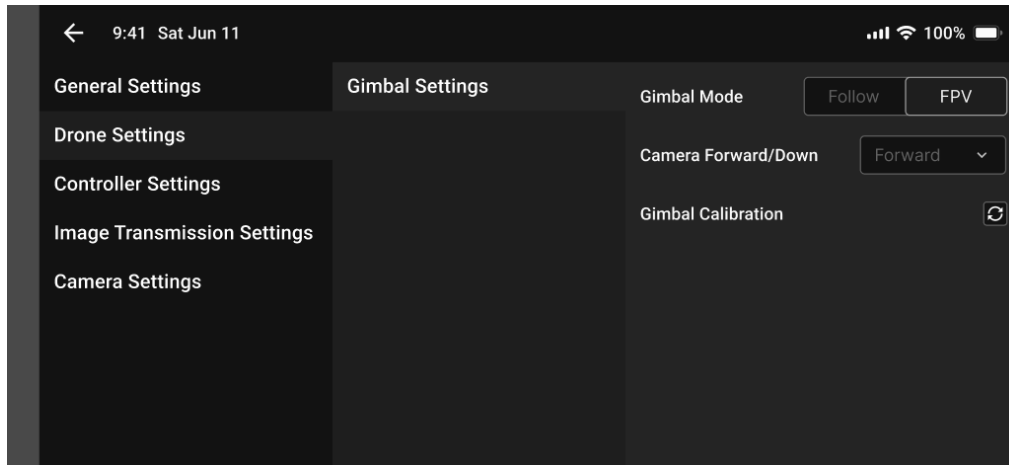
General Settings

Press the '**General Settings'** and check the general information.

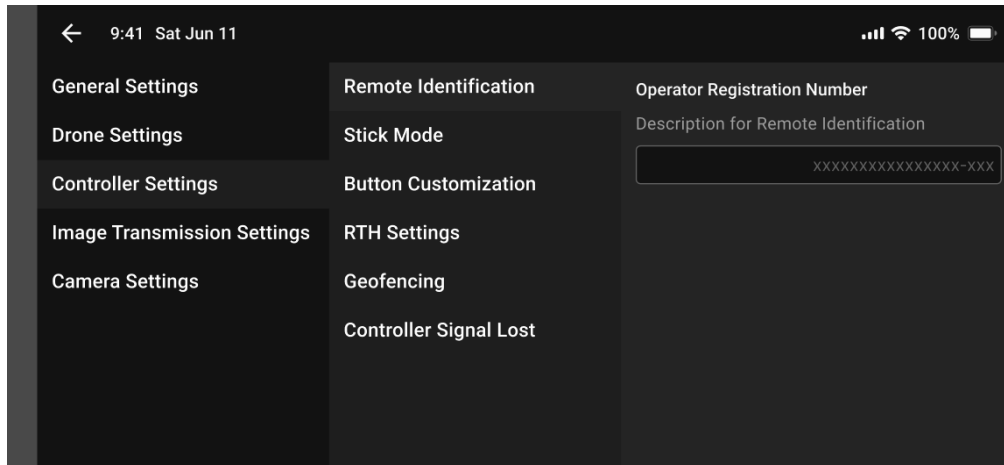| Menu	Description
Drone Information	Check the drone information.
ID	Check the drone ID information is correctly displayed. Ensure the drone calibration is complete. If not, please complete the calibration first. Press refresh button, if necessary.
Status	Ensure the status of the drone is in '**Ready to Fly**' state before the flight.
Location	Check the location of the drone before flying in case of return-to-home (RTH) in an emergency.
Battery	Ensure the battery of the drone is fully charged to perform the desired flight.
Controller Information	Check the controller information.
ID	Check the controller ID information is correctly displayed.
Status	Ensure the controller is connected to the drone.
Battery	Ensure the battery of the controller is fully charged.
Units	Set the desired units for the fly.
Measurement Unit	Set the fly speed units in accordance with your preference. ▪ **Imperial(mph)** ▪ **Metric(m/s)** ▪ **Metric(km/h)**

Drone Settings

Press the '**Drone Settings'** and check the drone information.

