



Aircraft Flight Manual

RDASS HD2



Part # 27670012
Revision 05-25-2017

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1. INTRODUCTION

Congratulations on your purchase of the Leptron RDASS. The Leptron RDASS offers a superior aerial data collection platform. Leptron provides this manual to support safe, effective, and legal operations of our small Unmanned Aircraft System (sUAS). You can ensure that you are getting the maximum benefit from your sUAS by strictly observing all operating procedures and practices outlined in this manual. You should regularly check leptron.com for updates to this manual, as this manual is subject to change without notice.

1.1 Documentation Conventions











 NOTE	An operating procedure, condition, etc., which is essential to highlight.
 CAUTION	An operating procedure, practice, etc. which, if not strictly observed, could result in damage to or destruction of equipment.
 WARNING	An operating procedure, practice, etc., which, if not correctly followed, could result in personal injury or loss of life.
SHALL:	Used to indicate a mandatory requirement.
WILL:	Used to express a declaration of purpose.
SHOULD:	Used to indicate a nonmandatory but preferred method of accomplishment.
MAY:	Used to indicate an acceptable method.











1.2 Abbreviations and Terms








(AGL) Above Ground Level	Altitude measured with respect to the ground surface. This is as opposed to altitude measured above mean sea level (MSL).
(ATC) Air Traffic Control	The ground-based personnel and equipment concerned with monitoring and controlling air traffic within a particular area.
(COA) Certificate of Waiver or Authorization	An authorization issued by the Air Traffic Organization to an operator for a specific unmanned aircraft activity.
(FOV) Field of View:	The area in front of a camera or sensor that can be observed instantaneously.
(FPV) First Person View	A method used to control a radio-controlled aircraft looking from the point of view of an on-board camera.
(FTF) Functional Test Flight:	A series of flight maneuvers used to verify functionality controllability of the aircraft and associated flight equipment throughout various flight regimes.
(IOC) Intelligent Orientation Control:	IOC modes consist of Course Lock (CL) and Point-of-Interest (POI). CL fixes the directional orientation of the aircraft in reference to the aircraft heading during boot-up. POI adjusts the aircraft heading to maintain a nose-in orientation on a recorded point.
(LiPo) Lithium Polymer:	A rechargeable battery consisting of a single or multiple cells containing lithium ion polymer chemistry.
(MTR) Military Training Route:	Aerial corridors across the United States in which military aircraft can operate below 10,000 feet faster than the maximum safe speed of 250 knots that all other aircraft are restricted to while operating below 10,000 feet.
Night	The time between the end of evening civil twilight and the beginning of morning civil twilight, as published in the Air Almanac, converted to local time.

(NOTAM) Notice to Airmen:	A written notification issued to pilots before a flight, advising them of circumstances relating to flying.
(PIC) Pilot in Command:	The person who has final authority and responsibility for the operation and safety of the flight; has been designated as PIC before the flight.
(RDASS) Rapidly Deployable Aerial Surveillance System	A UAS designed to be easily transportable and rapidly deployable.
(TFR) Temporary Flight Restriction:	An area restricted to flight due to a hazardous condition, a special event, or a general warning for the entire airspace.
(UA) Unmanned aircraft:	Any aircraft that is operated without the possibility of direct human intervention from within or on the aircraft.
(UAS) Unmanned Aircraft System:	Unmanned aircraft and associated elements, including communication links and the components that control the unmanned aircraft, that are required for the PIC to operate safely and efficiently in the national airspace system.
(VLOS) Visual Line of Sight:	Unaided (corrective lenses and/or sunglasses excepted) visual contact between a pilot in command and an unmanned aircraft sufficient to maintain safe operational control of the aircraft, know its location, and be able to scan the airspace in which it is operating to see and avoid other air traffic or objects aloft or on the ground.
(VO) Visual Observer:	A person acting as a flight crew member who assists the small UA remote PIC and the person manipulating the controls to see and avoid other air traffic or objects aloft or on the ground.

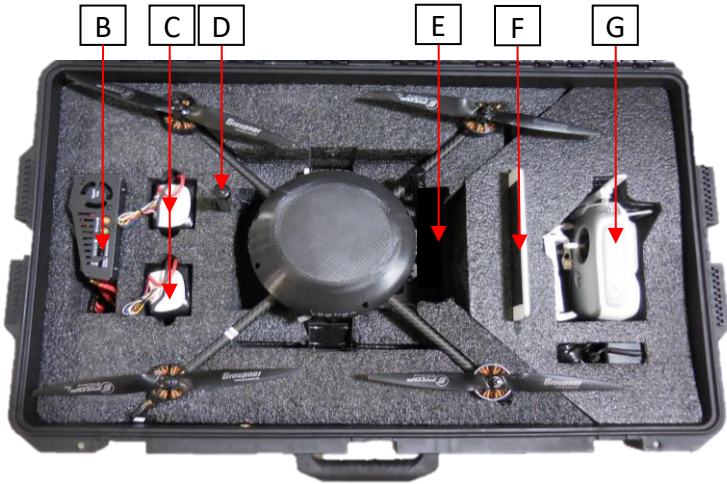
1.3 Notes, Cautions, and Warnings

 NOTE	<p>Read the entire manual before operating the RDASS.</p>
 NOTE	<p>This manual shall be immediately available to the operator at all times during operation of the RDASS. Check leptron.com regularly to ensure the most up-to-date version of this manual is used.</p>
 NOTE	<p>Always use the Flight Checklist provided herein during flight. For convenience, a laminated Flight Checklist (P/N: 27670011) is provided to meet this requirement.</p>
 NOTE	<p>Maintain a Pilot Log and an Aircraft Log (P/N: 27670002) for all flights. Additional log sheets are available on leptron.com (FAA 14 CFR 61.51 (b)).</p>
 NOTE	<p>Comply with all FAA (or similar aviation authority) and local regulations.</p>
 NOTE	<p>Before flying, check for Temporary Flight Restrictions (TFRs), Military Training Routes (MTRs), and Notice to Airmen (NOTAMs) that may affect your planned flight.</p>
 NOTE	<p>If you experience any issue not covered in this manual, please contact a Leptron Authorized Dealer. A list of dealers can be found at leptron.com.</p>
 NOTE	<p>Do not leave tablet in direct sunlight. The tablet can overheat and will not be usable until the temperature of the tablet drops sufficiently.</p>
 CAUTION	<p>Do not fly within 500 feet below or within 2000 feet horizontally of any cloud.</p>
 CAUTION	<p>ONLY use Leptron provided propellers and batteries.</p>

 CAUTION	<p>Keep the compass module away from magnets including car speakers. Magnets can damage the compass and can cause the aircraft to lose control.</p>
 CAUTION	<p>Do not leave LiPo batteries in direct sunlight. This can reduce the life of the batteries.</p>
 CAUTION	<p>Do Not Expose LiPo batteries to temperatures below 20°F. The internal battery cells can freeze and rupture.</p>
 CAUTION	<p>Store and ship batteries in accordance with local and federal laws.</p>
 CAUTION	<p>Verify the WiFi function is disabled on GoPro to avoid interference with the Radio Controller, which may cause the RDASS to execute a Go-Home or become uncontrollable.</p>
 CAUTION	<p>Do not leave LiPo batteries unattended while charging. An undetected fault in the charger could cause a fire.</p>
 CAUTION	<p>Visual Line of Sight SHALL be maintained at all times by ether the PIC or VO.</p>
 CAUTION	<p>Failure to install antennas can cause permanent damage to equipment. Always install antennas prior to powering any equipment that uses an antenna.</p>
 CAUTION	<p>Do not fly at night without red, green, and white navigation lights. Always follow FAA (or similar aviation authority) and local regulations when flying at night.</p>
 WARNING	<p>Flight within 5 nautical miles of any airport may require special permissions, a VHF 2-Way radio, and coordination with Air Traffic Control (ATC) a minimum of 24 hours in advance.</p>

 WARNING	<p>Always give right of way to manned aircraft.</p>
 WARNING	<p>Before flying you should seek out flight training from a qualified instructor. Leptron recommends receiving flight training from a Leptron factory trained instructor.</p>
 WARNING	<p>Maintain 500 foot clearance from all persons and property when conducting a post-maintenance functional test flight.</p>
 WARNING	<p>Beware of spinning motors and propellers.</p>
 WARNING	<p>All parts must be kept out of the reach of children to avoid choke hazard; if a child accidentally swallows any part you should immediately seek medical assistance.</p>
 WARNING	<p>Motors can be very hot after flight!</p>
 WARNING	<p>Do not alter auto pilot firmware or settings. Flight stability can be negatively affected.</p>

2. RDASS SYSTEM DESCRIPTION



2.1 List of Components

Table 1: RDASS Basic Components





Item	Qty	Description	Part Number
A	1	Pelican Case with Foam 	57605033
B	1	HiTec Charger 	57605021
C	2	Flight Battery 	57605014
D	C	Anti-Crush Tubes 	27606044

Table 1: RDASS Basic Components (Continued)






Item	Qty	Description	Part Number
E.1	1	Camera 	17606099
E.2	1	HDMI Ribbon Cable 	17606427
F	1	iPad Mini 	17606856
G.1	1	Remote Control 	17606829
G.2	1	Expansion Module 	17606958

Table 2: RDASS Maintenance Kit (Part # 57605029)







Item	Qty	Description	Part Number
-	1	Laminated Checklist 	27670011
-	1	Wattmeter 	17606022
-	1	Dynamite Driver Toolkit 	17606091
-	1	10mm Open/Closed End Wrench 	17606176
-	2	Spare e-Props (Right) 	17606024
-	2	Spare e-Props (Left) 	17606025

Table 3: Optional Equipment



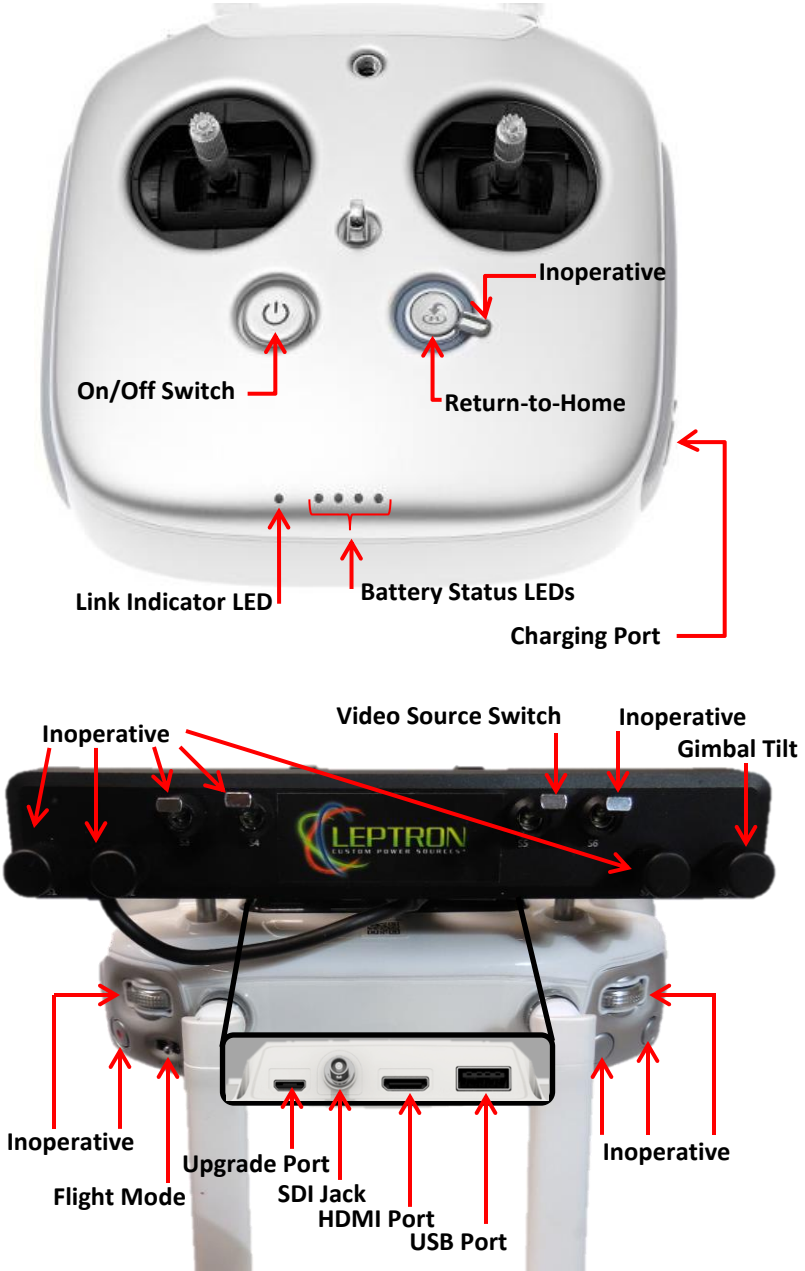
Qty	Description	Part Number
1	Sony a6000 	17606716
1	GeoReferencer 	17606826
1	Camera Gimbal and Power Cable 	87606044
1	Gyro Stabilized Dual Camera Gimbal 	17606769
1	FLIR Camera 	17606639
1	RedEdge Multispectral Camera 	17606602

