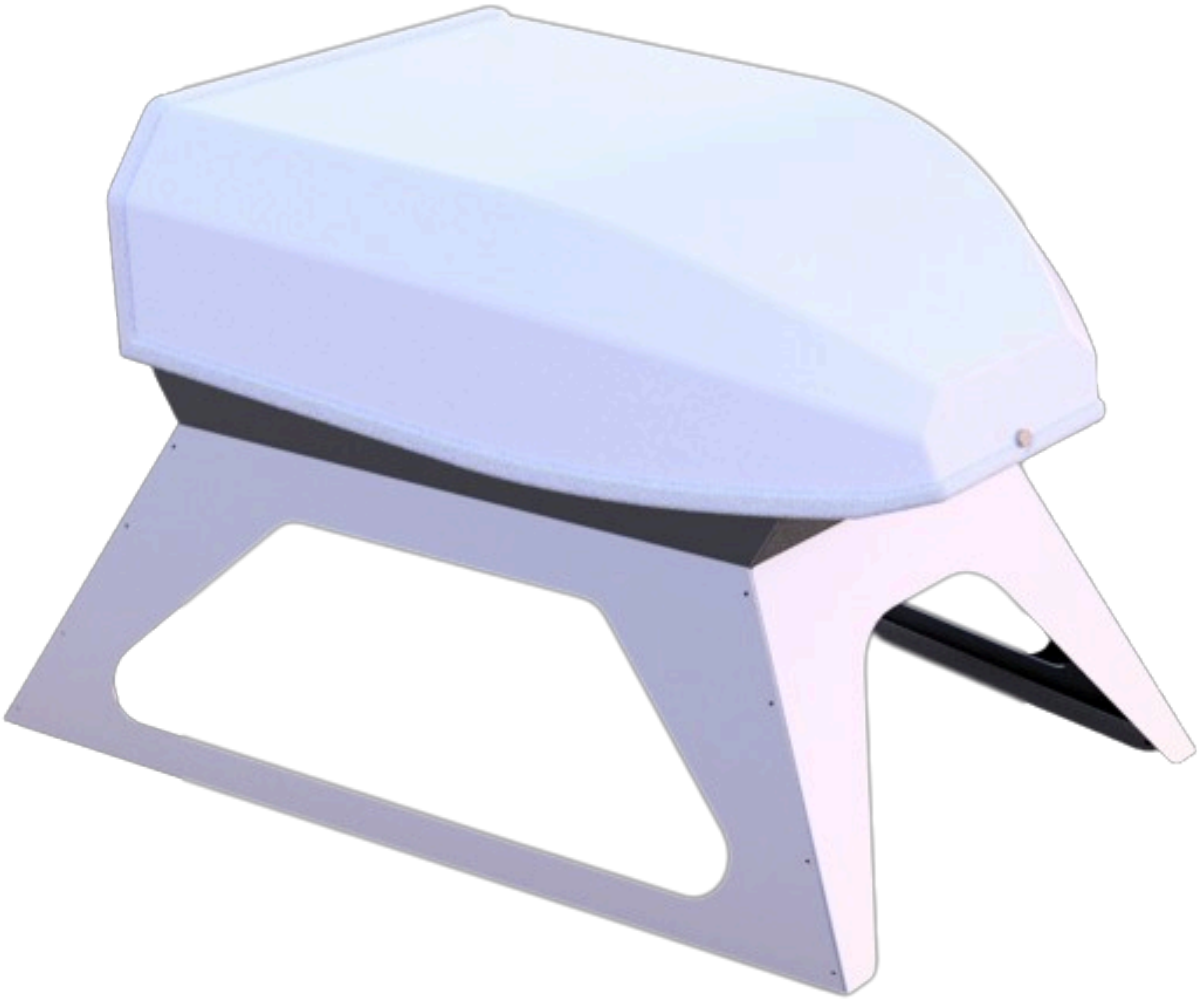
Universal

User Manual



HEXTRONICS

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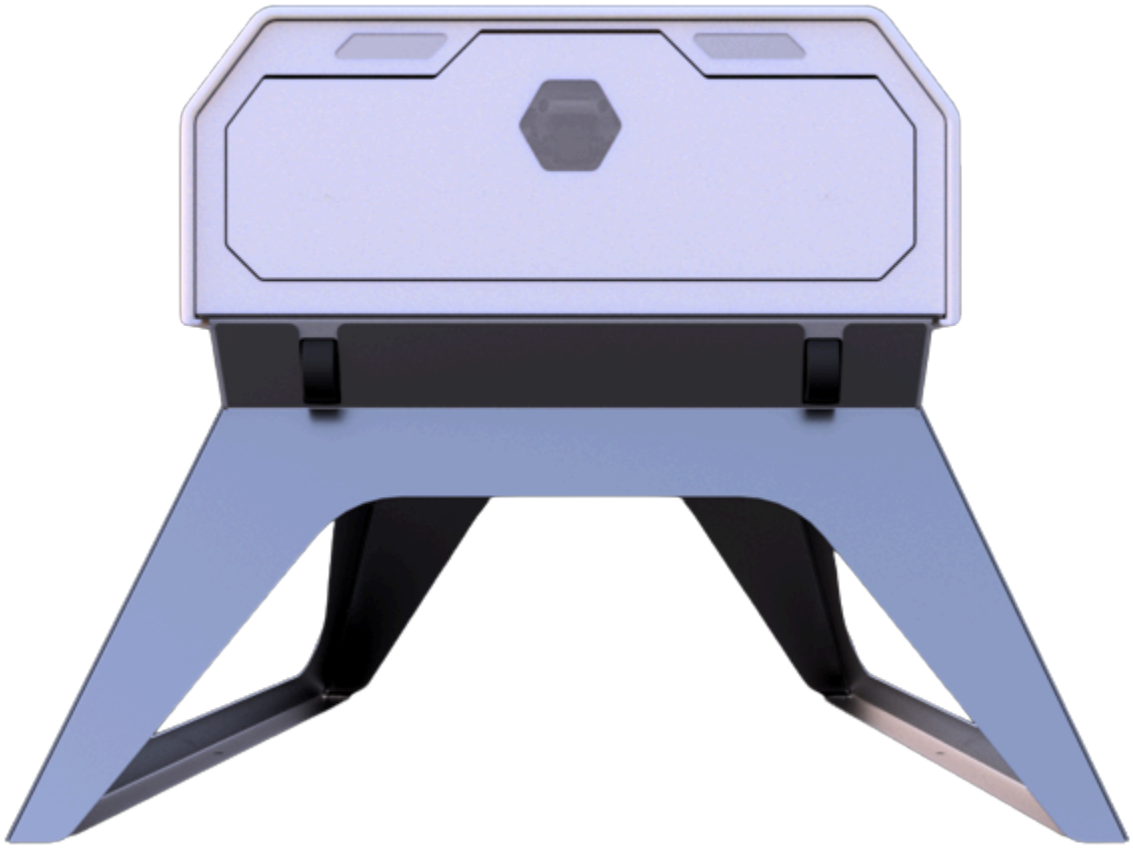
Introduction and Support

Welcome to the Hextronics Universal User Manual. At Hextronics, our goal is to enable aerial autonomy and we believe that the Hextronics Universal Unmanned Aircraft Station is a significant step towards achieving that goal.

This manual has been created to provide you with all the necessary information to install, operate and maintain your Hextronics Universal station. We want to ensure that you can use our product successfully and achieve your goals of aerial autonomy.

If you have any technical or support related questions, please do not hesitate to contact us at Support@Hextronics.tech. Our team of experts is available to assist you and ensure that your experience with the Hextronics Universal Unmanned Aircraft Station is nothing short of exceptional.

Thank you for choosing Hextronics Universal Unmanned Aircraft Station. We are honored to have the opportunity to be a part of your journey towards aerial autonomy.



This manual contains the necessary information and procedures for the safe operation and maintenance of the Universal units. To ensure your safety and prevent physical injury, it is essential that you carefully read, comprehend, and adhere to the safety instructions outlined in this manual. It is recommended that you keep a copy of this manual with the unit at all times. Additional copies are available from Hextronics or can be accessed via the website, Hextronics.tech.
It should be noted that the information provided in this manual is based on machines currently in production. Hextronics reserves the right to modify any portion of this information without prior notification. We advise you to read all manuals that come with the unit, as they contain specific details regarding setup, usage, and servicing requirements.

Applications

Security

Traditional surveillance methods require security guards to be present 24/7 and proactively conduct patrols. Our unique unmanned aircraft station charges and swaps the unmanned aircraft's battery, ensuring minimal downtime and immediate response under any circumstances. The system paired with the automated flight control software enhances effectiveness and collaboration and reduces operational costs significantly.

- Round-the-Clock (24x7) Patrols
- Live Situational Awareness
- Incident Response
- Third-party alarm integration
- Intruder Detection

Agriculture

Unmanned Aircrafts have revolutionized agriculture by offering cost-saving analogies and enhanced efficiency. Unmanned Aircrafts can do anything from precision agriculture to monitoring field activities. It provides high-resolution data for crop analysis and 3D mapping promptly and accurately. Our systems allow farmers to conduct scheduled missions from anywhere in the world, allowing them flexibility and proficiency.

- Plant health monitoring
- Reduced operations cost
- 3D Mapping
- Farm activity monitoring

Engineering & Construction

Current inspection methods are dangerous and inefficient. Automated Unmanned Aircraft stations are easy to operate and provide project/construction managers with accurate and high-resolution data faster. It reduces operational costs, enhances team alignment and collaboration, and ensures worker safety.

- Progress tracking
- Change detection
- Hazards & fault identification
- Equipment surveillance
- Site mapping & inspection
- Ensure crew safety
- Aerial and 360 degree view

Law Enforcement

When it comes to saving lives, 30-60 seconds can make a difference. Adopting an autonomous unmanned aircraft system allows immediate response, enhances officer safety, and provides a live video of the situation to the authorities to prepare an effective response.

- Event/crowd monitoring
- Surveillance
- Crime scene analysis
- Search and rescue
- Traffic control
- Collision investigation
- Suspect tracking

Disaster Response

The first 72 hours after a natural disaster is highly critical. As first responders work to save lives and minimize damage, they rely on accurate geographic information to coordinate operations. The more information officials have on the impacted areas, the more effective their response is. Because unmanned aircrafts can be quickly deployed over disaster zones, responders can use them to produce 3D maps, search for victims and assess damaged infrastructure.

- Damage detection & analysis
- Rescue & Response
- Site Visibility Enhancement
- Unsafe Area Access & Complete Situational Awareness (360-degree coverage)
- Food and Medical supply delivery

Asset Inspection

Various industries employ unmanned aircrafts for visual inspections as maintenance procedures. A few industries adopting unmanned aircraft technology are Gas and Pipeline, Mining, Energy (Solar PV, Wind turbines, Dams), ports and terminals, etc. Utilizing an unmanned aircraft to collect visual data on an asset's condition decreases operational costs and ensures the inspector's lives are not in danger.

- Power line inspections
- Solar panel inspections
- Railway track maintenance
- Roof maintenance and inspection

Safety

Unmanned Aircraft have become increasingly popular in recent years, with more and more people owning and operating these unmanned aerial vehicles. While unmanned aircraft can be fun and useful tools, it's important to prioritize safety and follow FAA rules and regulations to avoid potential risks and hazards.

One of the most important reasons to adhere to FAA rules is to prevent collisions with other aircraft. This can include airplanes, helicopters, and even other unmanned aircraft. Collisions can cause serious damage and potentially harm individuals on the ground or in the air. By following the FAA's guidelines for operating unmanned aircraft, pilots can help to prevent these dangerous situations.

In addition to collision prevention, adhering to FAA rules can help protect individuals on the ground. Unmanned Aircrafts can fly at high altitudes and at high speeds, which can make them dangerous if not operated responsibly. By following guidelines for flight altitude, distance from people and buildings, and other safety measures, unmanned aircraft pilots can minimize the risk of injuring others.

It's also important to remember that flying an unmanned aircraft irresponsibly can result in legal consequences. The FAA has regulations in place to ensure the safety of individuals and property, and violating these rules can lead to fines or even criminal charges.

Ultimately, prioritizing unmanned aircraft safety is crucial for both the unmanned aircraft pilot and those around them. By following FAA rules and regulations, pilots can help prevent collisions, protect individuals on the ground, and avoid legal consequences. So, if you're a unmanned aircraft owner or operator, make sure to educate yourself on the FAA guidelines and prioritize safety in all your flights.

Please visit https://www.faa.gov/uas for more information on UAV safety and certifications.

Regulatory Training

Please contact support@hextronics.tech for all regulatory training needs.

As of the current version of this document, Hextronics has three classes of certification that an individual can obtain to oversee the deployment, operation, and maintenance of an Universal Unmanned Aircraft Nest system. They are outlined as follows:

- Certified Operator
- Certified Technician
- Certified Instructor

Operations of scheduled or unscheduled unmanned aircraft flights/missions shall be conducted or overseen by a certified operator. Maintenance and preventative measures over the lifetime of the unmanned aircraft station shall be conducted by a certified technician. Note that a single individual can receive both certifications for both the operation and maintenance of the unmanned aircraft station. Official certification of other individuals can only be conducted by certified Instructors.

Certified Operator

- A certified operator is an individual who has obtained the relevant certifications for piloting a unmanned aircraft remotely in accordance with their local regulatory certification procedures; for example, obtaining a FAA Part 107 Remote Pilot Certificate, as well as completing the Hextronics Operator training with a certified instructor.
- Training will be conducted with the unmanned aircraft station present with at least one party. Operator training will cover the following categories: Installation and setup of the Universal Unmanned Aircraft Station, Basic Flight operations, Mission planning, Operating Limitations, Emergency Procedures, Pre and Post-flight inspections, as well as Basic hardware and maintenance

Certified Technician

- A certified Technician is an individual who has completed the Hextronics Technician training, conducted by a certified Instructor.
- Training will be conducted with the unmanned aircraft station present with at least one party. Operator training will cover the following categories: Installation and setup of the Universal Unmanned Aircraft Station and Procedures for routine / preventative maintenance inspections to be conducted in the field

Certified Instructor

- Instructor certification can only be obtained after three months, or 100 missions of use with the Universal Unmanned Aircraft station, and the individual must have completed the prior Hextronics operator and technician training of the unmanned aircraft station.
- A certified instructor will have a deep level of knowledge of the entire unmanned aircraft station, and can only be certified by another instructor.
- The certified instructor shall have training in all parts of the user manual, as well as an understanding of how to identify and solve any unforeseen issues with the unmanned aircraft station.

Specifications

This section describes the specifications of the Universal

Station Components & Features

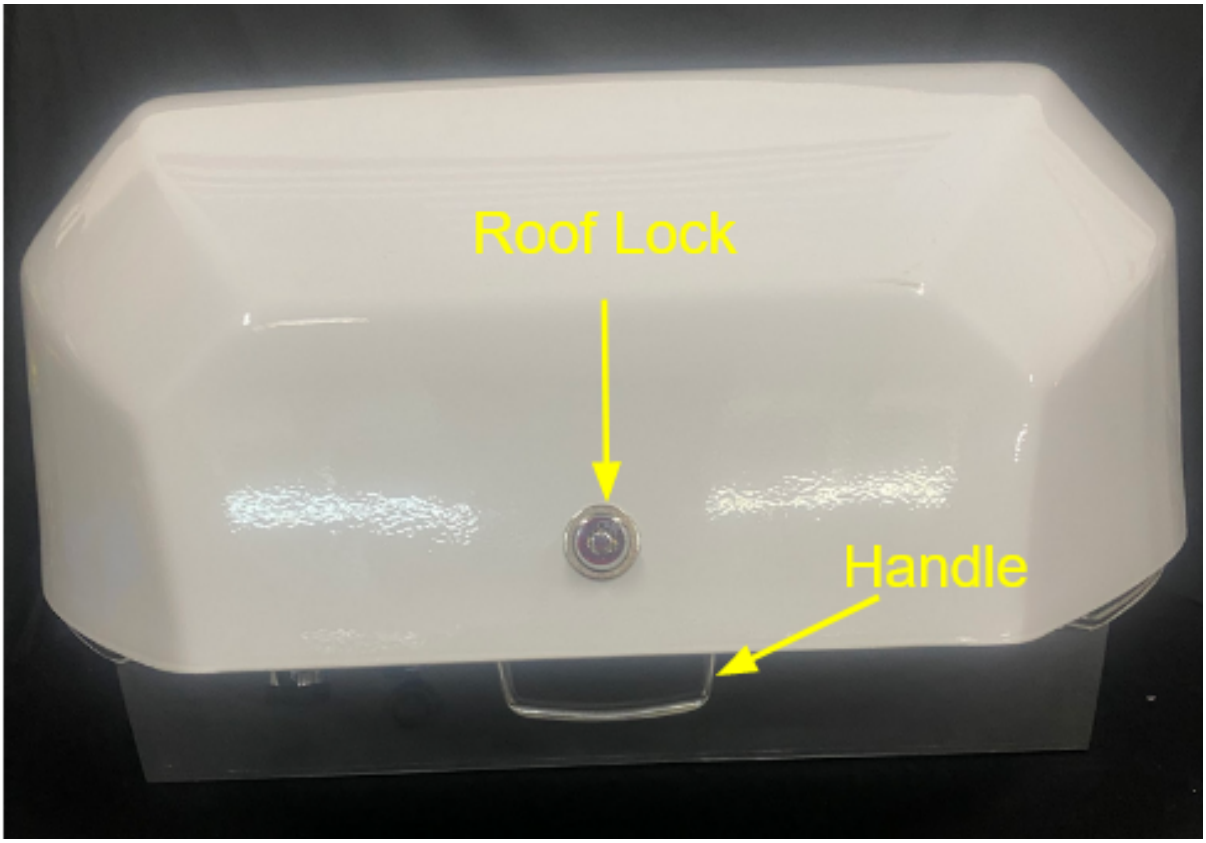
The Hextronics Universal Unmanned Aircraft Station is designed and intended to be used in combination with the DJI Mavic 3, Parrot Anafi USA, Parrot Anafi AI and Skydio 2/2+ unmanned aircraft for unmanned aircraft housing & deployment, and battery swapping & charging. In order to support these various unmanned aircraft, different components are necessary. There are four configurations of the Universal Unmanned Aircraft nest with slightly different features that enable them to be compatible with specific unmanned aircraft, which will be specified with each component.

General Overview: Universal Unmanned Aircraft Station

Compatible Aircraft:
DJI Mavic 3
Parrot Anafi USA
Parrot Anafi AI
Skydio 2/2+
Unmanned Aircraft attachments vary

A. Handle / Lock

Stations applicable: Universal C Mavic, Universal C Anafi, Universal CS Mavic, Universal CS Anafi

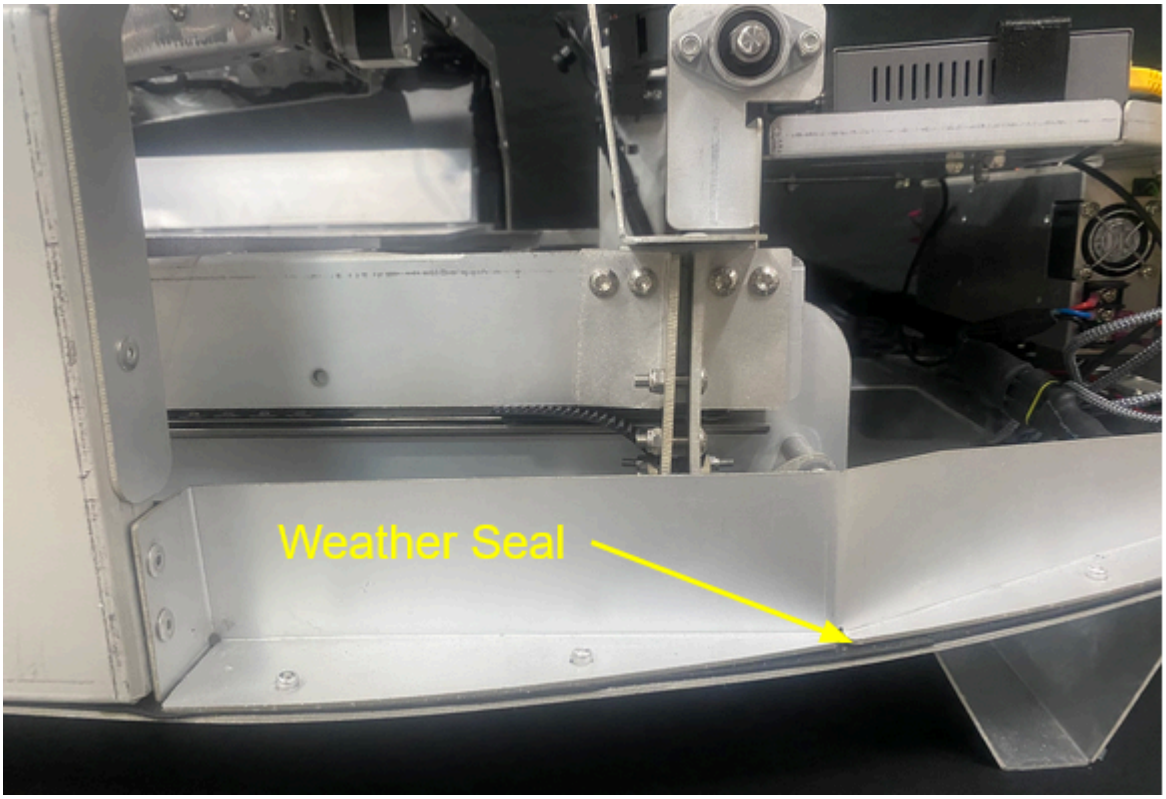


Handle: Allows easy transportation by a single person by pulling handle and rolling on the station's hind wheels.

Lock: Keyed lock that holds the shell/roof onto the base of the station.

B. Outdoor Weather Seal

Stations applicable: Universal C Mavic, Universal C Anafi, Universal CS Mavic, Universal CS Anafi



Outdoor weather seal: A rubber seal that lines the whole station and encases the entity of the unit to protect it from outdoor elements such as rain and dust.

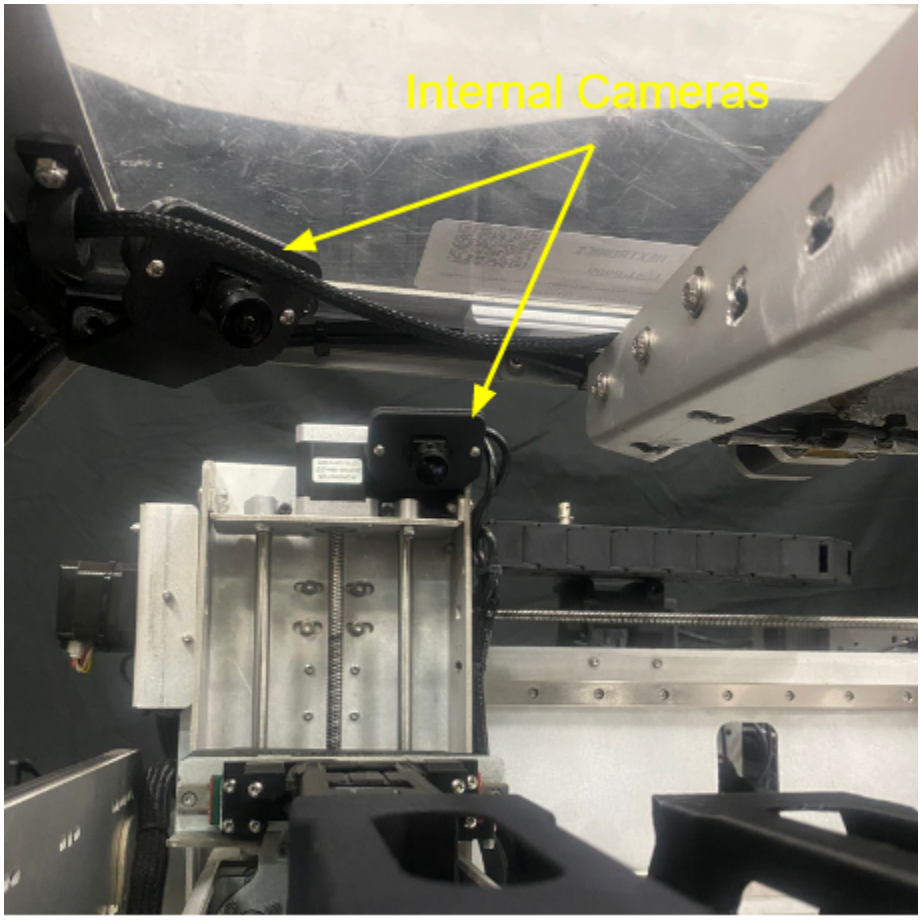
C. Shell / Roof

Stations applicable: Universal C Mavic, Universal C Anafi, Universal CS Mavic, Universal CS Anafi

Shell / Roof: Removable cover that locks in place to protect the station from outside factors that may cause damage to the entity.

D. Internal External Cameras

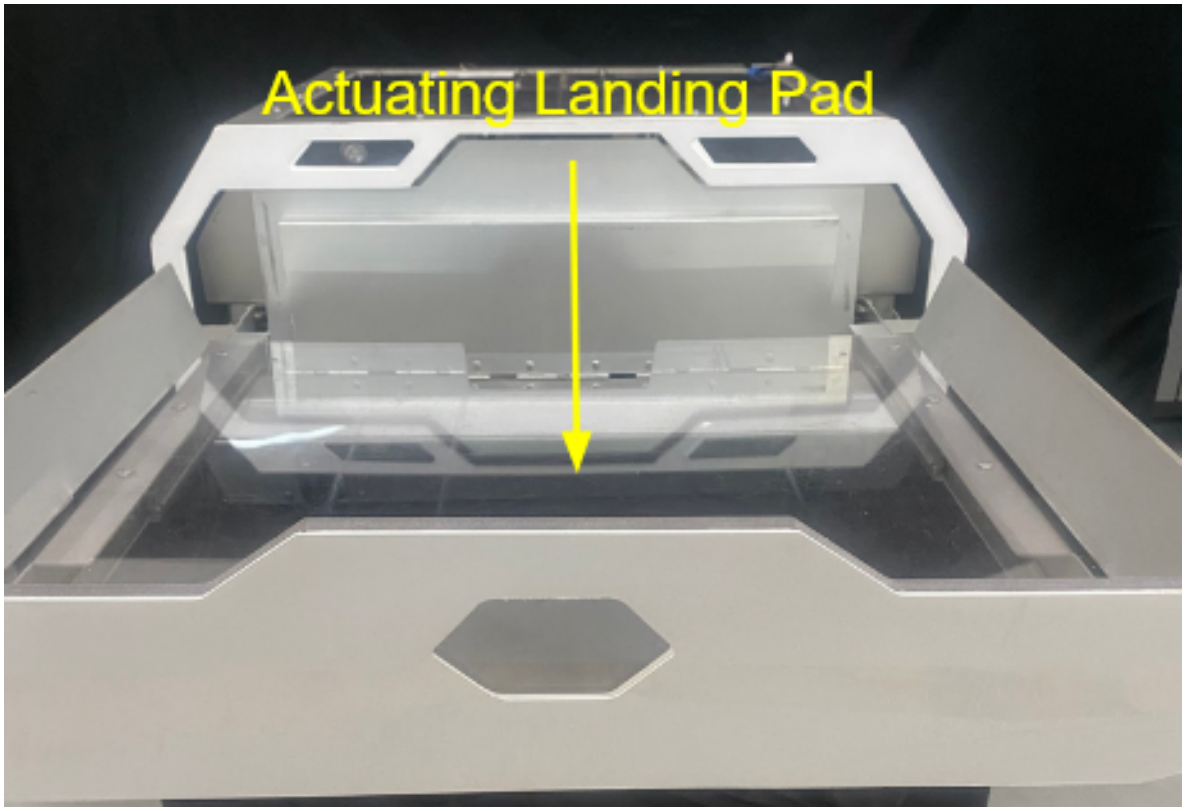
Stations applicable: Universal C Mavic, Universal C Anafi, Universal CS Mavic, Universal CS Anafi



Internal cameras: Accessible via web browser for surveillance & monitoring. (External camera not shown)

E. Actuating Landing Pad

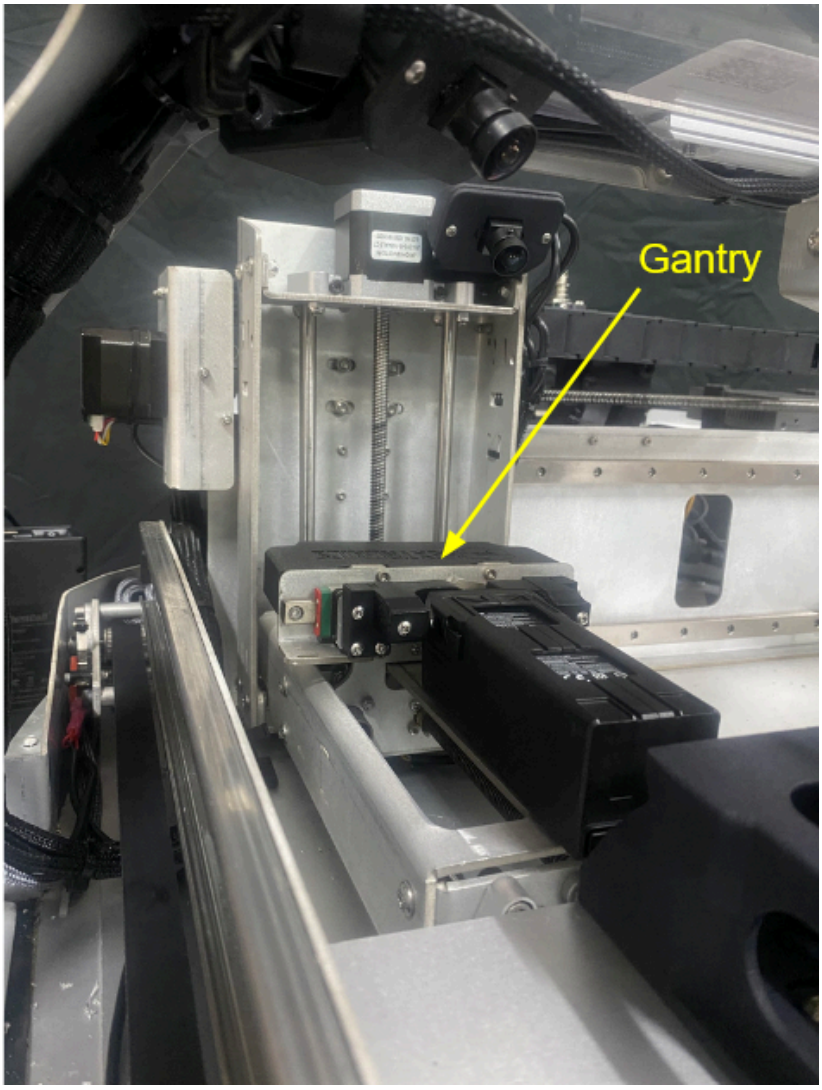
Stations applicable: Universal C Mavic, Universal C Anafi, Universal CS Mavic, Universal CS Anafi



Actuating Landing pad: Used for landing and take-off of the unmanned aircraft as well as latching and centering the unmanned aircraft into the proper position for station operations.