Menu	Description
Gimbal Settings	Set the Gimbal mode.
Gimbal Mode	Set the gimbal mode in accordance with your preference. ▪ **Follow**: Compensates the twilit by moving the gimbal angle so that the video is in a consistent direction ▪ **FPV**: The video is transmitted to the field of view tilted in accordance with the twilit of the drone
Camera Forward/Down	Set the default direction the gimbal camera during the flight. ▪ **Forward**: The camera points forward during flight by default ▪ **Down**: The camera points downward during flight by default
Gimbal Calibration	Press the refresh button to calibrate the gimbal camera.

Controller Settings

Press the '**Controller Settings**' and check the controller setting information.

Menu	Description
Remote Identification	Enter the remote ID.
Operator Registration Number	Enter the registered remote identification number.
Stick Mode	Select the stick mode in accordance with your preference. ▪ **Mode 1** ▪ **Mode 2** ▪ **Mode 3**
Button Customization	Reserved for the future access
RTH Settings	Set the return-to-home (RTH) function.
Home Point	The home point where the drone should be returned in an emergency. ▪ **Base Point**: The base point where the user has set ▪ **Pilot Point**: The point where the pilot is located ▪ **Take off Point**: The point where the drone has taken off
RTH Altitude	Set the altitude to which the drone returns at RTH. ▪ **Default**: An altitude of system set by default ▪ **Current**: The current altitude of the drone ▪ **Custom**: The pilot can customize the altitude
Geofencing	Set the maximum distance the drone can fly.
Max Flight Altitude	Set the maximum flight altitude the drone can fly by default or customized altitude.
Enable Max Distance	Set the maximum distance where the drone can fly away from the controller by default or customized value.

|	
Controller Signal Lost	Set the type of the flight type the drone can perform while the signal between the drone and the controller is lost.
Signal Lost	Select the flight type when the signal is lost. ▪ **RTH**: Perform RTH when the signal is lost ▪ **Landing**: Land the drone when the signal is lost ▪ **Hovering**: Perform hovering when the signal is lost

Image Transmission Settings

Press the '**Image Transmission Settings**' and check the controller setting information.
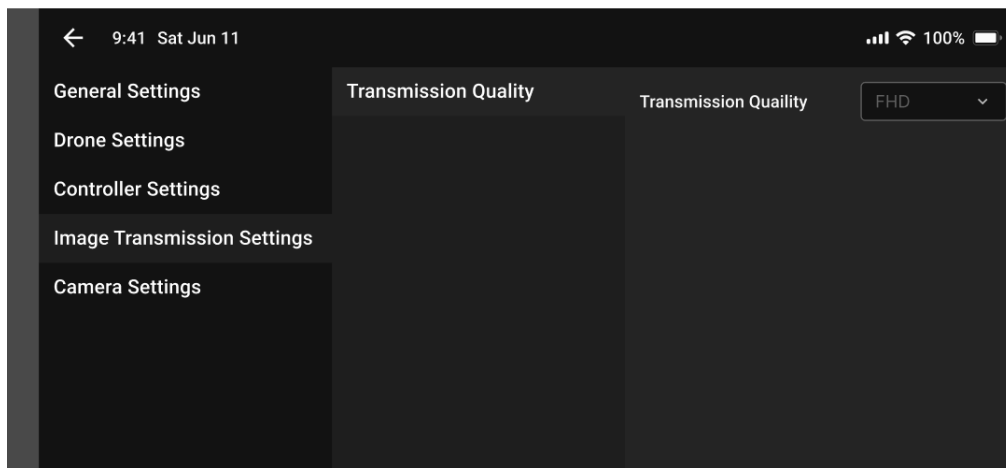
Menu	Description
Transmission Quality	Set the image transmission quality.
Transmission Quality	Select the image transmission resolution. ▪ **FHD** ▪ **HD** ▪ **VGA**

