

DRONE ROVER

Drone treasure detecting
system for larger areas

User manual



TREASUREHUNTER3D
Makes underground treasures visible



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Welcome

We would like to congratulate and thank you that you decided for DroneRover treasure detector and joined people around the globe that enjoy this fun and rewarding hobby.

DroneRover was designed as first drone treasure detection system on the market that is able to scan areas autonomously without and displays scan results on a smartphone map in real-time. DroneRover is able to discover precious metals like gold, silver and ancient bronze objects as well as chests, boxes, hidden rooms, graves and tunnels.

Here at TreasureHunter3D we are constantly focusing on innovating in order to provide high quality, affordable & easy to use products that incorporate high technology to our customers, by purchasing this device you are helping us to push metal detecting to the next level.

TreasureHunter3D team wishes you successful treasure hunting.

The latest product instruction manuals and detector software updates are available at:

<https://www.treasurehunter3d.com>

Marlon Alford USA

I was surprised when I first tested DroneRover, how well the scanning process is automated. Once the scan area is selected on the map, all the rest is done by the application, so you can just enjoy watching the drone flying on its own and observe results.



Read before use - important notes

Metal detector safety warnings

Any piece of equipment can be dangerous if not operated properly. It is YOU who is responsible for the safe operation of this equipment. Any metal detector may discover explosives, underground power lines, sharp objects or other items that could cause personal injury. The company or the manufacturer of the metal detector device DOES NOT ACCEPT responsibility for any personal injury or personal property damage!

To make your search more secure, please follow this precautions:

- never treasure hunt in a zone where bombs or other explosives may be buried,
- never treasure hunt in an area where there might be underground electric lines or pipes buried at a shallow depth,
- never treasure hunt in an area with flammable gas or liquid pipelines,
- always use reasonable caution in digging, especially in areas where you are uncertain of underground conditions,
- for safety reasons do not use headphones near traffic or other dangers like rattlesnakes.

Treasure hunter's code of ethics

- Respect the rights and property of others. Do not enter private property without the owner's permission.
- Always check Federal, State, County and local laws before searching.
- Never destroy historical or archaeological treasures.
- Take care to refill all holes and leave the land and vegetation undamaged.
- Always Appreciate and protect our inheritance of natural resources, wildlife and private property.
- Remove and dispose of any and all trash and litter found. Be extremely careful while probing, picking up, or discarding trash items.
- Keep in mind that all treasure hunters may be judged by the example you set.

Safety precaution for use

In order to prolong metal detector device life it is important to follow these precautions:

- Do not modify, disassemble, or open this product.
- When device is not used for a longer period of time always remove the battery.
- Do not expose your detector to extreme temperatures, particularly inside a car in full sun.
- Use and store the metal detector only in normal temperature environments. Temperature extremes can shorten the life of electronic devices and distort or melt plastic parts.
- The metal detector device is not waterproof. Make sure that you protect it in wet weather.
- Do not use solvents or alcohol to clean the detector. Soapy water is sufficient.
- Handle the metal detector gently and carefully. Dropping it can damage electronic components.
- Avoid strong magnetic fields generated by large magnets, loudspeakers or motors.

Drone safety warnings / drone code

- Always keep your drone or model aircraft in direct sight.
- Never fly more than 400ft (120m) above the surface and stay well away from aircraft, airports and airfields.
- Never fly closer than 50m to people. Even when your drone is more than 50m away from people it is safer to avoid directly overflying them.
- Never fly closer than 50m to buildings, cars, trains or boats.
- Never fly closer than 150m to a crowd of 1,000 people or more. Never fly directly over a crowd.
- Never fly closer than 150m to built-up areas. Never fly directly over a built-up area.
- Never fly in an airport's flight restriction zone. For further info, see: dronesafe.uk/restrictions/
- It is illegal to fly a drone or model aircraft between 250g-20kg that does not show a valid operator ID.



Assembly & getting started



Learn how to use Phantom 4

Before starting to use a DroneRover sensor device you need to learn how to use Phantom 4 drones. We highly recommend to visit DJi official link:

<https://www.dji.com/si/phantom-4/info>

and follow these video instructions.

- Unboxing Part 1-5
- Pre Flight Part 1-3
- How To Fly Part 1-5
- Phantom 4 Tutorials - Updating Firmware

This video will give you all the information that is required to understand before starting to use a DroneRover sensor device.

Here is a short checklist of things that you need to know before continuing:

- How to charge drone batteries
- How to properly assembly and prepare drone for the flight
- How to turn on Remote controller and drone
- How to use DJi go 4 app to upgrade drone firmware and calibrate drone compass (<https://www.dji.com/si/downloads/djiapp/dji-go-4>)
- How to safely take off, fly and land the drone

IMPORTANT NOTICE!

If you are not sure about things on this checklist please do not start using a DroneRover sensor or app since you might harm yourself, others or the drone & sensor itself. TreasureHunter 3D does not take any responsibility for the improper use of the device.



What do you need before starting?

- DroneRover sensor unit
- DroneRover receiver unit

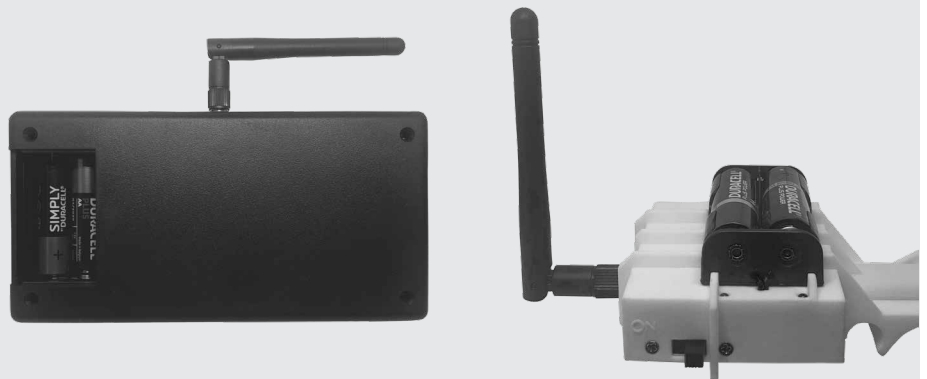
NOT INCLUDED:

- 4x AA alkaline batteries (not rechargeable)
- DJI Phantom 4 Advanced
- iPhone 6 or newer model