F. Gantry

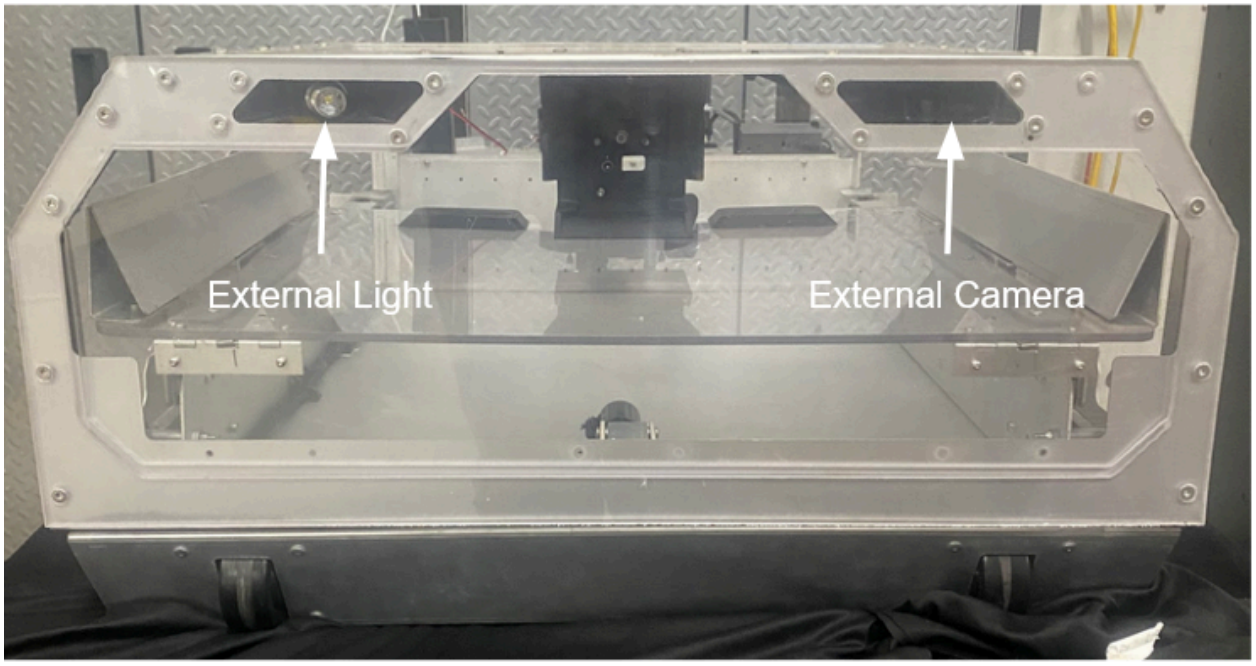
Stations applicable: Universal CS Mavic, Universal CS Anafi



Gantry: Used to remove/insert batteries from the unmanned aircraft and battery brace.

G. External Camera and Light

Stations applicable: Universal C Mavic, Universal C Anafi, Universal CS Mavic, Universal CS Anafi

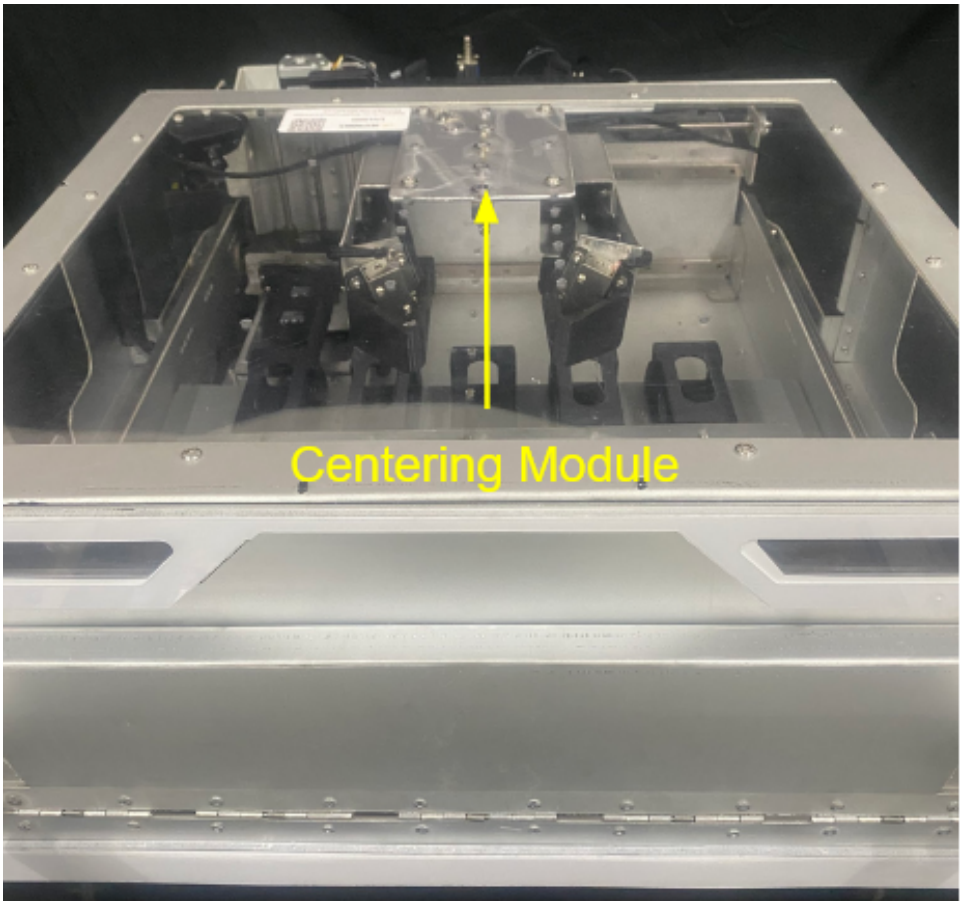


External Camera: Accessible via web browser for surveillance & monitoring the unmanned aircraft landing and takeoff.

External Light: Provides light to the landing pad area for the unmanned aircraft to easily spot the aruco landing tag as well as make it easier to view the landing of the unmanned aircraft via camera feed.

H. Centering Module

Stations applicable: Universal C Mavic, Universal C Anafi, Universal CS Mavic, Universal CS Anafi

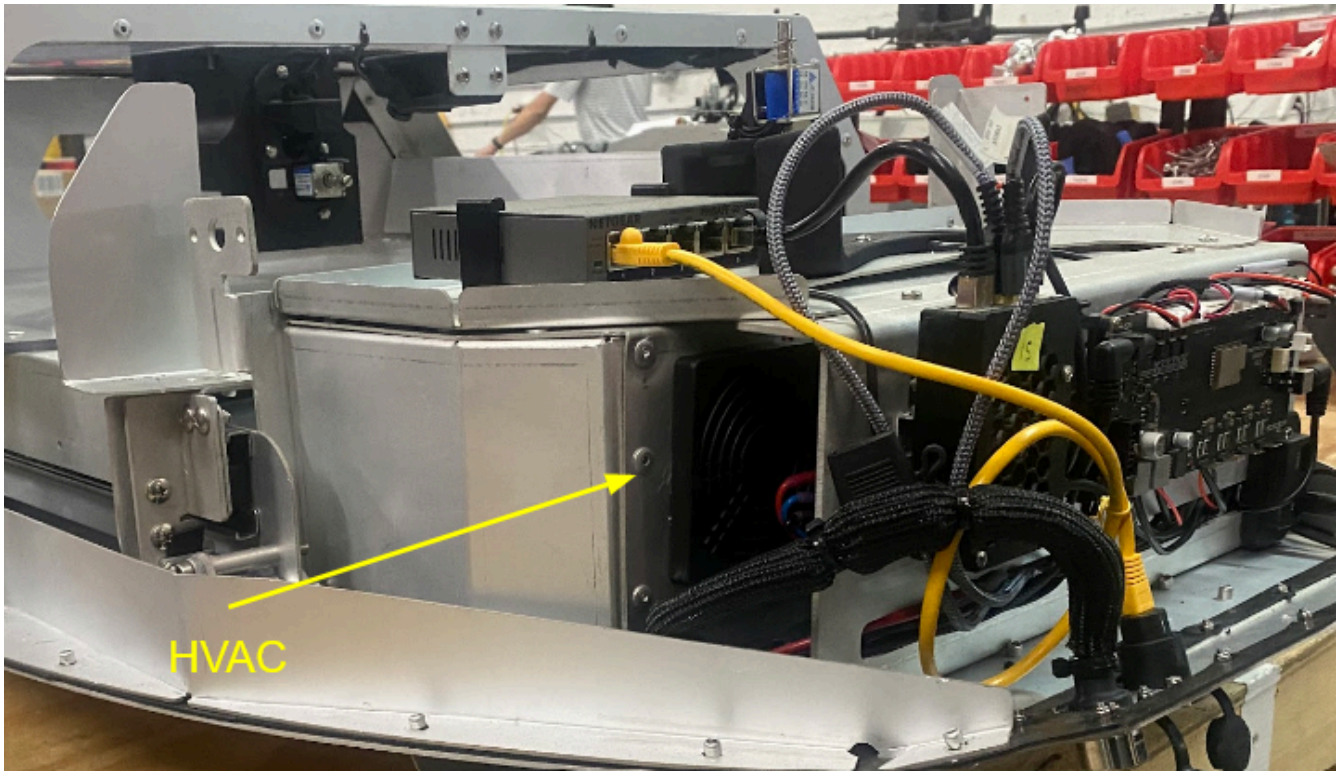


The design of the centering module varies depending on the configuration of the Universal station

Centering Module: Centers and latches the unmanned aircraft into the proper position for station operations.(Can also provide charging depending on the model of the station)

I. HVAC/ HVAC Controller

Stations applicable: Universal C Mavic, Universal C Anafi, Universal CS Mavic, Universal CS Anafi

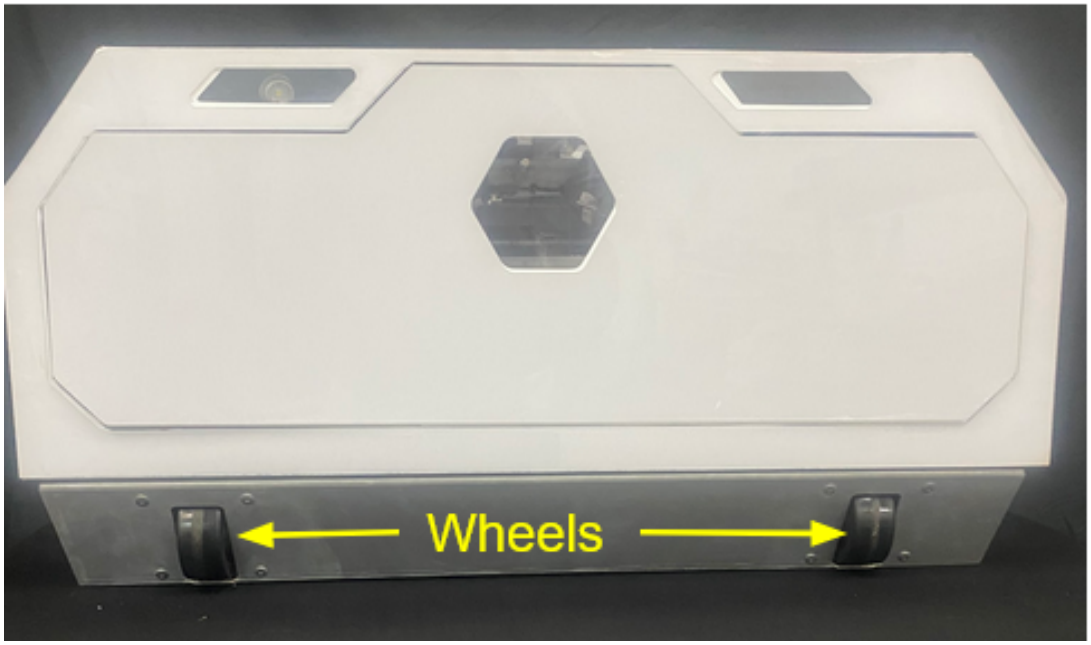


HVAC: A 200W compressor system capable of 500W cooling power and heating option for full climate control

HVAC Controller: climate control board, controls cooling and heating.

J. Wheels

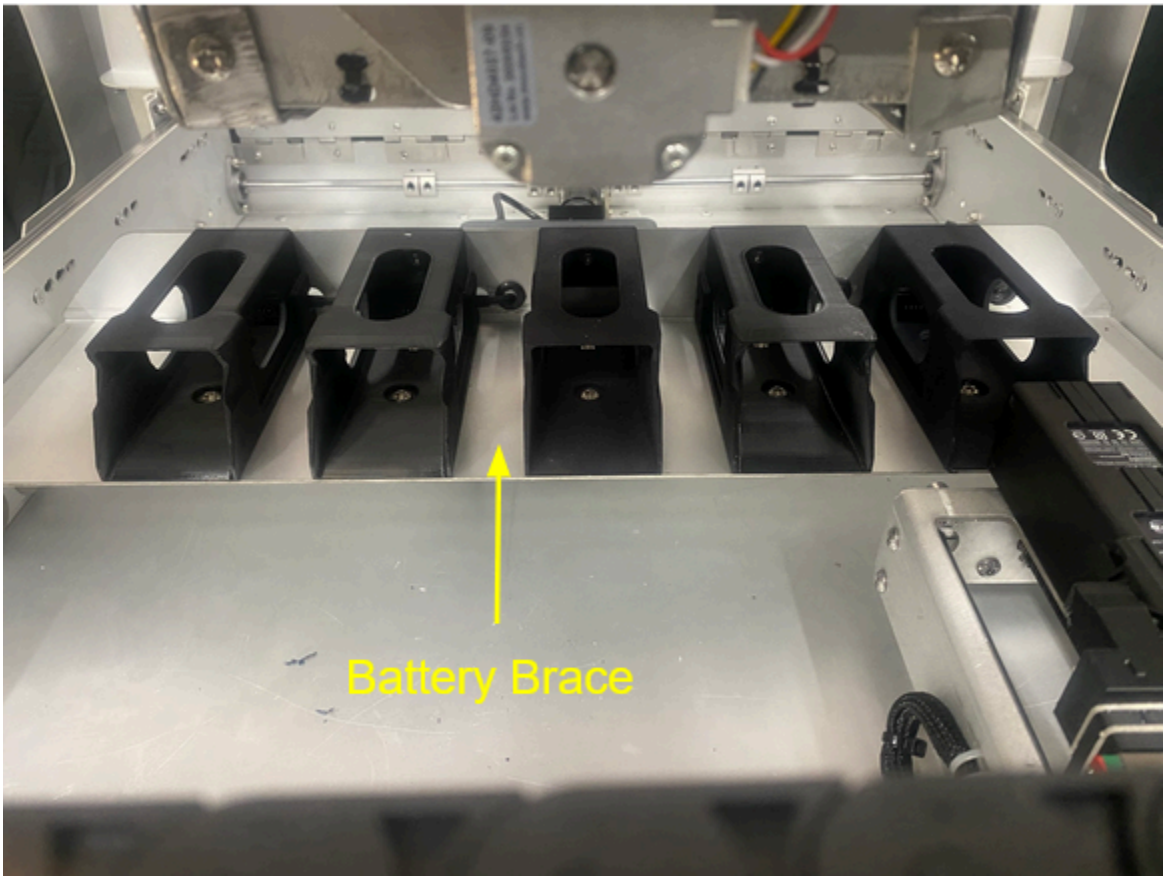
Stations applicable: Universal C Mavic, Universal C Anafi, Universal CS Mavic, Universal CS Anafi



Wheels: Enables easy transportation by a single individual by grabbing the handle on the back of the station and rolling on the wheels.

K. Battery Brace

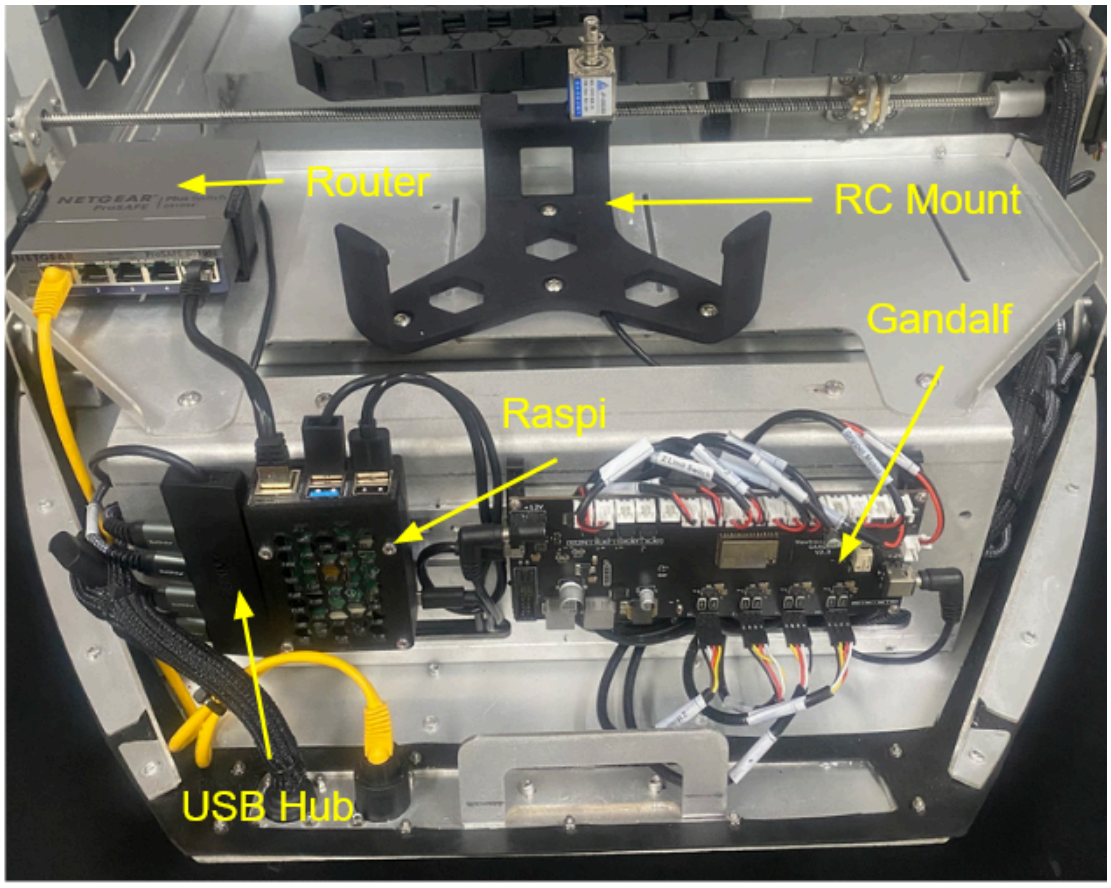
Stations applicable: Universal CS Mavic, Universal CS Anafi



Battery Brace: Contains five battery slots used to house & charge unmanned aircraft batteries. (As seen on image slots are from right to left: 12N34. N is not used)

L. Electronics Bay

Stations applicable: Universal C Mavic, Universal C Anafi, Universal CS Mavic, Universal CS Anafi



Gandalf motherboard: 12V & 24V ESP32 microcontroller handles motor and switch actuation.

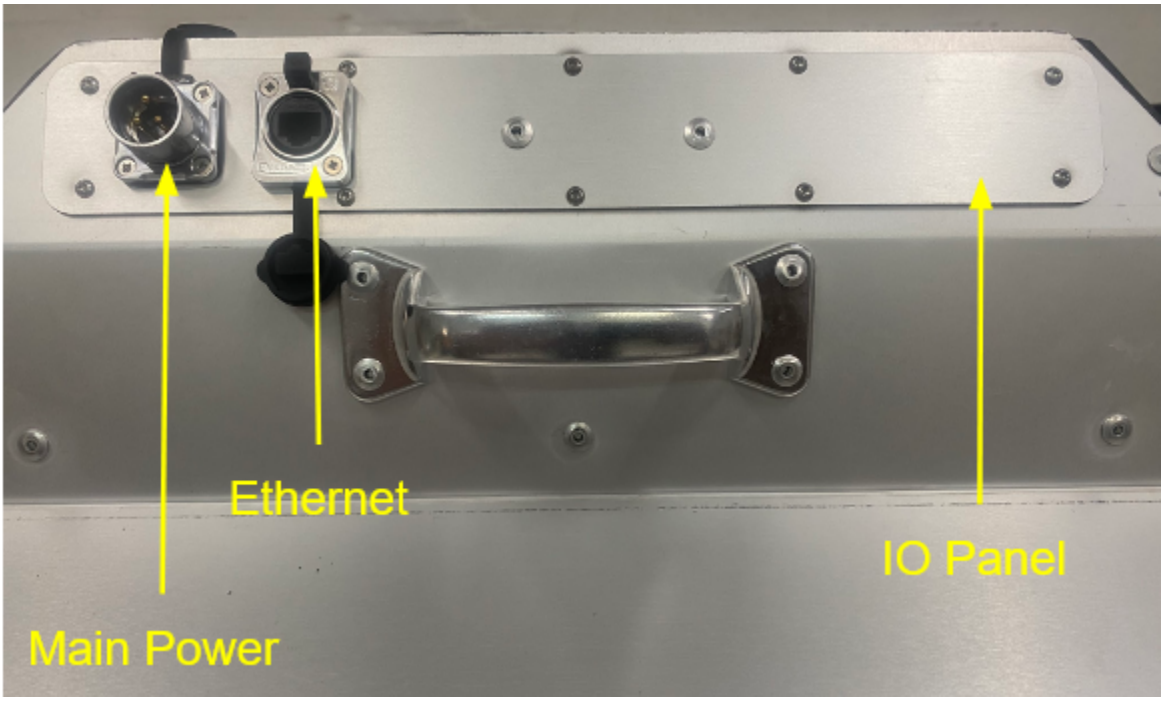
Raspberry Pi: Communicates and runs commands through Hextronics dashboard

RC: Controls the unmanned aircraft and allows manual flight.

Router: Provides local devices with an internet connection.

M. IO Panel

Stations applicable: Universal C Mavic, Universal C Anafi, Universal CS Mavic, Universal CS Anafi



I/O panel: The I/O panel consists of 2 connections.

Main Power Outlet: IP67 Plug 110/240VAC for power.

Ethernet Outlet: IP67 Plug for internet connectivity.

Technical Specifications

The Hextronics Universal Unmanned Aircraft Station has been designed to work in conjunction with the DJI Mavic 3, Parrot Anafi USA, Parrot Anafi AI and Skydio 2/2+ unmanned aircraft for the purposes of battery swapping, charging, deployment and storage.

Properties:

- Dimensions: 42” x 30” x 12” || 1.07m x 0.76m x 0.31m
- Max Weight: 70lbs || 31.75kg
- Exterior Material: UV Resistant ABS
- Exterior Temperature Range: -20ºC : 50ºC || -5ºF : 120º
- API Communication: HTTPS over Ethernet/Cellular
- Input Power: 110VAC/240VAC, 50-60 Hz
- Power Consumption (Standard): 200W
- Power Consumption (HVAC): 500W

Hardware:

- Compatible Unmanned Aircraft: *DJI Mavic 3, Parrot Anafi USA, Parrot Anafi AI and Skydio 2/2+*
- Battery Charging (Universal C Models): 60W Magsafe Charger
- Battery Swapping (Universal CS Models): 4 Slots, using Fast Charging Interface Connector
- Reconfiguration Kits: Convert Universal's unit’s configuration from one unmanned aircraft to another
- Integration Tray: Dedicated area for users to install / mount hardware

Codes and Certifications:

- HS Code: 8537.10.9090

Modular Add-Ons:

- HVAC System: Compressor Based HVAC System
- Edge Compute: On-board server for immediate data processing
- Cellular Expansion: 4G/5G connectivity for remote/mobile installations
- Pelican Case: Rugged enclosure for deployments in harsh environments

Performance:

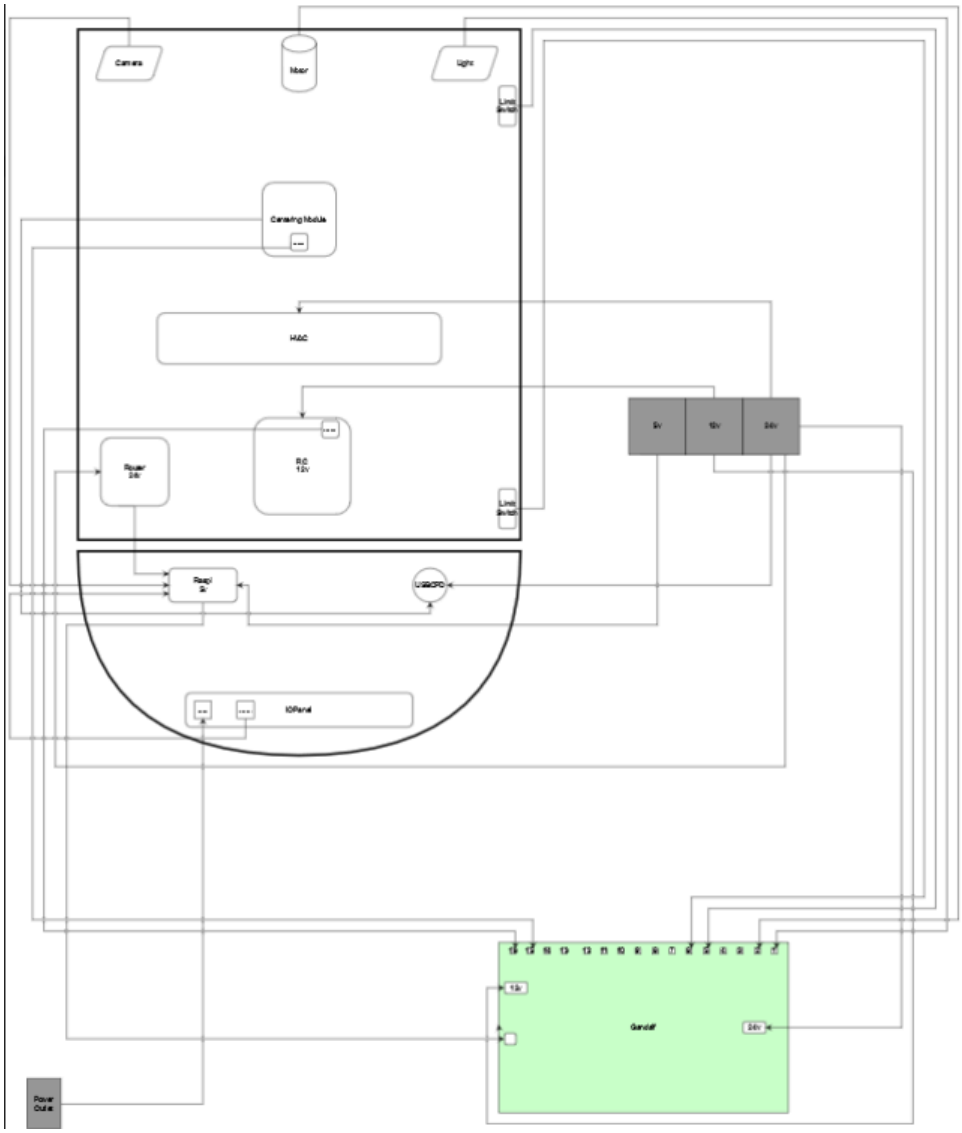
- Flight Software Providers: FlytNow Auto+ from FlytBase, VOTIX, or user-developer
- Station Software: Hextronics API

Wiring Diagram

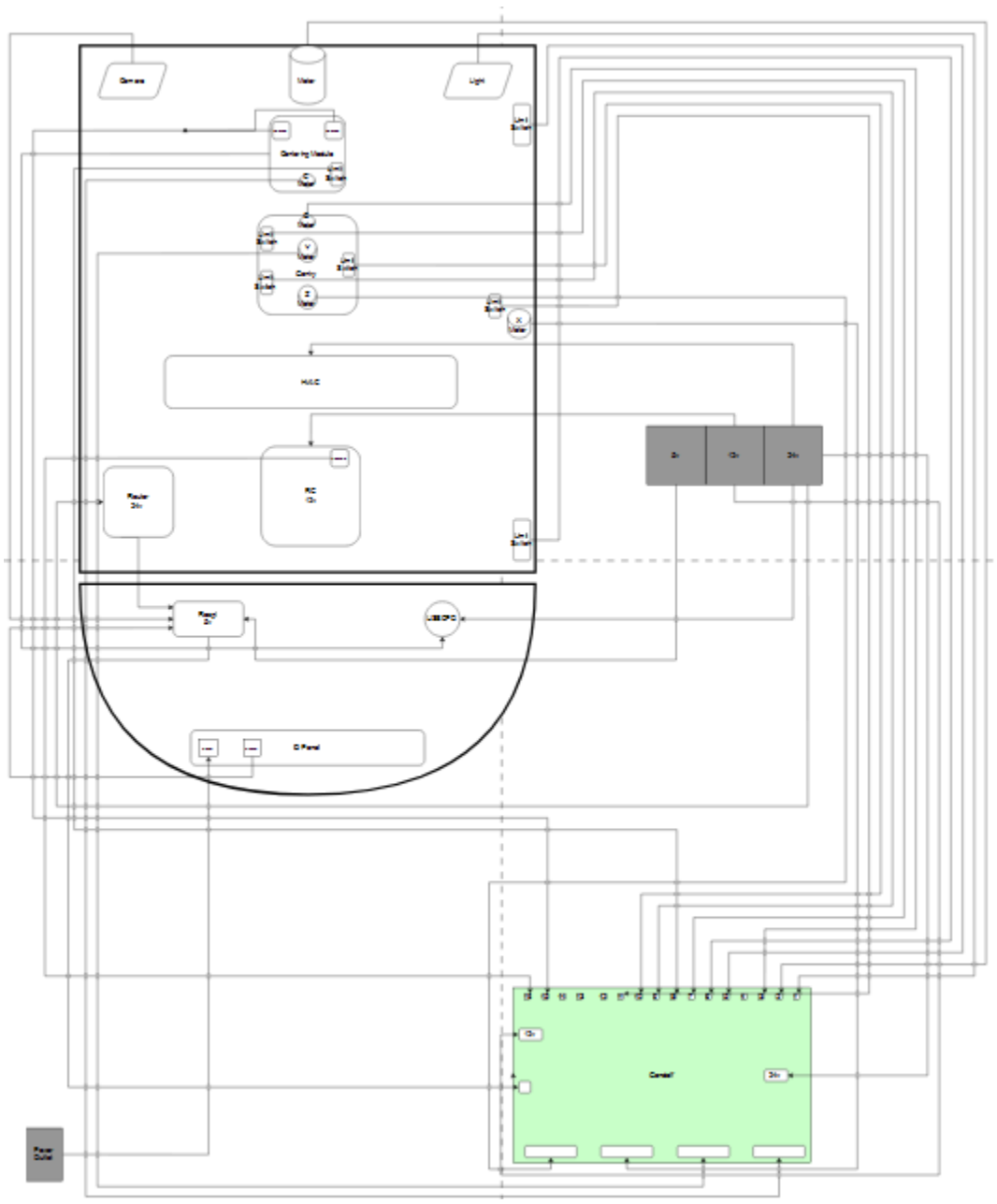
Contact support@hextronics.tech for a downloadable wiring diagram.