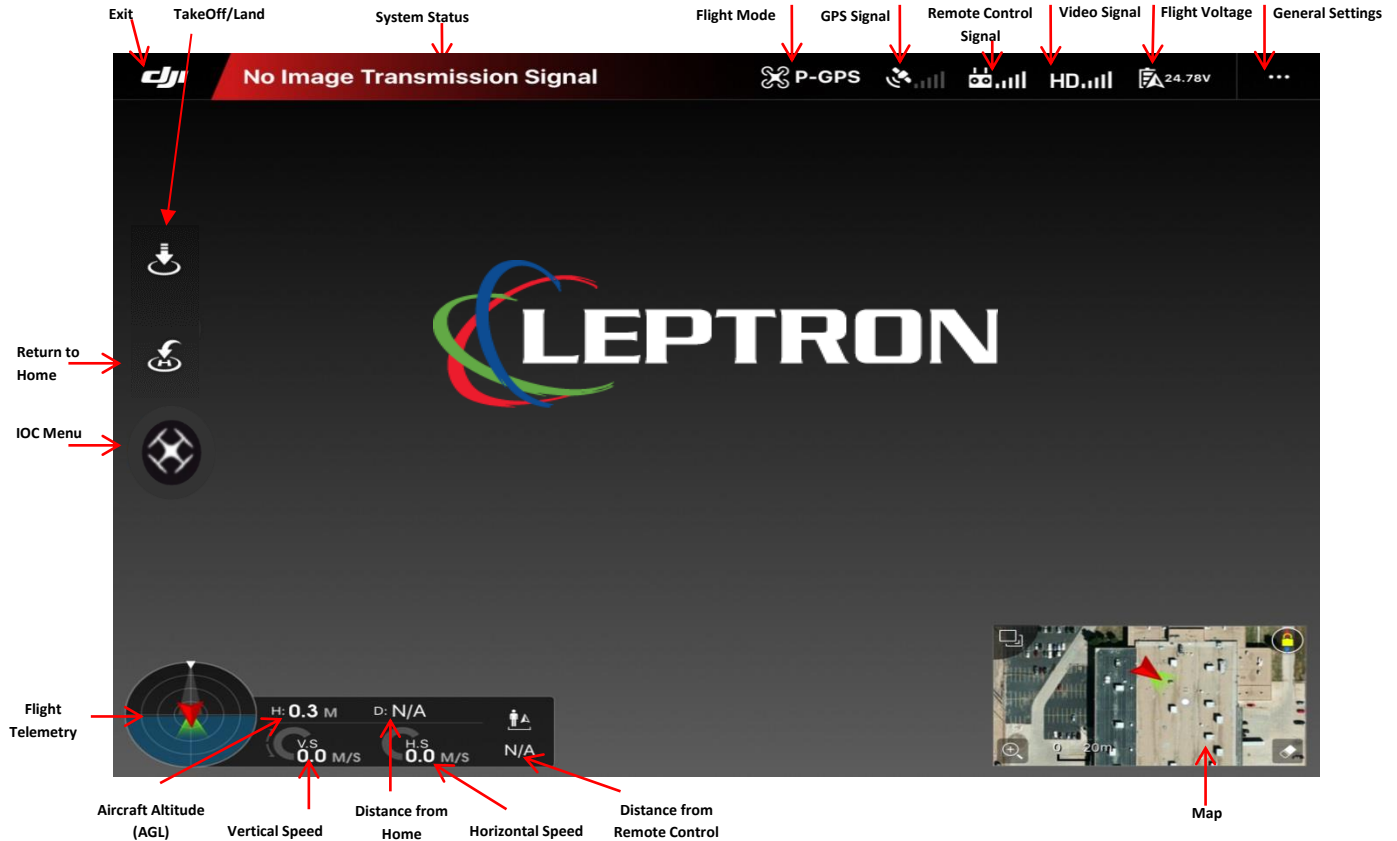
Table 3: Optional Equipment (Continued)

Qty	Description	Part Number
1	Red, Green, White Navigation Lights 	57606006
1	Additional Video HDMI Out and Ethernet Out 	87606018
1	SanDisk 64 GB Card 	17606527
1	12 Volt Power Supply 	77610000
1	Red and Blue Strobe 	17606629

2.2 Remote Control Switchology



2.3 GO App Tablet Display



3. GO APP

The GO App displays flight telemetry data and options during aircraft operation. In addition to aircraft status indications and location data, the Go app also allows for the selection of automatic takeoff and landing, intelligent orientation modes, and the return-to-home function.

3.1 Aircraft Status Menu

The screenshot shows the 'Aircraft Status' menu in the GO App. The top status bar indicates 'No positioning (ATTI)' and shows various system icons including 'Atti', signal strength, battery level (24.57V), and a menu icon. The 'Aircraft Status' menu lists several items with their current status:

Item	Status
Overall Status	Normal
Flight Mode	Atti
Compass	Normal
IMU	Normal
Redundancy State	>
ESC Status	Normal
Multicopter Type	N/A
Remote Controller Mode	Mode 2 >
Remote Controller Battery	89%
Radio Channel Quality	Poor

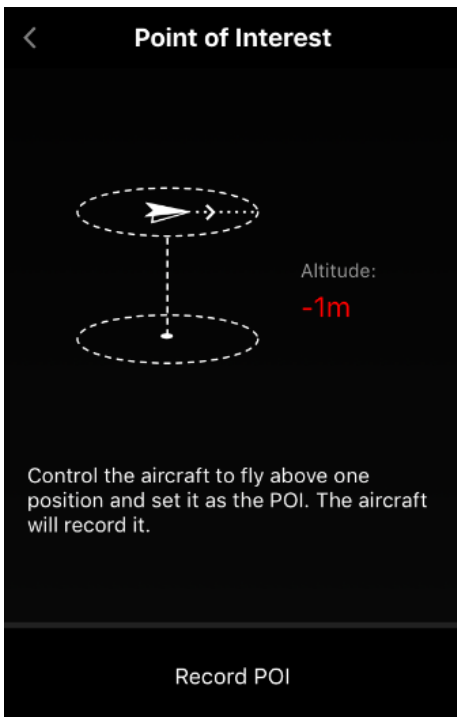
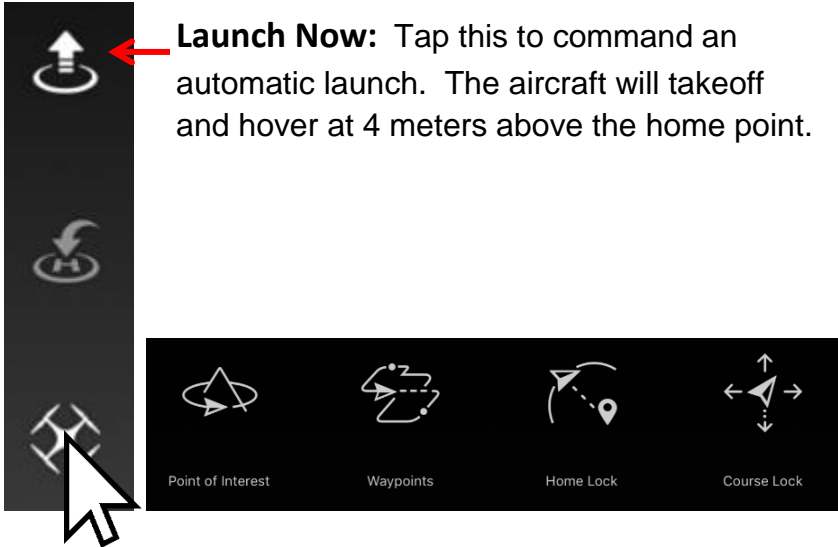
A red box highlights the 'Compass' section, which is expanded to show the following details:

Compass	Interference	Remark
Compass1	372	Good
Compass2	Disconnected	
Compass3	Disconnected	

Below the table is a 'Calibrate Compass' button and a legend: In Use (green), Excellent (yellow), Good (orange), Poor (red).

In addition to activating the compass calibration via flight mode switch, the compass can also be calibrated by clicking "Calibrate" in the Aircraft Status Menu.

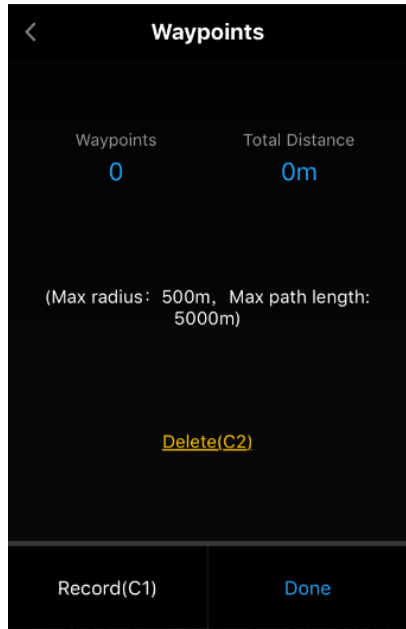
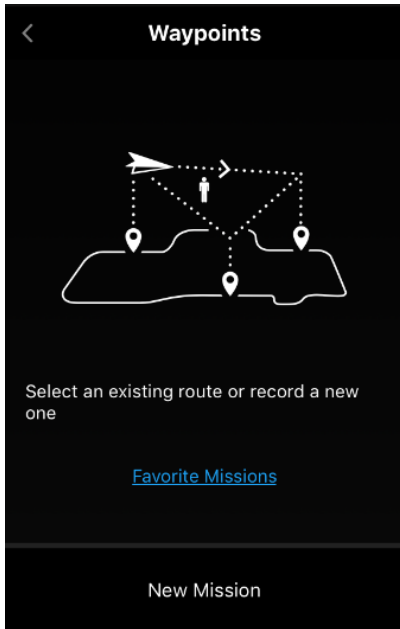
3.2 Intelligent Orientation Control (IOC) Menu



Point of Interest (POI):

Set the aircraft over a point of interest and have the aircraft orbit around it.

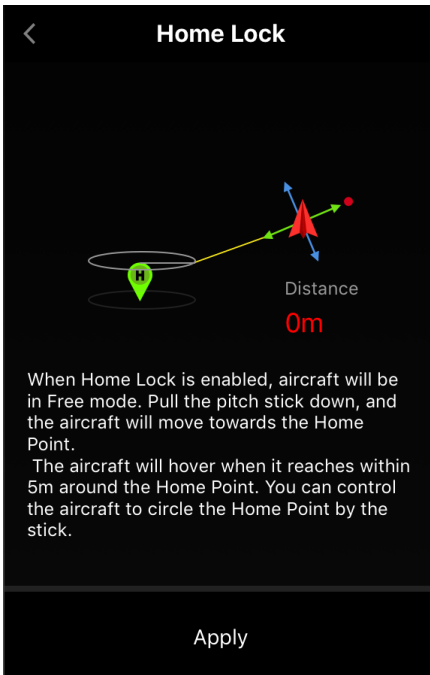
To activate POI, begin by flying the aircraft directly over the desired POI. Next, tap on the IOC menu icon, select “Point of Interest”, and then click “Record POI”. Use the settings window that appears on the right side of the app to adjust the POI settings.