Assembly

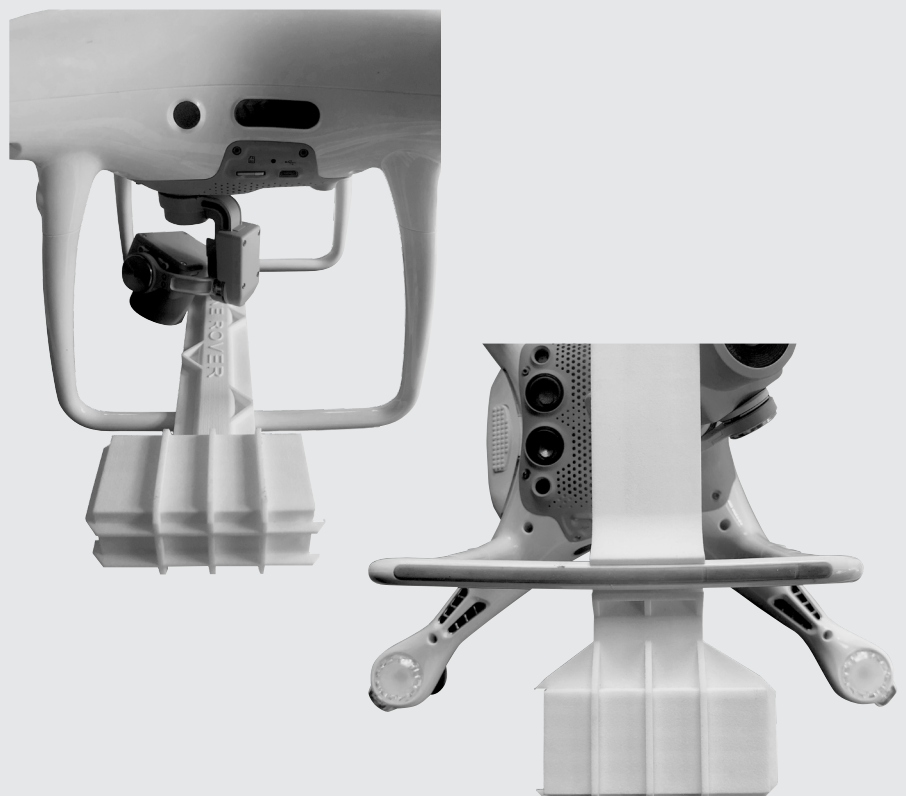
1. Sensor and Receiver unit preparation:

- check that antenna is installed and well tightened on both units, keep them closed
- install batteries and make sure not to reverse battery polarity since this can damage the device



2. Drone preparation:

- make sure drone batteries are fully charged and installed properly
- check drone propellers are not damaged and are properly installed
- install DroneRover sensor on drone and make sure that it is aligned with the camera holder as on the image and it is not covering any drone sensors on the bottom of the drone



3. Drone remote control unit preparation:

- make sure remote control unit is fully charged
- attach the smartphone to the holder on top of remote control unit and connect it with the original USB cable
- check P-S-A switch is in P position



4. Check smartphone and drone software and firmware

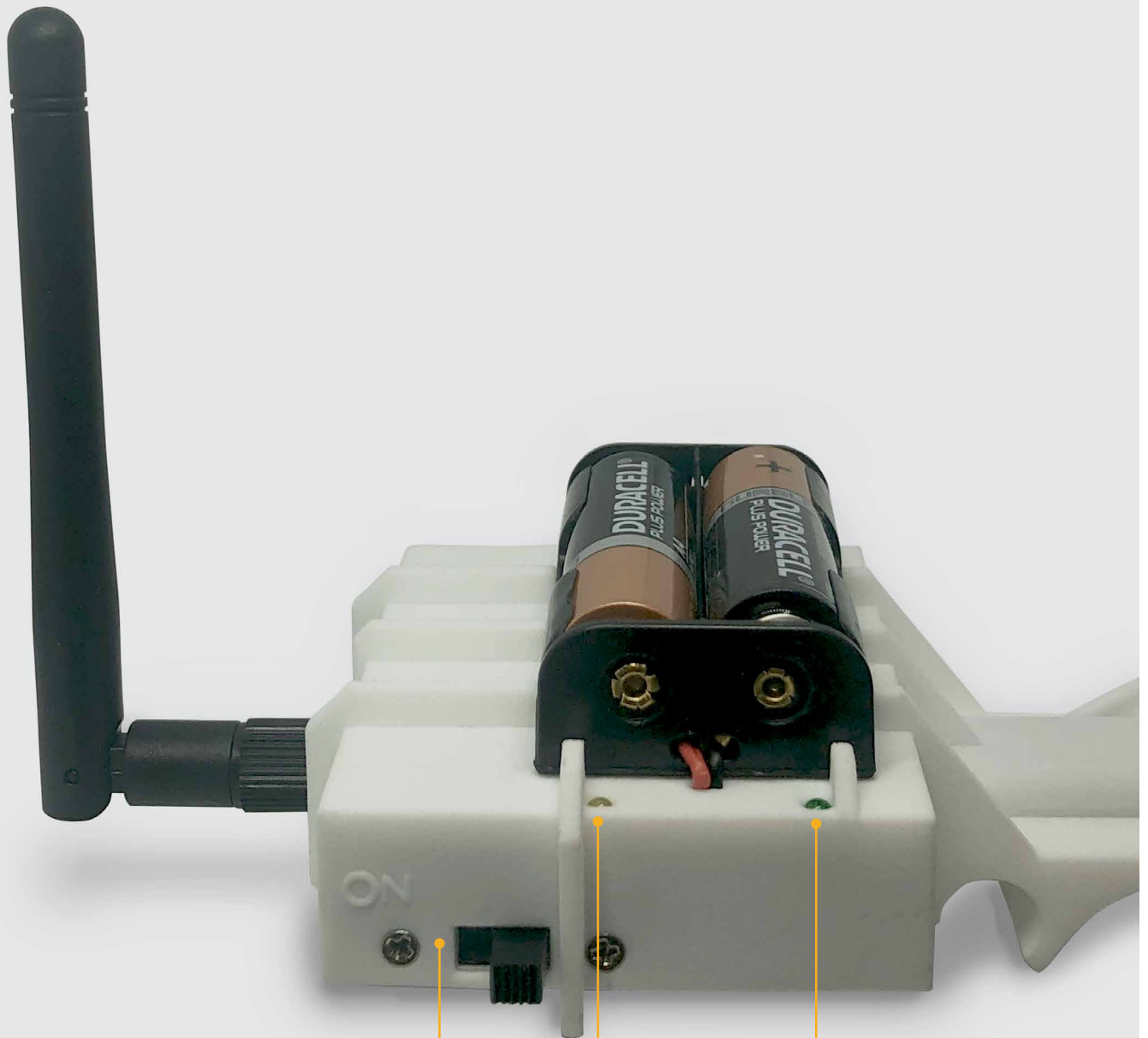
- make sure your smartphone is running latest OS and there are no apps running in the background
- Install DJI go 4 app to your smartphone and make sure:
 - drone and remote control unit have installed latest firmware & fly safe database
 - drone compass is calibrated
 - camera signal has no lag and signal is OK





Sensor unit

Sensor unit is used to detect targets and transfer target information to the receiver unit. It has to be mounted on a drone.