This wiring diagram includes detailed information about the electrical components and their connections within the system, providing a comprehensive overview of electrical architecture. By following the wiring diagram closely, you can ensure that your product is wired correctly, minimizing the risk of errors and ensuring safe and reliable operation.

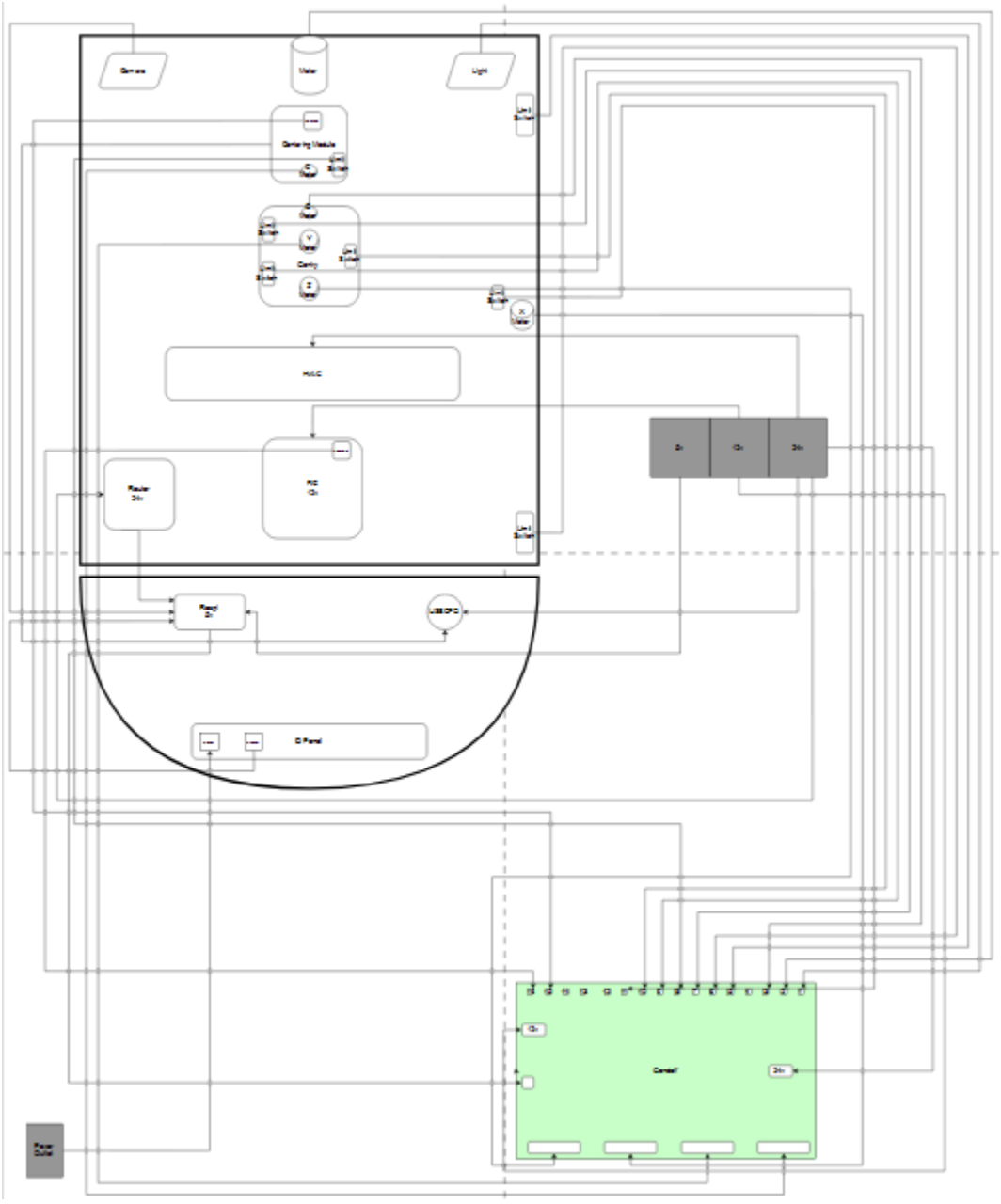
Universal C



Universal CS Mavic



Universal CS Anafi



Installation

This section describes the installation process for the Universal

Unboxing and Placement

Follow the instructions below in order. Once you have reached the end of this section, please proceed to the next section.

Unboxing

Inspect that the shipment is in good condition and that the palate is intact for initial movement.

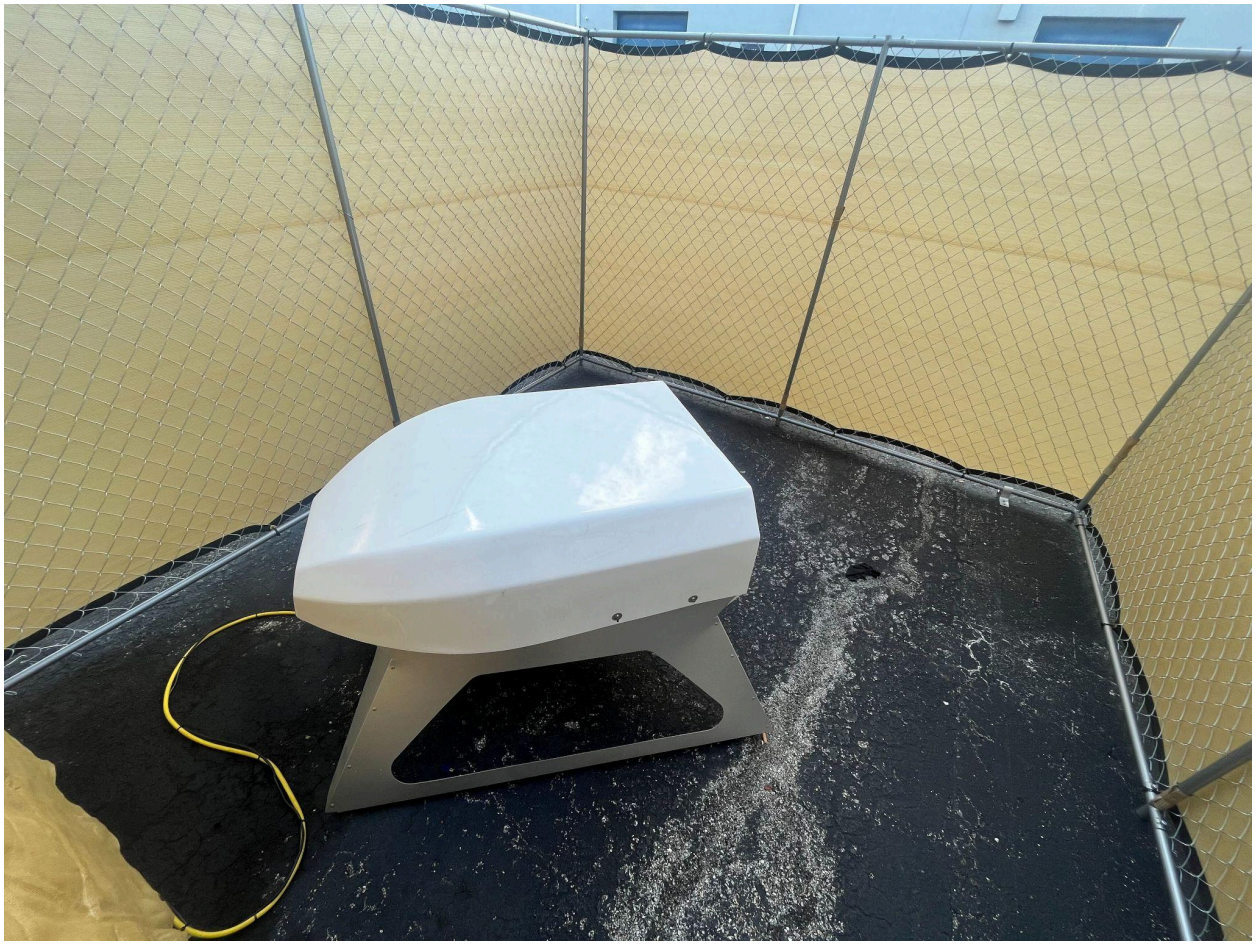
Movement can be done with:

- A pallet jack (See image below for entry point)
- Multiple healthy able-bodied individuals via lifting handles (Short distances only)
- Mechanical lifting machinery via the lifting ports or via the pallet entry points

1. Open the wooden crate to free the Universal station and remove the protective foam packaging.

Placement

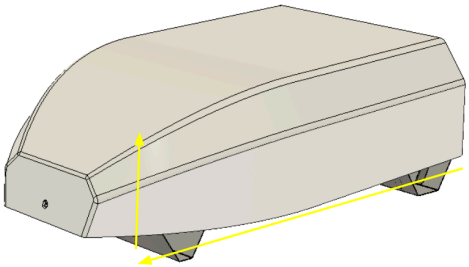
Strapping the station is advised for every moving method.
Place the station on a flat-level surface with open airspace.
Ensure that you have a reliable power and ethernet connection to reach said area.
Once you have placed the Universal station at your desired location, please continue to the next steps for the initial setup of the station.



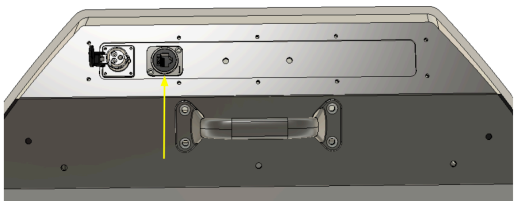
Initial Setup

Follow the instructions below in order.

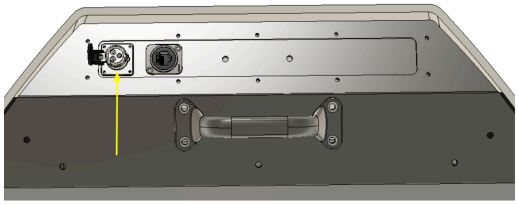
1. Remove Shell
    - Unlock shell using key provided in accessories
    - Slide shell forward to release cover guides
    - Pull shell up to remove from nest



2. Plug Ethernet Cord
    - Plug in an Ethernet cable to the port on the IO Panel. (It is important that the Ethernet cable is plugged in first to ensure Raspberry Pi internet connectivity is secured).

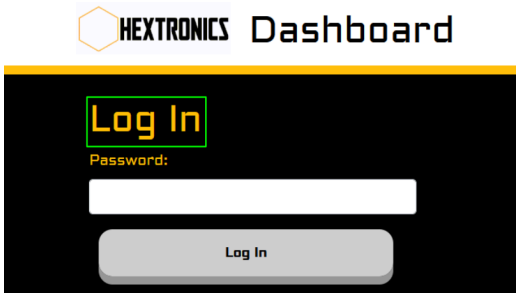


3. Plug in Main Power
    - Plug in the main power cable to the port on the IO Panel.

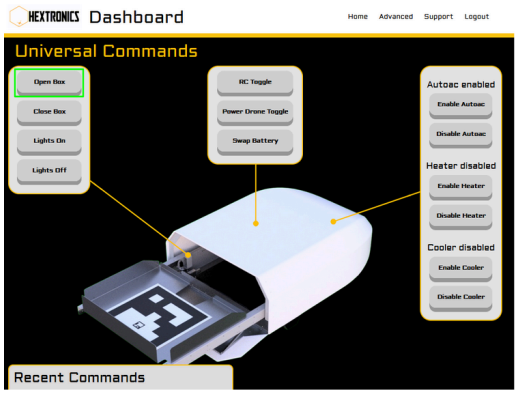


4. Scan QR Code
    - Wait 3 minutes after powering on the unit then scan the QR code located on the top of the station under the shell.
    - This will direct you to the login page to access the commands dashboard
    - For more information on navigating the commands dashboard see the Navigating the Dashboard section

5. Log into dashboard
    - Login by clicking the yellow "Log In" prompt on the Hextronics dashboard
    - For more information on logging into you nest see the Hardware & Software Inspection section



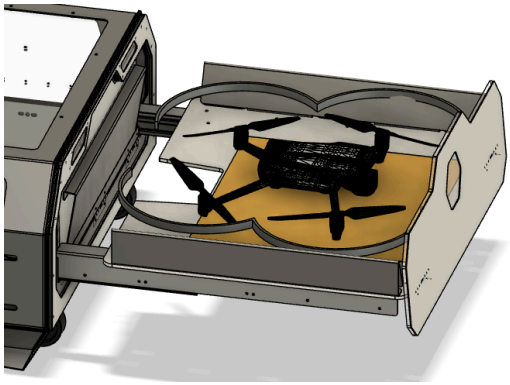
6. Open nest
    - On the left panel of the commands dashboard select **Open Box** to open the landing pad of the station



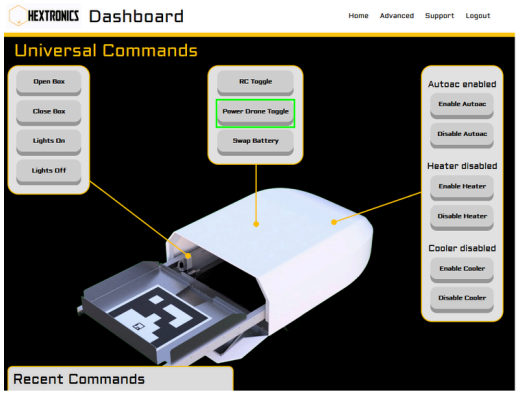
7. Put propeller guards on unmanned aircraft
    - Mount propeller guards onto the unmanned aircraft. (Aside from protecting the propellers in flight, the prop guards help to center the unmanned aircraft when entering the unmanned aircraft station)

8. Place batteries into battery brace
    - Place up to 4 batteries into the battery brace for charging and swapping
    - Be sure to leave the battery slot 3 open
    - For more information on battery placement see Battery Placement section

9. Place unmanned aircraft into nest
    - Place unmanned aircraft onto the landing pad
    - Select **Close Box** in the left panel of the Universal commands dashboard to close the landing pad

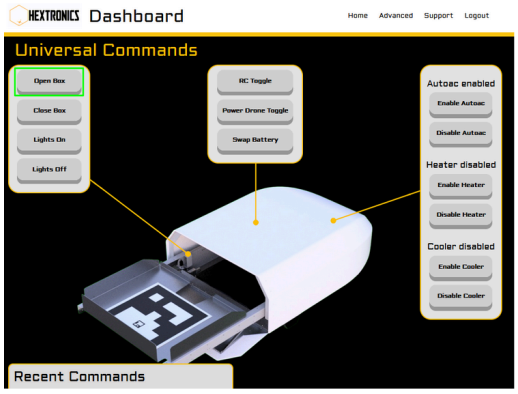


10. Test Power Toggle
    - In the middle panel of the Universal commands dashboard select **Power Drone Toggle**
    - Confirm that the station turns the unmanned aircraft on and off



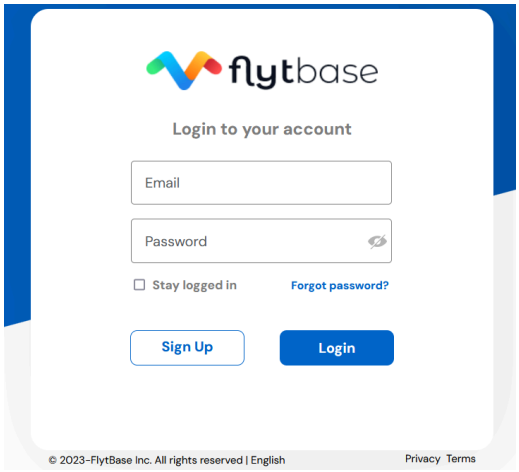
11. Test battery swap
    - In the middle panel of the Universal commands dashboard select **Swap Battery**
    - Confirm that the station swaps the battery of the unmanned aircraft with a battery from the battery brace

12. Open nest
    - On the left panel of the commands dashboard select **Open Box** to open the landing pad of the station

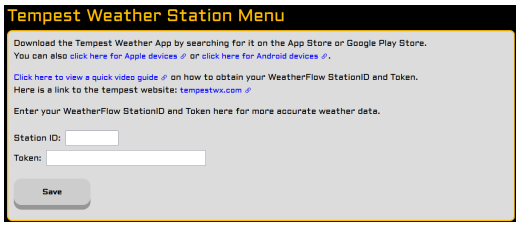


13. Link flight software with unmanned aircraft through the RC
    - For step by step walkthrough on how to properly do this see the [Register Unmanned Aircraft] section

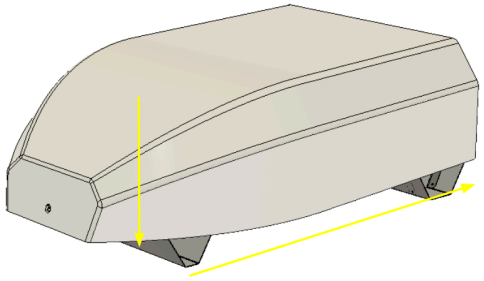
14. Link flight software with Universal nest
    - Login and link your flight software provider to the unit
    - For more information on linking your flight software with your nest see the FlytNow Operations section



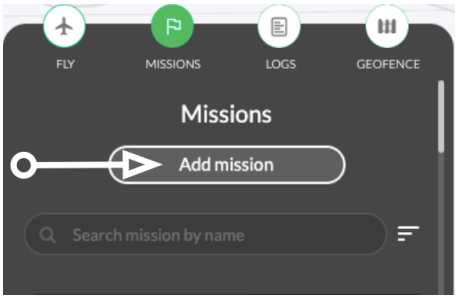
15. Weather Station Setup
    - In the Advanced Menu, scroll down to **Tempest Weather Station Menu** and click the link to download the app that correlates with your device
    - Below that click the video link and follow the steps in order to get your login weather station login information



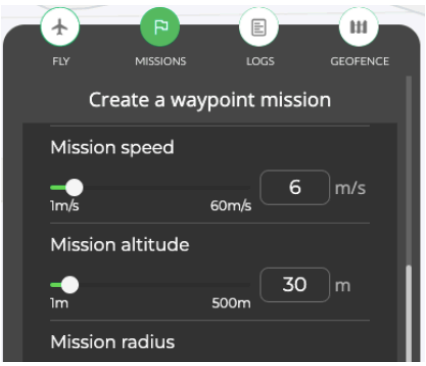
16. Reattach Shell
    - Place cover guides into grooves of the bridge and slide the shell forward to lock cover guides into place.
    - Turn the key on the back of the shell to lock the shell in place and remove the key.



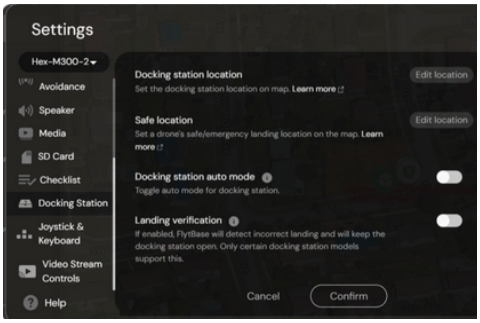
17. Run test mission on flight software and precision landing
    - For a step by step walkthrough on how to run a test mission see the How To Create Missions section



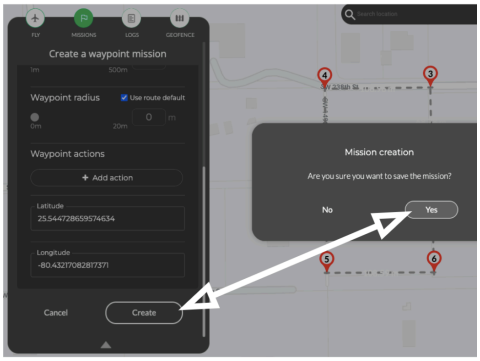
18. Prepare mission according to site
    - For a step by step walkthrough on how to prepare a mission see the How To Create Missions section



19. Run mission on non auto mode
    - For a step by step walkthrough on how to turn off auto mode see the How To Run A Mission On Non Auto Mode section



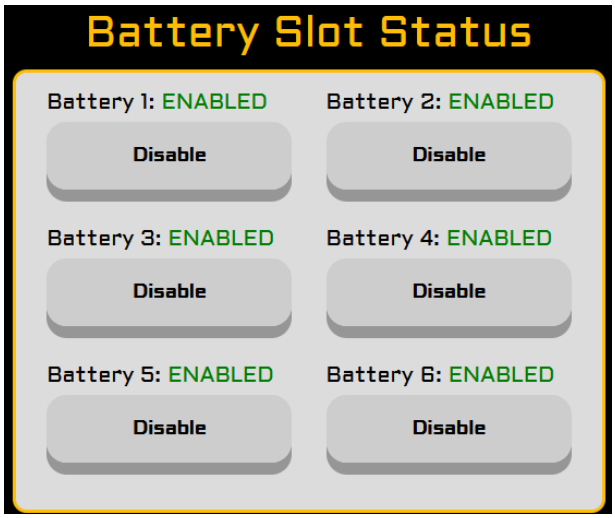
20. Run scheduled mission on auto mode
    - For a step by step walkthrough on how to turn on auto mode see the How To Create Missions section



Battery Placement

1. Insert batteries into desired slots 1-5, leaving slot 3 unoccupied for placement of the battery that is in the unmanned aircraft. *DO NOT manually place batteries into slot 3. It should always remain empty until the station puts a battery in it*

2. Match the battery slot status to the physical batteries (1-5) within the station
   a. Enter the **Hextronics Control Panel** and select **Advanced Menu** on the top right of the screen
   b. Scroll down to locate the **Battery Slot Placement** tab
   c. Set to **OCCUPY** if there is a battery in the slot
   d. Set to **EMPTY** if the slot is empty
   e. Select **SAVE CONFIGURATION** when you are ready



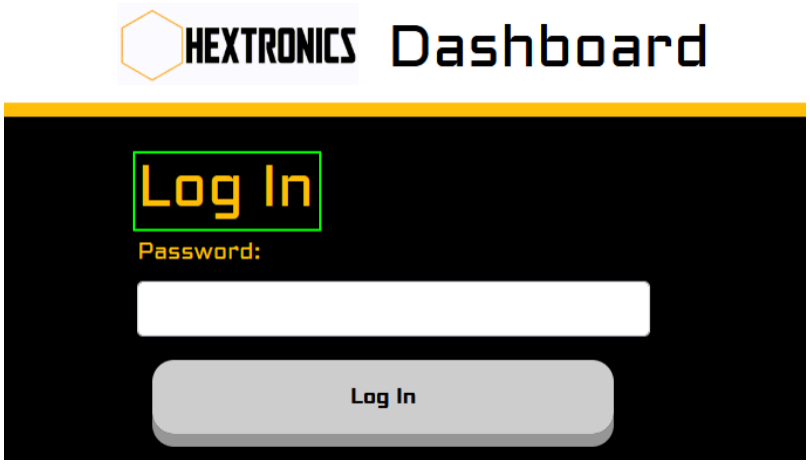
Hardware & Software Inspection

Please follow the steps below to inspect how the hardware & software operations work correctly. Please contact Support@hextronics.tech for assistance.

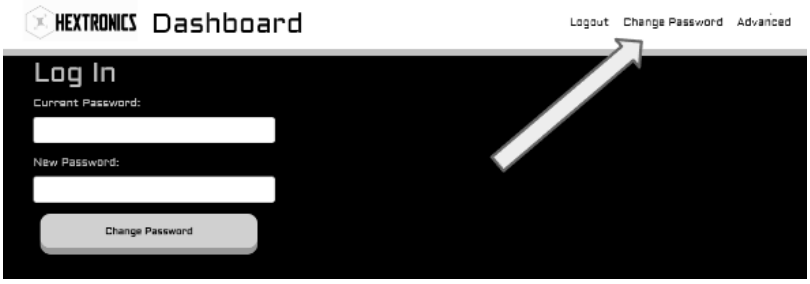
Login to the Hextronics Control Panel

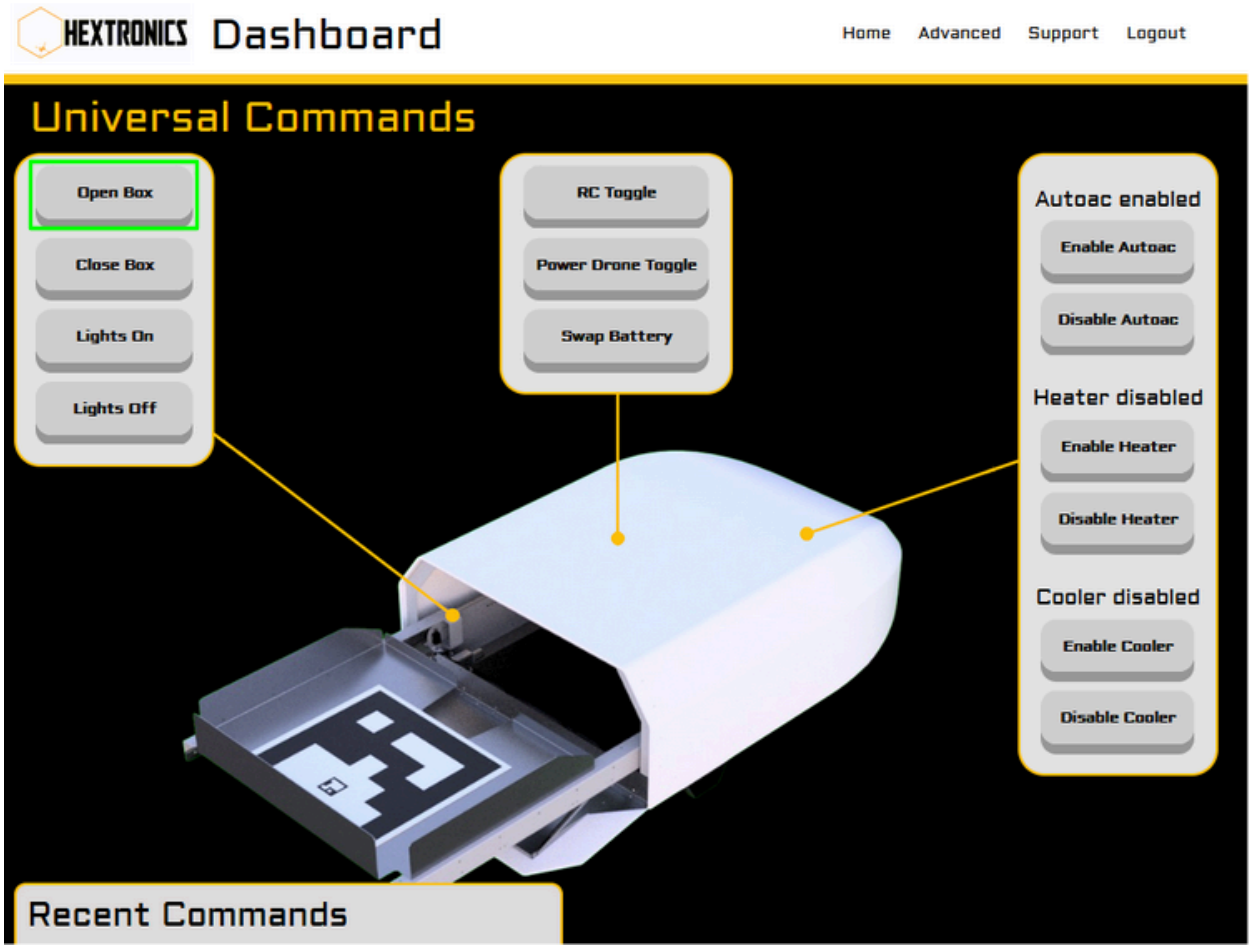
Scan the QR code located on top of the lexan inside of the shell and find the link within the Hextronics welcome email.

- You can login by clicking the yellow "Log In" prompt on the Hextronics dashboard
- To login using a password, within the URL, copy everything **within** the parenthesis (Hexone-xxxxxxxxxxxx).hextron.tech/login of your unique URL and paste in the password window.



- Once you've logged in you will be directed to the Universal Commands page. You may select "Change Password" at the top of your screen if you prefer to do so.





Universal Commands Page[1]

Open Box
Select **Open Box** in the left panel of the Universal Commands page.
Visually confirm that the landing pad extends outwards fully..

Close Box
Select **Close Box** in the left panel of the Universal Commands page.
Visually confirm that the landing pad closes completely.

RC Toggle (If applicable)
Select **RC Toggle** in the middle panel of the Universal Commands Page.
Visually Confirm that the solenoid above the RC actuates twice and holds the second time, powering the controller on and off

[1] See Navigating the Dashboard section for details on all commands

Power Drone Toggle (If applicable)
Select Power Drone Toggle in the middle panel of the Universal Commands page.
Visually confirm that the solenoid on the centering mechanism actuates twice and holds the second time, powering the unmanned aircraft on and off

Lights On
Select Light On in the left panel of the Universal Commands page.
Visually confirm that the internal and external lights turn on

Lights Off
Select Light Off in the left panel of the Universal Commands page.
Visually confirm that the internal and external lights turn off

Check Cameras
Select Check Cameras in the left panel of the Universal Commands page.
Scroll down to the System Information Panel and select View Hexcamera Images
Confirm that an image of the Universal camera view is populated.

Battery Swap (If applicable)
Shut off the unmanned aircraft.
Select Swap Battery in the middle panel of the Universal Commands page.
Visually confirm that battery removal and insertion is successful.

If all processes run successfully continue to the next section, if not please contact Hextronics Support

Calibration and Operation

This section describes the calibration of the Universal

Operation Limitations & Emergency Procedures

CAUTION Familiarize yourself with the flight & operation limitations, as well as the four emergency landing procedures prior to performing **any** unmanned aircraft station operations.

Flight Operation Limitations

- Connect your aircraft to the internet to update the database of DJI GEO Zones regularly. Consult the relevant local government agencies or governing bodies before flight to ensure you comply with all the relevant laws and regulations.
- Do not use the aircraft in severe weather conditions. These include wind speeds exceeding 15 m/s, snow, rain, and fog.
- When flying in open areas, tall and large metal structures may affect the accuracy of the onboard compass and GNSS system. Make sure to operate the aircraft by following the prompts in the app.
- Avoid obstacles, crowds, high voltage power lines, trees, and bodies of water.
- Minimize interference by avoiding areas with elevated levels of electromagnetism, including base stations and radio transmission towers.
- Aircraft and battery performance are subject to environmental factors such as air density and temperature. Be very careful when flying at high altitudes, as battery and aircraft performance may be affected.
- The compass and GNSS will not work in Polar Regions. Fly carefully.
- If flying in GEO Zones is required, apply for unlocking in advance.https://www.dji.com/flysafe
- Avoid operation of the unmanned aircraft station or performing missions during extreme weather conditions.