Camera Settings

Press the '**Camera Settings'** and to set the camera setting options.
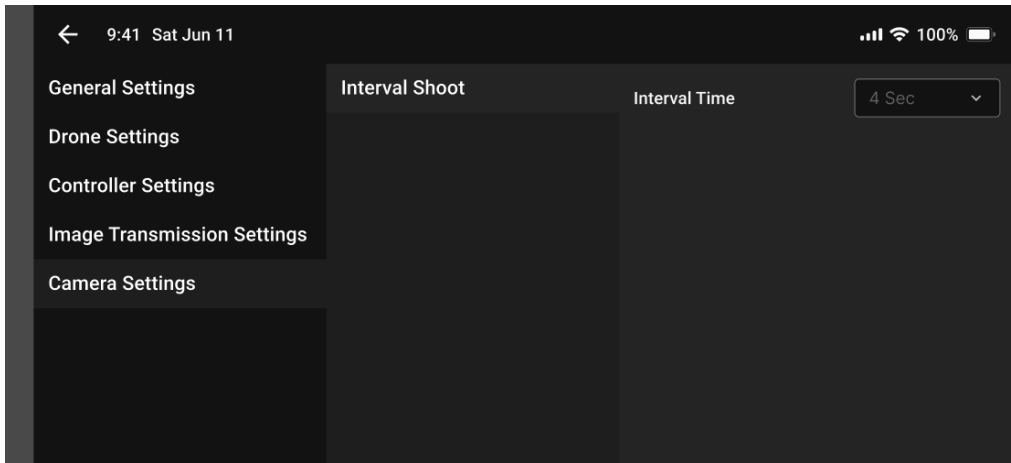
Menu	Description
Interval Shoot	Set the camera shooting interval.
Interval Time	Set the camera shooting interval time. ▪ **2 Sec** ▪ **3 Sec** ▪ **4 Sec** ▪ **5 Sec** ▪ **6 Sec**

Fly

Press the '**Fly**' menu on the home screen to start the inspection.

Fly Interface Symbols

Menu description:

Symbols	Description
✖	The aircraft with the percentage indicates the remaining battery capacity and the status of the aircraft
⎙	Total size and remaining size of the memory card
↻	An angle between the aircraft and home position
◉	GPS coordination of the aircraft
↓	Vertical distance of the aircraft from home position
⊢←	Horizontal distance of the aircraft from the home position
⛰↗	Altitude of the aircraft from the sea level
▁▂▃▄	Signal strength of the aircraft
📶	Wi-Fi strength of the aircraft
▬	Battery capacity level of the controller
←	Return to the home screen
⏻	Take off and landing
📷	On/Off the IR camera
△	Set the gimbal angle
⬤	Fan method mission
℧	Display the waypoint mission
⦿	Take a photo shoot
⦿	Start and end the video record
⏱	Interval record

Inspection Fly

Ensure you have set all the required settings before starting the inspection. Once all settings are ready, please follow the workflow for your inspection.
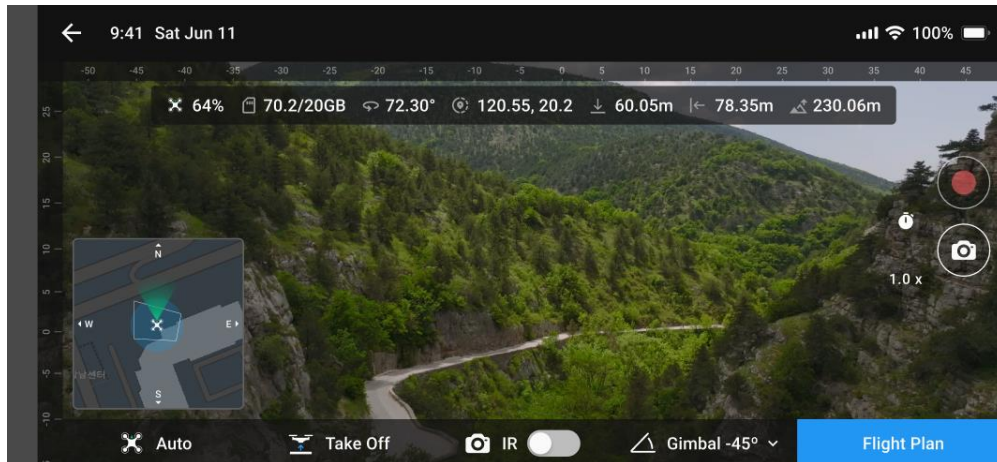
To Start the Inspection:

1. Press the '**Take Off**' button at the bottom tool bar to take off the aircraft.
2. Press anywhere on the screen then both camera and video record icon will be displayed.
3. Select the ratio number located next to the camera icon in accordance with your preference, if necessary. (Available only on photo shooting mode)
4. Press the IR camera toggle to turn on the infrared rays camera, if necessary.
5. Press the gimbal angle icon to change the gimbal angle setting.

To Take Image Inspection:

1. Press the interval record button, if necessary.

   The image is taken with the time interval according to the setting. A blue frame flashing indicates the image has been taken.
2. Press the camera icon again to end the photo shooting.