Switch
on/off
switch

GREEN
device
turned ON

ORANGE
sensor status
(on when ok)



Receiver unit

Receiver unit receives data from the sensor unit and forwards it to the smartphone.
It is recommended to place the receiver not more than 2m away from the smartphone.

Switch
on/off switch



ORANGE
Connection with the sensor unit is OK.

BLUE
Bluetooth connected / application is connected with Receiver unit

GREEN
device turned ON



Turn it on

1. Move the slider switch on the Sensor unit to ON position in order to turn it on.
Green LED will indicate the sensor is turned ON.
Orange LED will indicate that the sensor is ready to be used.
2. Move the slider switch on the Receiver module to turn it on.
Green LED will indicate the sensor is turned ON.
Orange LED should turn ON, indicating that a link between the Sensor and Receiver unit is established.
3. Turn ON drone & drone Remote controller. *(refer to drone user manual and instructions)*

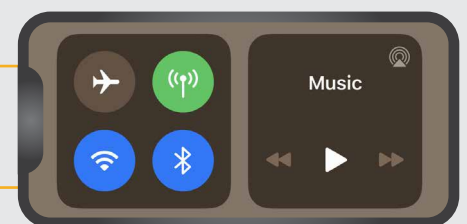
TROUBLESHOOTS

- If **green LEDs** are not turn on please check batteries are full and properly installed.
- If **orange LED** on Receiver unit will not start to blink check if antennas on both units are properly installed.

Smartphone application

DroneRover uses iOS application to navigate drone, display drone, detector information and scan results.
To start using application:

1. Install DroneRover application.
Applications can be downloaded from <http://www.treasurehunter3d.com/downloads>
or installed from AppStore.
2. Make sure iPhone bluetooth is turned on.
3. Make sure sensor and receiver unit are both turned ON.
4. Run the application.
5. The Bluetooth LED indicator on the receiver unit will turn blue indicating the smartphone is connected with a DroneRover sensor.



Congratulations, the DroneRover sensor is now ready to be used!



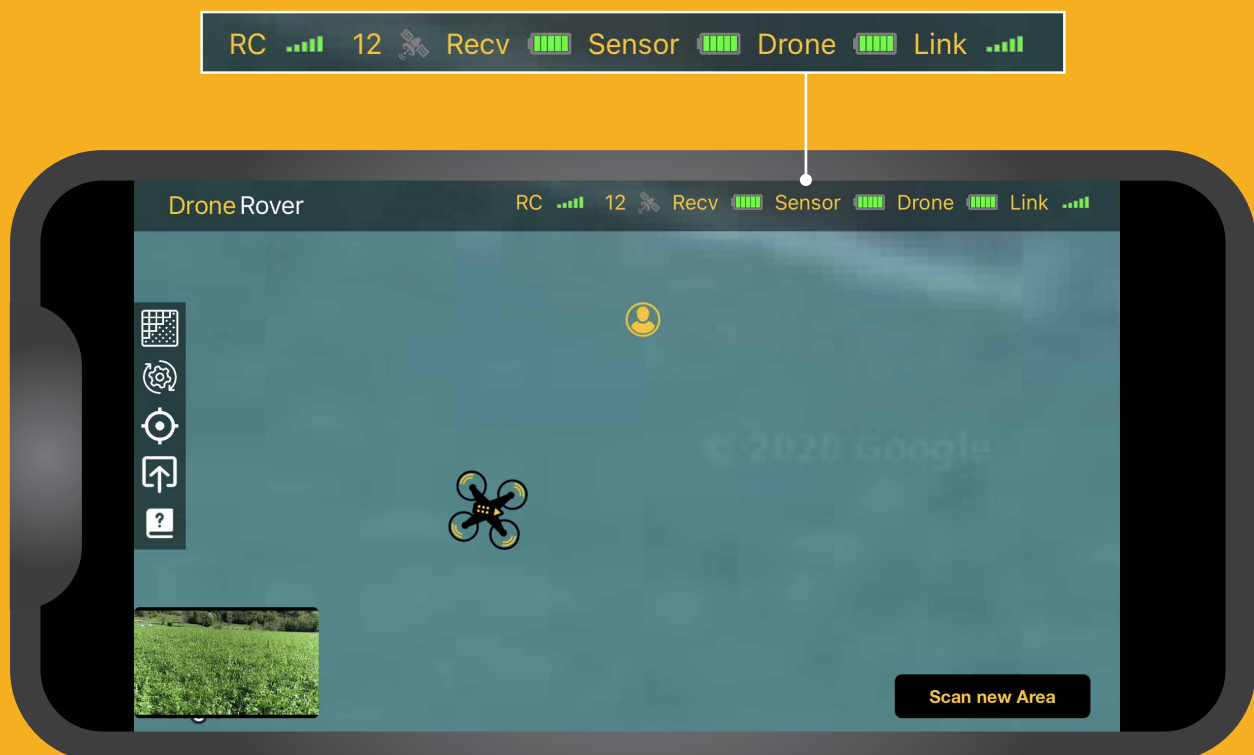
Quick start

Before start

1. To learn how to properly and safely use the DroneRover app, first find an area that is not populated, is flat and has no obstacles, so it is safe to fly. A perfect test scan area can be a meadow or field, away from houses & trees with no animals, people or other obstacles.
2. Place a drone on a flat clean surface with clear surroundings for safe drone launching and landing.
3. Check indicators to make sure that all devices are properly connected and turned ON:
 - **drone is connect to the app**
 - **all batteries are full**
 - **link to sensor is established**
4. Make sure the map is updated and that you can clearly see your location and location of the drone. Remember to always keep a safe distance from the drone!


Once all these conditions are met, continue with automated or manual scanning.