Unmanned Aircraft Station Warnings

- Keep any liquids (oil, water etc.) away from the inside of the unmanned aircraft station.
- Ensure the unmanned aircraft station has sufficient ventilation to regulate its internal temperature.
- Place the unmanned aircraft station on a flat and stable surface when in use. Ensure the device is properly insulated to prevent fire hazards.
- DO NOT touch the metal terminals on the battery charging racks, or the electrical connections within the station when the power is on. Wait 15 seconds after disconnecting power before touching.

- Take care to avoid injuring fingers or other bodily parts when operating the station. Ensure proper clearance behind the station before actuating the roof or activating any missions.
- Only operate the Universal Station under the guidelines of this user manual. If proper procedures are not followed, warranty of the docking station may be voided.
- Air pressure in the Battery Station may change during air transportation or after extreme barometric pressure changes. The station should balance air pressure automatically.

Emergency Landing Procedures

1. Automatic control through Flight Software

Use this FlytNow sequence via the Utility window & Flight Controls to dock the unmanned aircraft without any battery swapping operations - This is used if the unmanned aircraft has been rained on during a mission, in order to dock the unmanned aircraft without inserting the WET unmanned aircraft battery into the station charging slots.

a. Select ABORT current mission
b. Select RTDS and select ABORT again when the unmanned aircraft is nearly above the docking station to cancel the sequence
c. Manually fly the unmanned aircraft over the docking station & select Open Enclosure to open the pad
d. Select Precision Land and monitor that the unmanned aircraft lands safely on the pad
e. Select Close Enclosure once the unmanned aircraft has landed safely on the pad
f. Note: This sequence will prompt the unmanned aircraft to land on the pad and be inserted into the station for housing but NOT proceed to remove the wet battery from the unmanned aircraft for battery swap operations.

2. Manual control through Flight Software

Three manual control options: 1. Keyboard 2. XBOX controller 3. On-screen [2]
Take manual control mid-flight in the unmanned aircraft FPV view by clicking the Joystick icon[3]

a. Click the icons to change method of control (Keyboard / On-screen / External controller)
b. Select Resume/abort mission to continue (Bottom right toolbar)
c. Select Return to docking station to land the unmanned aircraft

3. Manually from the remote controller

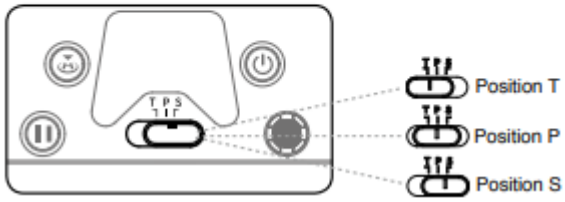
[2] See How To Fly Tab
[3] Middle bottom of the FlytNow screen

If an operator is present near the unmanned aircraft station and it is determined that manual unmanned aircraft control must be taken the following steps must be done:

a. The controller can be manually disconnected from the external control box and
b. Switching the controller to “S” mode will allow the user to manually and instantly take over control of the aircraft in an emergency. (Diagram 1A)

Flight Mode Switch

Toggle the switch to select the flight mode. Choose between T-mode, P-mode, and S-mode.



Position	Flight Mode
T	T-mode (Tripod)
P	P-mode (Positioning)
S	S-mode (Sport)

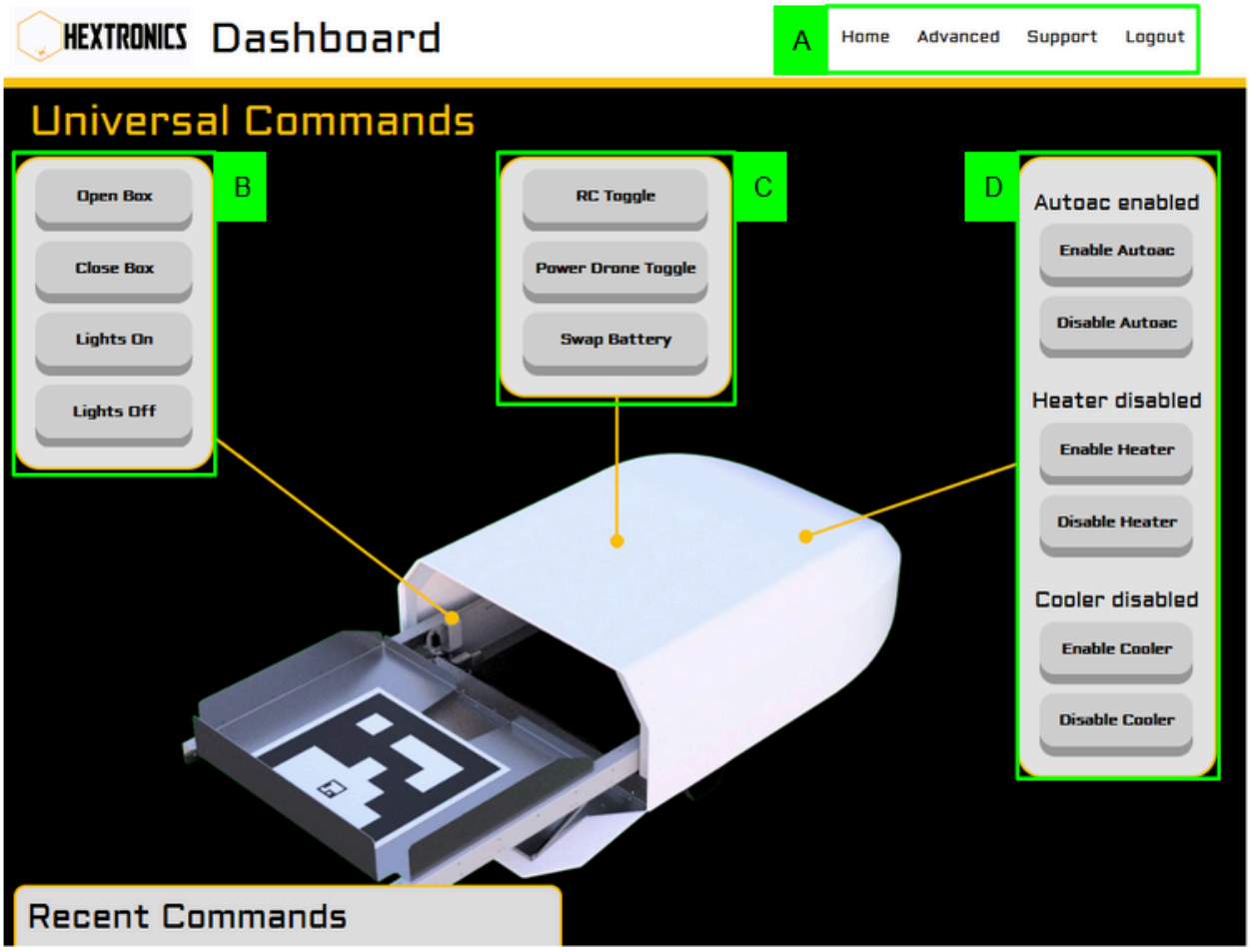
Diagram 1A

4. Loss of propellor automatic landing

During flight, if the aircraft lacks one lift output (e.g. propulsion system failure of a motor), it will automatically switch to the Three-propeller Emergency Landing Mode.
The flight controller will try to maintain the stability and controllability of attitude and velocity, and make the aircraft automatically land in this mode.
This mode enables a user to land the aircraft onto a safe zone by controlling the aircraft, helps to reduce the chance for the aircraft and payload to drop, and damage people and property on the ground.
When the aircraft enters the Three-propeller Emergency Landing Mode, the remote controller will alert the user by vibrating.
At this time, the aircraft will enter rapid spin and automatically descend by default.
The stick that controls back and forth movement will be adjusted to control the north-south movement and the stick that controls the left and right movement will be adjusted to control the west-east movement.
The user can operate the sticks to move the aircraft to the appropriate landing area as soon as possible.
When the aircraft reaches near to the ground, the user can use the Emergency propeller stop to land the aircraft to minimize the drop loss caused by the aircraft spin.

Navigating the Dashboard

Hextronics Dashboard Main Menu



A. Account and Advanced Menu
Account and Advanced Menu

- Home: Directs back to the home page.
- **Advanced:** Access the advanced menu for more options to test and tune the station.
- **Support: Contact us directly for assistance.**
- **Logout:** Logs the user out of the dashboard.

CAUTION The advanced menu should only be used by certified operators to avoid the risk of injury and damaging components

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B. Basic Commands

- **Open Box:** Opens the landing pad of the station
- **Close Box:** Closes the landing pad of the station
- **Lights On:** Turns on the interior and exterior LED lights of the station
- **Lights Off:** Turns off the interior and exterior LED lights of the station

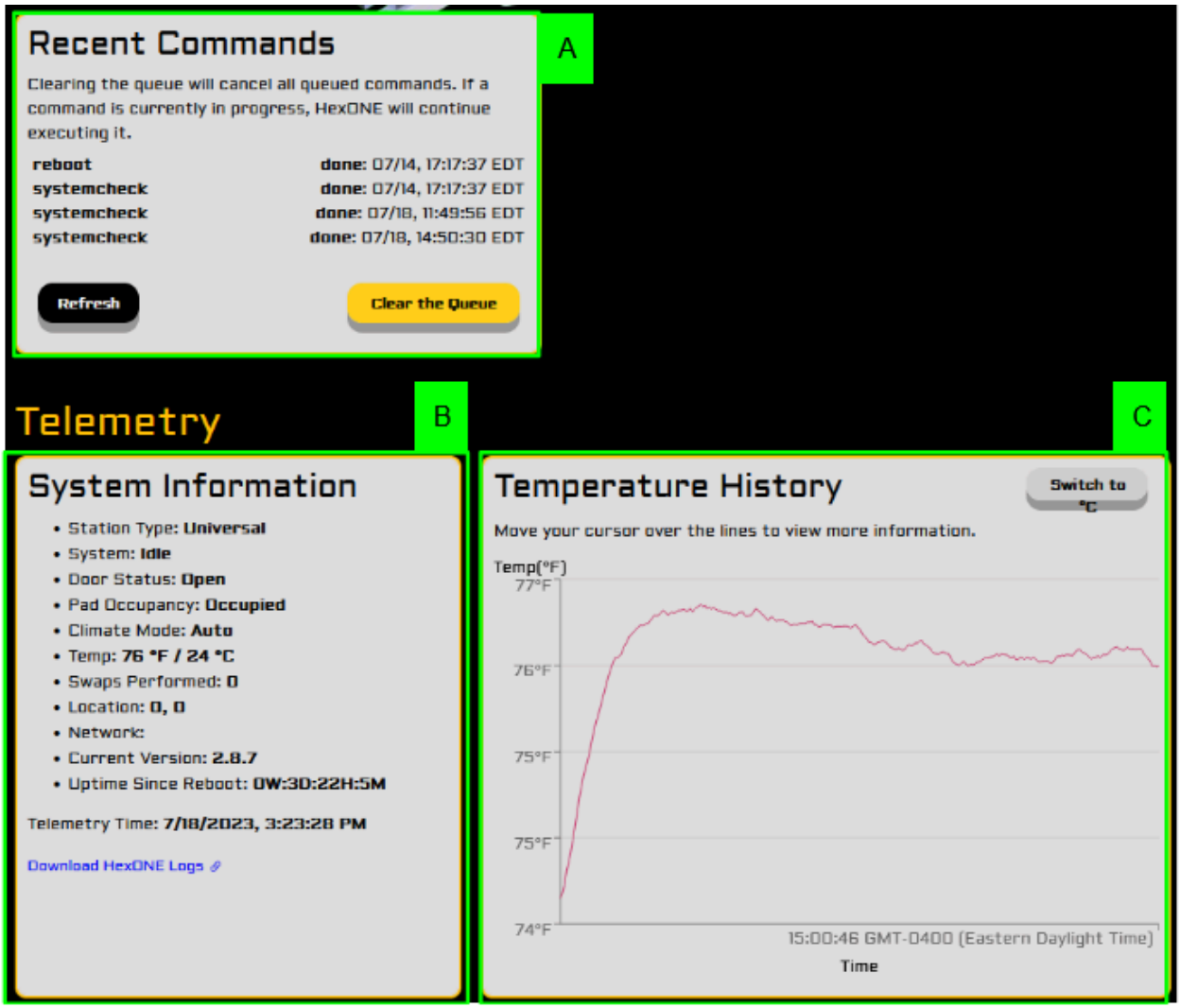
C. Calibration Commands

- **RC Toggle:** Powers the remote controller on and off
- **Power Drone Toggle:** Powers the unmanned aircraft on and off
- **Swap Battery:** Swaps battery from unmanned aircraft to battery brace and vice versa

D. Cooler/Heater and Odroid options

- **Enable Auto AC:** Enables the Auto AC option in which the HVAC system automatically turns on based on the users' inputted temperature threshold
- **Disable Auto AC:** Disables the automatic AC option
- **Enable Heater:** Turns on the HVAC thermo-electric heater
- **Disable Heater:** Turns off the HVAC thermo-electric heater
- **Enable Cooler:** Turns on the HVAC cooler
- **Disable Cooler:** Turns off the HVAC cooler

Recent Commands and Telemetry

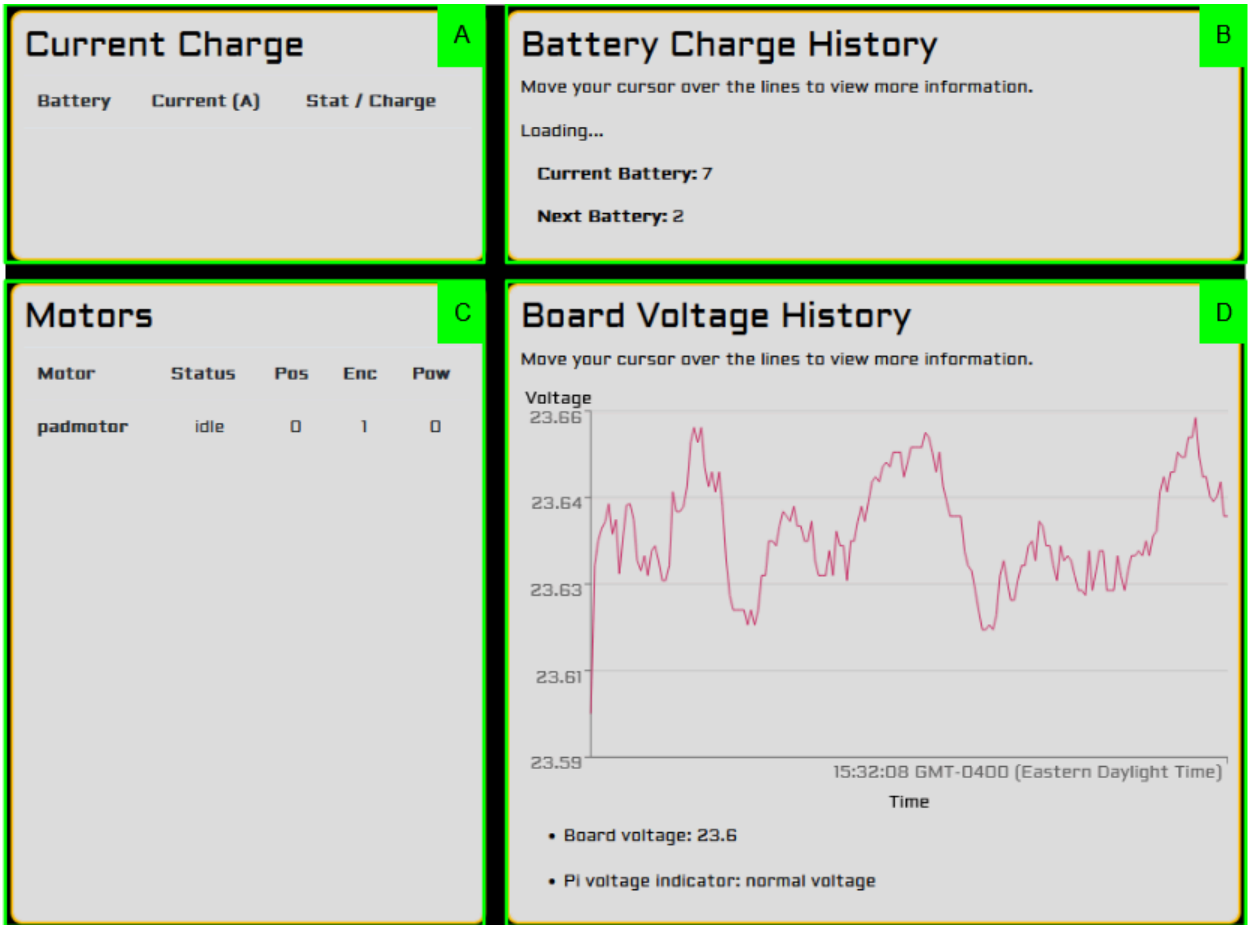


A. Recent commands
Refresh: Refreshes the command log to display the latest information
Clear The Queue: Clears the commands currently in queue

B. System Information
Download HexONE Logs: Downloads the weekly operation logs of the station

C. Temperature History
Switch to: Switches temperature scale between fahrenheit and celsius.

Battery Information



A. Current Charge

This sub-menu displays the battery charging status of the station.

B. Battery Charge History

This sub-menu displays the battery charge history of the station.

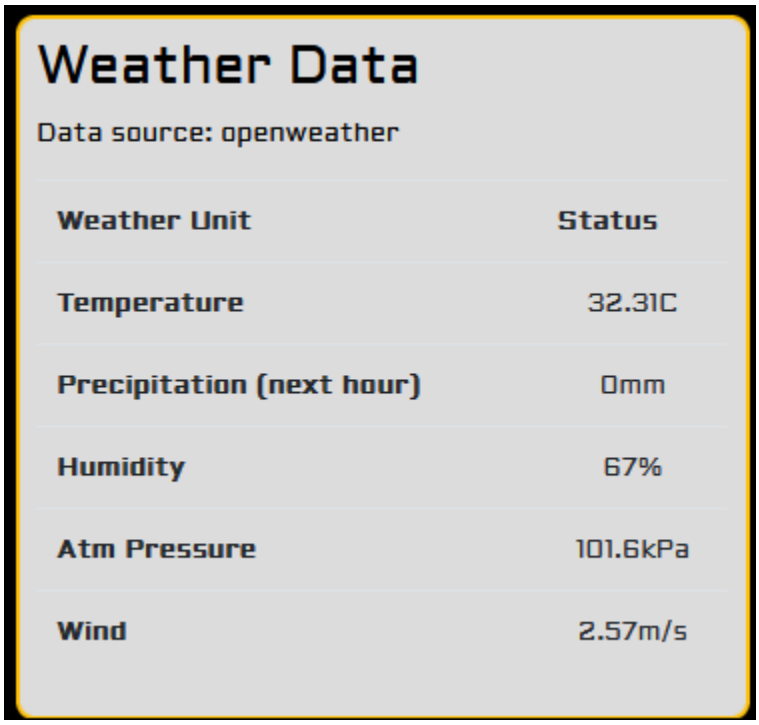
C. Motors

This sub-menu displays information on the motors of the station.

D. Board Voltage History

This sub-menu displays the voltage history on a line graph. The user can move their cursor along the graph for an accurate timestamp.

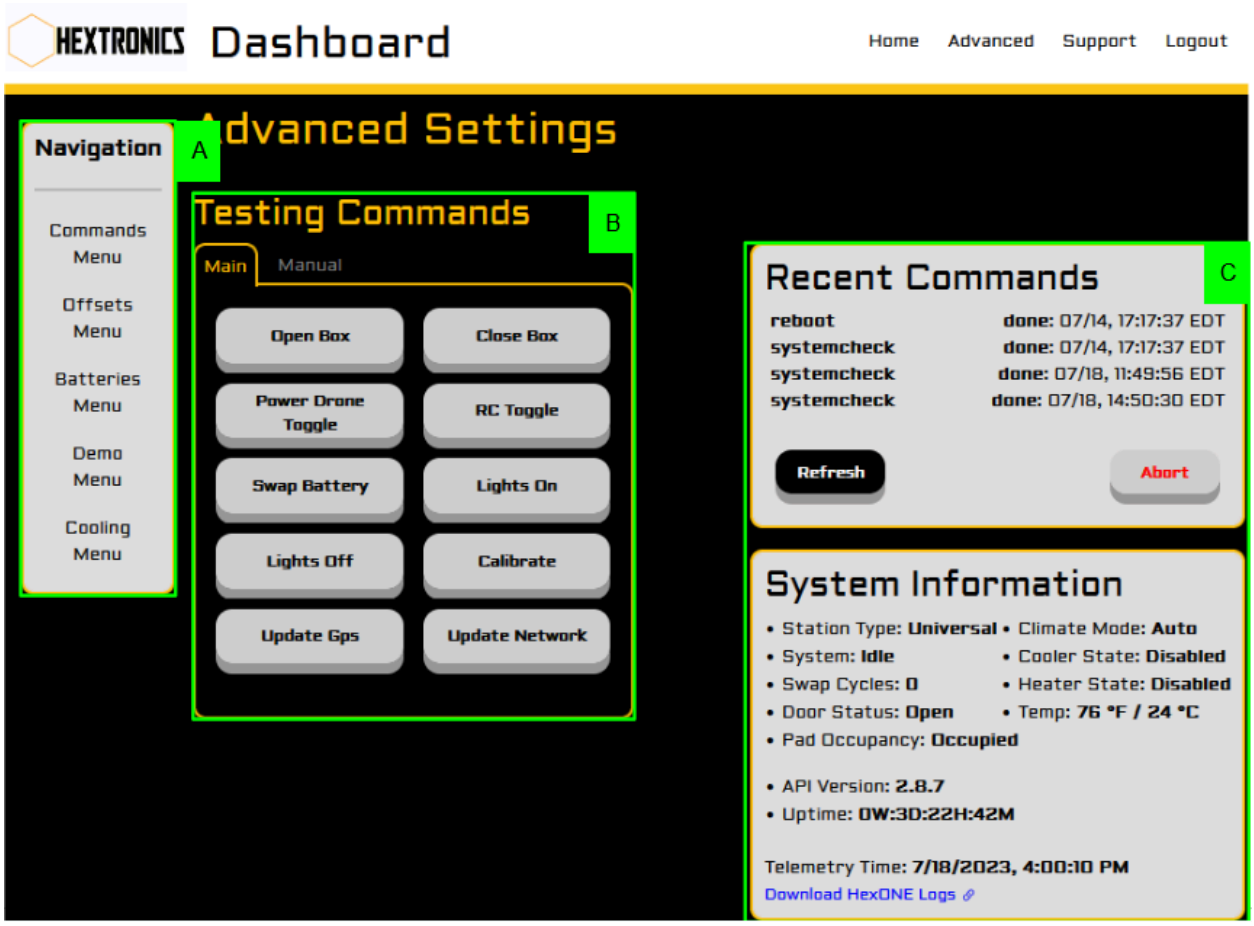
Weather Data



A. Weather Data

This sub-menu displays weather information for the station.

Advanced Settings Main Menu



A. Navigation Tab

This sub-menu includes quick access to information in the advanced menu.

CAUTION The advanced menu should only be used by certified operators to avoid the risk of injury and damaging components

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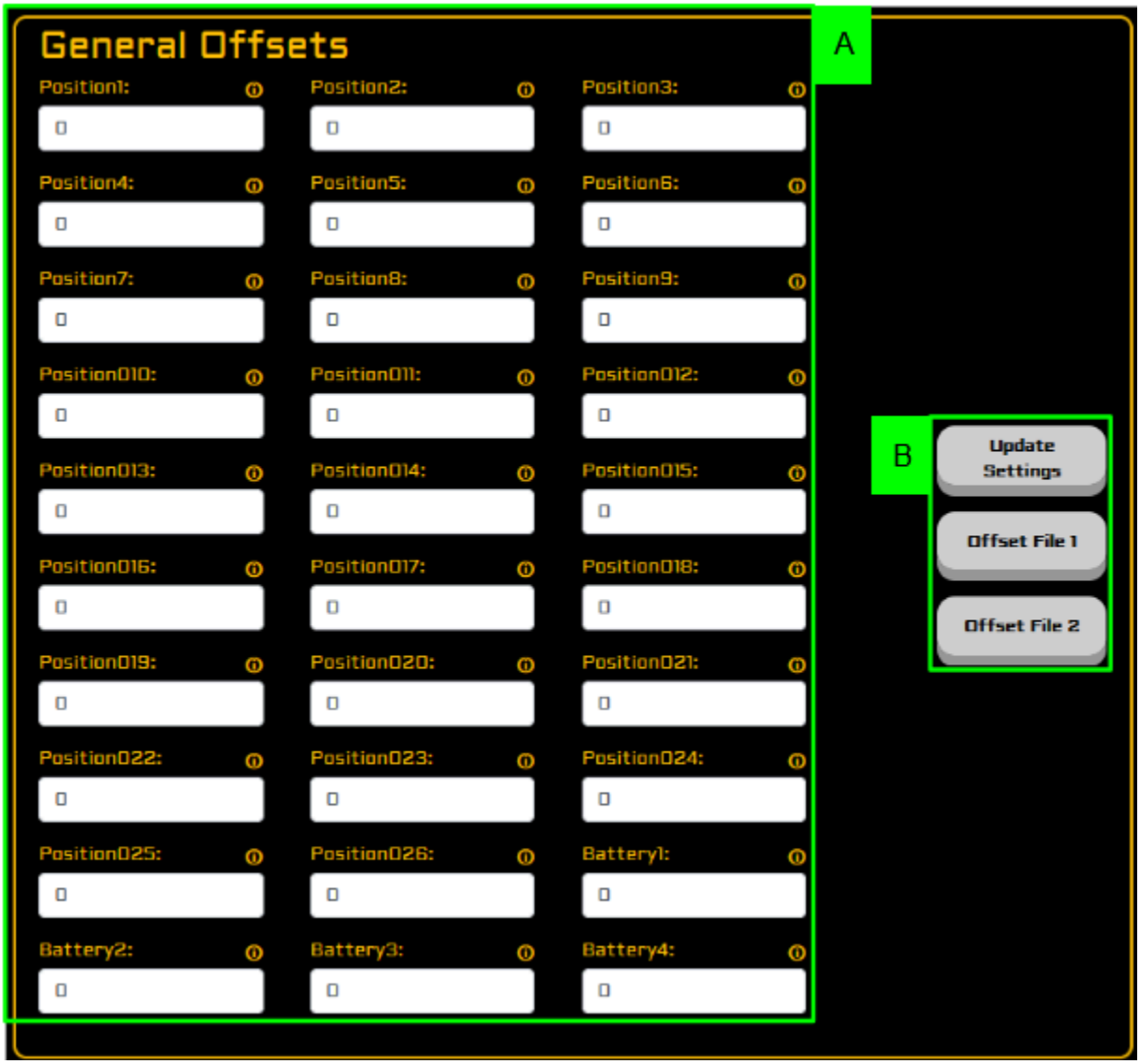
B. Testing Commands

This Sub-menu includes 2 Tabs with different Testing and Calibration Commands

C. Recent Commands and System Information

Offsets Main Menu



CAUTION The General Offset settings should ONLY be changed with the EXPLICIT consent of Hextronics Support. Please do NOT make any changes to Offset values without communicating with Hextronics support.

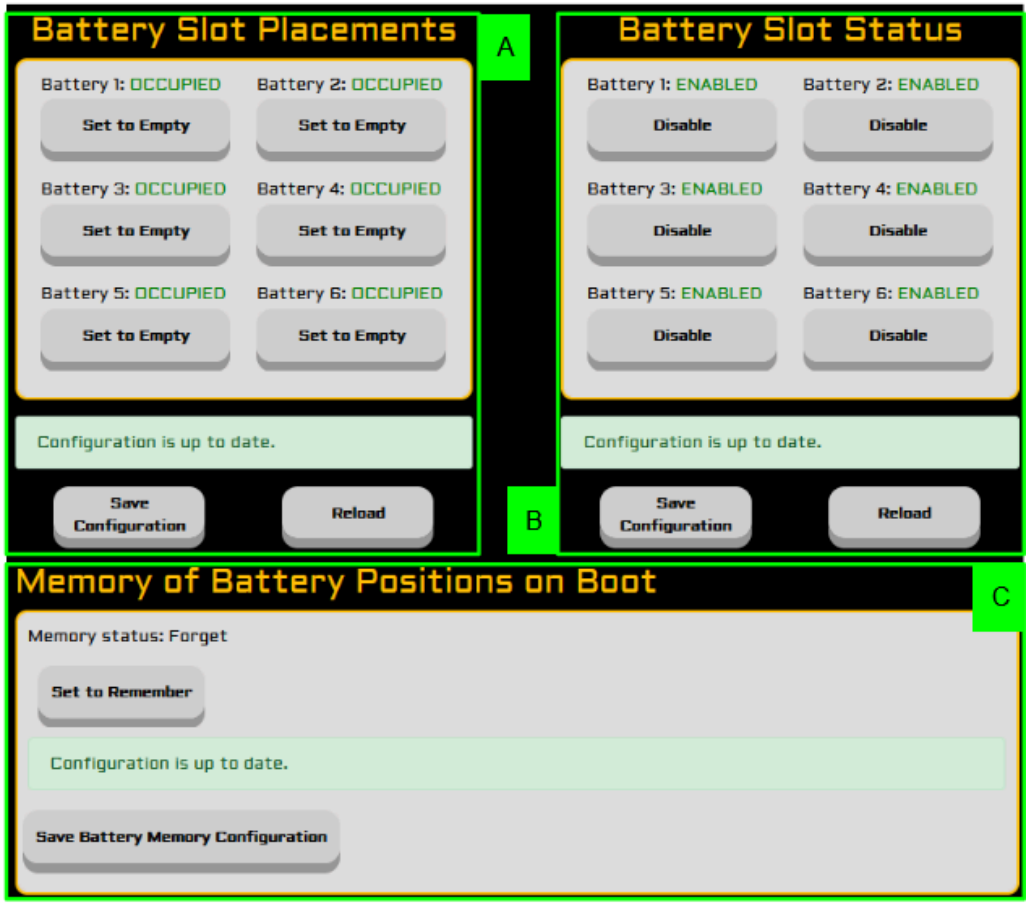
A. General Offsets

Access individual offset settings to tune the station

B. Offsets Menu Control

Update Settings: The user must click this button to apply any changes made to offset values.

Battery Slot and Row Settings



A. Battery slot placements

This sub-menu displays the current occupancy state and allows the user to set the occupancy state of each battery slot.