Waypoints:

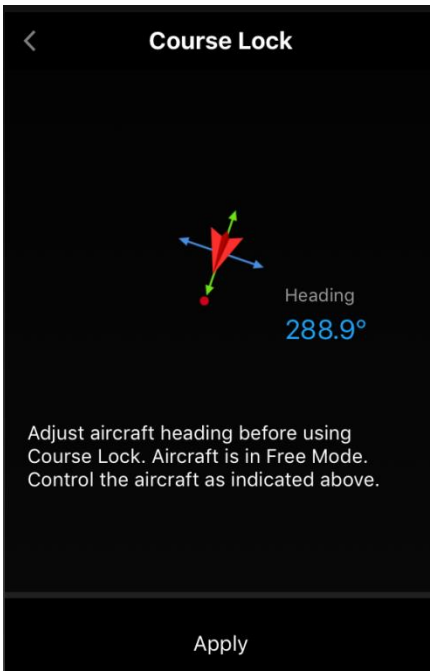
Waypoints allows the operator to record a flight plan by positioning the aircraft physically at the desired waypoints. This setting can be used solely to re-fly a flight or to provide a method for the operator to focus on payload functionality while the aircraft flies a prerecorded route.

To start, click the IOC icon on the left side of the Go App screen and select "Waypoints" from the submenu. Click "New Mission" if recording a new Waypoint mission. Fly the aircraft to the desired locations for a waypoint and click "Record" to record the waypoint. Repeat the previous step for all desired waypoints in the mission and then tap "Done" to save the Waypoint flight. Waypoint missions may be recalled by selecting "Favorite Missions" instead of "New Mission".



Home Lock:

Home Lock enables the aircraft to travel directly back to the home point by pulling straight down on the right control stick. When the aircraft reaches 5 meters from its home point, the aircraft will hover. Right stick movements to the left or right will result in the aircraft orbiting the home point.



Course Lock:

The Course Lock feature enables the user to set and fly on a course regardless of the aircraft heading. To do so, tap on Course Lock in the IOC menu and maneuver the aircraft such that its heading correlates with desired course to be flown. Click “Apply”. Right stick fore and aft inputs will maneuver the aircraft along this course, regardless of heading changes.

4. GROUND STATION PRO

4.1 GROUND STATION PRO PROCEDURES

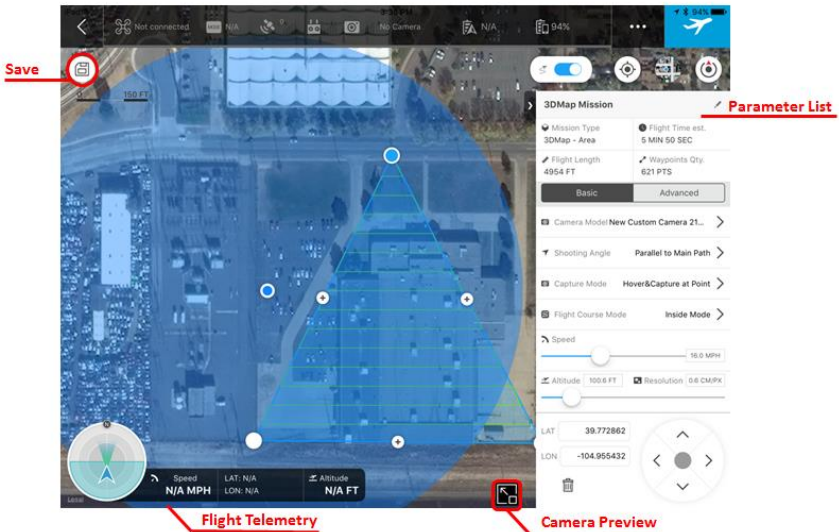
4.1.1 Link Ground Station Pro to the Aircraft

1. Open the Ground Station Pro application on the tablet.
2. In the upper left hand corner of the “GSP” app verify that the application connection status reads “Connected”.

4.1.2 Create a Mapping Flight Plan:

Define an area of interest and fly a “lawnmower” pattern that covers the entire area. The flight plan is configured based on the payload characteristics, desired flying height and desired overlap between adjacent flight lines.

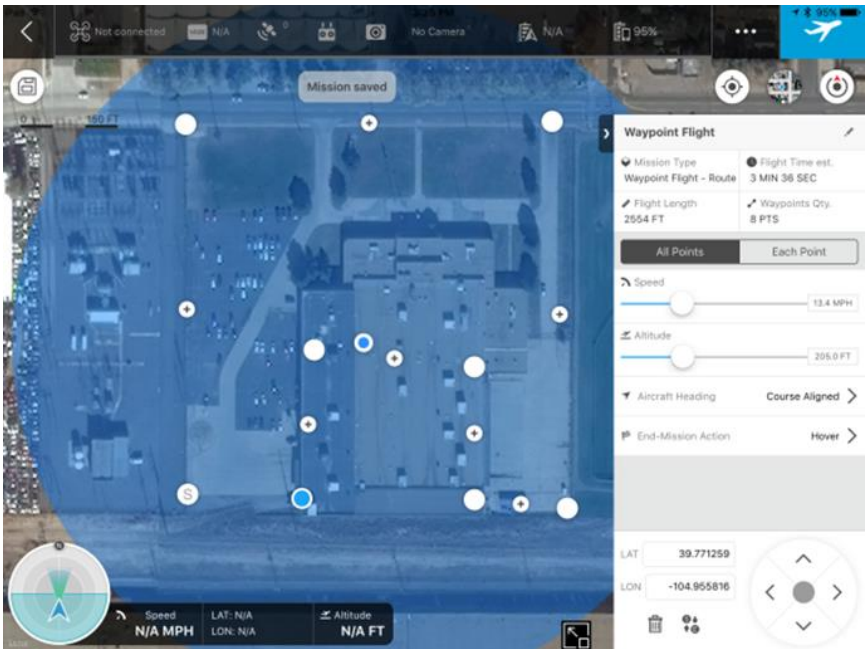
1. Click *New Mission* on the home screen.
2. Select *3DMap Mission* on the popup menu.
3. Touch the corners of the area of interest on the Ground Station Pro map that you want to scan.
4. Configure mission parameters.
5. Save the flight plan.



4.1.3 Create a WayPoint Flight Plan:

Pick individual location(s) and routes for the aircraft to fly. Set flight parameters such as speed, height, and heading for each of the waypoints to fit the user's application.

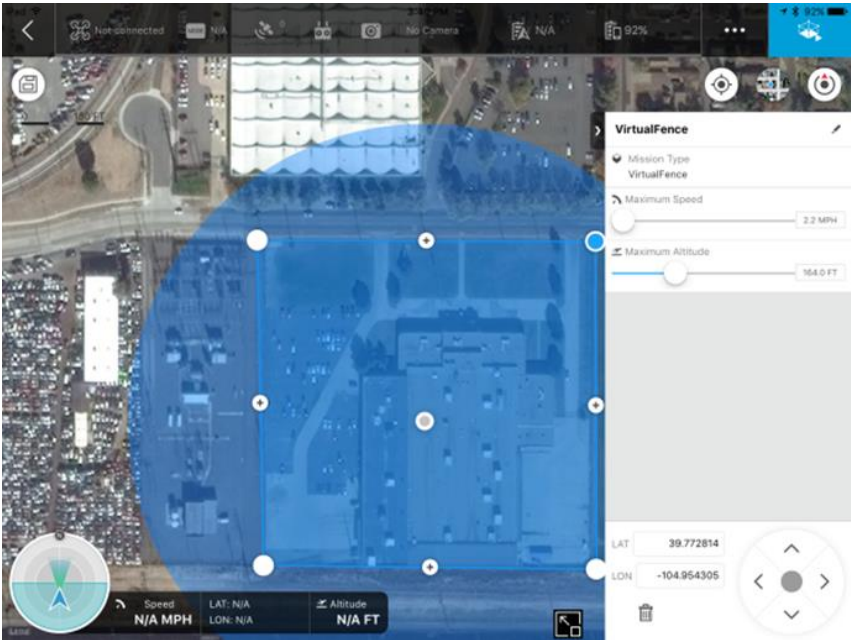
1. Click *New Mission* on the home screen.
2. Select *WayPoint Route* on the popup menu.
3. Touch the desired waypoint positions on the Ground Station Pro map.
4. Configure mission parameters.
5. Save the flight plan.



4.1.4 Create a Virtual Fence Flight Plan

Select the boundaries (area and height) where the drone is allowed to fly. Ground Station Pro will alert you if the drone comes close to the borders and will stop it from leaving this user defined area.

1. Click *New Mission* on the home screen.
2. Select *Virtual Fence* on the popup menu.
3. Touch the corners of the boundary area on the Ground Station Pro map.
4. Configure fence parameters.
5. Save the flight plan.



Main Menu/
Back

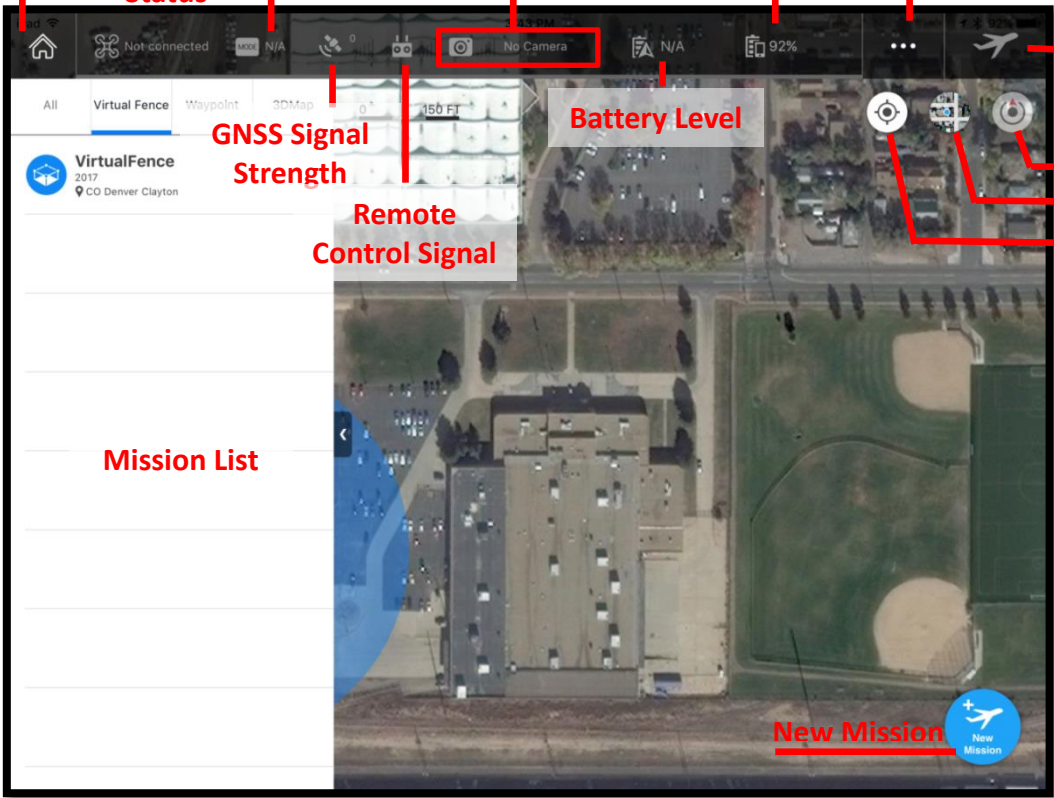
Connection
Status

Flight Mode

Camera

iPad Battery Level

General Settings



GNSS Signal
Strength

Remote
Control Signal

Battery Level

Rotation
Map Select
Location

Mission List








New Mission












5. BATTERY PROCEDURES

Battery	Type	Charge Setting	Charge Rate (A)	Maximum Voltage (V)	Charge Time
Flight	LiPo	22.2 (6S)	6-8	25.65	~40 min.