3



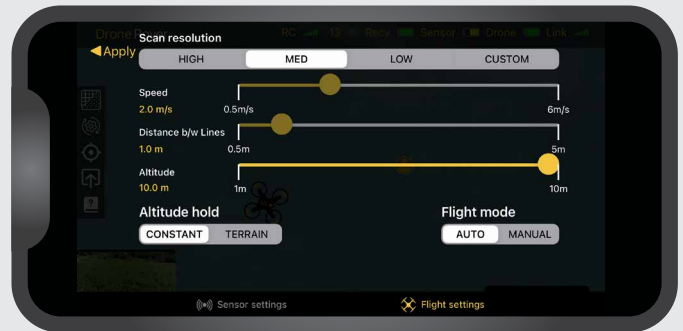


Automated scanning

1. Open settings menu  and select **Flight setting**.

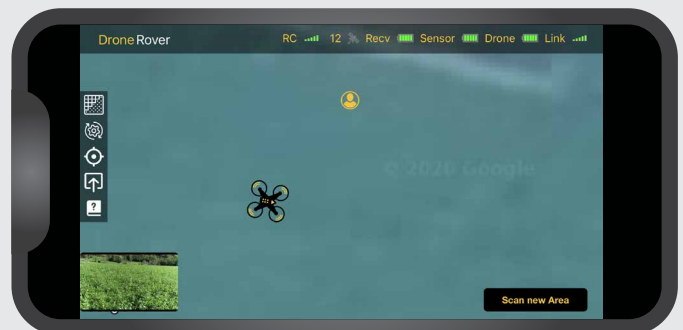
SET:

- Scan mode: **AUTO**
- Scan resolution: **LOW**
- Altitude hold: **CONSTANT**
- Altitude: **10m**



2. Press **“Apply”** to exit setting menu.

3. Press **“Scan new area”** button.

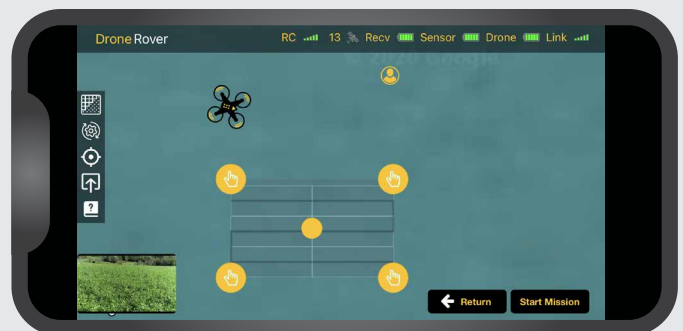



4. Drag rectangle over an area on the map you would like to scan.

IMPORTANT SAFETY PRECAUTION

Make sure that:

- there are no obstacles inside the area you selected
- there are no obstacles on the way from the drone current location to selected area
- area you are about to scan is flat



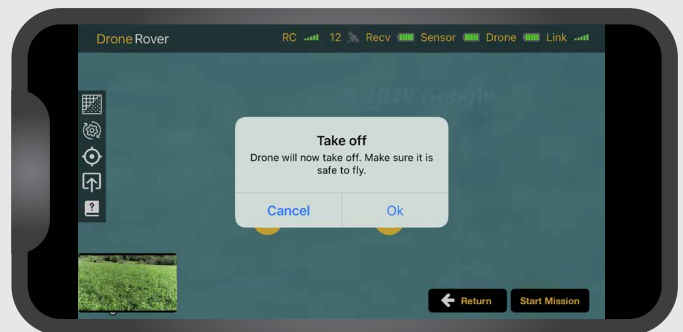
If you would like to change the scan area you can always tap  and mark new area.



5. Make sure to keep distance from the drone and you are not located in the drone's way to scan the area.

6. Press “**Scan mission**” button and confirm take off, the drone will now fly to scan the area and start scanning.

Notice that you can always **pause / abort mission** by pressing: **Abort button** in the app (see: Aborting mission chapter for more details) or **Home button** on Remote control to return drone back to home position.



7. Once scanning is completed drone will fly back to its home location and land.

Some of the latest DJi drone versions might not land completely but stop 0.5m before ground is reached. For this model, the user needs to confirm landing with the remote controller by pressing down on the left handle.


Due to *National Drone Safety Regulations*, autopilot can only fly 2m over the surface.

In order to achieve best sensitivity it is recommended to fly as close to the surface as possible (e.g. 0.5m).

This can be achieved by **Manual scan mode**.

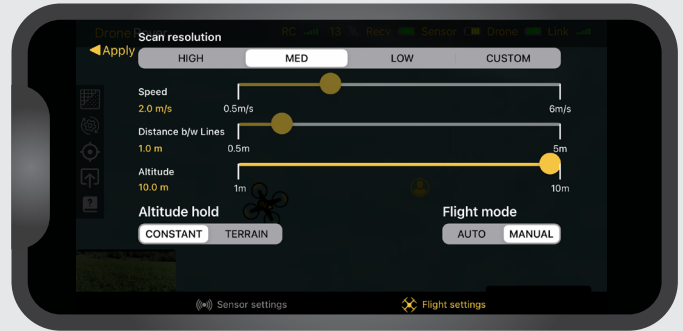


Manual scanning

1. Open settings menu  and select **Flight setting**.

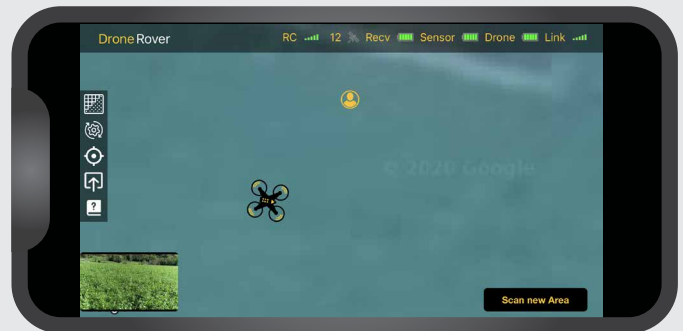
SET:

- Scan mode: **MANUAL**
- Scan resolution: **LOW**



2. Press **“Apply”** to exit setting menu.

3. Press **“Scan new area”** button.

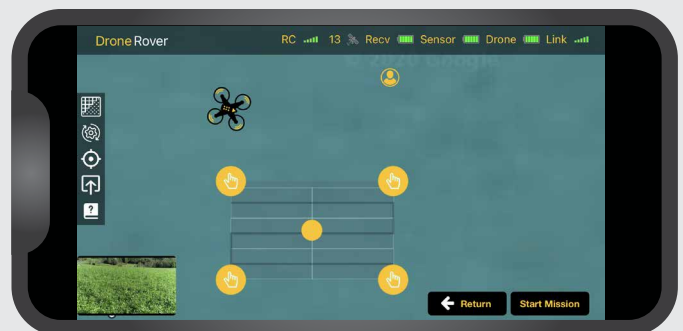



4. Drag rectangle over an area on the map you would like to scan.

IMPORTANT SAFETY PRECAUTION

Make sure that:

- there are no obstacles inside the area you selected
- there are no obstacles on the way from the drone current location to selected area
- area you are about to scan is flat



If you would like to change the scan area you can always tap  and mark new area.



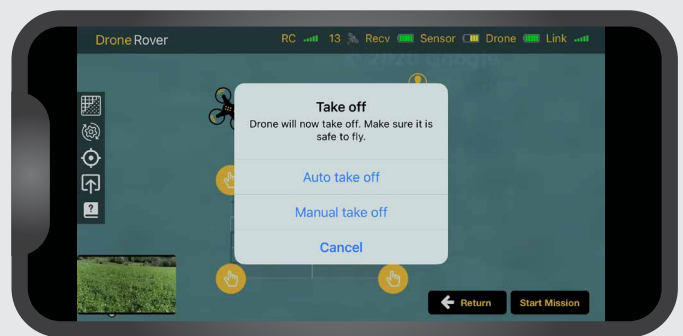
5. Make sure to keep distance from the drone and you are not located in the drone's way to scan the area.