Save Configuration: Saves changes made to battery occupancy states

Reload: Refreshes Battery Slot Placement menu to display current changes the user has made

B. Battery Slot Status

This sub-menu displays the current state of each battery slot and allows the user to enable or disable individual battery slots.

Save Configuration: Saves changes made to battery slot status

Reload: Refreshes Battery Slot Status menu to display current changes the user has made

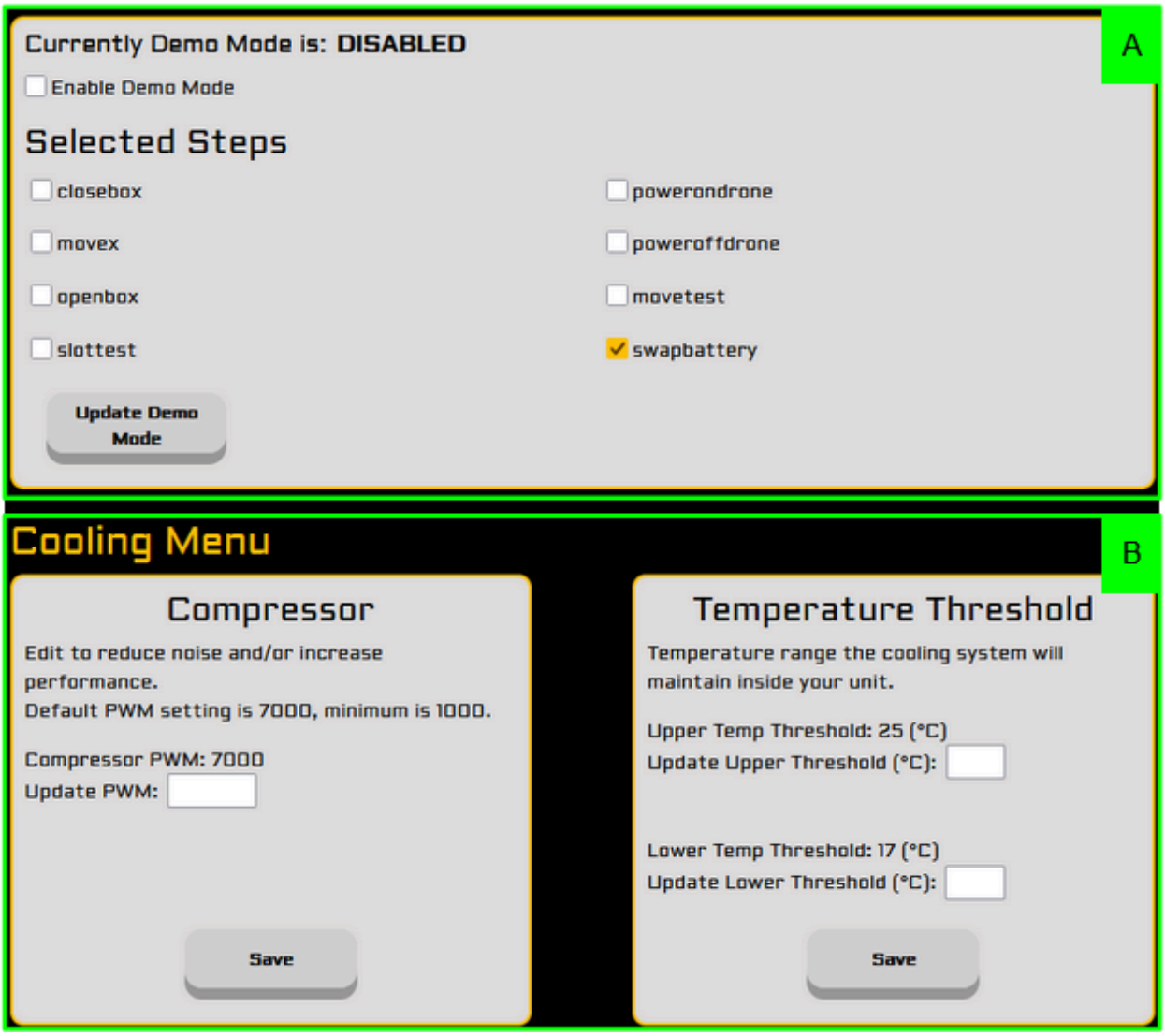
C. Memory of Battery Position on Boot

This sub-menu displays whether the station remembers the position of the batteries once the station is turned off and back on.

Set to Remember: Remember the position of the batteries when the station is turned back on.

Save Battery Memory Configuration: Saves the current configuration of the battery positions.

Demo Mode Settings and Cooling Menu



A. Demo mode settings

This sub-menu allows the unit to enable/disable a custom demo mode.

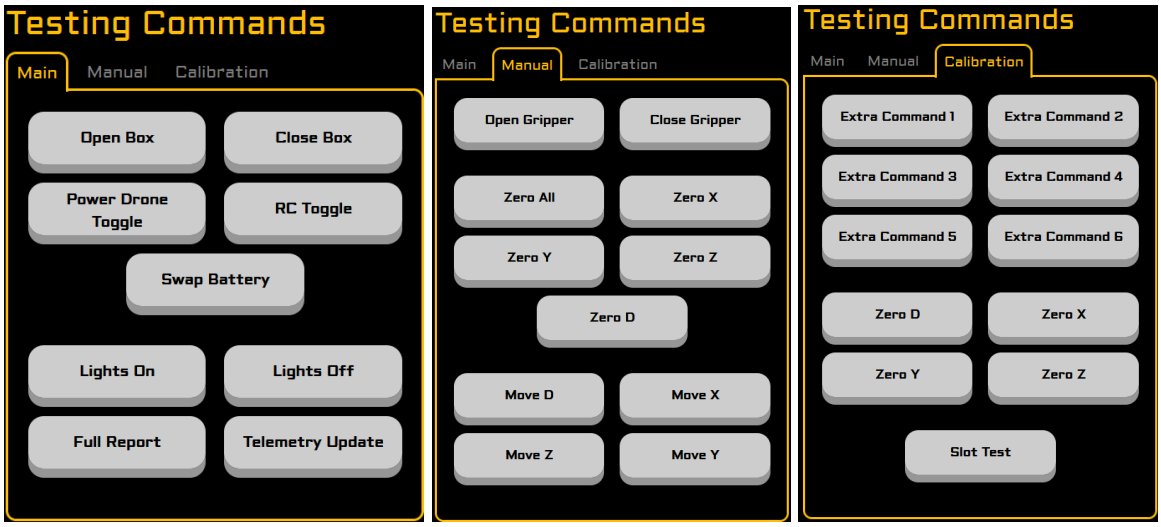
Update Demo Mode: Updates and applies changes made to the demo settings

B. Cooling Menu

In this menu, the user can set the PWM Compressor value as they see fit in order to reduce noise or increase performance. The user can also set an upper and lower temperature threshold range to better suit the region's climate.

Save: Saves the users' custom PWM compressor value and Temperature Threshold values

Testing Commands Expanded



CAUTION The advanced menu should only be used by certified operators to avoid the risk of injury and damaging components

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A. Testing commands **Main**

Open Box: Opens the landing pad of the station
Close Box: Closes the landing pad of the station
Power Drone Toggle: Powers unmanned aircraft on and off
RC Toggle: Powers the RC on and off
Swap Battery: Starts the battery swapping routine
Lights On: Turns on the interior and exterior LED lights of the station
Lights Off: Turns off the interior and exterior LED lights of the station
Full Report: Updates motor and firmware information[4]
Telemetry Update: Forces telemetry update (Telemetry updates automatically every 6 seconds)

B. Testing commands **Manual**

Open Gripper: Moves gripper to the open position
Close Gripper: Moves gripper to the close position
Zero All: Moves the centering module and all gantry axes gantry to the zero position
Zero X: Moves X-axis gantry to full zero position
Zero Y: Moves Y-axis gantry to full zero position
Zero Z: Moves Z-axis gantry to full zero position

4

Zero D: Moves the centering module to the zero position
MoveD: Moves D-axis centering module based on the users applied "move D" interval movement value
Move X: Moves X-axis gantry based on the users applied "move X" interval movement value
Move Y: Moves Y-axis gantry based on the users applied "move Y" interval movement value
Move Z Gantry: Moves Z-axis gantry based on the users applied "move Z gantry" interval movement value

D. Testing Commands **Calibration**
These are testing commands to be used when calibrating the station.
Extra Command 1: Moves gantry in position to retrieve battery from unmanned aircraft and extends gantry with grippers open
Extra Command 2: Closes grippers and removes battery from unmanned aircraft
Extra Command 3: Retracts gripper and places battery into battery brace
Extra Command 4: Retrieves battery from battery brace
Extra Command 5: Moves gantry in position to place battery into unmanned aircraft and extends gripper
Extra Command 6: Places battery into unmanned aircraft
Zero D: Moves the centering module to the zero position
Zero X: Moves X-axis gantry to full zero position
Zero Y: Moves Y-axis gantry to full zero position
Zero Z: Moves Z-axis gantry to full zero position

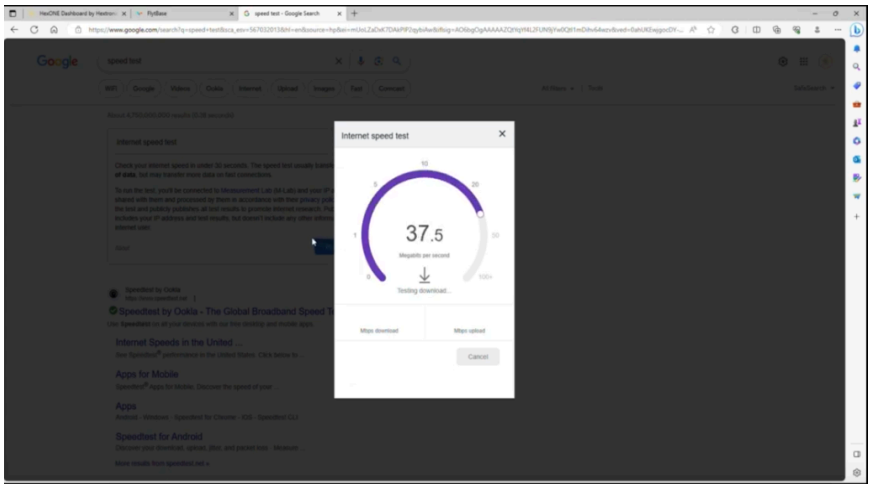
-

Pre-Flight Checklist

Before every unmanned aircraft flight, it is essential to conduct a thorough pre-flight checklist to ensure the safety of the operation and the well-being of the equipment. Following these steps will help you prevent potential issues and accidents during your flight. These can be performed preferably in person but also remotely via the internal video feeds.

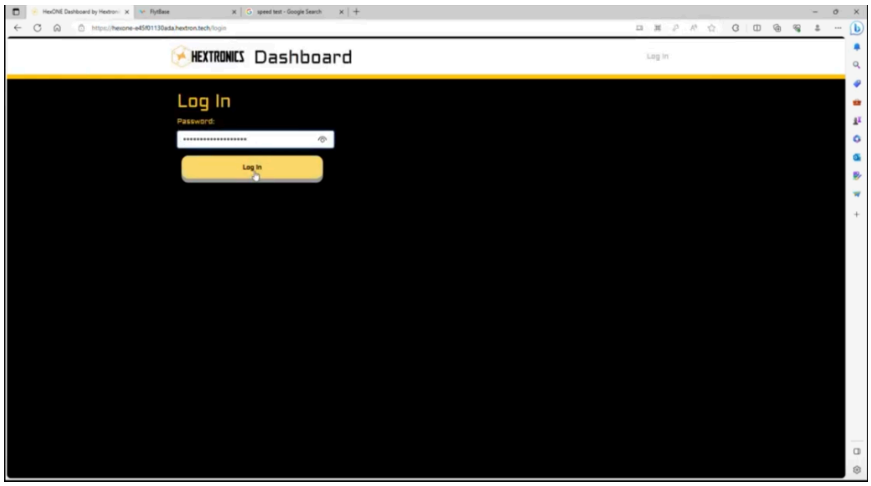
1. Login to Pilot Console

2. Perform Internet Speed Test on Pilot Console



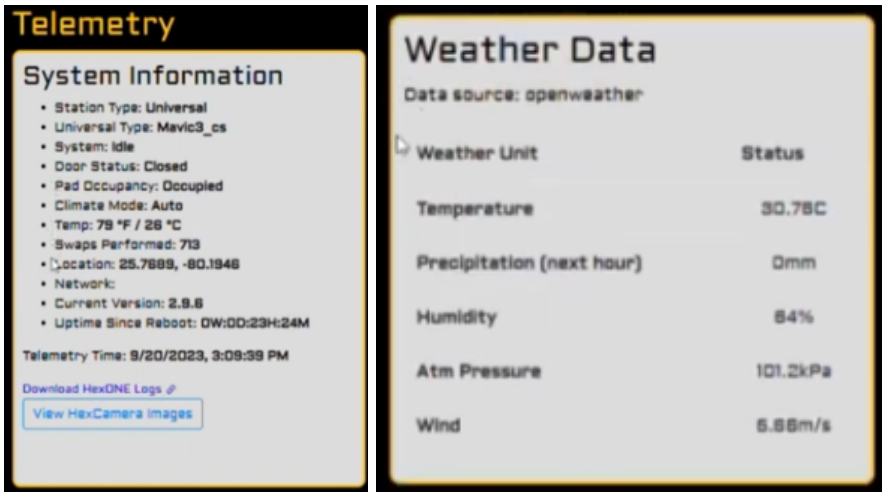
Minimum speeds are 2 mbps and 1 mbps upload.

3. Login to Hextronics Dashboard on Pilot Console

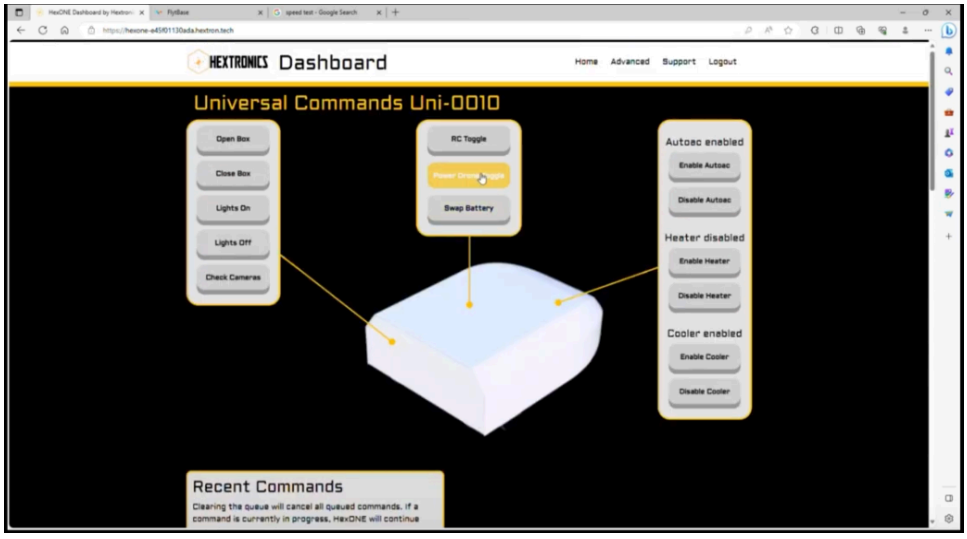


4. Check telemetry of nest to confirm:

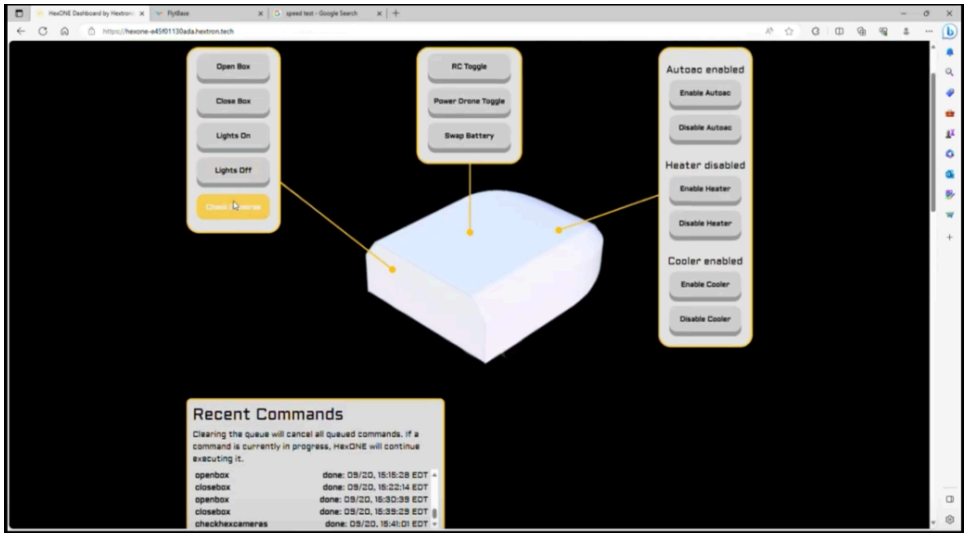
   A. Nest system state is idle
   B. Version number is 2.6.9 or greater
   C. Weather data shows acceptable flight conditions
   D. Precipitation is less than 10mm
   E. Wind speed is less than 12 mph



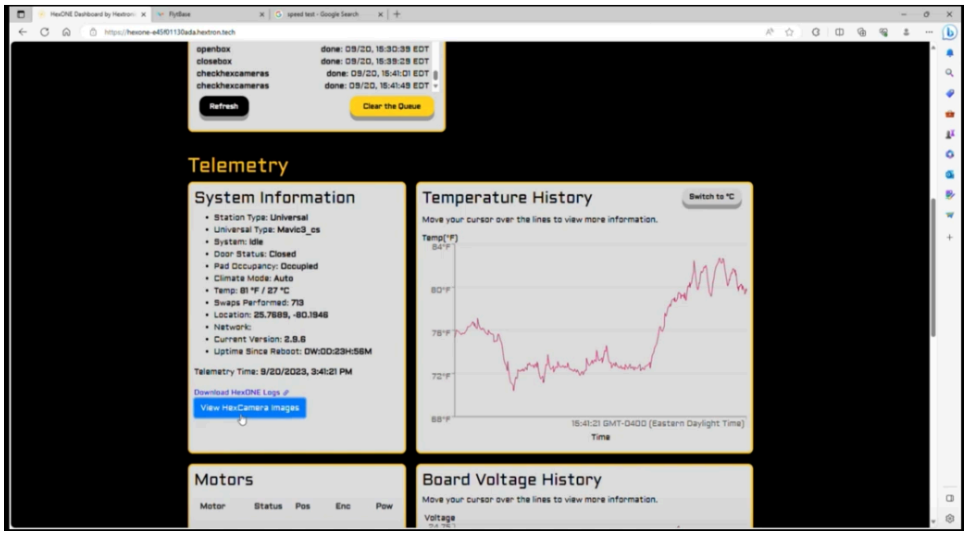
5. Perform the “Power Drone Toggle” command



6. Trigger the "Check Cameras" command



7. Trigger "Check HexCamera Images" to begin aircraft inspection

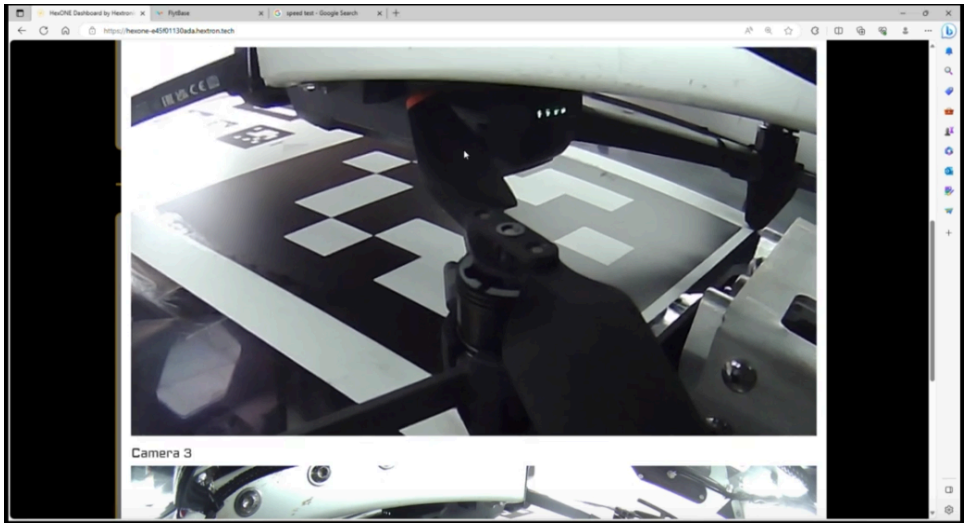


8. Verify absence of non-participating personnel within takeoff area

9. Verify propellers are properly attached and show no signs of wear on both sides of unmanned aircraft

10. Verify no physical damage on aircraft or prop guards

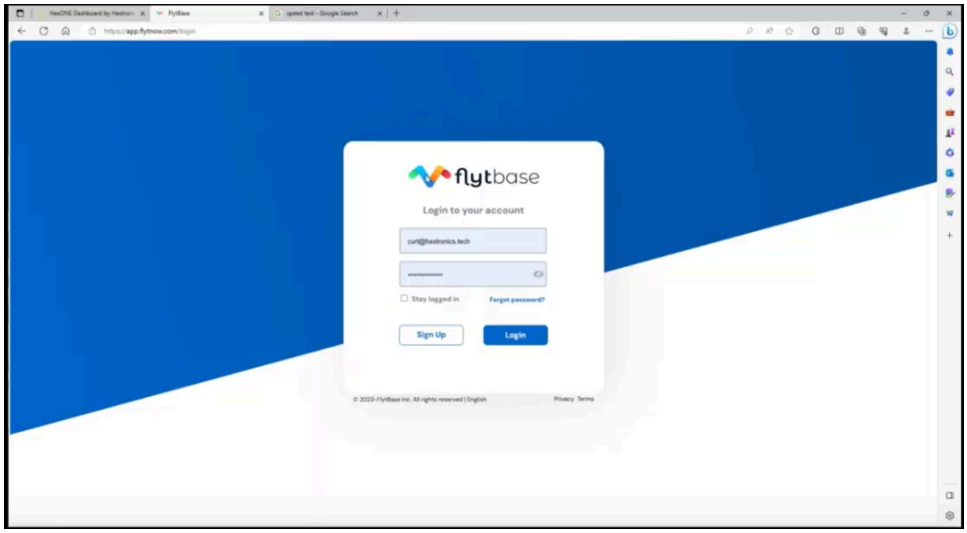
11. Verify battery is properly locked in place without wear or bulging



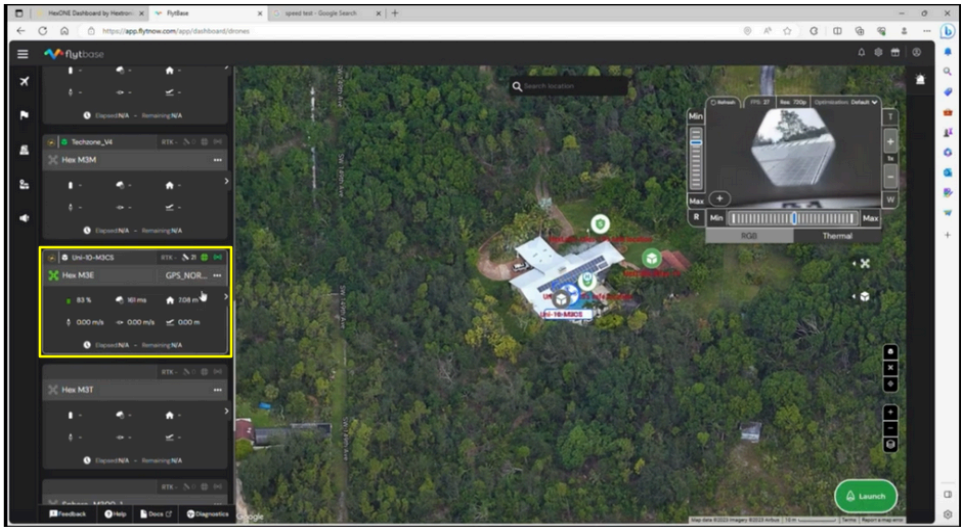
12. Verify landing pad is clear of foreign debris

13. Verify no physical damage on aircraft or prop guards

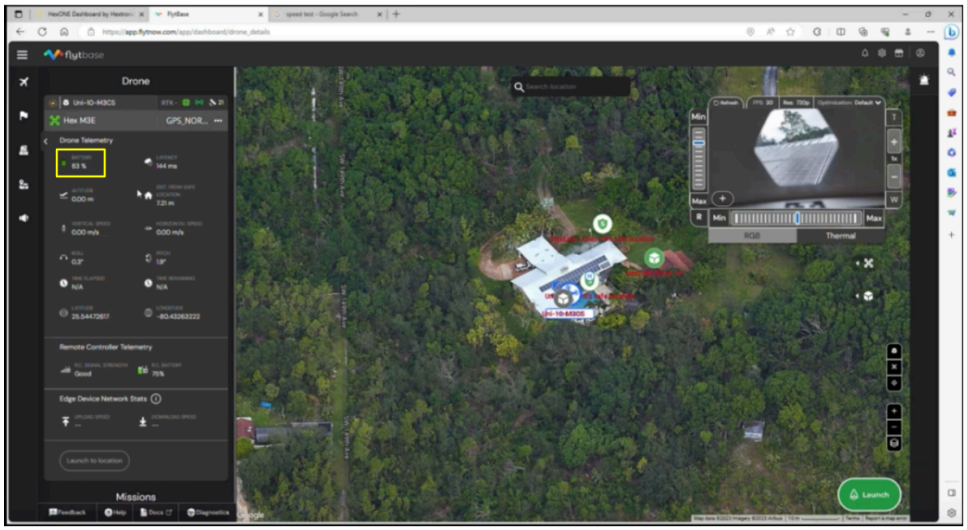
14. Login to FlytBase on Pilot Console



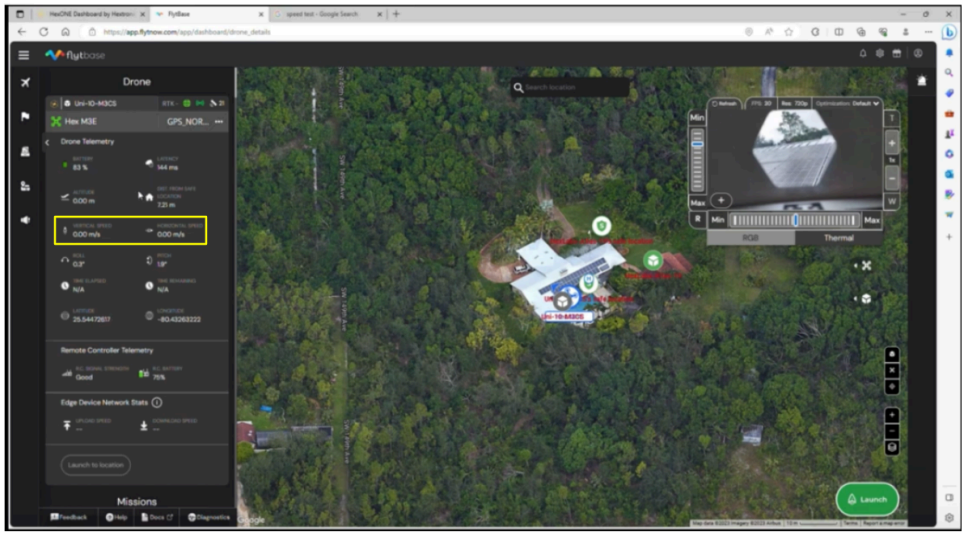
15. Select remote nest that will be operated



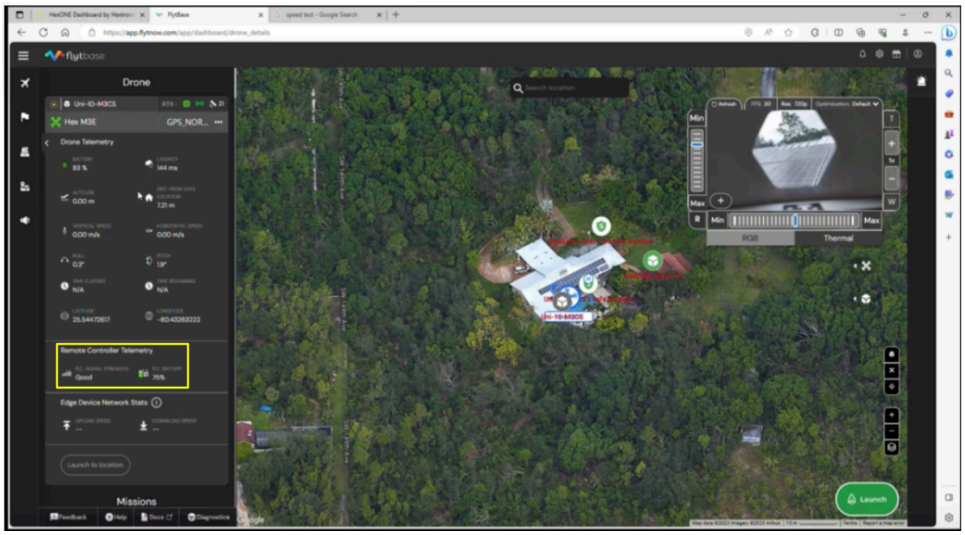
16. Verify aircraft battery level is greater than 75%



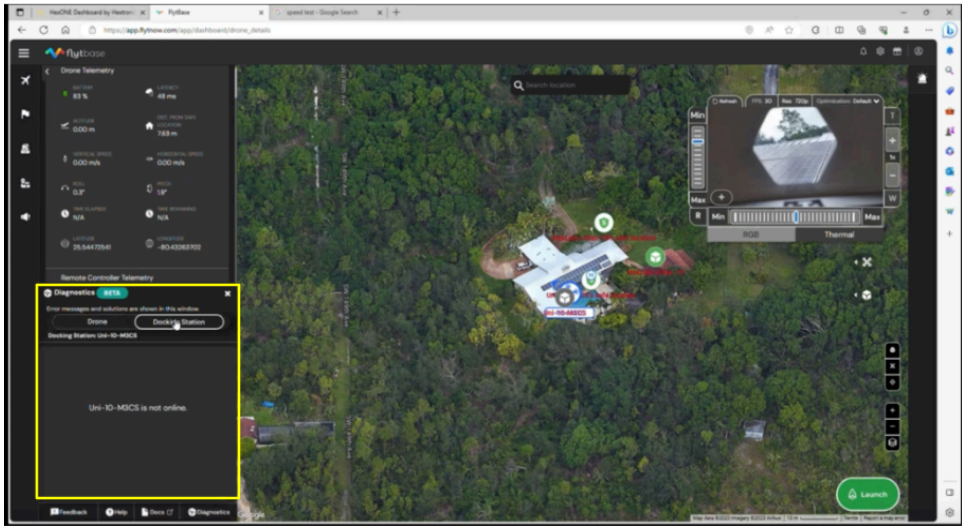
17. Verify aircraft has under 500 ms latency and a gps lock