5.1 Battery Safety

 CAUTION	<p>If a vehicle is to be used for charging, the vehicle must be running for the alternator to continue to charge the aircraft battery. Charging a Flight Battery with a car battery can leave you stranded if you don't run your car.</p>
 CAUTION	<p>The operator should not begin a flight with less than 25.0 Volts on the Flight Battery.</p>
 CAUTION	<p>Do not fly batteries beyond 80% of their capacity (7200 [mAh] = 80% of 9000 [mAh]).</p>
 CAUTION	<p>Do not put the battery into water; store the battery in a cool and dry environment.</p>
 CAUTION	<p>Do not use or store the battery near fire.</p>
 CAUTION	<p>Only use provided charger to charge batteries.</p>
 CAUTION	<p>Do not transport or store the battery with metal objects.</p>

 <p>CAUTION</p>	<p>Dropping the battery can cause rupture; avoid Puncturing Battery; do not disassemble or alter the battery.</p>
 <p>CAUTION</p>	<p>Do not use or store the battery in extreme heat environments, such as direct sunlight or in a car. Overheating the battery may affect the performance of the battery and shorten the service life of the battery.</p>
 <p>CAUTION</p>	<p>Battery electrolyte gel can be harmful or fatal if swallowed. Battery electrolyte gel is an eye irritant. If battery ruptures, avoid getting any gel in your eyes. If battery electrolyte gets in eyes, flush eyes with water then seek medical assistance immediately.</p>
 <p>CAUTION</p>	<p>If battery emits an odor, swells, or exhibits any other abnormal phenomena, discontinue use and discard battery in accordance with local laws.</p>
 <p>CAUTION</p>	<p>Use a clean dry lint-free cloth to clean battery contacts.</p>
 <p>CAUTION</p>	<p>Discarded battery could lead to a fire. Completely discharge the battery and wrap the output terminal with insulating tape before discarding. Discard battery in accordance with local laws.</p>
 <p>CAUTION</p>	<p>Do not charge batteries unattended.</p>
 <p>CAUTION</p>	<p>DO NOT drain the flight battery beyond 80% or leave the battery plugged in during storage.</p>
 <p>CAUTION</p>	<p>Land as soon as practicable when the low voltage LED alert flashes, to avoid damage to the battery, persons, or property.</p>

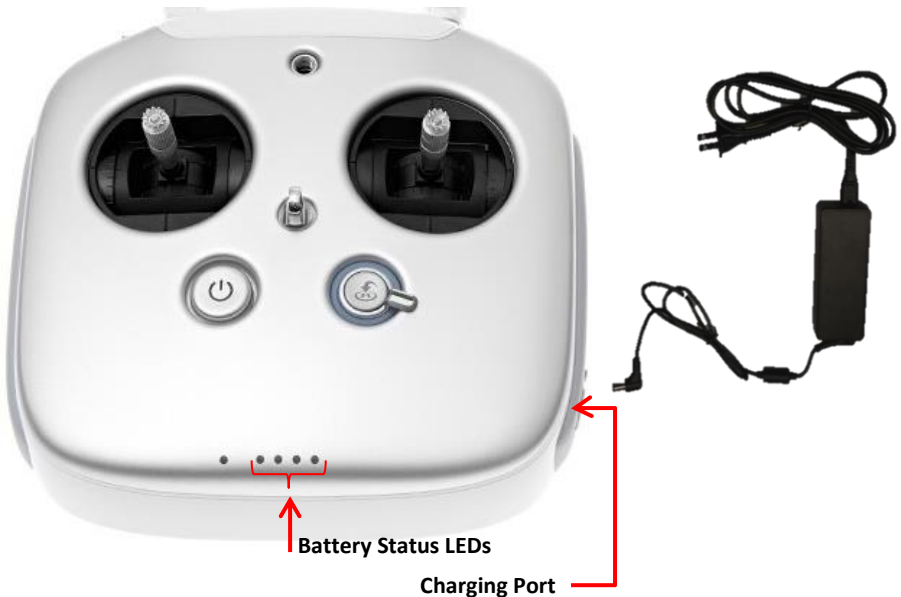
5.2 Charging the Radio Controller

The Radio Controller has an internal charger. The charge port on the right side of the transmitter is not polarity-dependent. Always charge the transmitter on a heat resistant surface.

1	Power off your transmitter.
2	Connect the power supply connector to the transmitter charge port.
3	Connect the power supply to a power outlet using the appropriate adapter.
4	The four status LEDs on the bottom of the front of the transmitter flash sequentially during charging and turn off when the battery is fully charged.
5	Disconnect the transmitter from the power supply once charging is complete and disconnect the power supply from the power outlet.



Do not attempt to operate the controller while charging.

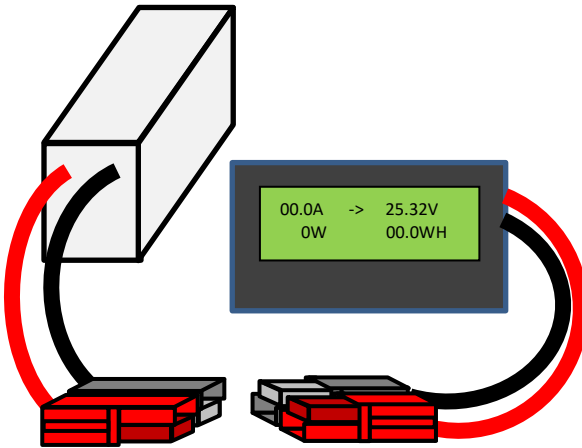


5.3 Charging the GoPro

Charge the battery by connecting the camera to a computer or other USB charging adapter using the included USB cable. The camera status light turns on during charging and turns off when charging is complete. Use on 5V 1A charger.



5.4 Testing LiPo Battery Voltage



5.5 Charging Sony α6000 Battery



5.6 Charging LiPo Flight Batteries

1. Plug in HiTec Charger to 12-18 V Direct Current source; Select channel 1 or channel 2.
2. Press “INC” to toggle to “LiPo CHARGE”. Press “Enter”.
3. Press “INC.” or “DEC.” to toggle Amperage. Press “Enter”.
4. Press “INC.” or “DEC.” to toggle Voltage. Press “Enter”.
5. Connect Battery to HiTec Charger.
6. Press and hold START for 2 seconds.
7. HiTec Charger prompts “CONFIRM”. Press “Enter”.

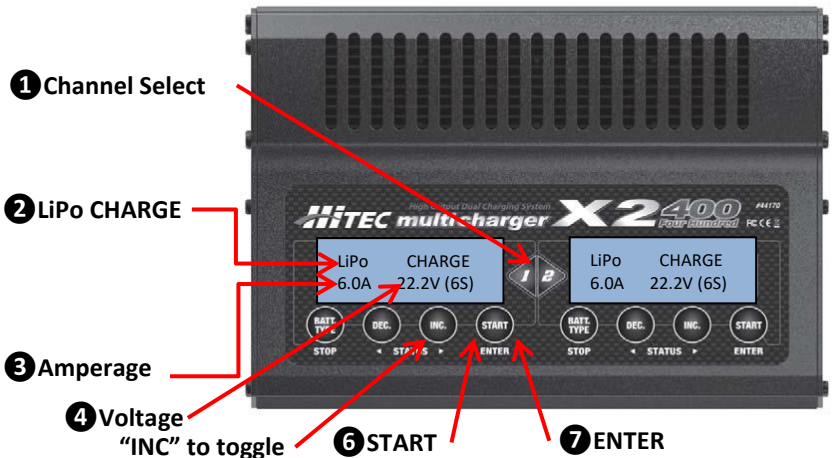
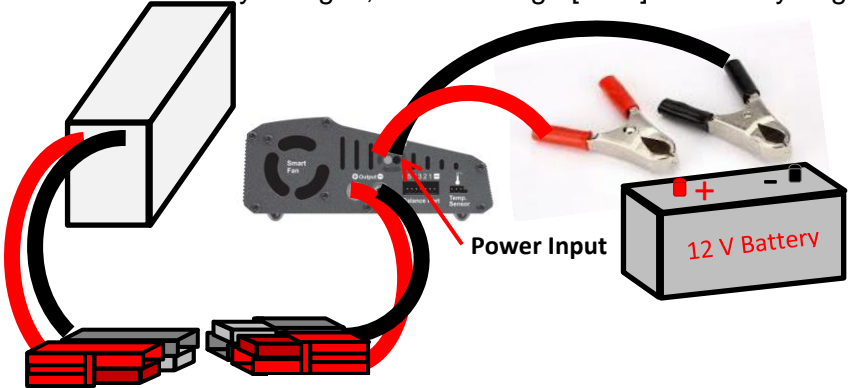
```
R:6SER S:6SER
CONFIRM (ENTER)
```

8. Verify charge [mAh] is counting up.

```
Li6s 4.7A 23.19V
CHG 022:43 00682
```

← **8** mAh Charge

9. After Battery charges, record charge [mAh] on Battery Log.



5.7 Lipo Battery Storage Procedures

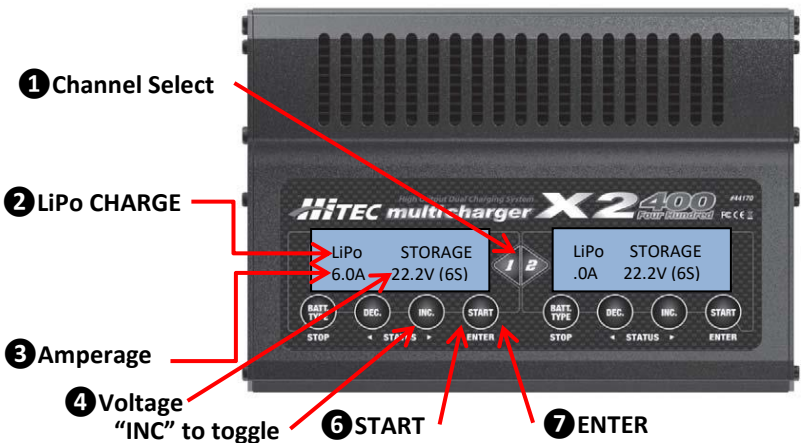
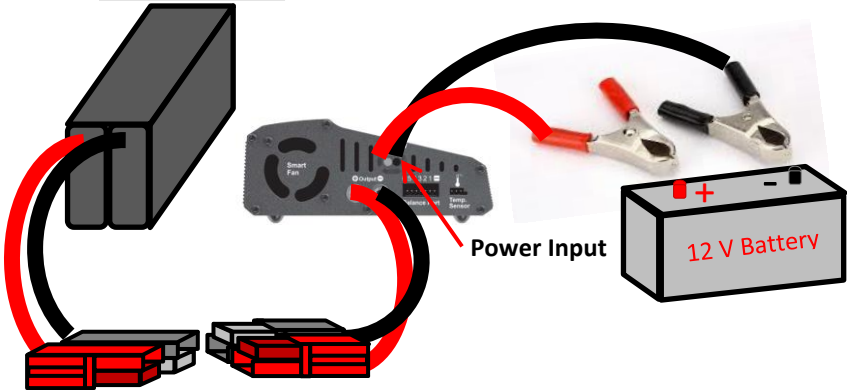
1. Plug in HiTec Charger to 12-18 V Direct Current source; Select appropriate channel.
2. Press “INC” to toggle to “LiPo STORAGE”. Press “Enter”.
3. Press “INC.” or “DEC.” to toggle Amperage. Press “Enter”.
4. Press “INC.” or “DEC.” to toggle Voltage. Press “Enter”.
5. Connect Ground Station to HiTec Charger.
6. Press and hold START for 2 seconds.
7. HiTec Charger prompts “CONFIRM”. Press “Enter”.

```
R:6SER S:6SER
CONFIRM (ENTER)
```