6. Press the **"Scan mission"** button, app will now check GPS signal, battery and other drone status indicators to confirm everything is ok and ready for safe flight.

7. A pop-up window will appear to select automatic or manual take off or cancel the flight.

When automatic takeoff is selected the drone will take off by itself while in manual remote control needs to be used to take off. After that remote control needs to be used to fly over the marked area and to perform scanning.

During the flight please make sure that you fly at constant altitude from the ground and also constant speed.



IMPORTANT NOTES

Best scan results are achieved when the drone is flying stable with no fast movements and as close to the ground as possible. Scanning should be performed at a constant speed (2-3m/s). An unstable drone flight will result in sensor error readings.



Sensor reading / scan interpretation

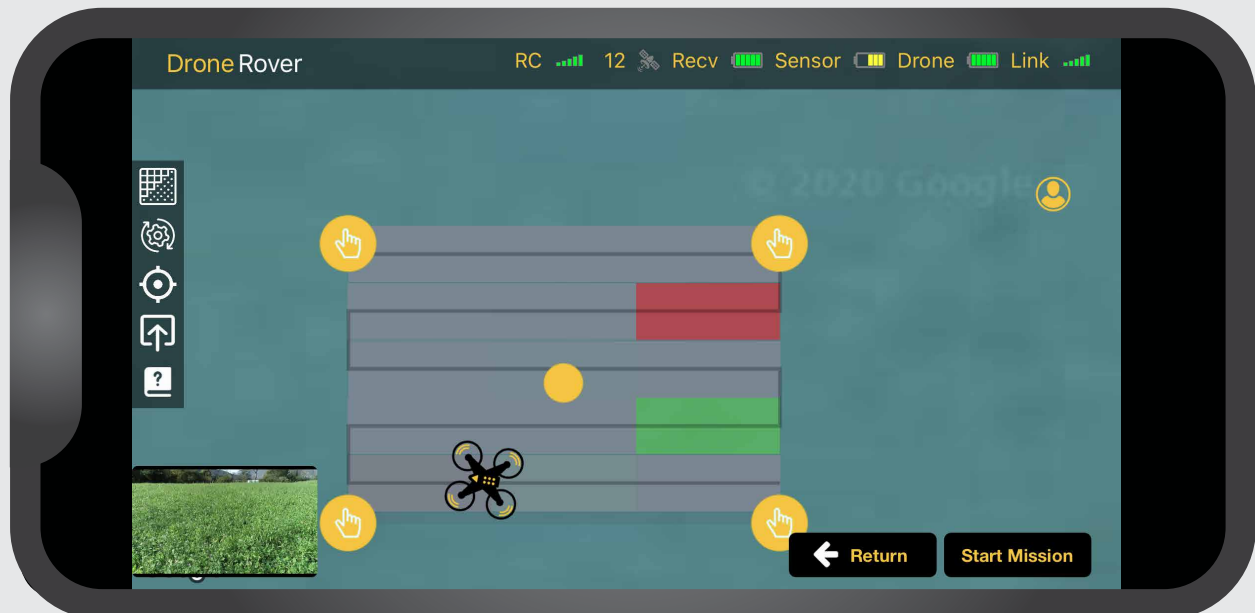
When a drone flies over a selected area, scan results are updated in real-time using different colours to indicate target probability.

GRAY COLOUR indicates that sensor reading was incorrect due to unstable drone flight caused by wind or other disturbance.

GREEN COLOUR indicates that there was nothing detected.

YELLOW COLOUR indicates that there is high probability of object.

RED COLOUR indicates that there is highest probability of object.



If the scan was not updated on some locations this means that either signal from the sensor was lost (bad link between sensor and receiver unit) or drone has problems receiving proper GPS signal.

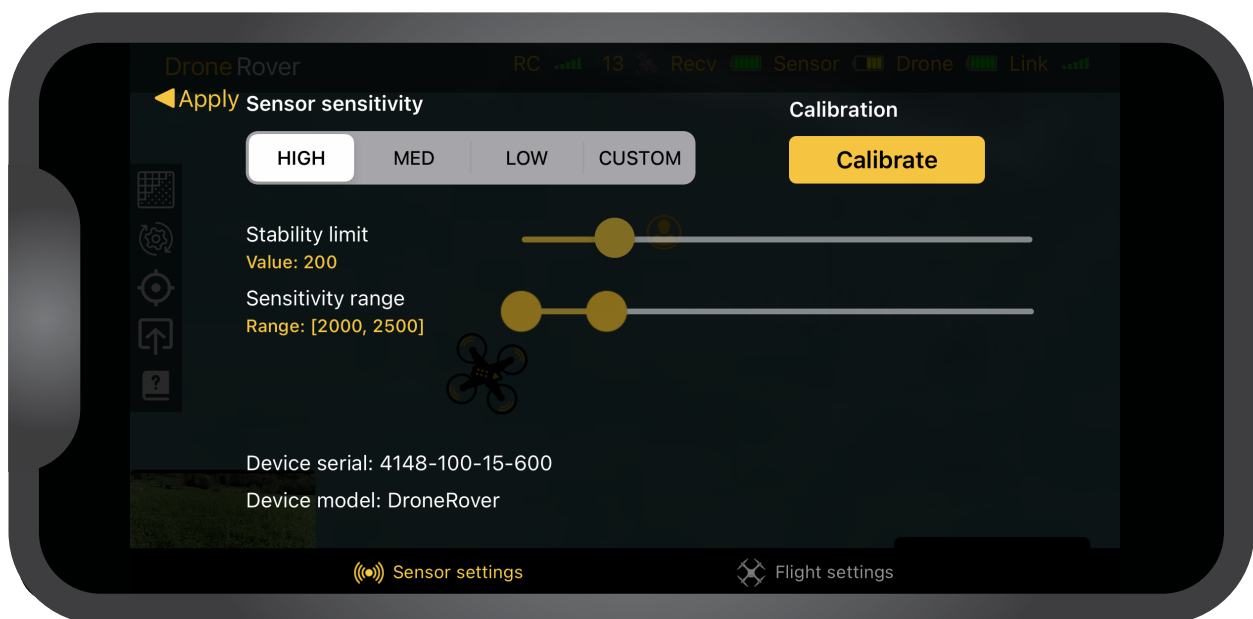


Sensor settings & calibration

Sensor settings enable users to set sensor sensitivity, stability limit and perform sensor calibration.