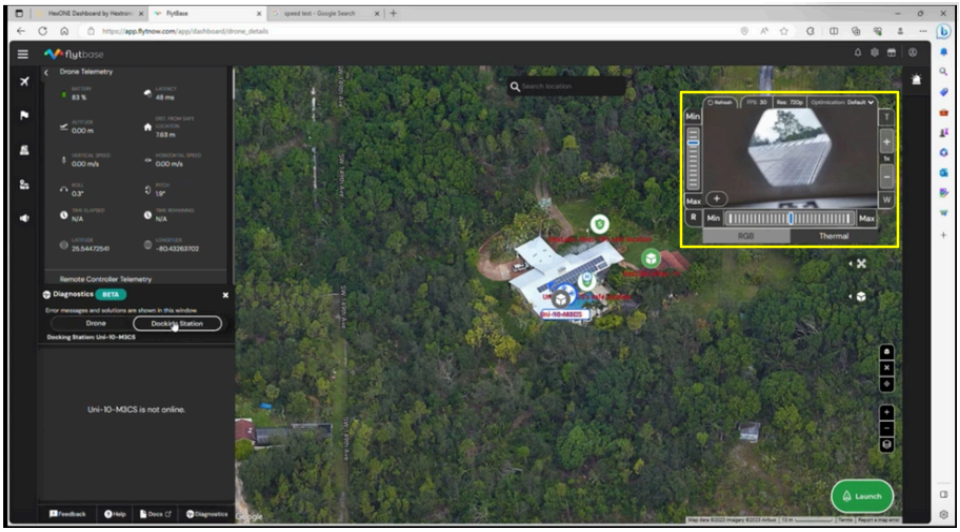
18. Verify aircraft radio has good connection and over 70% battery

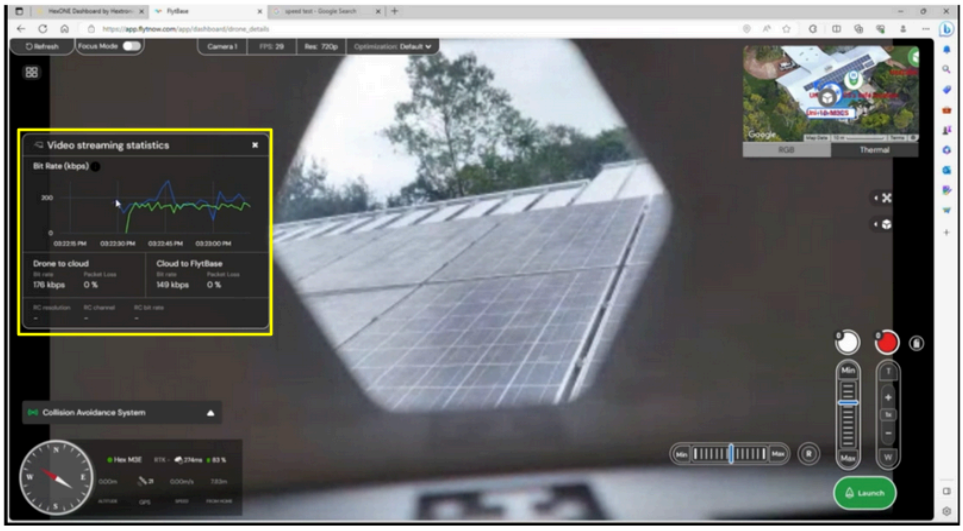


19. Verify aircraft and nest have no reported error states

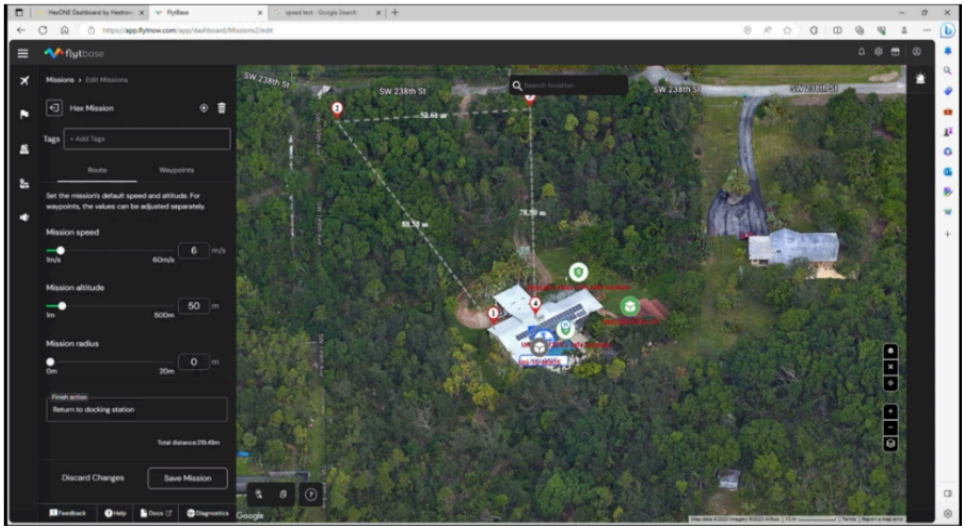


20. Verify aircraft stream bandwidth is over 100 kbps

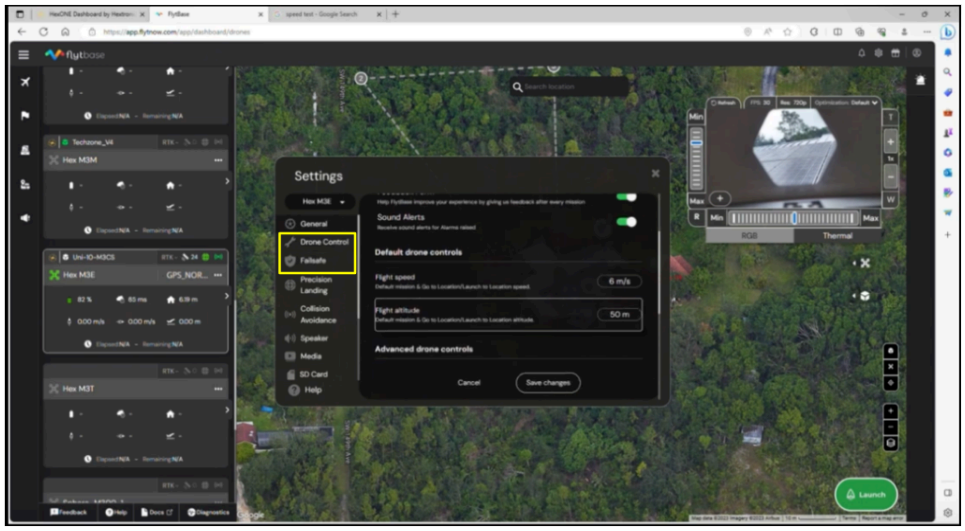




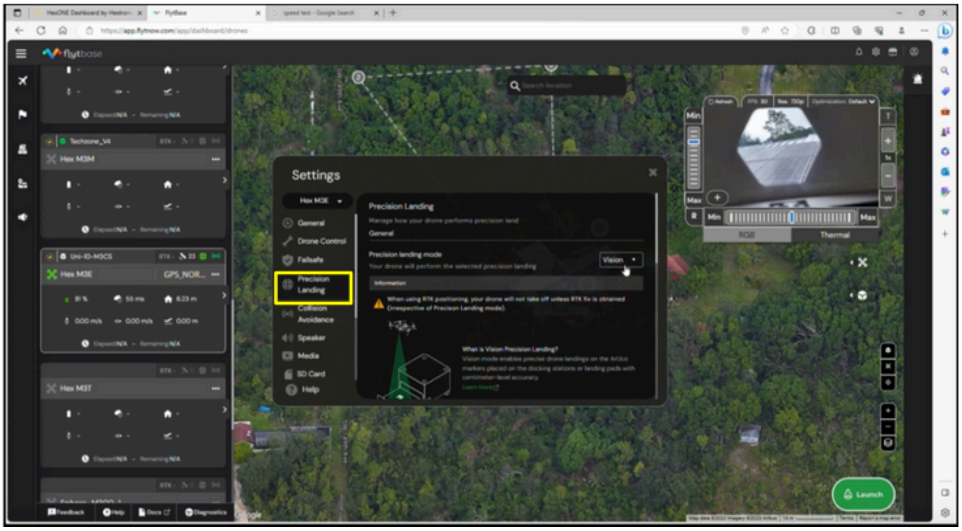
21. Verify mission path and altitude are clear of obstacles



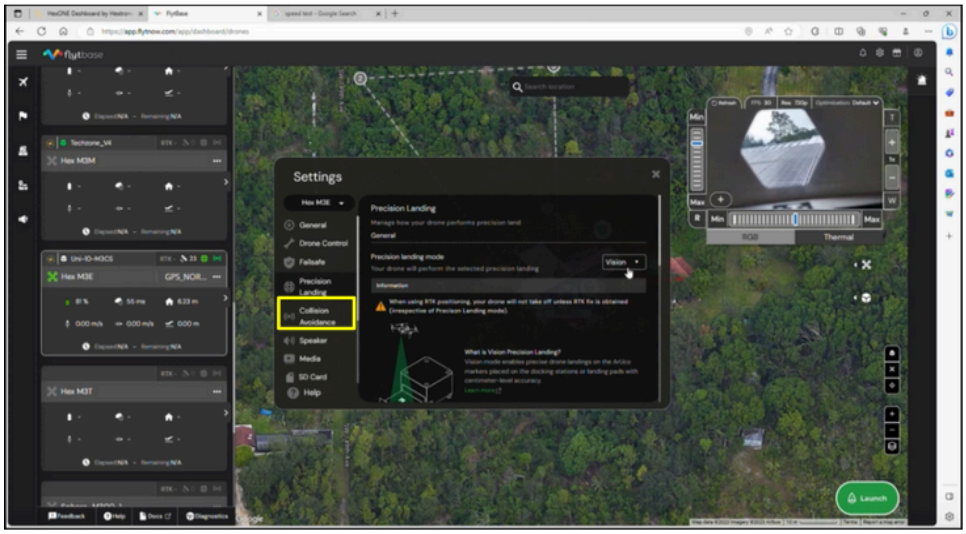
22. Verify drone controls and failsafes are properly set



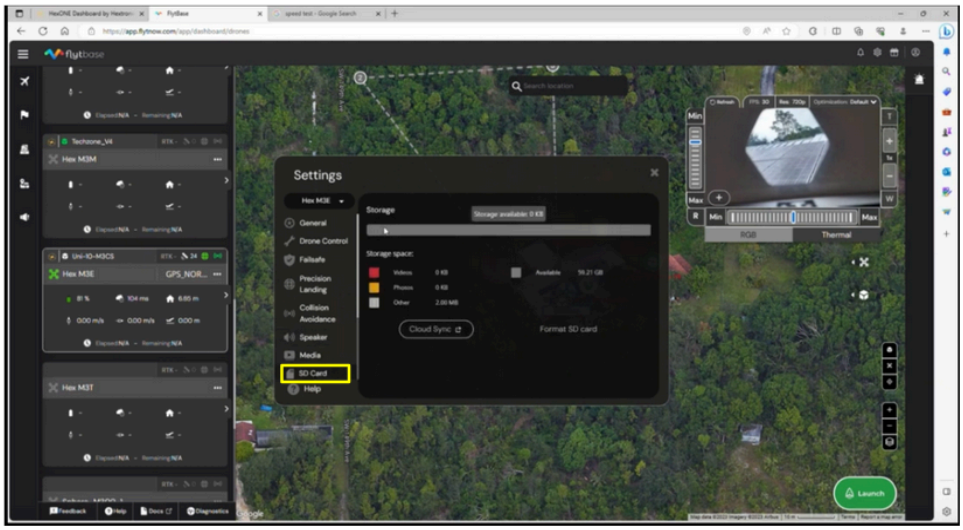
23. Verify precision landing is properly configured



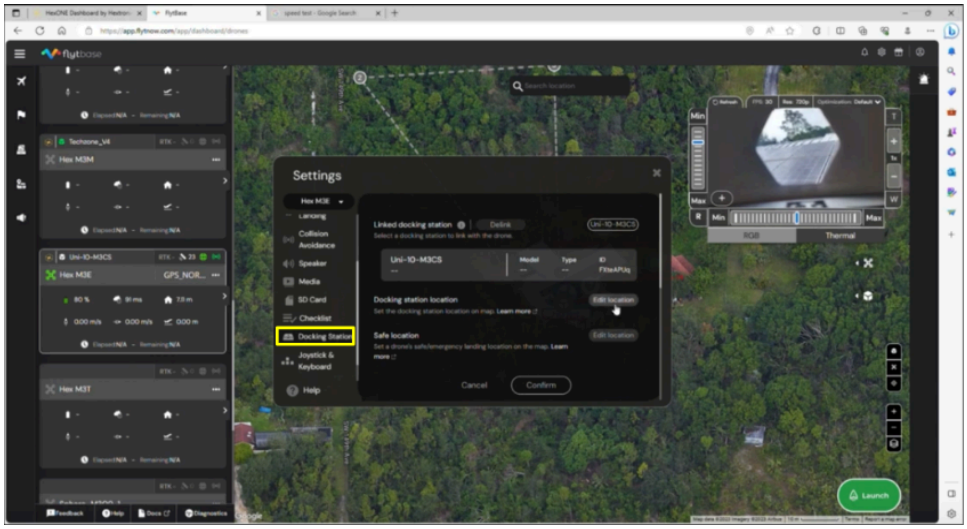
24. Verify obstacle avoidance is enabled



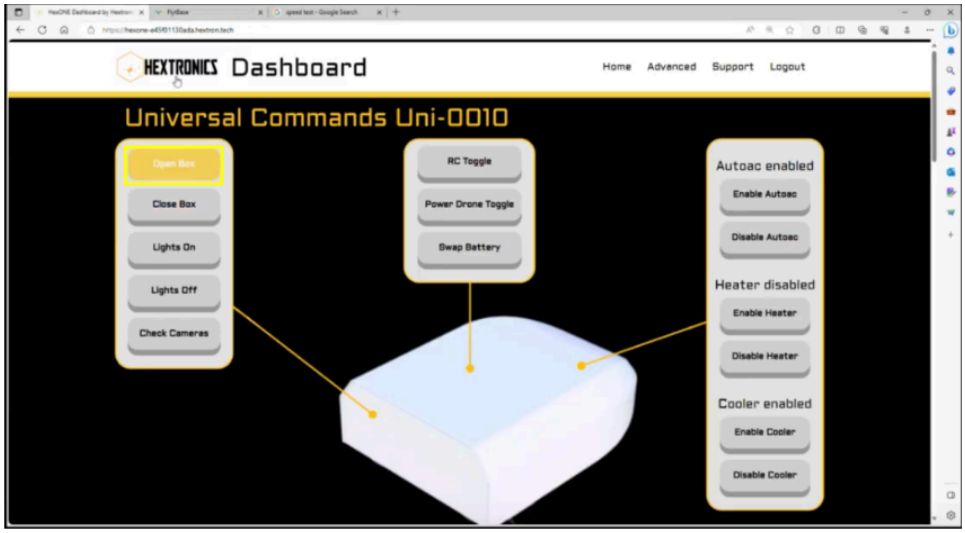
25. Verify aircraft mircoSD card is inserted with adequate storage



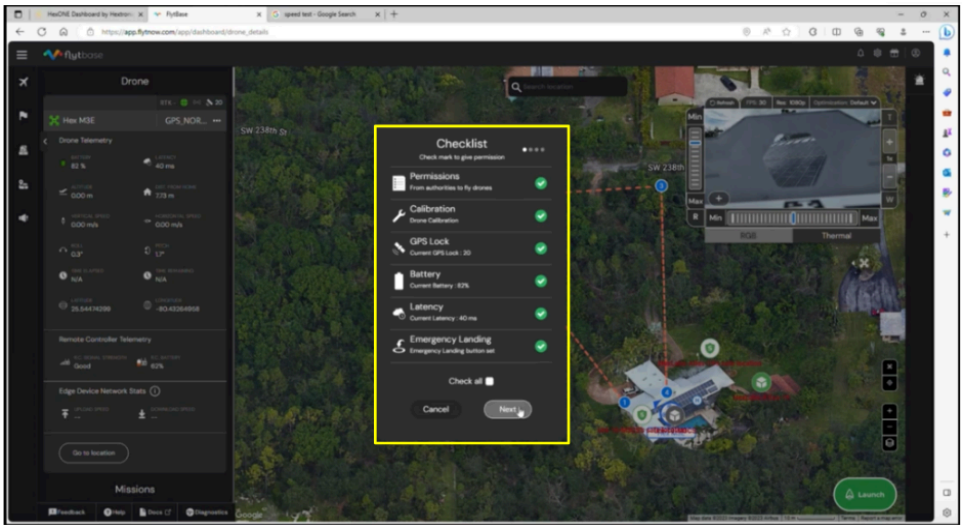
26. Verify docking station and safe location are set properly



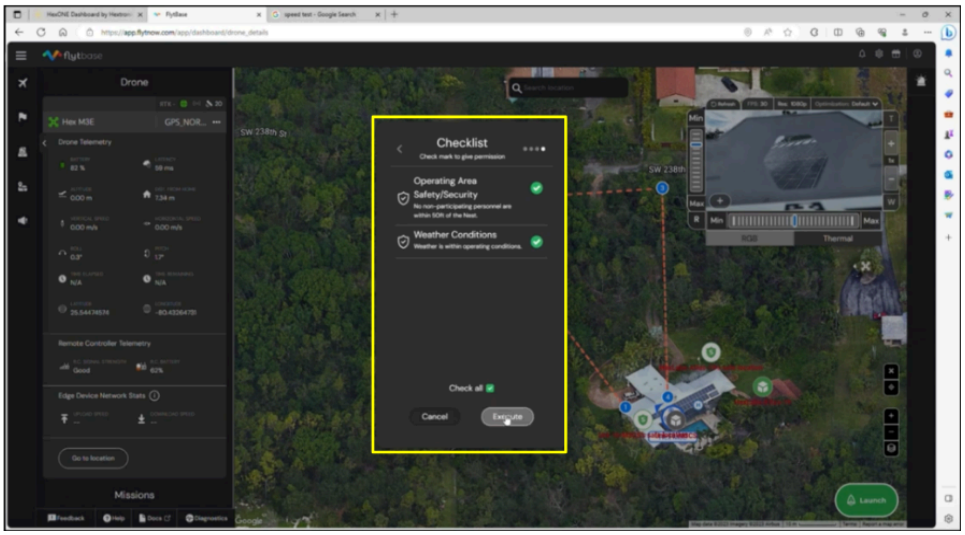
27. Verify nest is open and surrounding area is clear



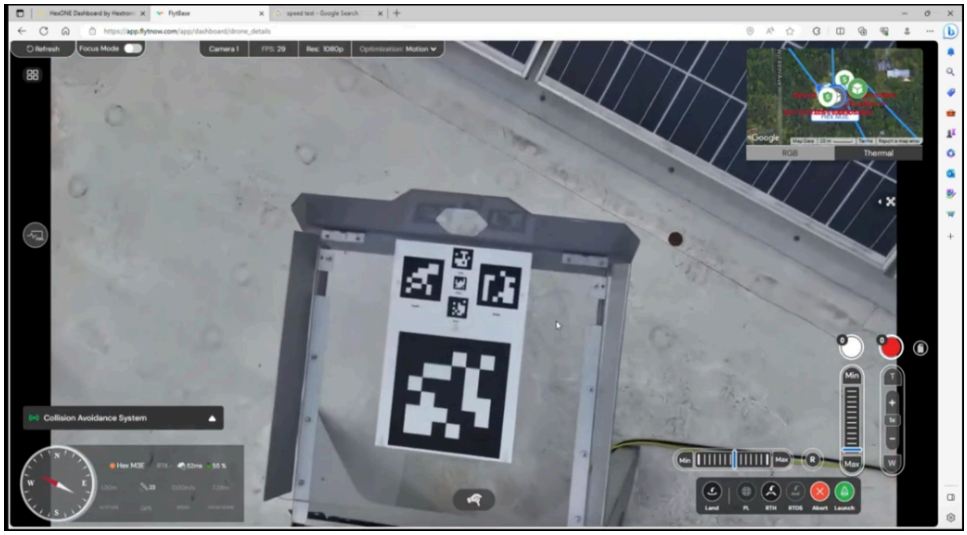
28. Verify and record all preflight checks are completed



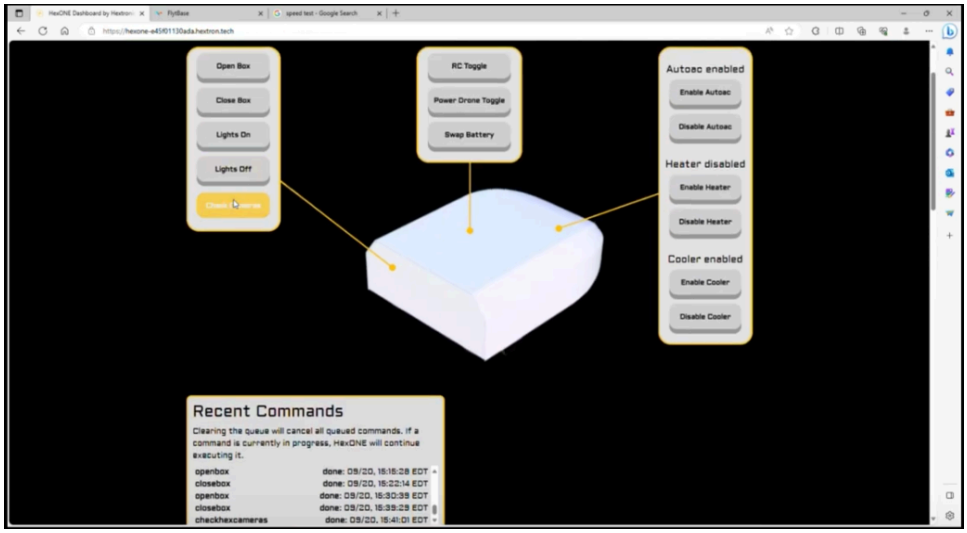
29. Execute and monitor mission

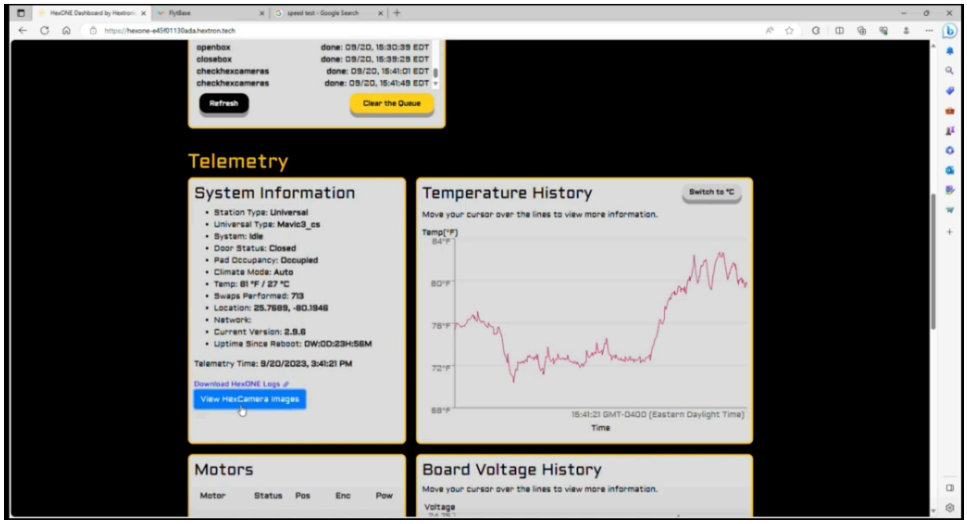


30. Monitor precision landing routine



31. Perform post flight checks to ensure drone returned safely





32. Store drone in nest to complete mission

Remember, conducting a pre-flight checklist is crucial to ensure safe and successful unmanned aircraft flights. Regular maintenance and adherence to safety guidelines contribute to a positive and enjoyable unmanned aircraft piloting experience. Always prioritize safety and responsible unmanned aircraft operation.

As unmanned aircraft technology continues to evolve, incorporating safety measures like propeller guards becomes increasingly essential. In adherence to FAA guidelines, these guards serve as a crucial line of defense, protecting both the unmanned aircraft and its surroundings during flight. By selecting manufacturer-approved, properly fitted, and well-maintained propeller guards, unmanned aircraft operators can ensure the utmost safety and compliance while piloting their unmanned aircraft. However, it is crucial to remember that these guards are not substitutes for responsible flying practices and adherence to flight regulations. The combination of propeller guards and a strong commitment to safety fosters an environment where unmanned aircraft enthusiasts can enjoy the benefits of this technology while minimizing potential risks to themselves and others.

Propeller guards are essential accessories for unmanned aircraft operators, providing an extra layer of safety and protection during flights. When used correctly, propeller guards can help prevent injuries and minimize damage to the unmanned aircraft and surrounding objects. To ensure compliance with FAA guidelines, follow these guidelines when selecting and using propeller guards:

1. Purpose of Propeller Guards: Propeller guards are designed to protect people, objects, and the unmanned aircraft itself from the spinning propellers. They create a barrier between the propellers and external elements, reducing the risk of accidents and enhancing flight safety.

2. Manufacturer Approved Guards: Ensure that the propeller guards you use are approved and recommended by the unmanned aircraft manufacturer. Using unauthorized accessories may void warranties and compromise flight stability.

3. Proper Installation: Follow the manufacturer's instructions for installing the propeller guards correctly. Improper installation can affect the unmanned aircraft's balance, stability, and flight performance, leading to potential issues.

4. Lightweight and Durable Material: Select propeller guards made from lightweight yet durable materials like high-quality plastics or carbon fiber. The guards should be strong enough to withstand minor impacts while adding minimal weight to the unmanned aircraft.

5. Correct Size and Compatibility**:** Choose propeller guards specifically designed for your unmanned aircraft model. Ill-fitting guards may interfere with the propeller's movement or create additional aerodynamic drag, affecting flight performance.

6. Check for Secure Attachment: Before each flight, inspect the propeller guards to ensure they are securely fastened. Loose guards can detach during flight, creating a safety hazard.

7. Routine Maintenance: Regularly inspect and clean the propeller guards to remove dirt, debris, or any damage that may impair their functionality.

8. Respect Flight Limits: Keep in mind that the addition of propeller guards may reduce flight endurance and speed. Adjust your flight plans accordingly, and do not push the unmanned aircraft beyond its recommended limitations.

9. Not a Substitute for Safe Flying Practices: While propeller guards provide an extra layer of protection, they do not eliminate the need for responsible flying practices. Always fly the unmanned aircraft within your line of sight, avoid flying over people or sensitive areas, and adhere to all FAA regulations and local laws.

10. Educate Others: If flying the unmanned aircraft in public spaces, inform nearby individuals about the potential risks and ask for their cooperation in maintaining a safe distance during the flight.

11. Respect No-Fly Zones: Do not fly your unmanned aircraft in restricted or prohibited areas, such as airports, national parks, or emergency response zones. Familiarize yourself with FAA's B4UFly app or other relevant resources to identify no-fly zones.

12. Safety First: Remember that propeller guards are not foolproof, and accidents can still happen. Always prioritize safety and exercise caution during unmanned aircraft operations.

By adhering to these guidelines, you can enhance safety and comply with FAA regulations when using propeller guards with your unmanned aircraft. Responsible unmanned aircraft operation and awareness of potential risks are crucial elements in promoting safe unmanned aircraft flights for everyone.

Installation of Propeller Guards

1. Below is the orientation in which the propeller guards and feet will be mounted. On both the propeller guards and feet there are letters that indicate its mounting position. For example, RF is right front and BL is back left. Keep in mind that the front of the unmanned aircraft is the side that the camera is on.

2. Place the legs of the unmanned aircraft into the slotted clips provided on the propeller guards.

3. Fasten slotted clips around the arms of the unmanned aircraft.

4. Now that the propeller guards are fastened, it is time to mount the feet. Verify that the proper feet are being mounted in the proper position by looking at the lettering engraved on them.

5. Slide the front feet onto the lets of the unmanned aircraft. Once they are pushed up far enough they will snap into place.

6. Repeat the same process for the back feet.

7. Once you have properly mounted the propeller guards and feet please continue to the next section.

FlytNow Operations

Create a FlytNow Account

Please contact Support@Flytbase.com for assistance with account creation or Support@Hextronics.tech for assistance locating your unique UDC code.

Step by step:

1. If you do not already have a FlytNow account, go to https://app.flytnow.com/signup to create one.

2. Once you verify the email, share the email you used with team FlytBase at support@flytbase.com.

Registering Unmanned Aircraft

Follow the instructions below **in order**. Once you have reached the end of this section, please proceed to the "AWS Photo/Video Bucket Setup" section.

1. Login into the FlytNow dashboard

   https://app.flytnow.com/login

2. Power cycle the station

– Remove and re-insert the main power cable, this will clear the timeframe window for registration and provide a fresh 15 minutes.

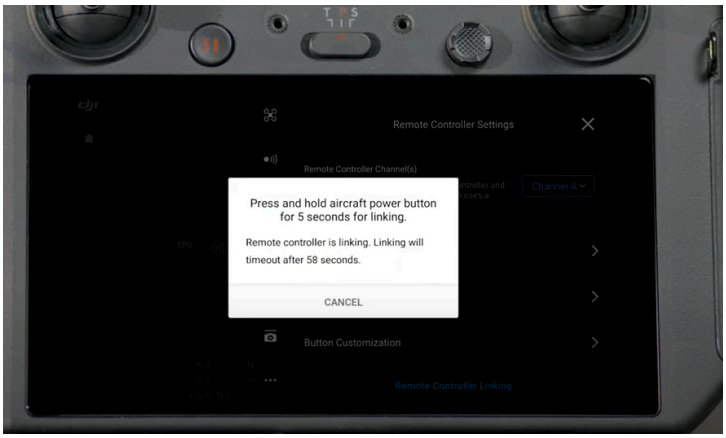
3. Turn on RC
   - Manually press the solenoid to power ON the RC.