8. Verify charge [mAh] is counting up.

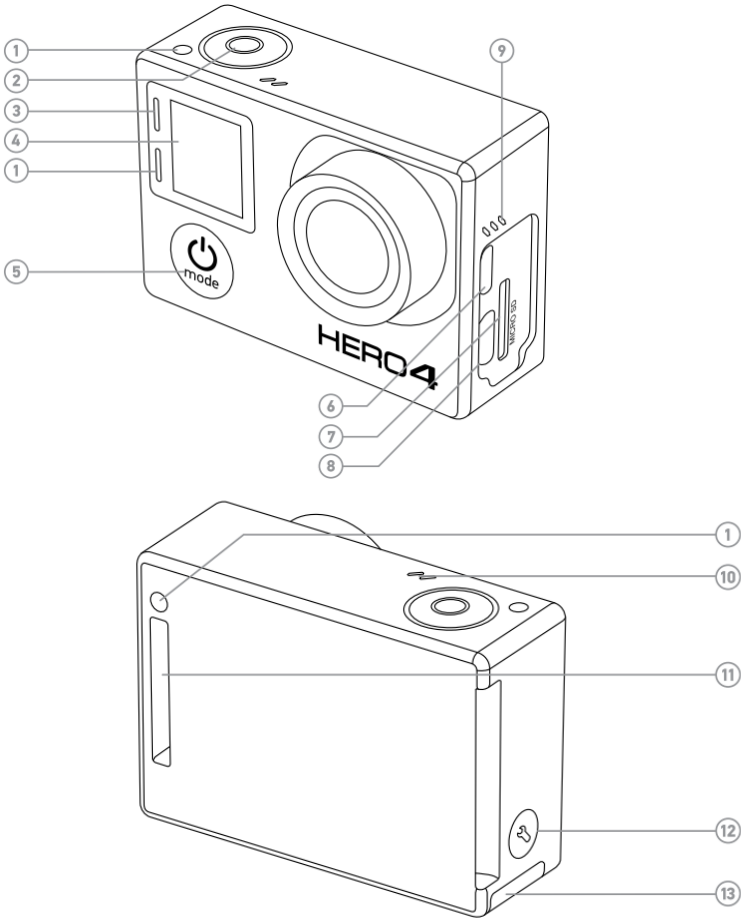
```
Li6s 4.7A 23.19V
STO 022:43 00682
```

← **8** mAh Charge



6. Cameras

6.1 GOPRO HERO4



1. Camera Status Light (red)	6. Micro HDMI Port (cable not included)
2. Shutter/Select Button	7. Micro SD Card Slot (micro SD card not included)
3. Wireless Status Light (blue)	8. Mini-USB Port (supports composite A/V cable/3.5mm stereo mic adapter, not included)
4. Camera Status Screen	9. Audio Alert
5. Power/Mode Button	10. Microphone
11. HERO Port	12. Settings/Tag Button
13. Battery Door	

6.1.1 GoPro Camera Specifications

Sensor Size	1/2.3-inch type 4:3 sensors with 4,000 x 3,000 pixels
-------------	---

Field-of-View		
	Vertical	Horizontal
4 x 3 Wide	94.4°	122.6°
4 x 3 Medium	72.2°	94.4°
4 x 3 Narrow	49.1°	64.6°
17 x 9 Wide	69.5°	125.3°
16 x 9 Wide	69.5°	118.2°
16 x 9 Medium	55°	94.4°
16 x 9 Narrow	37.2°	64.4°

6.1.2 Common GoPro Operations

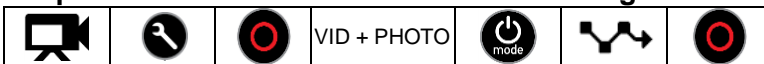
6.1.3 Take Time Lapse Photos



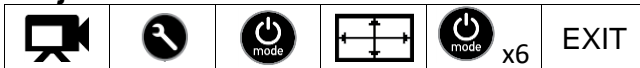
Take Time Lapse Video



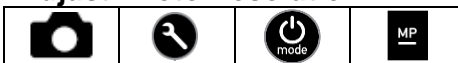
Capture Time Interval Stills While Recording Video



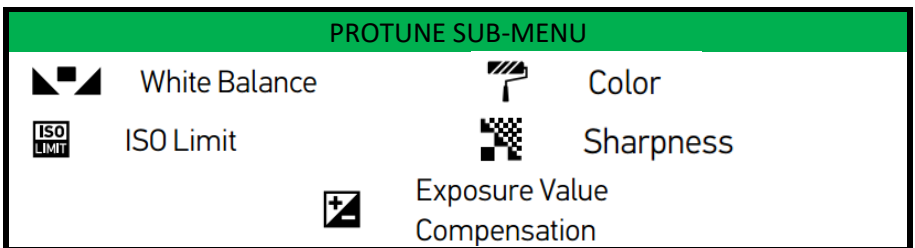
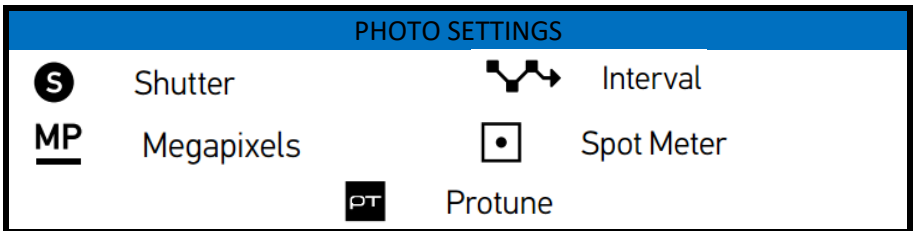
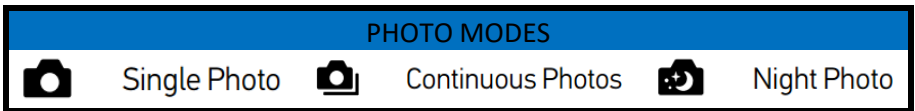
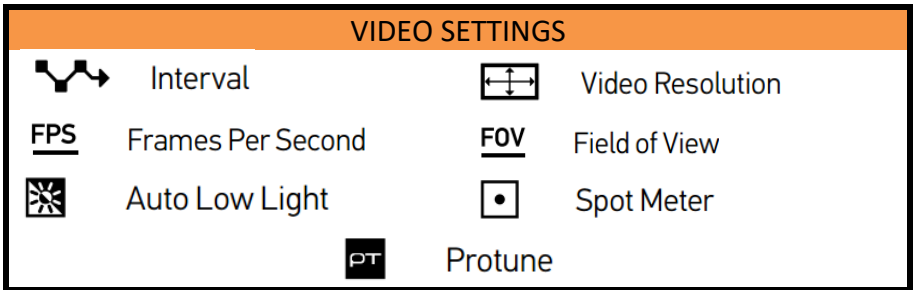
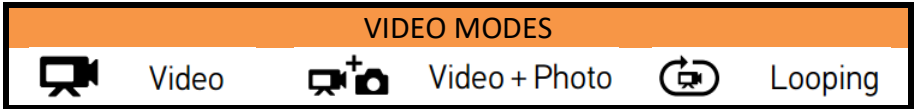
Adjust Video Resolution
















Adjust Photo Resolution




6.1.4 GoPro Hero4 Menus



SETUP MODE

	Wireless		Touch Display
	Orientation		Default Mode
	QuikCapture		LEDs
	Beeps		Video Format
	On-Screen Display		Auto Off
	Date/Time		Delete
		Language	

6.1.5 GoPro Status Screen



The status screen displays the following information:

- Camera Modes / Field of View:** Indicated by icons at the top left.
- Resolution:** 1080S-30
- Protune™:** PT
- # of Files Captured:** 01
- Time/Storage/Files:** 2H:05
- Camera Settings:** Indicated by an icon at the top right.
- Frames/sec.:** 30
- Battery Life:** Indicated by a battery icon.
- Wi-Fi:** Indicated by a Wi-Fi icon.

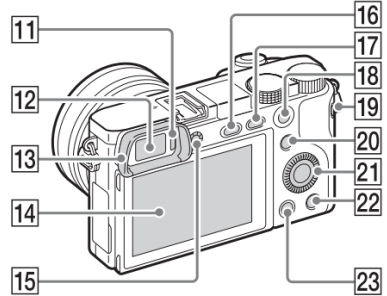
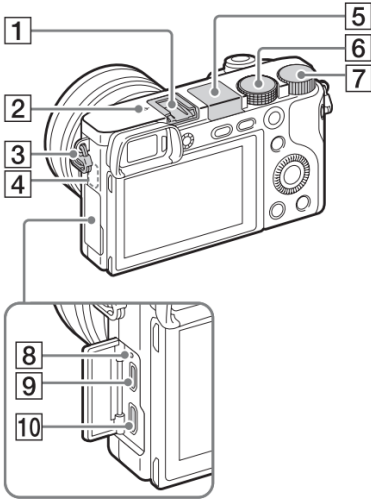
6.2 FLIR VUE AND FLIR VUE PRO

6.2.1 FLIR Vue and FLIR Vue Pro Specifications

- Polarity Control (Black Hot/White Hot) and Color Palettes can be adjusted using the Camera Controller GUI application on a computer. For FLIR Vue Pro a mobile app is available.
- Do not touch the lens. If the lens gets dirty, a light dusting of air should dislodge any dust particles. If the lens is still noticeably dirty, use 75% isopropyl alcohol and lens tissue. Use light wiping motions with a fresh section of lens tissue with each swipe so as not to drag dust or dirt particles back over the lens surface.
- FLIR Vue is neither water nor dust resistant. Care for it as you would any valuable piece of electronics equipment.

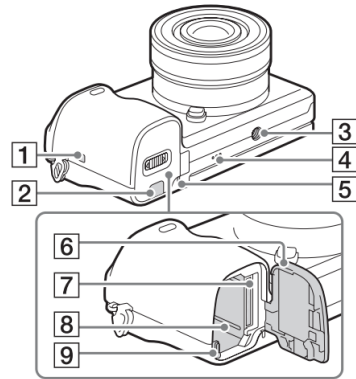
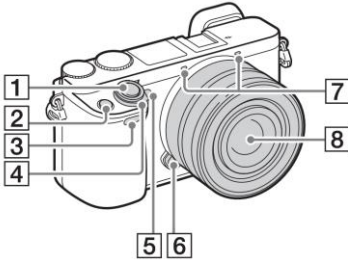
Thermal Imager	Uncooled VOx Microbolometer
Resolution	640 x 512
Lens Option	9 mm; 69° x 56° 13 mm; 45° x 37° 19 mm; 32° x 26°
Spectral Band	7.5 μm – 13.5 μm
Full Frame Rates	30 Hz (NTSC); 25 Hz (PAL) US only, not for Export
Exportable Frame Rates	7.5 Hz (NTSC); 8.3 Hz (PAL)
Size	2.26" x 1.75" (57.4 mm x 44.5 mm) (including lens)
Weight	3.25 oz. to 4.0 oz. (92.1 g to 113.4 g) configuration dependent
Input Supply voltage	4.0 VDC – 6.0 VDC
Power Dissipation, steady state (max 2.5 W during shutter event of approximately 0.5 seconds)	<1.2 W
Operating Temperature Range	-20°C to 50°C
Non-Operating Temperature Range	-55°C to 95°C
Operational Altitude	40,000 feet

6.3 SONY A6000



Rear View

1	Multi interface shoe	13	Eyepiece cup
2	Image sensor position mark	14	LCD screen
3	Hook for shoulder strap	15	Diopter-adjustment dial
4	Wi-Fi sensor (built-in)	16	(Flash pop-up) button
5	Flash	17	MENU button
6	Mode dial	18	AEL button / Playback zoom
7	Control dial	19	MOVIE (Movie) button
8	Charge lamp	20	Fn (Function) button / Send to Smartphone
9	Multi/Micro USB Terminal	21	Control wheel
10	HDMI micro jack	22	C2 (Custom 2) button/ (Delete) button
11	Eye sensor	23	(Playback) button
12	Viewfinder		



Front View	
1	Shutter button
2	C1 (Custom 1) button
3	Remote sensor
4	ON/OFF (Power) switch
5	Self-timer lamp/AF illuminator
6	Lens release button
7	Microphone
8	Lens