SENSOR SENSITIVITY

Sensor sensitivity defines how strong the signal from the sensor will be when objects or other underground anomalies are detected. It is recommended to start scanning with HIGHEST sensitivity and reduce it if the signal from the sensor is too strong. Lower sensitivities when the interest is to only detect very big & massive objects and ignore smaller targets. There are several profiles available from HIGH to LOW, while experienced and advanced users can also define CUSTOM sensitivity profile.



Custom sensitivity profile

Custom sensitivity profile can help you to get the best out of DroneRover devices and it is definitely worth being used once you already get familiar with the device.

Custom sensitivity profile enables user to adjust 3 things:

Stability limit - unstable drone flight can cause false sensor reading, by setting stability limit users can eliminate these false readings, so that they appear as grey colour when displayed on scan area. Lower stability limit values mean that the drone needs to fly very stable, by that we can make sure that measurements are ok, but on the other side requires the user to navigate the drone very smoothly. Higher values can be used when it is not possible to fly stable due to wind or other reasons. Users should be aware that when the stability limit is set to higher values, sensor readings might not be as valid as for the lower stability limit values.

Sensitivity range - provides user ability to set sensitivity threshold (left slider) and sensitivity level (right slider). Signals that are lower than sensitivity threshold will spread on the screen in green colour - indicating that there is no object found. By using sensitivity threshold we can eliminate environmental noise or ignore smaller targets and underground anomalies.

Sensitivity level defines the limit of the signal that needs to be reached to display the target on the scan area with highest probability (in red colour). Sensitivity level can be used to compress sensor signals and make smaller targets more or less visible compared to bigger targets. In other words, signals lower than the sensitivity threshold will appear on the scan in green, and will turn yellow and red when they reach sensitivity level.

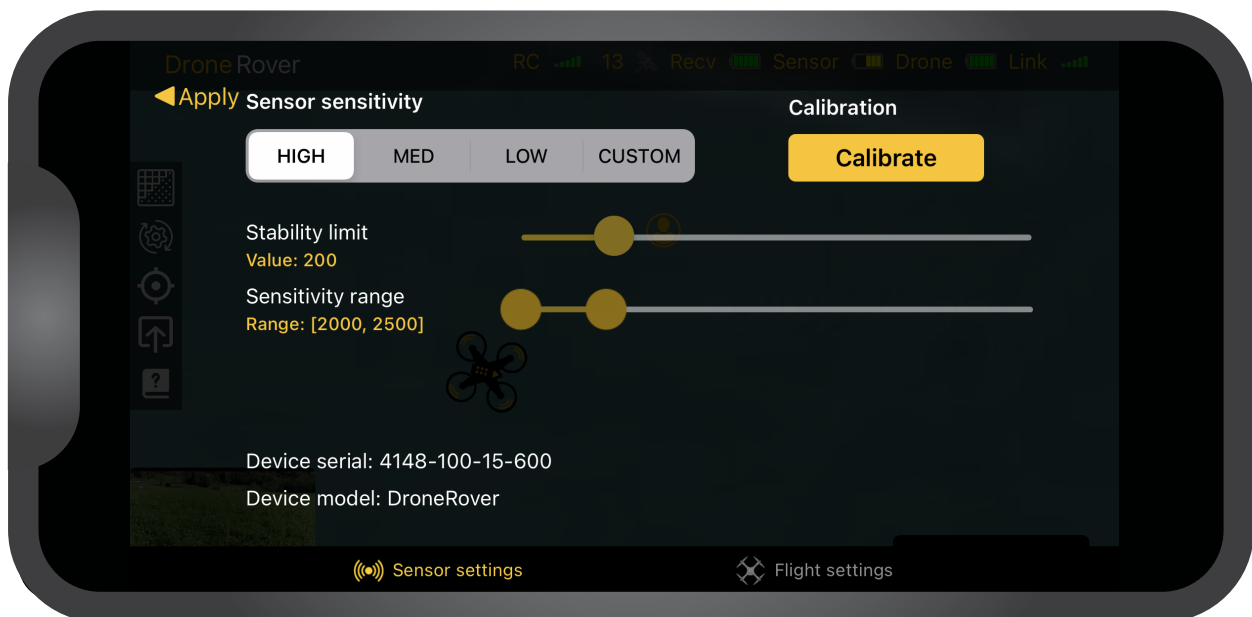


SENSOR CALIBRATION

DroneRover has an integrated error correction system that requires calibration. In order to achieve best scanning results, the sensor needs to be calibrated after being mounted on the drone.

Procedure to calibrate the sensor goes as follows.

1. Make sure to go to location that has no metallic objects in the field of 50m and you are also not wearing any of it.
2. Start application & check indicators to make sure that all devices are properly connected and turned ON.
 - drone is connect to the app
 - batteries are full
 - link to sensor is established
3. Enter settings menu.
4. Click calibration and follow procedure in the application.



It is recommended to repeat calibration from time to time, especially when the sensor is re-mounted to the drone.



Troubleshoots

DRONE DOESN'T TAKE OFF ONCE MISSION IS STARTED

There are several reasons that could cause a drone not to take off:

- **Drone not connected** (make sure to connect smartphone with USB cable to remote control and that both devices - drone & remote control are turned ON and firmware is upgraded to latest available using *DJI go 4 app*).
<https://www.dji.com/si/downloads/djiapp/dji-go-4>
- **Propellers are not installed** (in this case motors will start running and then stop).
- **GPS signal too low** (if such msg appears on screen before takeoff, move drone to location where drone can clearly see the sky and wait a few more minutes for drone to find enough satellites).
- **Compass not calibrated** (if such msg appears on screen before takeoff please connect to drone using *DJI go 4 app* and perform compass calibration).
<https://www.dji.com/si/downloads/djiapp/dji-go-4>
- **Battery of drone or remote control is low** (if such msg appears on screen make sure both batteries are full then try again).

If all of the above will not help, please test the drone flight using *DJI go 4 app* (<https://www.dji.com/si/downloads/djiapp/dji-go-4>) and confirm the drone is working properly before contacting TreasureHunter3D technical support.

SENSOR DATA IS NOT UPDATED

There are several reasons why sensor data is not updated

- **Sensor is not connected with smartphone** (to make sure sensor will connect with smartphone, turn both sensor and receiver unit ON - this is indicated by green LED on both, then make sure bluetooth on smartphone is turned ON and BLUE led on receiver also turns ON when you open DroneRover app)
- **Signal between sensor and receiver unit is too low** (to make sure signal link between sensor and receiver is ok, make sure both units have properly mounted antennas and that Link indication in the app shows full signal and orange LED on the receiver unit is turned ON)
- **Sensor unit is broken** (when sensors are operating properly orange LED on the sensor unit is turned ON, if only green is turned on contact TreasureHunter3D technical support)

DRONE LOCATION IS NOT VISIBLE OR WRONG

Try to restart that DroneRover application and reconnect the remote control USB cable. Make sure that the top of the drone can see the sky and wait for a while so that the drone finds enough satellites to have a stable location. If the location is not stable, the DroneRover application will not work as specified.