4. Turn on unmanned aircraft using **Power Drone Toggle** button in the center panel of the **Universal Commands** page

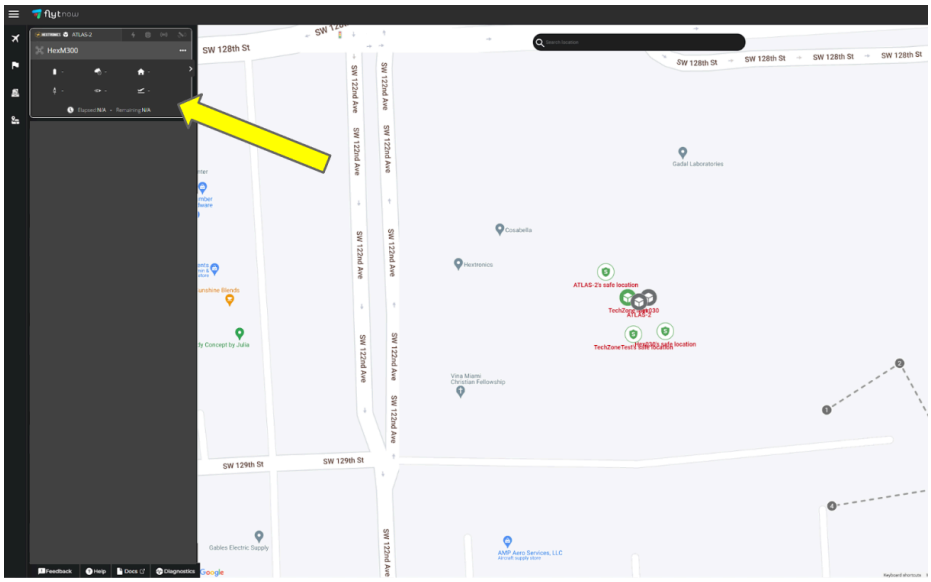
5. Enter FlytNow and select **Add Device** from the dashboard tab

6. Select **Setup DIAB** in the bottom left corner of the window and follow the on-screen prompts until completion.

7. Bind unmanned aircraft when prompted
   - When the FlytNow **Setup Diab** process prompts you to link the unmanned aircraft, please press and hold the unmanned aircraft power button for 5 seconds to link the unmanned aircraft to the RC.



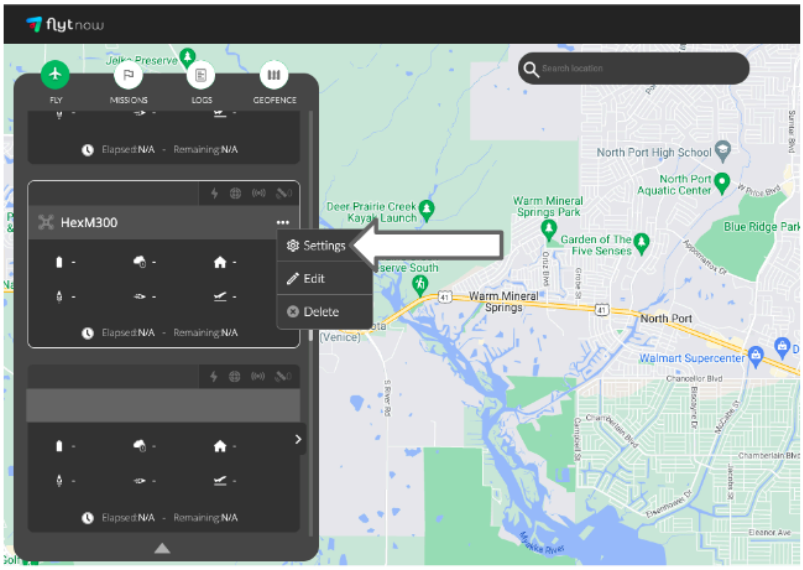
8. Once DIAB setup is complete confirm that your station is the **Devices Added** tab on the Flytnow dashboard



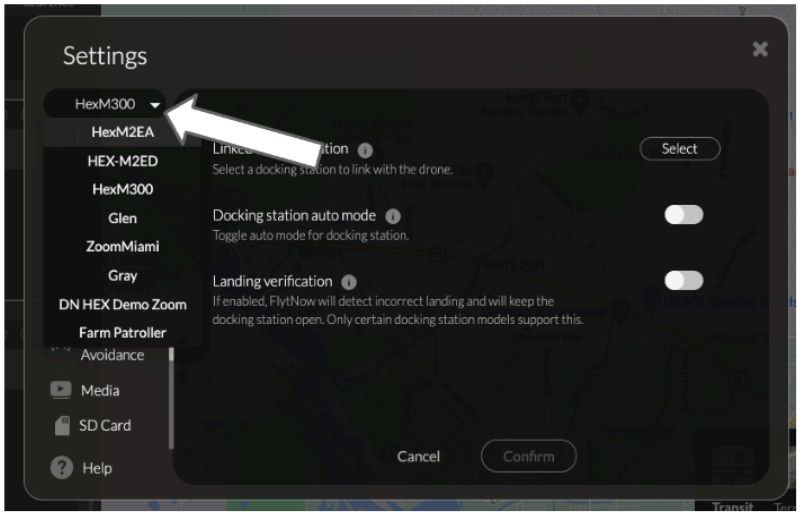
Linking **Unmanned Aircraft**

Once you have registered, follow the steps below in order to link your unmanned aircraft to the station.

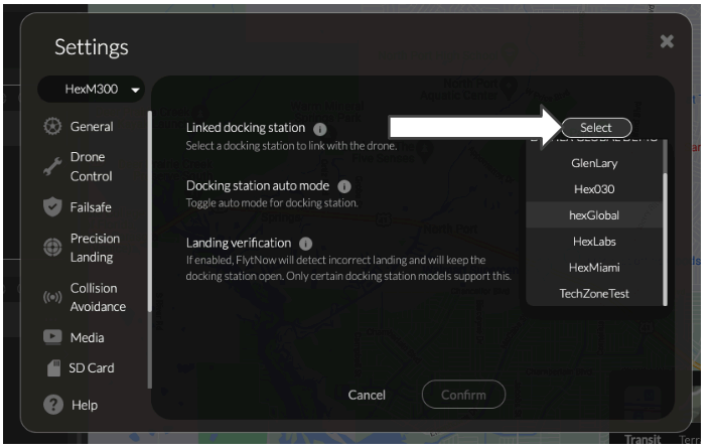
1. On the FlytNow dashboard go to settings



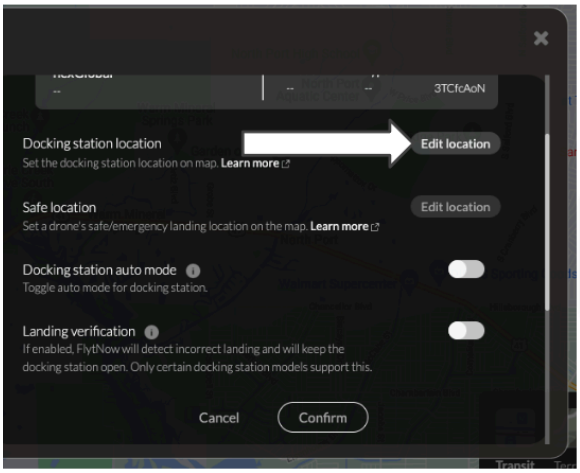
2. Select your unmanned aircraft from the drop down menu

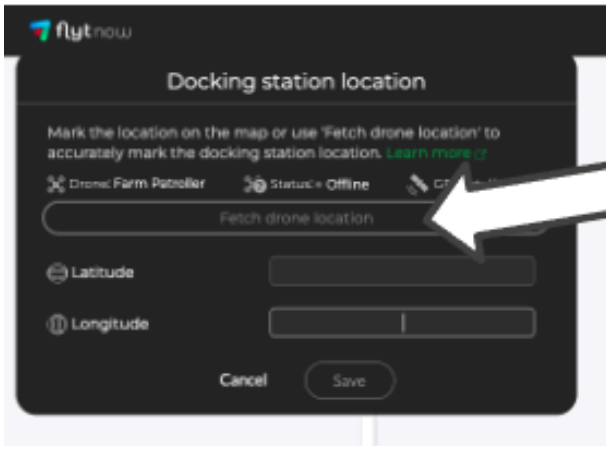


3. Select your docking station from within the drop down menu



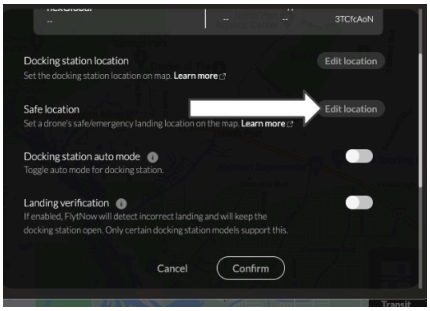
4. Edit docking station location



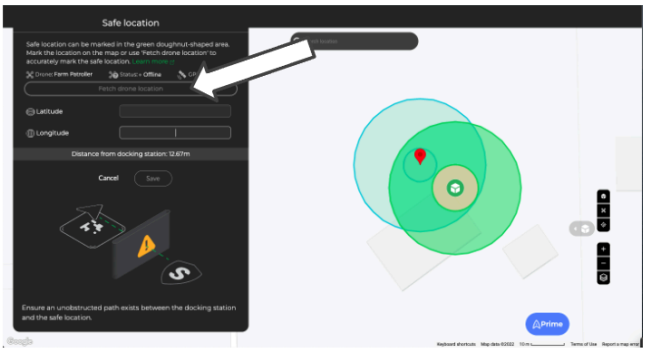


- Open the landing pad and power on the unmanned aircraft to fetch its location
- This is the most accurate way to get to the docking station location and improve overall precision landing efficiency

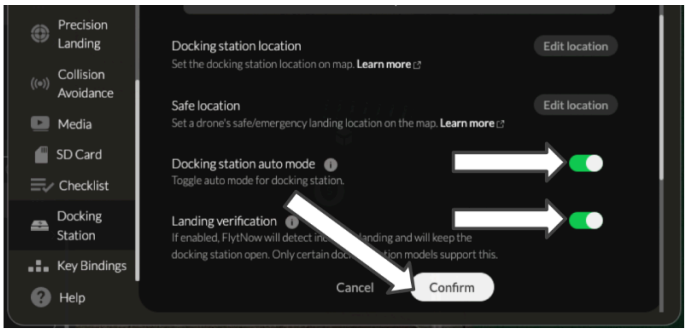
5. Edit safe location



- Place your unmanned aircraft in the safe physical location you desire for it to land
  OR
  Select an area on the map free of any obstructions, structures and trees[5]



6. Enable auto mode & landing verification, then select save changes.
   – Select the tab to enable (green) **Docking station auto mode**
   – Select the tab to enable (green) **Landing verification**
   Once all settings have been edited, you can **Confirm** changes.



[5] Use the satellite view to observe topography changes

Cloud Media Sync

FlytNow allows for seamless synchronization of unmanned aircraft media to personal cloud storage, ensuring operator privacy and convenience.

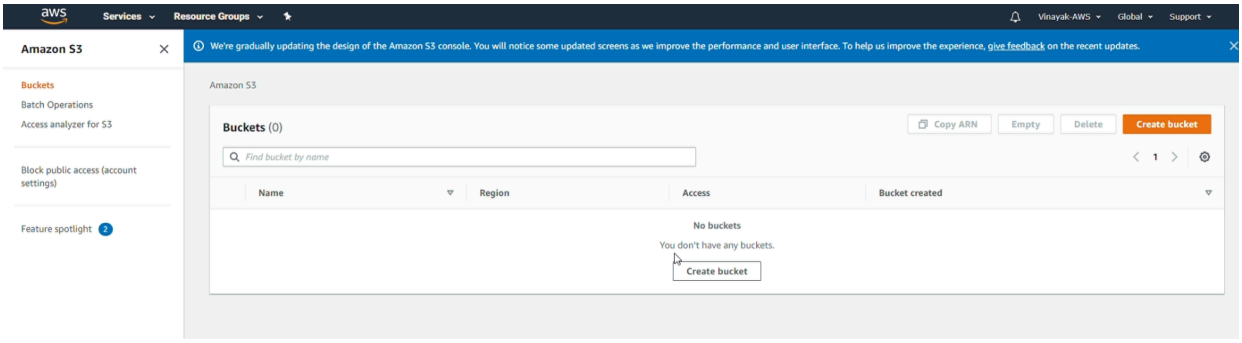
Private Cloud Storage

FlytNow allows the operator to integrate their own private cloud storage for archiving unmanned aircraft videos and images. FlytNow does not maintain any copies of the user's unmanned aircraft videos to ensure privacy. To save and replay videos and images, the operator has to set up an AWS S3 bucket.

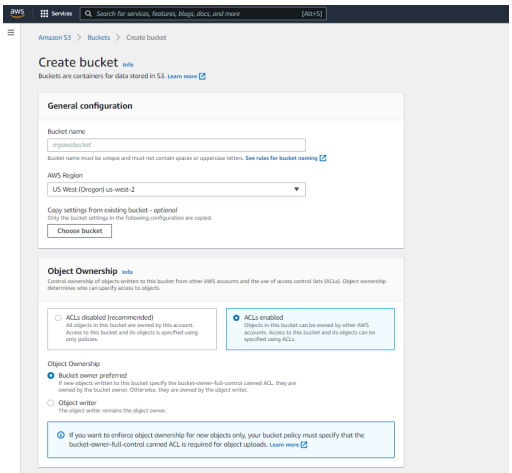
AWS S3 Setup

1. Sign in or create an AWS account: https://aws.amazon.com/

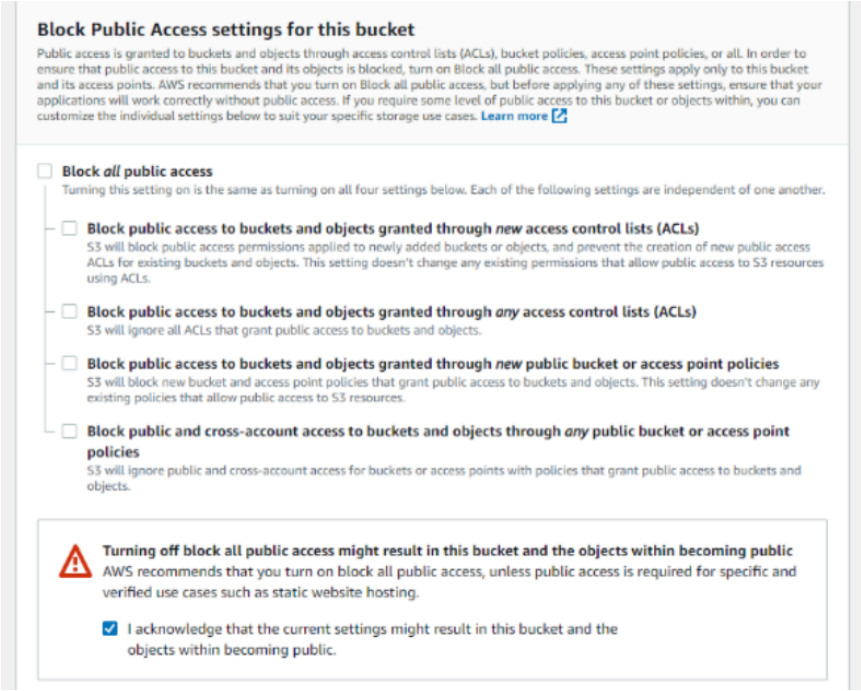
2. Go to the **Bucket** tab in the Amazon S3 console. Click on Create Bucket to create a bucket in the preferred region.



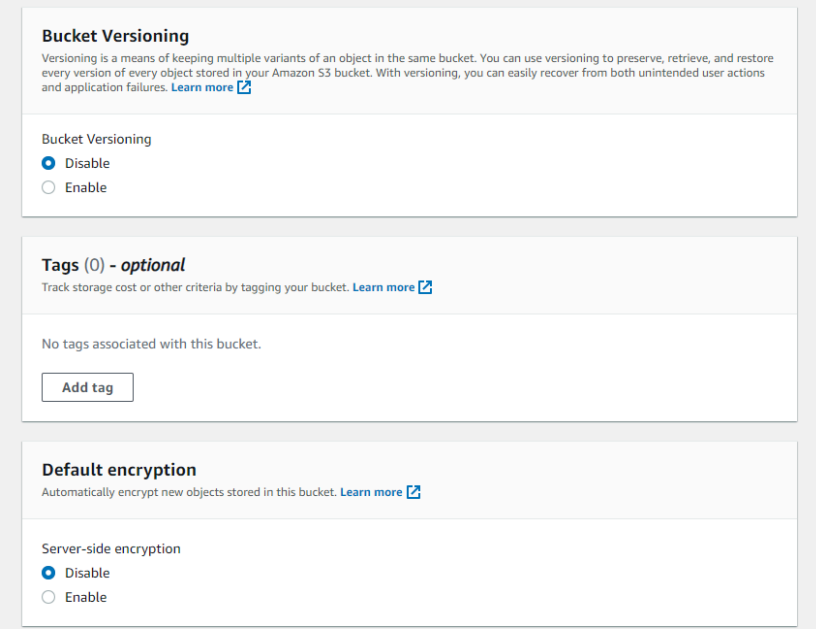
3. **Enable the ACLs** and select the object ownership to **Bucket owner preferred**.



4. Next, ensure that **Block all public access** is set to **off**.

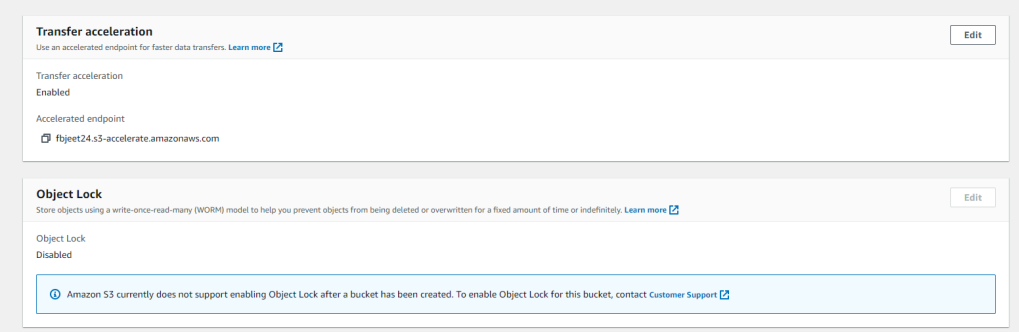


5. Ensure that **Bucket Versioning** and **Default Encryption** are set to **Disable**.



6. Now click on **Create bucket**.

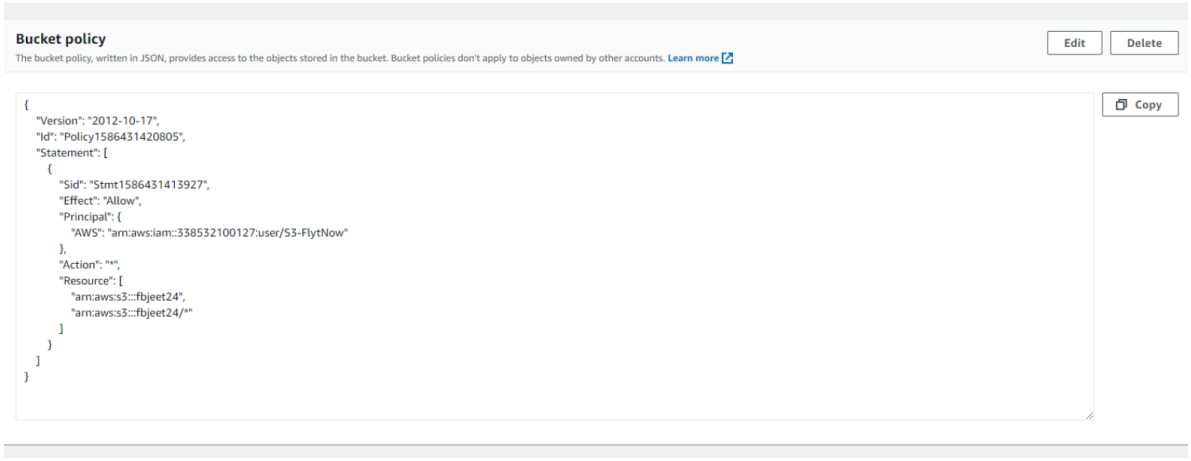
7. Once the organizer has successfully created the bucket, go to **Bucket Name> Properties > Enable Transfer acceleration**.



8. Now go to **Bucket Name > Permissions > Bucket Policy**. Paste the following JSON and replace the **Bucket_Name** with the actual name of the bucket.

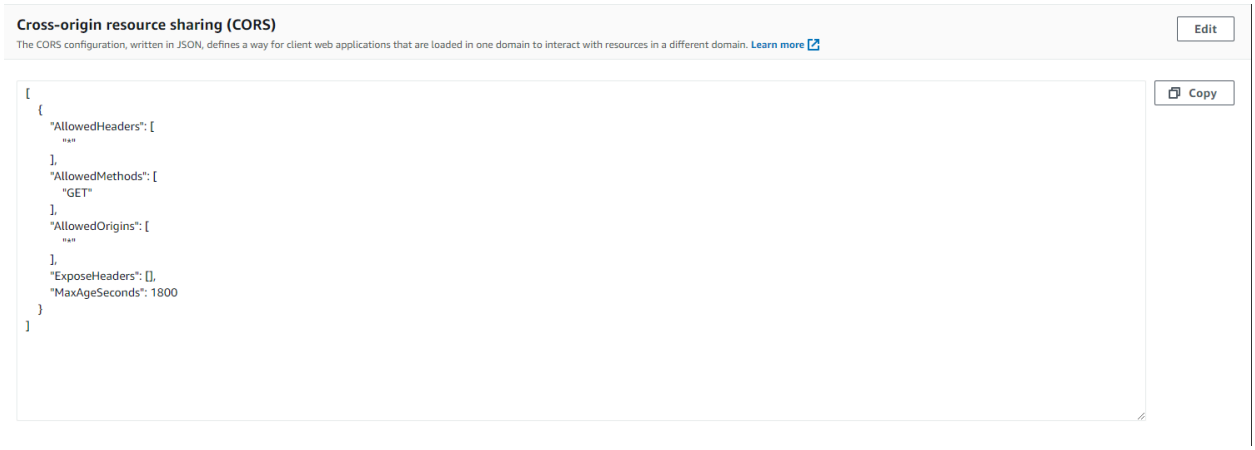
```
{
  "Version": "2012-10-17",
  "Id": "Policy1586431420805",
  "Statement": [{
    "Sid": "Stmt1586431413927",
    "Effect": "Allow",
    "Principal": {
      "AWS": "arn:aws:iam::338532100127:user/S3-FlytNow"
    },
    "Action": "*",
    "Resource": [
      "arn:aws:s3:::Bucket_Name",
      "arn:aws:s3:::Bucket_Name/*"
    ]
  }]
```

```
}
```



Finally, proceed to **Bucket Name > Permissions > CORS Configuration**. Paste the following array to update the **CORS configuration**.

```
[
    {
        "AllowedHeaders": [
            "*"
        ],
        "AllowedMethods": [
            "GET"
        ],
        "AllowedOrigins": [
            "*"
        ],
        "ExposeHeaders": [],
        "MaxAgeSeconds": 1800
    }
]
```

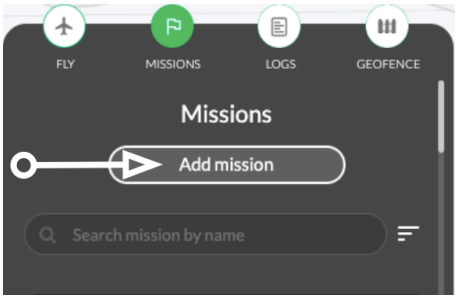


Once completed, please send the **S3 Bucket Name** with the **AWS region** over email to *support@flytbase.com*.

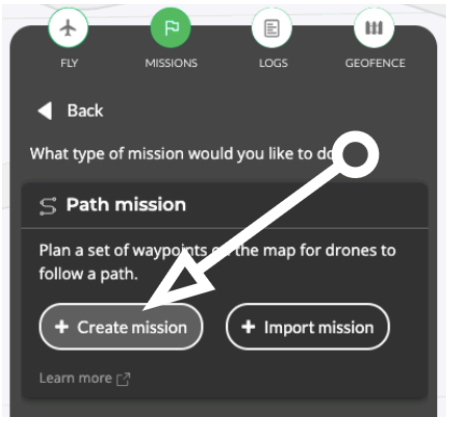
How To Create Missions

1. To begin flight operations, login to the FlytNow Dashboard. (Using your new username/password)

2. On the **Missions** tab, select **Add Mission**.

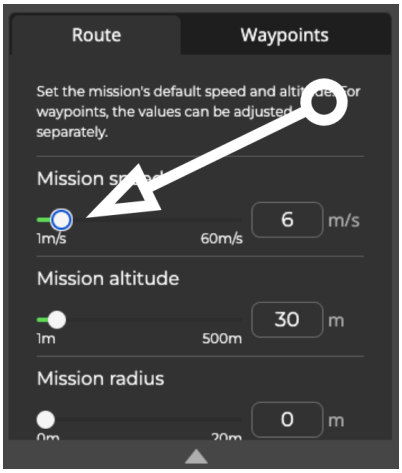


3. Select **Create Path Mission**.



4. Change **Mission speed** to **6m/s**[6].

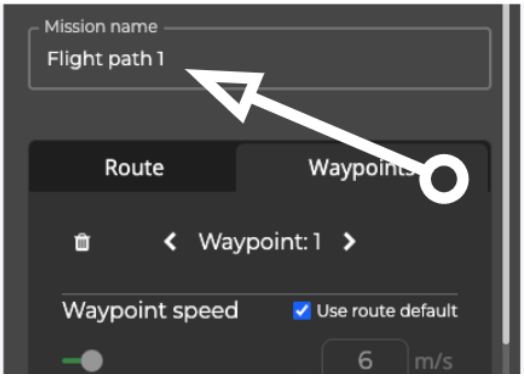
   * The maximum speed is 15m/s. Will not operate beyond that. 6m/s is a good start speed.



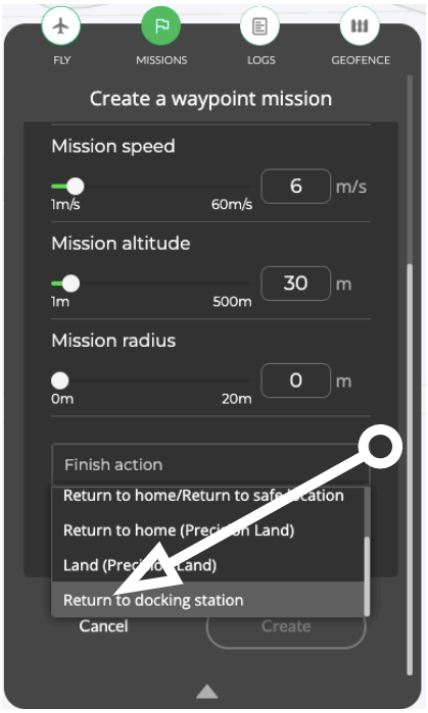
5. Raise the **Mission altitude** to **at least** 30m or more depending on your terrain[7].

[6] This is a safe entry-level speed at 13 mph
[7] Stay well above the treeline and topography changes

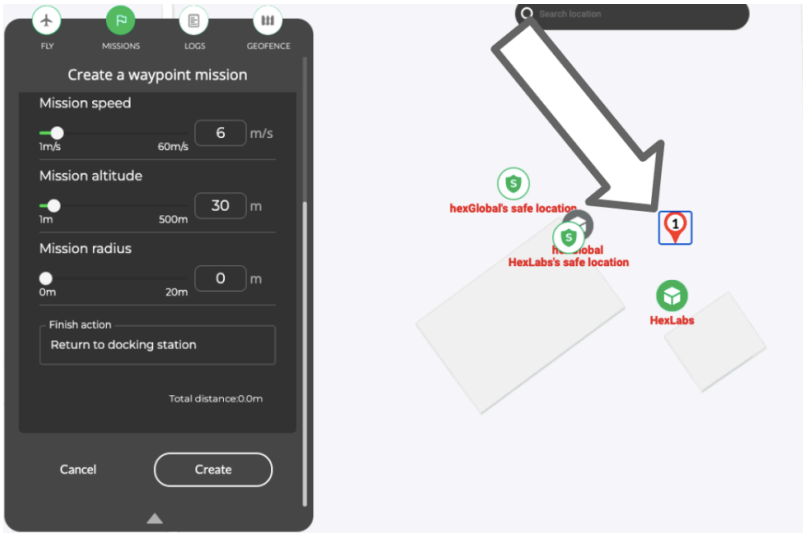
6. Name your mission.



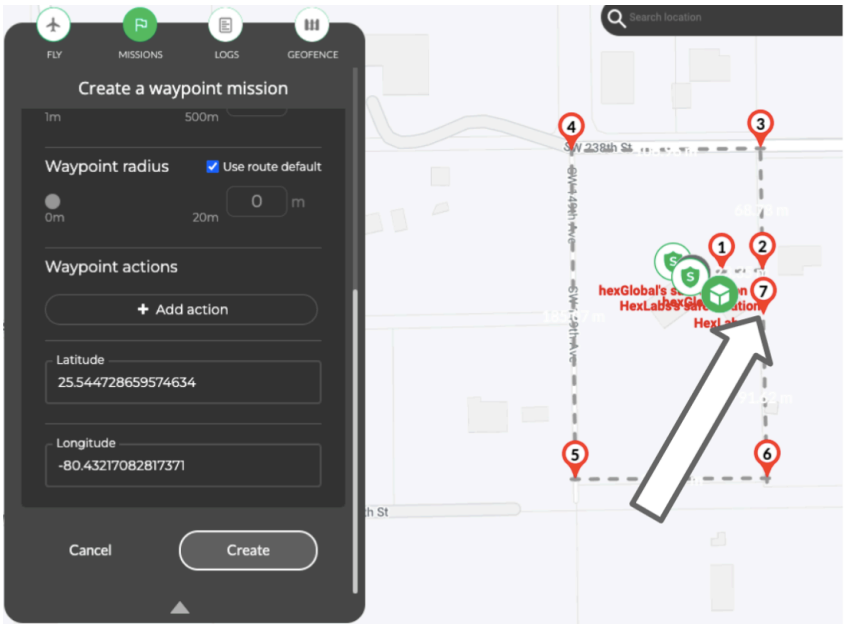
7. Scroll down and select **Return to Docking Station** from the **Finish action** drop down menu.