To Take Video Inspection:

1. Press the video record icon on the screen.

   A blued frame indicates the video is on the recording.
2. Press the video record button again to end the recording.

To Start Inspection with the Flight Plan:

1. Press the '**Flight Plan**' button at the bottom tool bar. The aircraft will fly according to customized path.
2. Press the Waypoint mission icon on the right panel.

   ⱱ𝒩

3. Press the '**+**' button and current coordination is created as waypoint 1.
4. Drag the map on the screen to move the aircraft to the next waypoint.
5. Press the '**+**' button again to create the second waypoint.
6. Repeat the procedure until all waypoints are created to the destination.
7. Press the '**Mission Start**' button to start the flight according to the waypoints.
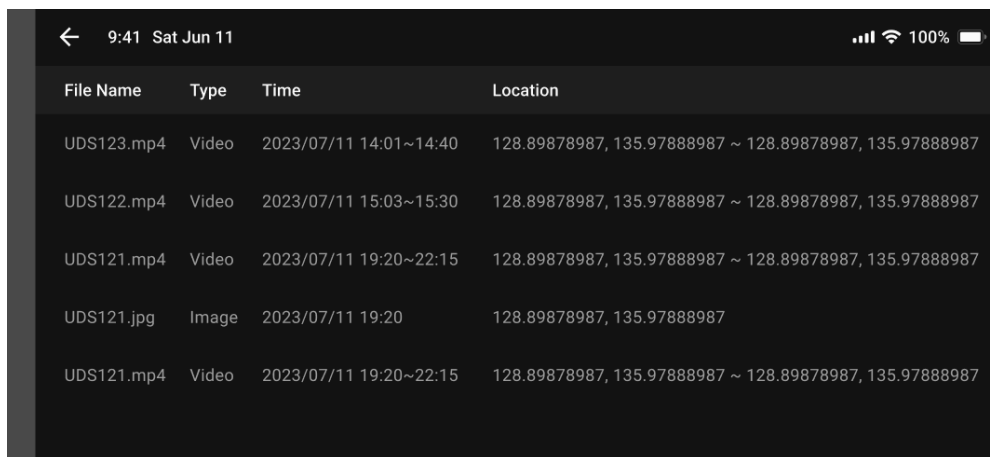
   The button is activated when at least one waypoint exists.
8. Press the '**X**' button next to the waypoint to delete the waypoint, if necessary.

Note: The aircraft remain the altitude during the mission flight.

Media

Press the '**Media**' menu on the home screen to view the inspected data.

Menu	Description
File Name	Displays the file name.
Type	Displays the file type as video or image.
Time	Displays the time the data has been taken.
Location	Displays the coordinates of the data.

To View the Inspected Data:

1. Press the desired data from the list.
2. Selected image or video is displayed.

    The video can be played backward/forward and pause/resume is enabled.

Technical Specification

AiDEN Specification

Specs	Value
Dimensions (unfolded)	670 x 550 x 120 mm (L x W x H)
Dimensions (folded)	130 x 550 x 200 mm (L x W x H)
Weight (with the batteries)	2 kg
Battery Weight	0.7 kg
Max. Flight Speed	12 m/s (40 km/h)
Max. Wind Speed Resistance	11 m/s
Max. Communication Range	5 km
Operating Temperature	0° ~ 35°C (32° ~ 95°F)
Operating Frequency	2.400~2.4835 GHz
Flight Duration	+ 30 Minutes
Collision Detection Lidar	On the payload gimbal

Sensor Specification

Specs	Value
Image Stabilization	Dual-Axis Pitch and Roll
Gimbal Pitch Angle	-100 ~ 100°
Image Resolution	▪ Optical: 64MP, 67° +FO2 ▪ Thermal: 640×512, 32° +FO245.75MP
Laser Range Finder	5 ~ 2,000 m

Appendix

FCC COMPLIANCE STATEMENT

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and

2. This device must accept any interference received, including interference that may cause undesired operation.

WARNING: Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

NOTICE This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications.

However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and receiver.

- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.

- Consult the dealer or an experienced radio/TV technician for help.

Proprietary Notice

Information in this document is subject to change without notice and does not represent a commitment on the part of Nearthlab, Inc. Users may not use the service unless they agree to the terms of the agreement. The information contained within this manual is believed to be true and correct at the time of publication.

NEARTHLAB