DRONEROVER APPLICATION CRASHES

In many cases it is very hard to understand why application crashes, anyhow if you are able to reproduce it, please send us exact procedure to reproduce the problem and also log files that can be found on your iPhone by following these instructions:

<https://help.getpocket.com/article/1098-how-to-find-the-iphone-ipad-app-crash-logsHow>

This will help us to understand what the problem is and improve our application.

GPS LOCATION & VIDEO IS NOT UPDATED IN REAL-TIME / LAG

If GPS location & video are not updated in real-time there could be a problem with drone wireless link due to interference with other surrounding networks. In this scenario we suggest restarting the remote controller, drone and application. Same problem could occur if a bad USB cable for connection with a remote controller is used. It is also recommended to have smartphone batteries full and close or other apps beside DroneRover.

For more information how to fix this problem can be found at this link:

<https://www.letusdrone.com/28-causes-of-video-lag-on-dji-go-4-and-how-to-fix-it/>

DRONE DOES NOT CONNECT TO DRONE ROVER APP

There can be several reasons why drone will not connect with the app.

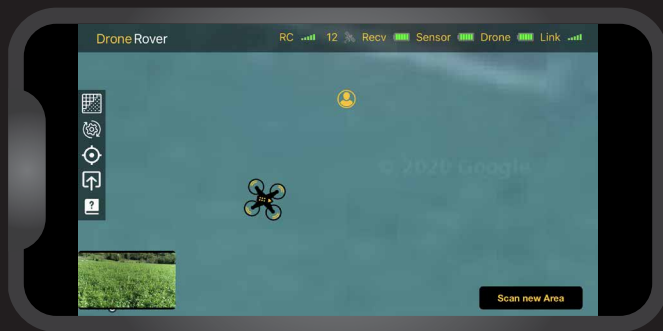
- Drone and Remote control needs to be turned ON.
- Smartphone must be connected with the drone over USB cable.
- Drones is not compatible with DroneRover app.
- Drone or Remote control firmware needs to be updated.



Smartphone application features



Main control screen



From the main control screen user can:

- Observe map with smartphone and drone location
- Select scan area
- Enter settings menu to adjust sensitivity, scan resolution, flight mode & altitude
- Start / abort mission / scanning
- Monitor battery and link status
- See mission status & drone connection
- Share scan results
- Access support information
- View real-time video from drone camera

Battery & link status

Icons in top right corner indicate:

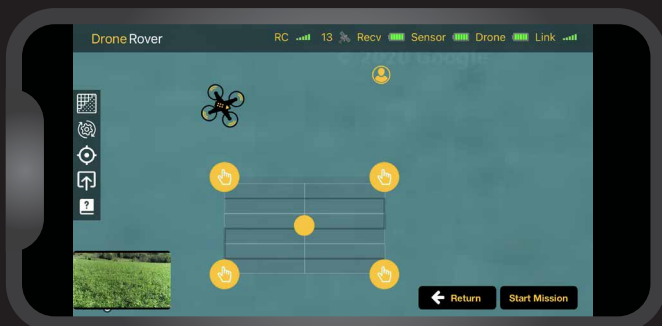
- Recv - sensor receiver module battery status
- Sensor - sensor module battery status
- Drone - drone battery status
- Link - data link quality between sensor receiver and sensor module


Location information

Applications provide information about these locations:

- Smartphone/user location
- Drone current location
- Drone home location - this location where drone was when mission was started and where drone will return after scanning is completed

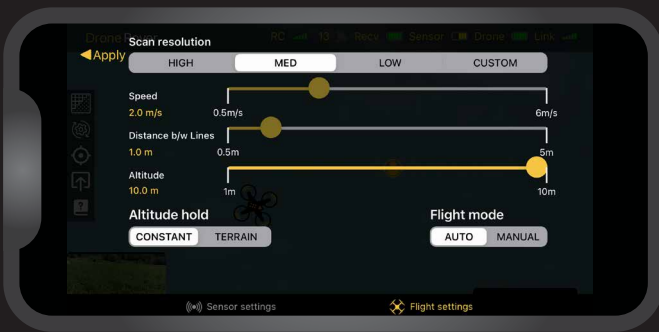
Scan area selection & map view



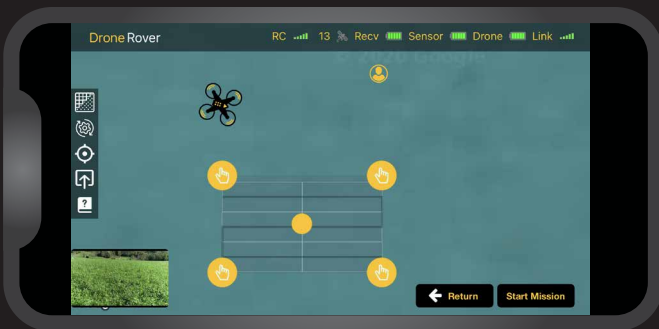
- To select scan area, user should press  then drag a rectangle over the area that should be scanned.
- To adjust the location of the scan area, the user can put a finger on the dot in the center and move the area to another location.
- To change the shape of scan area, user can put finger on the dot on the borders and move them to desired location.



Automated scanning mode mission control



When automated scanning mode is selected in the Flight settings menu tab, the user has the ability to start automated area scanning.

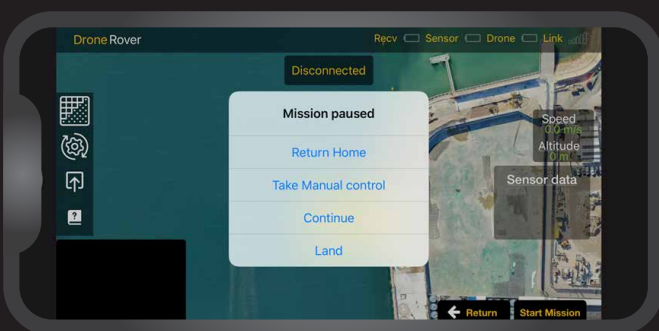


Starting mission

Missions can be started or aborted with a button at the right bottom of the screen.

Pressing a button **"Scan new area"** will automatically enable scanning area selection after that mission can be started by pressing the **"Start Mission"** button and confirmation of drone take off.

Once the mission is started the drone will take off, fly to a selected area, scan it and return to it's home position to land.



Aborting mission

Users can always stop the mission by pressing the **"Abort mission"** button. Once this button is pressed Drone will stop scanning and will stay at it's last position.