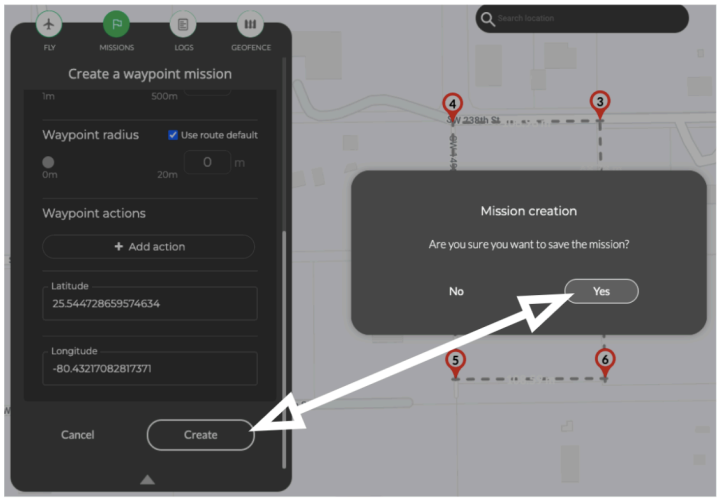
8. Make the first waypoint close to the docking station
    - **Note:** Click the map to add waypoints



9. Create your flight path using multiple waypoints
    - **Note:** Make the last waypoint near the docking station



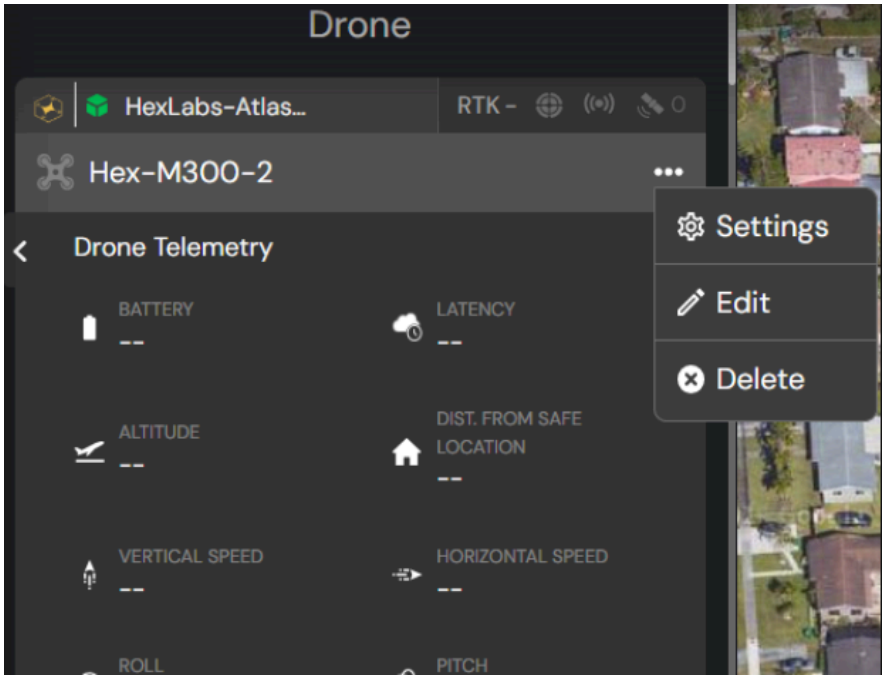
10. Select **Create** & Save mission after completing your flight route



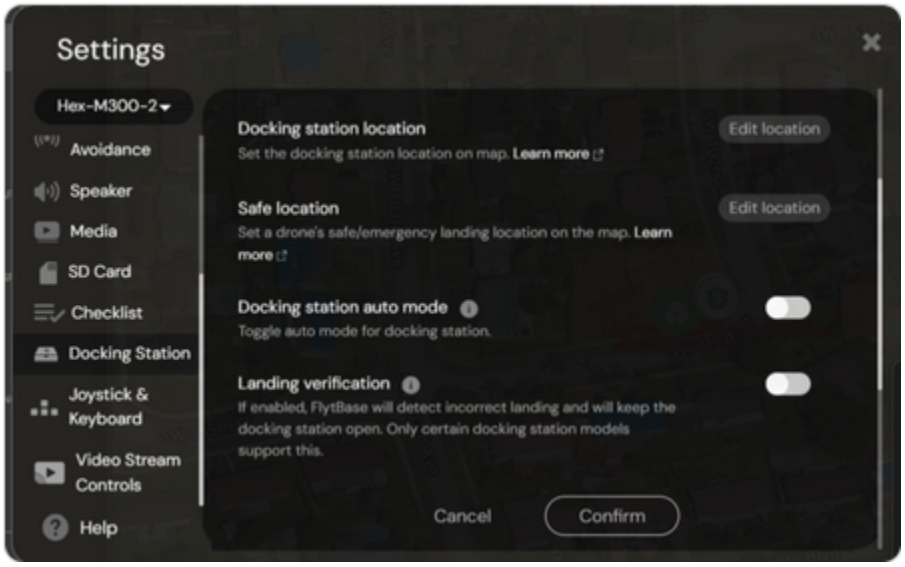
Mission creation is now complete. You can now find and edit your missions within the **Missions** tab on the dashboard.

How To Run A Mission On Non Auto

1. Once you have logged into Flytbase select your individual unmanned aircraft and click on the three dots in the upper right corner and select **Settings**.



2. Scroll down and select the **Docking Station** option.



3. On this tab you will have a **Docking Station Auto Mode** option. Select this option to toggle auto mode on and off.

How To Fly

Flight tips:

- Confirm that the station is powered ON. Although not required, power cycling the station beforehand can be beneficial for a fresh connection.
- Refresh FlytNow web browser at the start of operations
- Log onto the Hextronics Dashboard to confirm the station is online
- Priming before a flight will provide a quicker manual takeoff
- Always allow Pre-Flight Routine to complete
- Always allow Post-Flight Routine to complete before starting a new mission.
- Familiarize yourself with the flight area for obstacles and altitude changes before creating a mission.
- Flight waypoints should not bunch up too close to one another
- First and last waypoints should be near the docking station home location
- Use FlytNow utility window for station handling such as open/close, battery swap, etc

Photo/video action tips:

- For Capture image & Start Video waypoint action the unmanned aircraft will always face and capture towards the next waypoint.

Gimbal pitch action inputs:

- 0° looks directly forward
- -45° is a neutral forward/down view
- -90° looks directly down
- Adjust the value + or - for optimal pitch angle

WET Unmanned Aircraft emergency landing - (WITHOUT battery swap):

Use this FlytNow sequence via the Utility window & Flight Controls to dock the unmanned aircraft without any battery swapping operations - This is used if the unmanned aircraft has been rained on during a mission, in order to dock the unmanned aircraft without inserting the WET unmanned aircraft battery into the station charging slots.

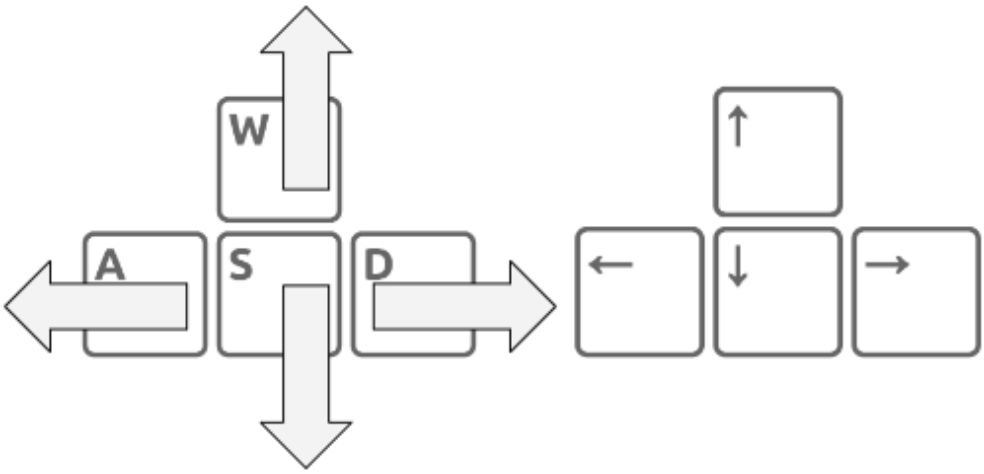
- Select Abort current mission
- Manually fly the unmanned aircraft over the docking station / OR /Select RTDS and select Abort again when the unmanned aircraft is nearly above the docking station to cancel the sequence
- Select Open Enclosure to open the pad
- Select Precision Land when the unmanned aircraft is above the station
- Select Close Enclosure once the unmanned aircraft has safely landed and is positioned on the pad

Note: This sequence will prompt the unmanned aircraft to land on the pad and be inserted into the station for housing but NOT proceed to remove the wet battery from the unmanned aircraft for battery swap operations.

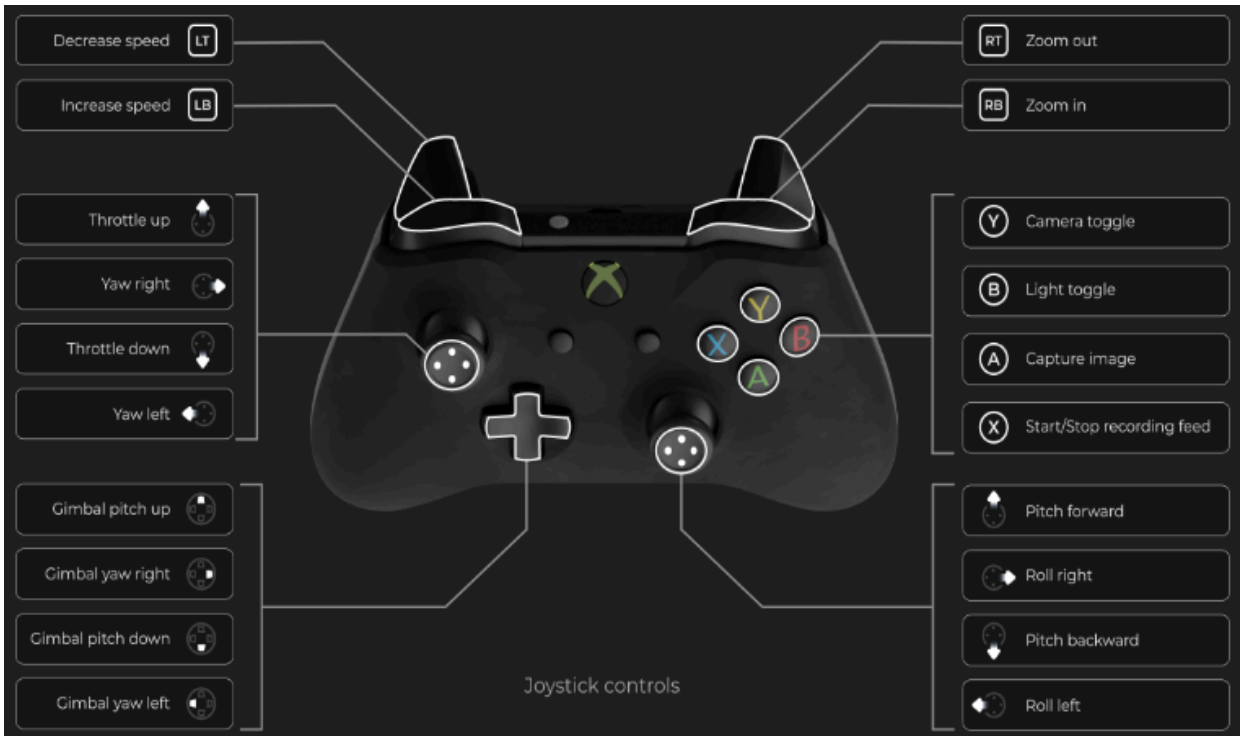
Take manual control:

Please reference the 3 manual control options below.

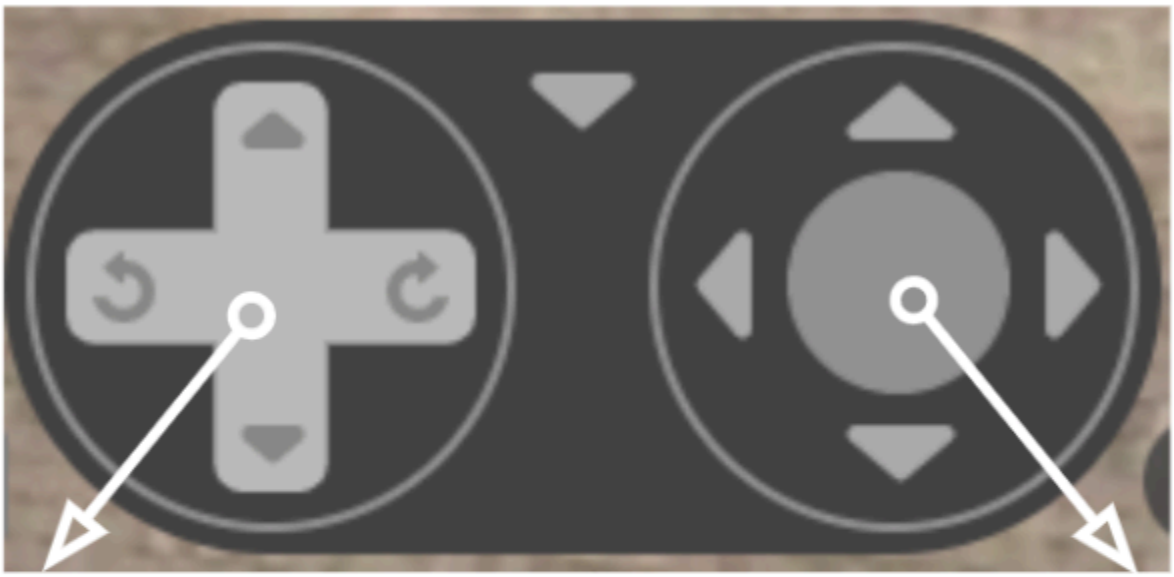
1. Keyboard
   - Keyboard controls:



2. XBOX controller
   - XBOX controls:



3. On-screen
   - Take manual control mid-flight in the unmanned aircraft FPV view by clicking the **Joystick icon** (middle bottom of the FlytNow screen)
   - Click the icons to change method of control (Keyboard / On-screen / External controller)
   - Select **Resume/abort** mission to continue (bottom right toolbar)
   - Select **Return to the docking station** to land the unmanned aircraft
   - On-screen controls:



Drone Control

- Pitch forward
- Pitch backward
- Yaw left
- Yaw right

Gimbal Control

- Pitch up
- Pitch down
- Yaw left
- Yaw right

Maintenance

This section describes the maintenance procedures for the Universal and Mavic 3 Unmanned Aircraft

Maintenance Introduction

Hextronics Universal, as deployed as part of a larger fleet, are subject to wear and tear from normal use. This maintenance/inspection manual is designed to extend and conserve the lifespan of the products in use. This maintenance/inspection manual does not promise or guarantee the products to be free from defects, damages, and errors.
This checklist is designed to suit the needs of routine maintenance check-ups and can be applied as frequently as necessary, but it is most efficient to perform maintenance on a per-flight basis, rather than a set time frame.
Proper operation, scheduling and maintenance of the unmanned aircraft & the station will result in increasing the lifespan and longevity of both the station and the unmanned aircraft. Regularly perform the inspections to ensure all systems are in working order and that any repairs or replacements can be addressed before the next flight.
Check that you have the following equipment on hand before maintaining the unmanned aircraft and the station: Anti-static cloth, small cleaning brush (for tight crevices), Compressed air canister (air duster), Anti-static wristband Electrical Contact Cleaner.

CAUTION

Always ensure the use of proper protective equipment when engaging with Hextronics or DJI components. Both unmanned aircraft stations and aircrafts incorporate a range of electrical and mechanical components, which, if mishandled, could pose risks. Prior to any interaction involving handling, operation, maintenance, inspection, or servicing of Hextronics or DJI devices, verify that all devices and components are disconnected from power sources and not actively operational.
Recommended protective equipment includes closed-toed rubber shoes (for electrical grounding to prevent electric shock) and protective gloves, including electrically insulated ones, to safeguard hands from potential injuries such as cuts, scrapes, and shocks. Additionally, it's strongly advisable to utilize impact-resistant goggles or safety glasses to protect your eyes during any activity related to operating, handling, maintaining, servicing, repairing, or inspecting these devices.
Should you have any inquiries, concerns, or uncertainties, please don't hesitate to consult the Hextronics or DJI support teams prior to commencing any tasks involving inspection, maintenance, servicing, operation, or handling. You can reach out to them via the provided email below. Your safety and the proper handling of these devices are of paramount importance. *Support@Hextronics.Tech*

DASHBOARD & SOFTWARE MAINTENANCE/INSPECTION

This document outlines the inspection and maintenance guidelines for DIAB operacions. It provides details on categorizing areas, determining inspection frequency, and ensuring the reliability of equipment.

In case of any queries or concerns, do not hesitate to reach out to our support team. Remember to exercise caution and use protective equipment when operating hardware and electrical components.

Inspection and maintenance check frequency description	
Low	Reserved for areas posing minimal danger, requiring infrequent inspection as they are non-critical to operation. (Inspected approximately every 6–12 months)
Medium	Designated for areas needing slightly more inspection than low-risk zones, considering potential issues that may not be critical but warrant regular checks. (Inspected approximately 2-3 months)
High	Allocated for areas with a higher likelihood of requiring attention; frequent inspection is essential due to the critical nature of potential issues that may arise. (Inspected approximately every on site operation or at a minimum once a month)

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305-420-6395

#	Part	Maintenance Description	Frequency (Low, Med, High)
	Dashboard Online	● Enter the Hextronics URL to access the station dashboard ● Confirm that the QR link associated with the station is associated correctly to the correct unit (Test light on/off)	High
	Battery slot status & placement	● In the advanced menu page of the dashboard verify that the battery slot status for the slots you want to use are visible and enabled. ● Also, test that each of the slots (1-4) are all showing the correct occupancy status (empty/occupied) . ● Test that each battery slot (1-4) changes status correctly when inserting a battery manually to each slot, this is to confirm the limit switches are functional.	High
	HVAC PWM	● PWM should be set at a value of 7000	Low
	Lights	● Confirm interior lights illuminate when activated	Low
	Pad	● Confirm pad activates when activated. ● Confirm that the pad stops at the full range of motion in open and close command without attempting to continue moving at end of range. ● Confirm pad movement is smooth and without audible resistance	High
	Power drone toggle	● Ensure PDT turns the battery on/off when actuated ● Ensure the pointer finger runs directly over the drone battery button (Adjust offsets if required) ● Ensure the PDT is not too aggressively pressing down on the drone	High
	Battery swap	● Ensure battery swap works normally (Adjust offsets if required) ● Confirm that the gripper grabs the battery firmly on the battery buttons and remove the battery from the drone smoothly ● Confirm the battery insert into battery rack is accurate ● Ensure battery rack status 1-4 reflects correctly of the inserted battery ● Confirm insert back into the drone is accurate and without audible resistance	High

	Enable Cooler	• Test the HVAC by enabling the “Cooler” button and confirm the HVAC compressor turns on and provides cold air	Med
	RC Solenoid	• Confirm that the RC solenoid triggers when the command is sent in the dashboard • Confirm that the RC solenoid turns on/off the drone everytime its triggered	Med

STATION HARDWARE MAINTENANCE/INSPECTION

This document outlines the inspection and maintenance guidelines for DIAB operacions. It provides details on categorizing areas, determining inspection frequency, and ensuring the reliability of equipment.

In case of any queries or concerns, do not hesitate to reach out to our support team. Remember to exercise caution and use protective equipment when operating hardware and electrical components.

Inspection and maintenance check frequency description	
Low	Reserved for areas posing minimal danger, requiring infrequent inspection as they are non-critical to operation. (Inspected approximately every 6–12 months)
Medium	Designated for areas needing slightly more inspection than low-risk zones, considering potential issues that may not be critical but warrant regular checks. (Inspected approximately 2-3 months)
High	Allocated for areas with a higher likelihood of requiring attention; frequent inspection is essential due to the critical nature of potential issues that may arise. (Inspected approximately every on site operation or at a minimum once a month)

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#	Part	Maintenance Description	Frequency (Low, Med, High)
	Exterior shell	● Confirm the exterior shell is intact and without any damage that may allow water to pass through the main body of the shell. ● Verify that the exterior shell can be easily removed ● Confirm that the exterior shell lock	Low
	Gandalf	● Inspect that all Gandalf JST connections are firmly in place, free of damage, rust, exposed wiring or loose pins. ● Add non conductive glue to JST connections if loose connections are a recurring problem. ● Inspect that 4 pin motor cables are firmly in place, free of damage, rust, exposed wiring or loose pins. ● Confirm that both DC power connections (12/24) are secure on the Gandalf and free of damage, rust or exposed wiring. ● Confirm that micro usb connection is free or damage or exposed wiring and firmly in place on the gandalf (Micro usb connection plug is a delicate area)	High
	Raspi	● Confirm that the Raspi case is intact and firmly in place protecting the Raspi board. ● Confirm that the ethernet cables are firmly inserted ● Confirm that the Raspi ethernet port is illuminating green/orange LED lights when connected to an active ethernet cable with active internet connection ● Confirm that USB cable is secure and in good condition ● Confirm that Raspi	
	Router	● Inspect router ethernet connections to be in place and in good condition ● Inspect router power connections to be in place and in good condition	
	Network switch	● Inspect switch ethernet connections to be in place and in good condition ● Inspect switch power connections to be in place and in good condition	
	Aircraft Remote Control	● Verify that RC turns on/off every time when the “enable RC” command is sent ● Confirm that the RC charges correctly by inspecting the battery indicator on the top right corner of the screen.	

		• Confirm that the RC is receiving wired internet connection and not WIFI, inspect the ethernet adapter. • Confirm that the RC screen is operational and that you can maneuver throughout the desktop • Confirm that the RC settings for the flight software are correct and automatically opening when the RC is turned on (See Hextronics support)	
	Battery Brace	• Confirm charging functionality in all four slots. • Ensure the battery brace is rigid and not sloping down	Low
	Landing Pad hardware	• Ensure the landing pad is free from dirt or debris. • Thoroughly examine the surface for scratches or damage. • Check the landing pad rail system to confirm clean and light lubrication. • Confirm the Aruco marker is in good, clean condition with no damage. • Ensure the front panel extends outwards when the pad is fully open • Ensure the interior sealant door closes flush when the pad is fully open.	High
	Power cable & port	• Ensure power cable & port are clear of rust, damage, or debris on all ends.	Med
	Ethernet cable & Port	• Ensure ethernet cable & port are clear of rust, damage, or debris on all ends. • Ensure that the ethernet extension pill is sealed.	Med
	HVAC Coils	• Ensure the HVAC is producing cold air. • Use compressed air to blow out debris and clean HVAC coils.	Low
	Antenna Mounts	• Ensure that the antennas are tight and secure on router and antenna adapter	Low
	Landing Pad Belts	• Confirm the belt is not loose. • Ensure the belt is in the proper orientation facing inwards towards the pulleys. • Confirm no missing teeth or ribs.	Med
	Landing pad motor	• Confirm the DC motor is in good condition without rust. • Verify the motor actuates in both directions when prompted.	Med
	Landing pad couplers, rods & pulleys	• Confirm motor rods, couplers, and pulleys are not slipping during motor actuation. • Confirm each coupler & pulley has all set screws present, inserted with loctite.	Med

	Stepper Motors & DC motor	● Confirm motors are in good condition without rust, damaged hardware/cables. ● Verify the motor actuate when prompted, and without sound of resistance. ● Ensure the JST connections are firmly secured onto each stepper motor	Med
	Limit switches	● Inspect that the metal level on the limit switch is in good shape. ● Confirm each limit switch is working correctly and stopping actuation according to commands: 1. Pad out: 2. Pad in: 3. Gripper: 4. X: 5. Y: 6. Z: 7. D:	High
	Gripper	● Ensure the gripper opens and closes correctly. ● Confirm the gripper firmly grabs the battery when closed. ● Check gripper rubber pads for wear.	High
	HVAC Fan	● Confirm the internal fan is blowing air out the vent, and blowing cold air when the cooler is enabled.	Low
	Weather Seal	● Confirm the weather seals are in good condition and effectively seals the station when closed.	Low

Unmanned Aircraft Maintenance

Use the resources below in order to maintain your Mavic 3 Unmanned Aircraft

DJI Mavic 3 Official Maintenance link

https://dl.djicdn.com/downloads/DJI_Mavic_3/DJI_Mavic_3_User_Manual_v1.0_en.pdf

LED Indicator chart

The Mavic 3 Unmanned Aircraft features front LED aircraft status Indicator lights. Below is a diagram with the position of the LED lights on the aircraft & a description of each light pattern.

⚠ If any WARNING indications are made during flight operations - Immediately cease flight, safely land the unmanned aircraft, and contact support.

Aircraft Status Indicator States

Normal States			
R G Y ·····	Alternating red, green, and yellow	Blinks	Turning on and performing self-diagnostic tests
Y ×4 ·····	Yellow	Blinks four times	Warming up
G ·····	Green	Blinks slowly	GNSS enabled
G ×2 ·····	Green	Periodically blinks twice	Vision Systems enabled
Y ·····	Yellow	Blinks slowly	NO GNSS or Vision Systems
Warning States			
Y ·····	Yellow	Blinks quickly	Remote controller signal lost
R ·····	Red	Blinks slowly	Low battery
R ·····	Red	Blinks quickly	Critically low battery
R ·····	Red	Blinks	IMU error
R ——	Red	Solid	Critical error
R Y ·····	Alternating red and yellow	Blinks quickly	Compass calibration required

Unmanned Aircraft Calibration

Only calibrate the compass if the DJI pilot APP instructs you to do so. Follow the guidelines below for a proper compass calibration process.

⚠ Do not calibrate the compass if there is a strong magnetic field such as a parking structure, structural buildings, powerlines or antennas. Make sure not to carry any items that may cause electromagnetic interference, such as cellphones or smart watches. The DJI pilot app will notify you in the case of magnetic interference.

Calibration process

1. Download and open the DJI pilot app, select the aircraft status bar, then select calibrate. From this point please follow the app instructions for the compass calibration process.

2. When prompted on the DJI pilot app, hold the aircraft horizontally as seen in the diagram below and rotate it 360 degrees on its axis. The aircraft LED indicators go solid green when done correctly and red if incorrectly.

3. When prompted by the DJI pilot app, hold the aircraft vertically as seen in the diagram below, and rotate it 360 degrees on its center axis. Re attempt if the LED indicator is blinking red.

Note: If your aircraft blinks red & yellow after completing the calibration process please change locations and try again, it is likely that the calibration process was not successful due to magnetic interference interrupting the calibration process.

Vision Sensor Calibration

The Vision System cameras installed on the aircraft are factory calibrated. If the aircraft experiences a collision or the working temperature has changed significantly, it may require calibration to the Vision System.

HVAC LED Code Troubleshooting

In the event of an HVAC error, please verify the number of LED flashes on the HVAC board as seen below, and compare the number of flashes to the chart below for a description of the error.

LED Flashes	Error	Description
1	Short or output over-current	The driver will alarm over current failure when the peak value of output current is larger than 30A, and stop the output. The driver will restart in 3 mins. The driver will lock if there are more than 7 times the current within 1 hour.
2	Motor stall	The motor will stop the output and alarm if the motor stalls. The driver will attempt to run after 3 minutes.
3	Temperature sensor failure	The driver will shut off if the temp tensor is not detected.
4	MOSFET over temperature	Stop the output if the MOSFET temp reaches 105°C Will restart when the temp of PIM reduces to 85°C If over temp is detected the driver will stop and re-attempt after 3 minutes.
5	V_BUS low voltage	The driver will alarm and stop the output if detected under 19v and will restore when output is over 20v for over 3 minutes
6	V_BUS over voltage	The driver will alarm and stop the output when V_BUS is higher than 33v and will restore when V_BUS is lower than 32v and last more than 3 minutes.
7	Lack phase	The driver will alarm and stop the output if disconnecting between the driver and the compressor. The drive will re-attempt after 3 minutes.

Troubleshooting & Repair

This section describes the troubleshooting and repair process for the Universal

Universal Troubleshooting and Repair Introduction

If you encounter any problems with your Universal Unmanned Aircraft Station or have inquiries or worries, please reach out to your assigned Hextronics support contact. Alternatively, you can connect with us for help by emailing support@hextronics.tech.

Warranty

This section includes the Universal warranty

Hextronics Universal Unmanned Aircraft Station

Manufacturer's Warranty

This Limited Warranty applies only to physical goods, and only for physical goods, purchased from Hextronics LLC. STANDARD ONE YEAR MANUFACTURER WARRANTY: The manufacturer warrants this product to be free from defects in workmanship and materials, under normal use and maintenance, for a period of one (1) year from date of purchase. Shipping and handling fees are to be paid by the customer. The manufacturer agrees, as its option during the warranty period: ● To repair and replace any defective components without charge (except for a fee for shipping, handling, packing, return postage, and insurance which will be incurred by the customer). ● Such repair or replacement is subject to verification of the defect or malfunction and proof of purchase as confirmed by showing the Record of Purchase form with corresponding Model and Serial Number.

Manufacturer’s Limitations

This warranty does not include: ● Any condition resulting from other than ordinary residential wear or any use for which the product was not intended, such as use in rental or contract trade or commercial use ● Any condition resulting from incorrect or inadequate maintenance or care ● Damage resulting from misuse, abuse, negligence, accidents or shipping damage ● Dissatisfaction due to buyer’s remorse ● Normal wear and tear ● Damages incurred during transportation ● Damages incurred during assembly or maintenance ● Any used, previously displayed items The Company makes no express warranty or condition whether written or oral and the company expressly disclaims all warranties and conditions not stated in this limited warranty. To the extent allowed by the local law of jurisdictions outside the United States, the Company disclaims all implied warranties or conditions, including any implied warranties of merchantability and fitness for a particular purpose. For all transactions occurring in the United States, any implied warranty of condition of merchantability, satisfactory quality, or fitness for a particular purpose is limited to the duration of the express warranty set forth above. Some states or countries do not allow a limitation on how long an implied warranty lasts or the exclusion of limitation of incidental or consequential damages for consumer products. In such states or countries, some exclusions or limitations of this warranty may not apply to the Purchaser. For consumer transactions, the warranty terms contained in this statement, except to the extent lawfully permitted, do not exclude, restrict, or modify but are in addition to the mandatory statutory rights applicable to the sale of this Product to the Purchaser. All warranty claims must be filed by the consumer directly to the manufacturer. Please retain Record of Purchase for warranty purposes. CLAIM PROCEDURES: ● Claims for defective merchandise must be made within ONE year from the date of purchase. Claims for missing parts must be made within 60 calendar days after the merchandise is received ● Any claim for defective merchandise returns must be packaged in

original packaging ● We reserve the right to specify that items be returned to the original warehouse for inspection or be inspected by our representative in the field ● Pictures are required to claim defective merchandise, along with a Record of Purchase form. ● If the claim is justified, the item(s) or part(s) will be repaired or replaced.It is our policy to replace parts whenever possible. This warranty gives you specific legal rights. You may have other rights, which vary from state to state.

Conclusion

This section concludes the Universal User Manual

We hope that this user manual has provided you with all the necessary information to install, operate, and maintain your product successfully. Our goal is to ensure that your experience with our product is nothing short of exceptional, and we believe that this manual will help you achieve that. If you have any questions or concerns, please do not hesitate to contact our support team for assistance. Thank you for choosing our product, and we look forward to being a part of your success.
Thank you for using the Hextronics Universal Unmanned Aircraft Station.

Please contact Support@Hextronics.Tech for assistance & support.