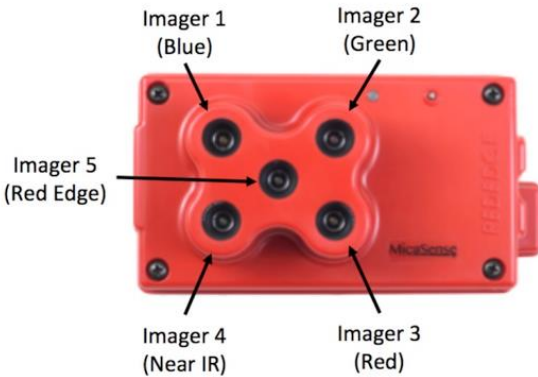
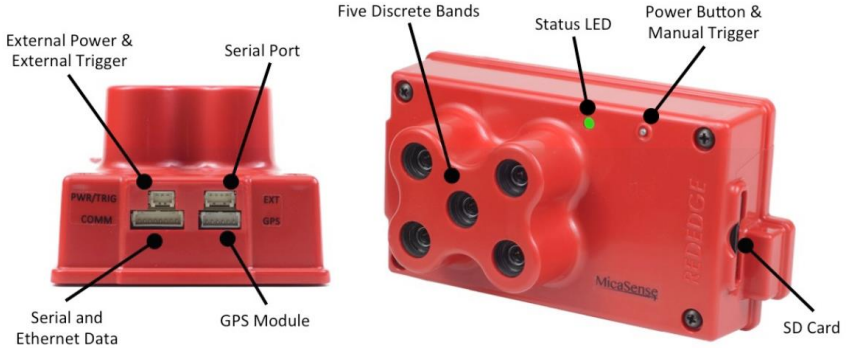
Bottom View	
1	NFC function
2	Connection plate cover
3	Tripod socket hole
4	Speaker
5	Access lamp
6	Battery/memory card cover
7	Memory card slot
8	Battery insertion slot
9	Battery eject lever

6.3.1 Sony α6000 Camera Specifications

Sensor	Image sensor: APS-C format (23.5 mm × 15.6 mm) CMOS image sensor Total pixel number of image sensor: Approx. 24,700,000 pixels Effective pixel number of camera: Approx. 24,300,000 pixels	
Field-of-View For 20mm lens	Vertical	Horizontal
	40.8°	58.5°

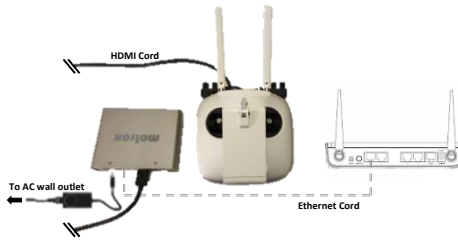
6.4 MICASENSE REDEGE

6.4.1 MicaSense RedEdge Camera Specifications



Sensors	4.8 mm x 3.6 mm , 1280 x 960 Global Shutter Focal length: 5.5 mm Aspect Ratio: 4:3	
Band 1	Blue Filter	
Band 2	Green Filter	
Band 3	Red Filter	
Band 4	Near IR Filter	
Band 5	Red Edge	
Field-of-View	Vertical	Horizontal
	36.2°	47.1°

6.5 ADDITIONAL ETHERNET OUT



1	Go to User Interface to complete setup.
2	Connect the Matrox power cord to the Matrox.
3	Connect the HDMI Out Remote Control to the HDMI In on the Matrox.
4	Plug Matrox into power outlet.
5	Tap twice then hold the power button on the Remote Control to turn on (same sequence of tap then hold will turn Remote Control off).
6	Connect LAN port on Matrox to Ethernet port on computer or router.
7	Place SD card in matrox if recording is desired.

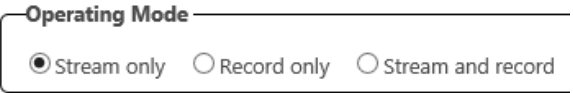
Use explorer to navigate to 169.254.1.11



Go to Settings >> Stream
Username: admin
Password: admin



Select *Stream only* or *Stream and record*.



Streaming

RTSP RTMP

Stream name:

Port:

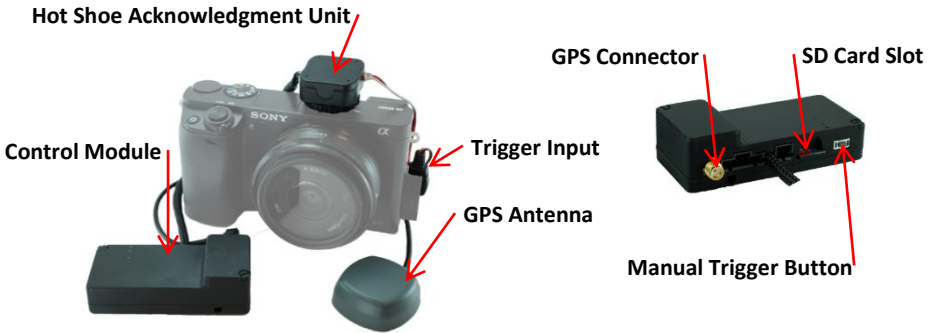
Stream URL: `rtsp://169.254.1.11:8554/Stream1`

Enable jumbo frames:

7. GeoReferencer

The GeoReferencer offers precision photo triggering while recording every capture event's location, altitude, and direction information.

7.1 GeoReferencer Components


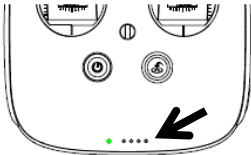

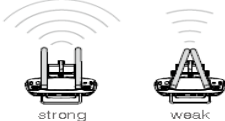
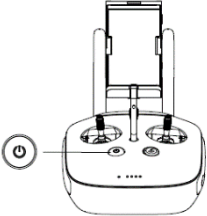
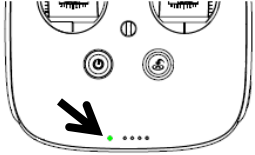












7.2 Configuring the GeoReferencer


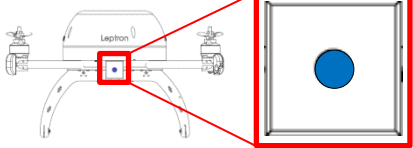
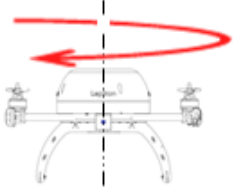
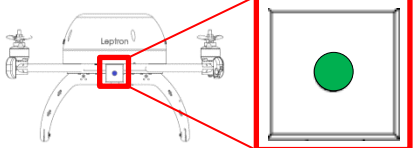
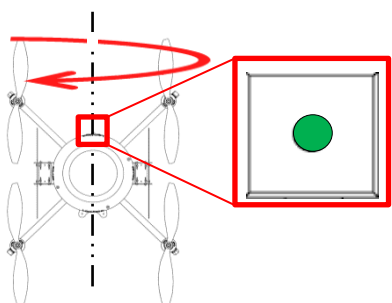
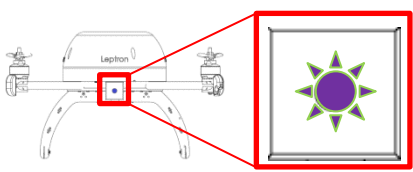
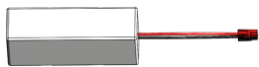
- To configure the GeoReferencer open the Config.txt file and follow the instructions.
- If the Config.txt file is lost, install the SD card in the GeoReferencer and plug in the 9 volt battery and a new Config.txt file will be created.

8. FLIGHT PROCEDURES

8.1 Remote Control Power On/Off

 <p>NOTE</p>	<p>When the remote control is turned off, press the On/Off Switch once to display the current remote control battery level on the Battery Level LEDs.</p> 									
 <p>NOTE</p>	<p>Ensure that the remote control antennas are oriented parallel and pointing vertically for best signal.</p>									
<p>Remote Control Power On/Off Procedure</p>										
<p>1</p>	<p>Double click and hold the On/Off Switch on the Remote Control.</p>									
<p>2</p>	<p>The light on the bottom left side of the remote control shows green or red to indicate the controller to aircraft connection status.</p>									
 <p>NOTE</p>	<table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th data-bbox="227 1146 650 1195">LED Status</th> <th data-bbox="650 1146 965 1195">Meaning</th> </tr> </thead> <tbody> <tr> <td data-bbox="227 1195 650 1276">  </td> <td data-bbox="650 1195 965 1276"> <p>Remote Control is connected to the aircraft</p> </td> </tr> <tr> <td data-bbox="227 1276 650 1357">  </td> <td data-bbox="650 1276 965 1357"> <p>Remote Control is disconnected from the aircraft</p> </td> </tr> <tr> <td data-bbox="227 1357 650 1433">  </td> <td data-bbox="650 1357 965 1433"> <p>Remote Control error</p> </td> </tr> </tbody> </table>	LED Status	Meaning		<p>Remote Control is connected to the aircraft</p>		<p>Remote Control is disconnected from the aircraft</p>		<p>Remote Control error</p>	
LED Status	Meaning									
	<p>Remote Control is connected to the aircraft</p>									
	<p>Remote Control is disconnected from the aircraft</p>									
	<p>Remote Control error</p>									

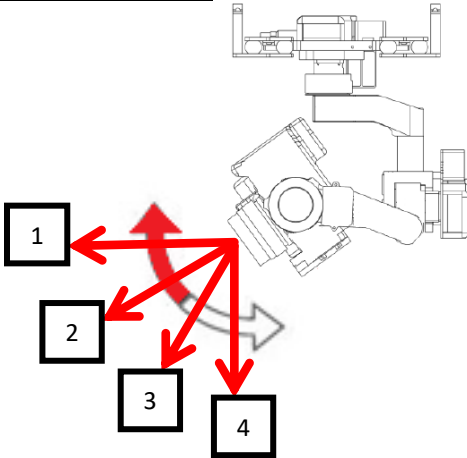
8.2 Compass Calibration

1	Quickly flip the Flight Mode switch from “P” to “A” to “P”, 6-10 times.	 <p style="text-align: right;">x 6-10 times</p>
2	A solid blue LED will indicate the aircraft is ready to begin the horizontal calibration.	
3	Slowly rotate the aircraft 360° about its vertical axis (aircraft in a level attitude). Do not exceed 90° in three (3) seconds.	
4	A solid green LED indicates the aircraft is ready to begin the vertical calibration.	
5	Tilt the aircraft so that the LED Indicator is up (nose downward). Slowly rotate the aircraft about its longitudinal axis. Do not exceed 90° in three (3) seconds.	
6	The Purple Heartbeat LED indicates the compass calibration was successful. Blinking red LED indicates the calibration must be repeated.	
7	Disconnect, then reconnect Flight Battery.	

8.3 Gimbal Procedure




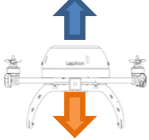
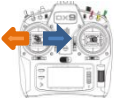
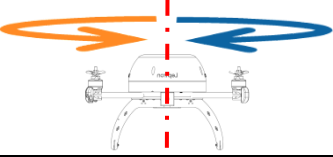
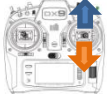

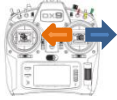
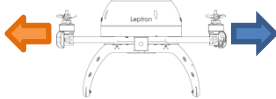


The gimbal can be positioned between position 1 and position 4.



Gimbal Procedure




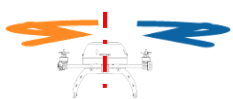

<p>Gimbal Tilt</p>	<p>Rotate the gimbal tilt knob in the desired direction of movement.</p>	
<p>Source Switch</p>	<p>Toggle (down and back up) the source switch to change between video sources.</p>	

8.4 GPS Mode

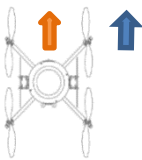
GPS Mode Controls		
 <p>Throttle</p>	<p>↑ Climb ↓ Descend</p>	
 <p>Yaw Control</p>	<p>← Yaw Left → Yaw Right</p>	
 <p>Pitch Control</p>	<p>↑ Fly Forward ↓ Fly Rearward</p>	
 <p>Roll Control</p>	<p>→ Fly Right ← Fly Left</p>	
 <p>Motor Startup</p>	<p>↘↙ Combined Stick Command(CSC) to start motors</p>	<p>Note: if the operator holds the CSC ↘↙ for longer than 2 seconds the motors will shut off</p>
 <p>Motor Shutdown</p>	<p>↓ Hold 6 seconds to shutoff motors</p>	<p>Warning: Releasing the Throttle ↓ prior to 6 seconds can result in unintentional flight</p>

8.5 Course Lock Procedure

- The aircraft's autopilot records the aircraft's current heading (i.e. the aircraft's orientation with respect to the direction of the nose). This aircraft orientation at the time Course Lock Mode is engaged can be used to steer the aircraft during flight, regardless of any changes to the orientation thereafter.