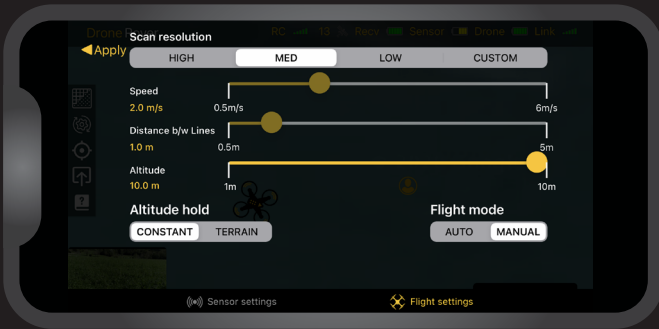
User can then choose between different options:

- Return Home - drone will return and land at its home position **
- Take manual control - user will take control over drone using remote control
- Continue - continue with the mission
- Land - land at its current position

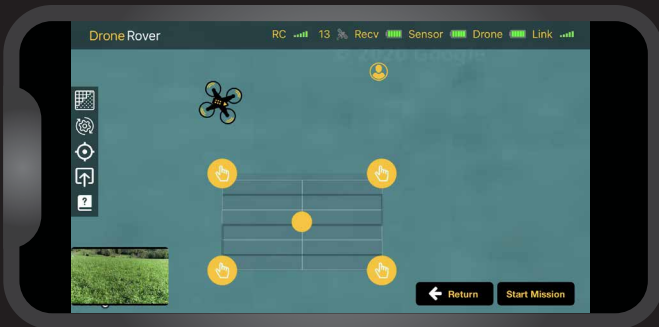
** If drone is very close to home position it will land at position where mission was aborted.



Manual scanning mode control



When manual scanning is enabled in the Flight settings menu tab, the user can scan the area manually using drone remote control.

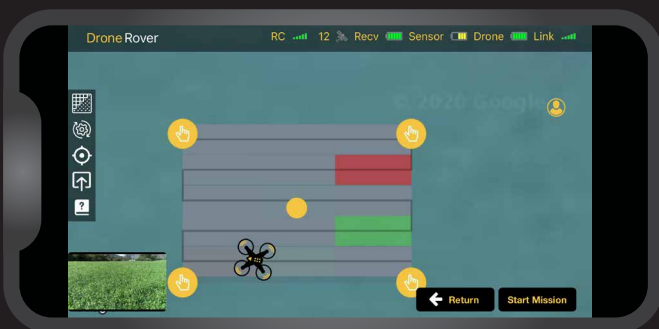


Starting mission

The mission can be started with a button at the right bottom of the screen.

Pressing the button **“Scan new area”** will automatically enable area selection.

After that user can mark the scan area on the map and manually perform the scanning.



Scanning selected area

Once the drone will take off, the user can manually fly over the area to perform the scanning.



Settings menu

Settings menu provides two tabs, one for sensors and one for flight settings.

Sensor settings tab

SENSITIVITY

Defines sensitivity of scanning sensor & algorithm.

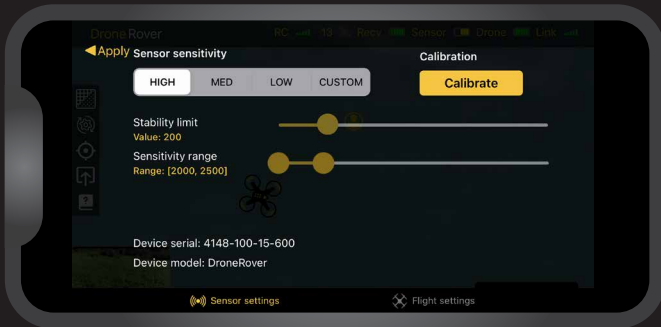
Best sensitivity is achieved when **HIGH** sensitivity is selected and the drone is flying close to the ground.

CALIBRATION

Provides possibility to calibrate sensor once mounted on the drone.

DEVICE INFORMATION

Device model and serial number for warranty and customer support.



Flight settings tab

FLIGHT MODE

Auto - drone will fly automatically over area selected by user
Manual - user will fly the drone using drone control unit

SCAN RESOLUTION

Defines how precisely selected area will be scanned.

Best resolution is achieved when the drone speed and distance between scan lines is lower. Fastest scans can be done at high speed and a larger distance between scan lines, in this case resolution will be lower and the drone might not detect smaller objects.

Custom scan resolution enables users to manually adjust scanning speed and distance between scan lines.





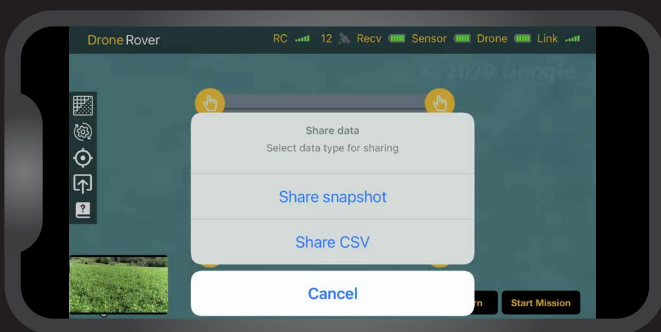
ALTITUDE MODE


Constant - means the drone will scan the area at constant altitude. Recommended for flat areas.

Terrain - means drone will follow terrain while keeping constant distance from terrain. Recommended for not flat.

Altitude - distance measured from ground at which drone will perform scanning.

Exporting and sharing scan data



By pressing the  user can share the screen as an image or as comma separated values format (csv. data) that can be imported into 3D mapping softwares.



**Technical spec. &
warranty**



Technical specification

Operating temperature range:	-10 to 50 °C
Operating humidity:	0-90%
Bluetooth connectivity:	certified Bluetooth 4.0 low energy radio
Sensor data link:	certified long range low-power wide-area network technology
Batteries:	removable AA batteries
Weight:	100g (sensor) 200g (receiver unit)
Sensor type:	certificated 3D mag. sensor
Error correction:	sensor data real-time digital signal processing
Processor:	32-bit ARM® Cortex®-M4 core at 38.4 MHz
Sensor range:	1km

Warranty

1 YEAR LIMITED WARRANTY

The metal detector device is warranted against defects in materials and workmanship under normal use for one year from the date of purchase. Damage due to neglect, accidental damage or misuse of this product is not covered under this warranty. Decisions regarding abuse or misuse of the detector are made solely at the discretion of the manufacturer. Proof of Purchase is required to make a claim under this warranty. Liability under this Warranty is limited to replacing or repairing, at manufacturer choice. Warranty does not cover shipping costs.

According to FCC part 15.21 Changes or Modifications made to this device not expressly approved by the party responsible for compliance could void the users authority to operate this equipment.



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