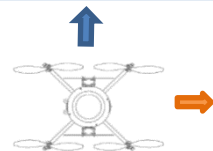
Engage Course Lock Mode		
 NOTE	Course Lock Mode shall only be engaged when the aircraft has commenced flight. Do not attempt to initiate Course Lock Mode prior to take off.	
1	Click on the Intelligent Orientation Controls menu icon on the left side of the DJI GoApp screen.	
2	On the bottom of the screen, select Course Lock from the options panel.	
3	Yaw the aircraft to the desired heading with which to orient Course Lock grid.	
4	Press Apply on the Course Lock panel.	
5	Aircraft displays the Course Lock engaged LED sequence.	
6	To dis-engage Course Lock press Exit on the Course Lock panel and then select OK on the confirmation panel that subsequently appears.	

Orientation during Course Lock engagement




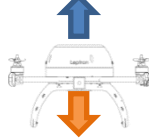

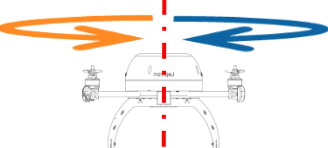

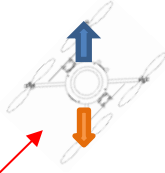
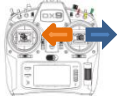

Aircraft heading

Right control stick forward yields aircraft movement in the direction that aircraft was heading during CL activation








Aircraft heading (changed)

8.6 Course Lock Mode

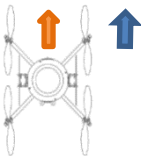
Course Lock Mode Controls		
 <p>Throttle</p>	<p>↑ Climb</p> <p>↓ Descend</p>	
 <p>Yaw Control</p>	<p>← Yaw Left</p> <p>→ Yaw Right</p>	
 <p>Pitch Control</p>	<p>↑ Fly in direction that aircraft nose was pointing during Course Lock engagement regardless of current aircraft orientation</p> <p>↓ Fly in direction that aircraft tail was heading during Course Lock engagement</p>	<p>↑</p> <p>Orientation during Course Lock Mode engagement</p>  <p>Current aircraft heading</p>
 <p>Roll Control</p>	<p>→ Fly in direction that aircraft right wing was heading during Course Lock engagement</p> <p>← Fly in direction that aircraft left wing was heading during Course Lock engagement</p>	<p>↑</p> <p>Orientation during Course Lock Mode engagement</p>  <p>Current aircraft heading</p>

8.7 Home Lock Procedure

- The aircraft's position at the time of flight battery connection is used as a home reference point. Any right control stick movements in the aft or forward direction will be towards or away from the home reference point, respectively.

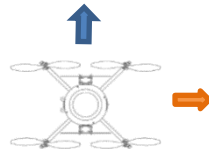
Engage Home Lock Mode		
 NOTE	Home Lock Mode shall only be engaged when the aircraft has a minimum of 21.7 volts remaining on the flight battery.	
 NOTE	Home Lock Mode shall only be engaged when the aircraft has commenced flight. Do not attempt to initiate Home Lock Mode prior to take off.	
1	Click on the Intelligent Orientation Controls (IOC) menu icon on the left side of the DJI Go App screen.	
2	On the bottom of the screen, select Home Lock from the options panel.	
3	Press Apply on the Home Lock panel.	
4	Aircraft displays the Home Lock engaged LED sequence.	
5	To dis-engage Home Lock press Exit on the Home Lock panel and then select OK on the confirmation panel.	

Orientation during flight battery connection




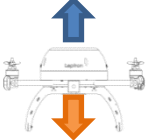

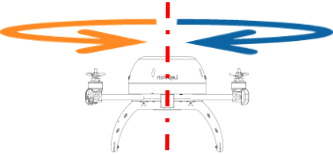




Aircraft heading

Right control stick forward yields aircraft movement away from Home Point




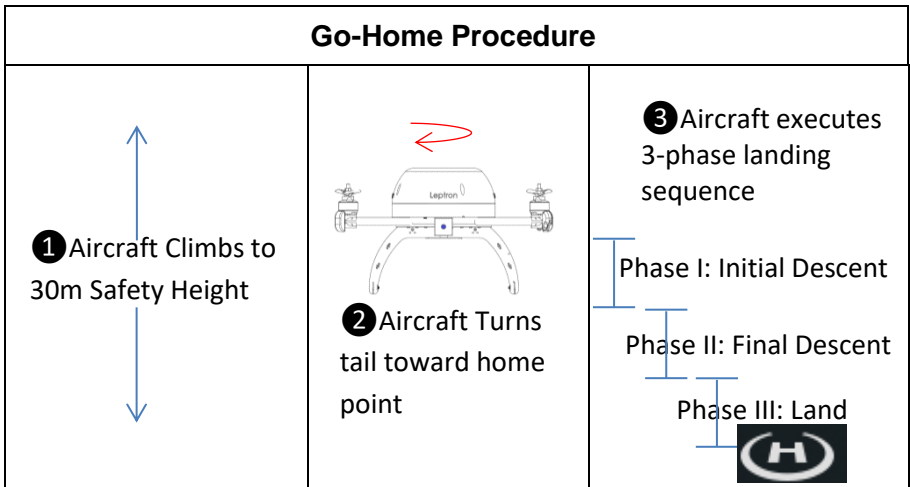
Aircraft heading changed




8.8 Home Lock Mode

Home Lock Mode Controls		
 <p>Throttle</p>	<p>↑ Climb ↓ Descend</p>	
 <p>Yaw Control</p>	<p>← Yaw Left → Yaw Right</p>	
 <p>Radius Control</p>	<p>↑ Fly away from home point along a radial regardless of aircraft heading ↓ Fly toward home point along a radial regardless of aircraft heading</p>	
 <p>Orbit Control</p>	<p>→ Fly clockwise in an orbit around a circle centered about the home-point ← Fly counter-clockwise in a circle centered about the home-point</p>	

8.9 Return-to-Home Procedure

- To execute a Go-Home the Pilot-on-the-Controls shall hold the Return-to-Home button on the Remote Control for 2 seconds. An audible alert tone and a blinking white light around the Go-Home bottom confirm activation.
- To execute a Go-Home using the Ground Station, set the Home Point and press the Go-Home button. 



 <p>NOTE</p>	<p>Autopilot commands Return-to-Home after 3 seconds of lost communication with the Remote Control.</p>
 <p>CAUTION</p>	<p>Phase III is not recommended. The pilot should regain control of the aircraft and land with the Remote Control (See Remote Control Take Back Procedure in paragraph 8.10 for more details).</p>
 <p>NOTE</p>	<p>Always follow Flight Checklist.</p>

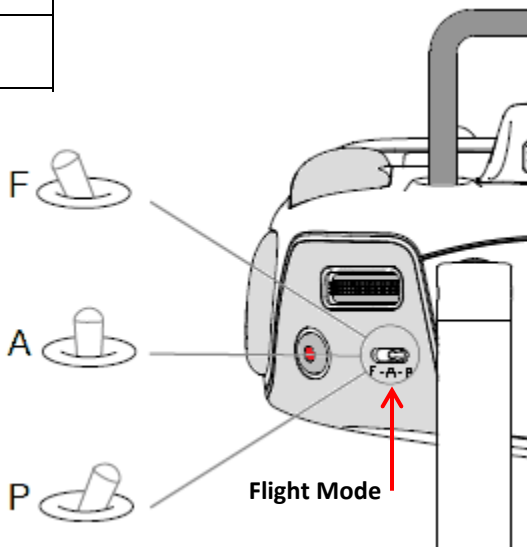
8.10 Remote Control Take Back Procedure

To regain control of the aircraft after executing a Return-to-Home command, toggle the Flight Mode switch from position “P” to “A” and immediately return the switch to position “P”.

Remote Control Take Back Procedure

Quickly toggle the Flight Mode switch from “P” to “A” to “P”, 1 time.

P	GPS Mode
A	Attitude Mode



NOTE

The Take Back procedure is also used to regain control of the aircraft while flying in Waypoint Mode with the Ground Station

9. FLIGHT CHECKLIST

PRE-FLIGHT CHECKS	
1	Conduct Crew Brief
2	Install SD Card(s)
3	Radio Controller Checks
	Radio Controller Mode Switch – Set to “P”
	Radio Controller Power Switch – On
	Radio Controller Voltage – Check 3 LEDs Minimum
4	Tablet Checks
	Tablet Cable – Attach to Remote Control
	Tablet – Power On
	Tablet Battery – Check (greater than 50%)
	GoApp – Launch
	Satellites – Verify Minimum 8(status bar reads “Safe to Fly” in green)
	Transmit Signal Strength – Verify 4 Bars Minimum
	In Settings, HD – Verify EXT Port Enabled
5	Flight Battery Installation
	Flight Battery – Check and Record Voltage (25.0 Volts minimum)
	Flight Battery – Install with Velcro Strap
	DO NOT CONNECT BATTERY AT THIS TIME
	Gimbal – Check Freedom of Movement
6	Mechanical Checks – Bottom
	Landing Gear – Check
	GoPro Bracket – Check
	Gimbal Rubber Mounts - Check (4 zip ties)
	Ribbon Cables – Check (Gimbal and GoPro)
	GoPro – Power on and Record if Desired
	Underside – Check for Worn/Loose Items
7	Mechanical Checks – Top
	Main Rotor Nuts – Check Tightness (Hold motor housing)
	Antennas – Attach
	Motor Mounts and Arms - Check Security and Verify Level/Plumb
	Rotor Blades – Check Condition

Flight Preparation	
	Place aircraft on Level Non-Metallic Surface
	LED (Tail) Toward Operator – Verify
	Flight Battery – Connect (outside of skids)
	Compass Calibration – Complete First Flight of the Day, Cycle Power

GROUND STATION PREPARATION (if in use)

- [Optional] Tablet WiFi – Connect to Cell Phone Hot Spot
- Ground Station App – Launch
- Flight Plan – Build or Open as required
- Ground Station Connection to Aircraft - Verify
- Flight Plan - Upload

TAKE-OFF CHECKS

- Verify SD Card(s) Installation
- Status Indicators – Verify (GoPro, Satellites, Voltage, Height)
- Check Area for Non-Participants and Potential Hazards
- Timer – Activate
- Motors – Startup (Keep Throttle at ¼ position)
- Takeoff – Verify Aircraft Stability
- (Optional) Ground Station "GO" Button – Press as required

GROUND STATION POST-FLIGHT CHECKS (if in use)

- Tablet – Off
- Cell Phone Hot Spot – Off

















POST FLIGHT CHECKS

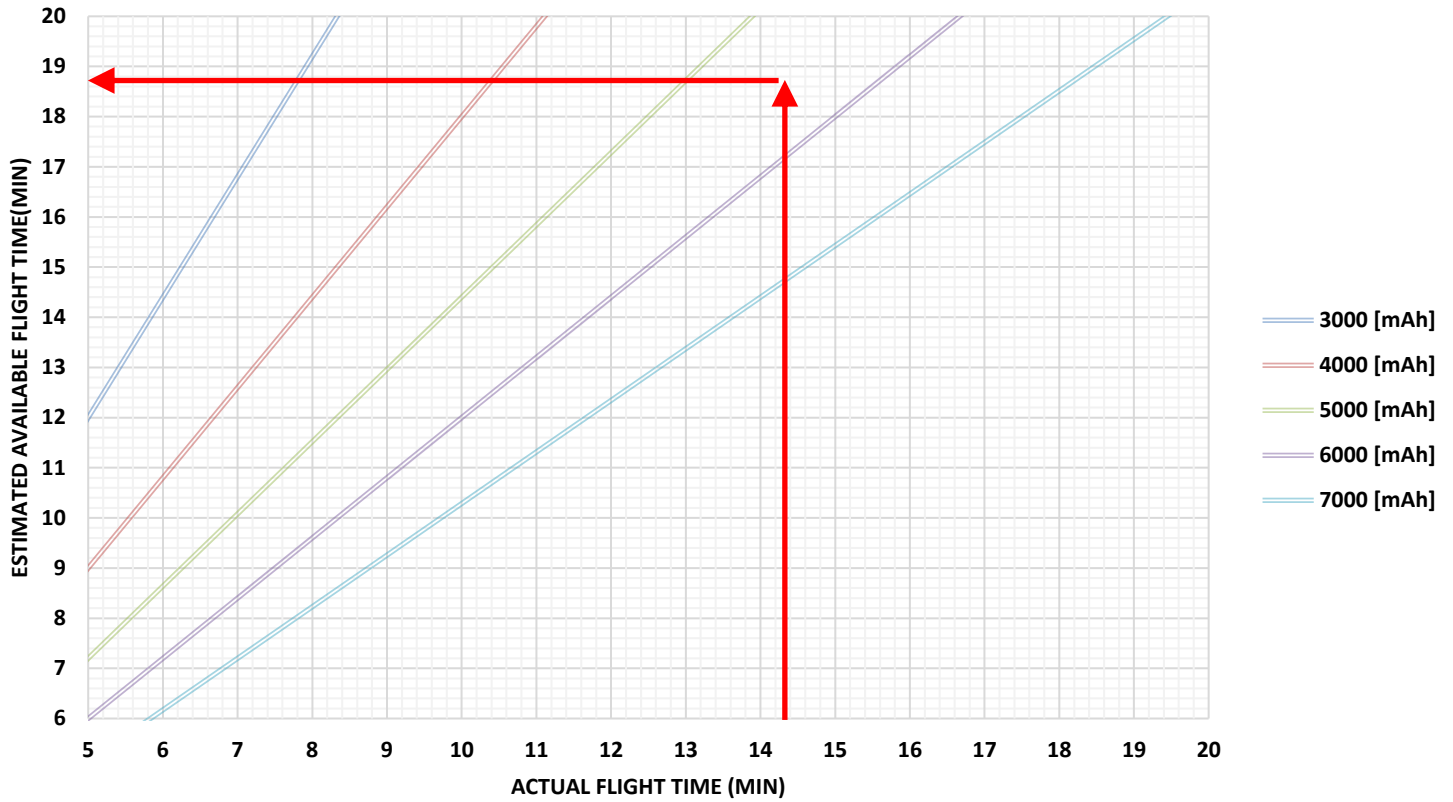
- Throttle Stick – Full Down for 6 seconds **Verify Rotors STOP**
- Timer – Stop (Announce Flight Time to VO for Logbook)
- Flight Battery – Disconnect
- GoPro – Stop recording and power off
- IR Camera (if installed) Lens Cover – Replace
- Check Motors for Excessive Heat (**Warning: Motors Can Be Hot!**)
- Tablet Power – OFF
- Radio Controller – OFF
- Flight Logs – Record
- NOTAMs – Close as required
- Review Recorded Data**
- Post Flight Debrief – Complete

9.1 Crew Brief

CREW BRIEF	
1	Aircraft
	Time Available on Flight Battery with five minute reserve
	Time Available on SD Data Recorder
2	Scheme of Maneuver
	Timeline of Events & Timer Settings
	Route of Flight, Altitudes, Airspeeds
3	Airspace
	Required Radio Calls
	Satellite Coverage (Number Visible)
	http://www.trimble.com/gnssplanningonline/
	Weather (Winds, Visibility, Ceiling)
	Obstacles and Hazards
4	Crew Duties
	Designate a Pilot in Command
	Pilot on the controls:
	1) Fly aircraft (focus on Vehicle)
	2) Traffic/obstacles avoidance
	3) Monitor FLIGHT CLOCK
	Pilot not on the controls:
	1) Assist avoiding traffic/obstacles
	2) Cross check FLIGHT CLOCK
	3) Assist in Maintaining Aircraft Position and Orientation
	4) Operate Ground Station as required
	5) Monitor and transmit on assigned radios
	6) Perform other duties assigned by the Pilot on the controls
5	Transfer of Aircraft Control
	3-Way Positive Transfer of the Controls
6	Crew Coordination
	Two challenge rule
	Most Conservative Approach
	Avoid Excessive Professional Courtesy
7	Post Flight Responsibilities
	Disconnecting the Flight Battery
	Battery Charging Procedures
	Logbook
8	Back Brief

9.2 LED Autopilot Status Lights

LED Code	Meaning
 Blinking Red, Green and Yellow	System Running Diagnostic Test
 Blinking Yellow Four Times	System Warming Up
 Blinking Green Slowly	Safe to Fly, GPS Working
 Blinking Yellow Slowly	P-ATTI or ATTI Mode
 Blinking Green Quickly Twice	VPS Working, no GPS
 Blinking Blue (Alternates with flight mode Patterns)	Positioning with D-RTK
 Blinking Purple Twice	Manual Mode
 Blinking Blue Rapidly for 1.5s	Switching Devices for Modular Redundancy System
 Blinking Green Rapidly for 1.5s	Home Point/POI/Course Orientation Set
 Blinking Yellow (Alternates with other flight mode and D-RTK Patterns)	Intelligent Flight Modes
 Blinking Yellow Rapidly	Remote Controller Signal Lost
 Blinking Red Slowly	Low Battery Warning
 Blinking Red Rapidly	Critically Low Battery Warning
 Blinking Red Rapidly for 0.6s While Performing CSC	Large IMU Bias or IMU Initialization
 Solid Red	Critical Error
 Blinking Red and Yellow Alternatively	Compass Calibration Required



10. PERFORMANCE AND LIMITS

11.1 Aircraft Specifications

Platform Type	Multi-Rotor (four fixed- pitch rotors)
Rotor tip to rotor tip dimensions	31 ½ inches (80.1 cm)
Operating Temperature	-10°C ~ 50°C
Take-off Weight	7 lbs. 13 ounces (3539g)
Weight without Battery	5 lbs. (2269g)
Hovering Accuracy (GPS Mode)	Vertical: ± 31in (0.8m) Horizontal: ± 98 in (2.5m)
Max Yaw Angular Velocity	180°/s
Max Tilt Angle	35°
Max Horizontal Flight Velocity	35 mph (30 knots, 15 m/s)
Wind Limits	35 mph (30 knots, 15 m/s) or gusts of 25 mph (22 knots, 11 m/s)
Vertical Speed Limits	800 feet/min. (4.1 m/s)
Supported Flight Battery	LiPo 6S
Operational Ceiling	12,000 feet DA (3650 m)
Maximum payload	1 lb. 8 ounces (680g)
Operational Range	1.5 mi. (2.4 km)
Max. Power Consumption	300 Watts (0.4 hp)

11.2 Flight Time Calculation

Example: RDASS flew 14 minutes and 19 seconds. Flight Battery required 5459[mAh] to fully charge. How much available flight time is there? (Under similar flight conditions this battery can be flown 18 minutes and 53 seconds)

- 1) Convert minutes and seconds to decimal minutes

$$\left(\frac{19 [\text{sec.}]}{60 [\text{sec.}]} + 14 [\text{min.}] \right) = 14.31 \text{ minutes}$$

- 2) Multiply the decimal minutes by 80% of battery capacity
 $14.31 [\text{min.}] \times 7200 [\text{mAh}] = 103,080 [\text{min} \cdot \text{mAh}]$

- 3) Divide the result from step 2 by the required charge

$$\frac{103,080 [\text{min} \cdot \text{mAh}]}{5459 [\text{mAh}]} = 18.88 [\text{min.}]$$

- 4) Multiply by 60 to convert decimal minutes to seconds

$$18.88 [\text{min.}] = (0.88 \times 60) + 18 = 18:53$$

11. USER-LEVEL MAINTENANCE

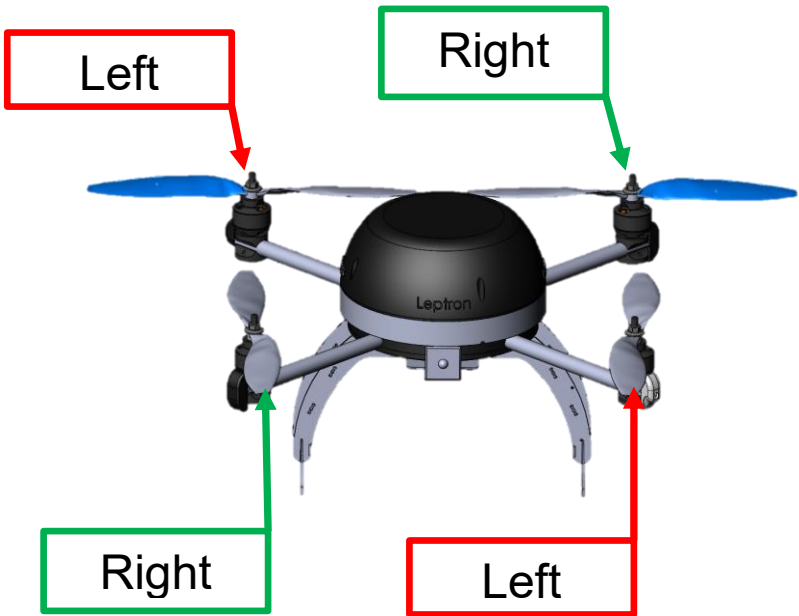
11.1 Rotor Removal

1. Use a 10 mm wrench to remove the nut by turning counter-clockwise.
2. Remove and save the anodized black washer for use with new rotor blade.
3. Remove the rotor blade from the motor post.
4. Remove and save the aluminum bushing from the motor post. (If the bushing remained inside the rotor blade, remove the bushing from the rotor blade.)




11.2 Rotor Installation



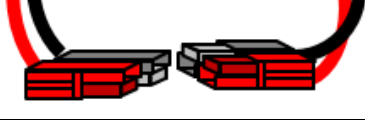

1. Place the aluminum bushing on the motor post.
2. Install the correct rotor blade.
3. Install the anodized washer.
4. Install the 10mm nut by turning clockwise until increased resistance is felt.
5. Use a 10mm wrench to turn the nut an additional quarter turn.


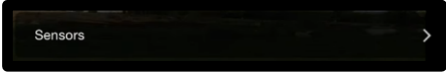
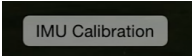




11.3 IMU Calibration

The IMU (Inertial Measurement Unit) includes a 3-axis accelerometer, a 3-axis angular velocity and a barometric altimeter. It is used to recognize and maintain aircraft attitude. The IMU calibration will fix many of the RDASS HD issues including erratic flying errors.

 <p>WARNING</p>	<p>Leptron requires the IMU to be calibrated upon receiving the aircraft and any time erratic flight behavior is observed, or in the event of a crash.</p>
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1	Loosen the four prop nuts (one for each motor) that secure the propeller to the motor shafts
2	Setup the aircraft according to the preflight checklist
3	<div style="display: flex; align-items: center;"> <div style="flex: 1;"> <p>Connect the Remote to the Tablet</p> </div> <div style="flex: 1; text-align: center;">  </div> </div>
4	Power on the Remote
5	Power on the Tablet
6	<p>Launch the GoAPP</p> <div style="text-align: center;">  </div>
7	<p>Power on the aircraft</p> <div style="text-align: center;">  </div>
8	Verify connection to aircraft
9	<p>Tap 'General Settings' at the top-right corner of the screen</p> <div style="text-align: center;">  </div>

10	Select 'MC Settings' on the left side of the window	
11	Select 'Advanced Settings' from the bottom of the 'Main Controller Settings' list	
12	Select 'Sensors' at the bottom of the 'MC Settings' list	
13	Select "IMU Calibration" at the bottom of the 'Sensors' list	
14	Position the bubble level on the center of the aircraft dome and center the bubble in the level by adjusting the landing gear with shims. Ensure the aircraft is located on a steady surface and do not touch the aircraft during the IMU calibration	
15	Click "Start Calibration"	
16	Read the warning window and click "OK"	
17	Do not touch the aircraft while IMU Calibration is in progress	
18	Look for a window to verify the calibration was successful	
19	Close the GoApp	
20	Disconnect the aircraft power	
21	Disconnect the tether	

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