USER MANUAL

DIODON HP30 SYSTEM

V2024.02.00

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VERSION INFORMATION

The DIODON HP30 system is continuously being improved. Therefore, new information is constantly added to match with the upgrades. Make sure you have the latest version of this document with your point of contact.

VERSION	DATE	COMMENTS
1.0	Nov. 2020	First version of the DIODON HP30 system manual
1.1	Feb. 2021	Release corrections
1.2	May. 2022	Edition of piloting interface
1.3	Oct. 2022	Consolidate changes and clarifications
2023.01.01	Mar. 2023	Update of the manual with the 23.01.01 release and update of the manual numbering
2023.04.00	May. 2023	Manual update to version 23.04.00 Added a note summarizing the changes between each version Added an appendix on the philosophy of alarm management
2023.04.01	Aug.2023	Manual update to version 23.04.01
2023.04.02	Sept.2023	Manual update to version 23.04.02
2023.04.03	Nov.2023	Manual update to version 23.04.03
24.02.00	Feb.2024	Manual update to version 24.02.00

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Items	Comments
Items: All illustrations (Photos, 3D views)	Updated all illustrations in the user manual.
Items : Checklist Pré-vol **Page:** 38 and 57	Explanation of the new pre-flight checklist.
Items : Mode « Orbit » **Page :** 46	Explanation of a new flight mode: "Orbit".
Items: New feature **Page:** 59	Explanation of the adaptation of the communication loss time according to the distance of the system from the operator feature.
Items: New features **Page:** 61	Explanation of the new navigation LED lighting frequencies.
Items: New features **Page:** 65	Explanation of the new "Channel" change feature.
Items: New features **Page:** 75	Illustration of the new and updated Hystrix interface.
Items: New features **Page:** 80	Illustration of the new updated "Drone firmware" and "Drone parameters" interface.
Items: New features **Page:** 82	Explanation of the new Radio Update feature.
Items : Process de maintenance **Page :** 85/86/87	Explanation of the different maintenance actions: Preventive and Corrective.
Items: Alarm Management **Page:** 105	Improvement and simplification of alarm notification system.

TABLE OF CONTENTS

GENERAL SYSTEM OVERVIEW

This section identifies the different parts of the drone, controller and general equipment and accessories.

DIODON HP30 DRONE

PRESENTATION OF THE DIODON HP30 DRONE

The DIODON HP30 is a mini unmanned aerial system designed natively for maritime and aquatic environments.

Thanks to 5 years of operational feedback from end users and military first responders, the DIODON HP30 is a turnkey solution to improve situational awareness and decision-making from all types of boats, day and night.

The resistance of the system at sea, to most weather conditions, in tough environments and its high versatility enables it to meet a wide range of naval requirements for missions related to law enforcement at sea.

The DIODON HP30 flies for 30 minutes[1] and is equipped with a watertight 2-axis mechanically stabilized payload. It incorporates a high-resolution dual EO (real-time transmission in 1280x720 pixels) /IR (640x52 pixels) sensor to provide a high-performance detection, recognition, and operational identification capability[2].

It is strongly discouraged to equip third party sensors on the drone, at the risk of damaging the integrity or performance of the DIODON HP30 system[3].

FIGURE 1 – DIODON HP30 DRONE MODEL

[1] Optimised flight time. This autonomy may vary depending on conditions, configuration and usage.
[2] IR sensors are affected by surrounding conditions.
[3] DIODON DRONE TECHNOLOGY shall not be held liable for any consequence caused by a third-party equipment integrated on the drone.

LAYOUT OF THE COMPONENTS OF THE DIODON HP30 DRONE – TOP VIEW

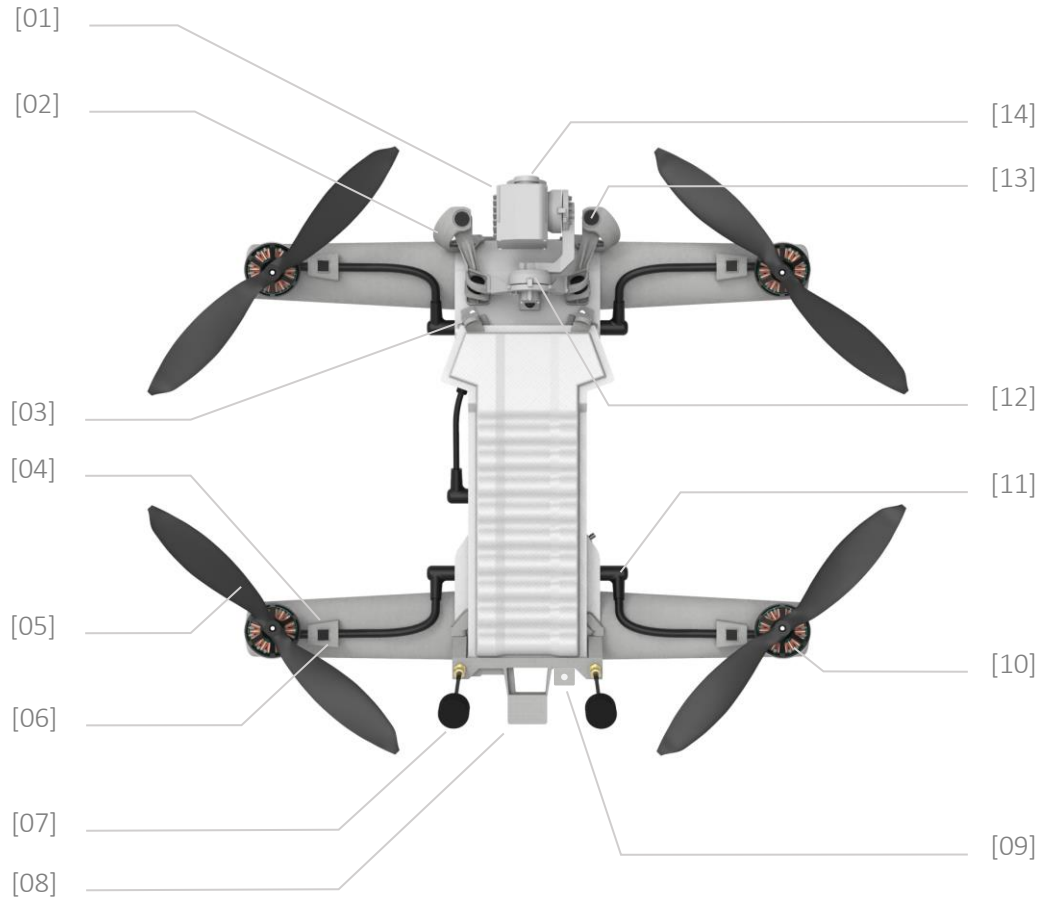


FIGURE 2 – TOP VIEW OF THE DIODON HP30 DRONE

[01]	Payload cooling radiator	[08]	GPS box
[02]	Stabilisation skids (Bracket and Gimbal Supports)	[09]	Position LED
[03]	Battery quick-release latches	[10]	Waterproof brushless motor
[04]	Inflatable structure / landing pad	[11]	Powertrain (or propulsion group) connector[4]
[05]	Propeller	[12]	Stabilization motor (roll)
[06]	Motor attachment system	[13]	Dampers
[07]	Communication/video antenna	[14]	EO/IR payload

[4] Military-grade connectors have a red dot on the connector and on the baseplate. To properly connect the two, the red dots must be facing one another.

LAYOUT OF THE COMPONENTS OF THE DIODON HP30 DRONE – BOTTOM VIEW

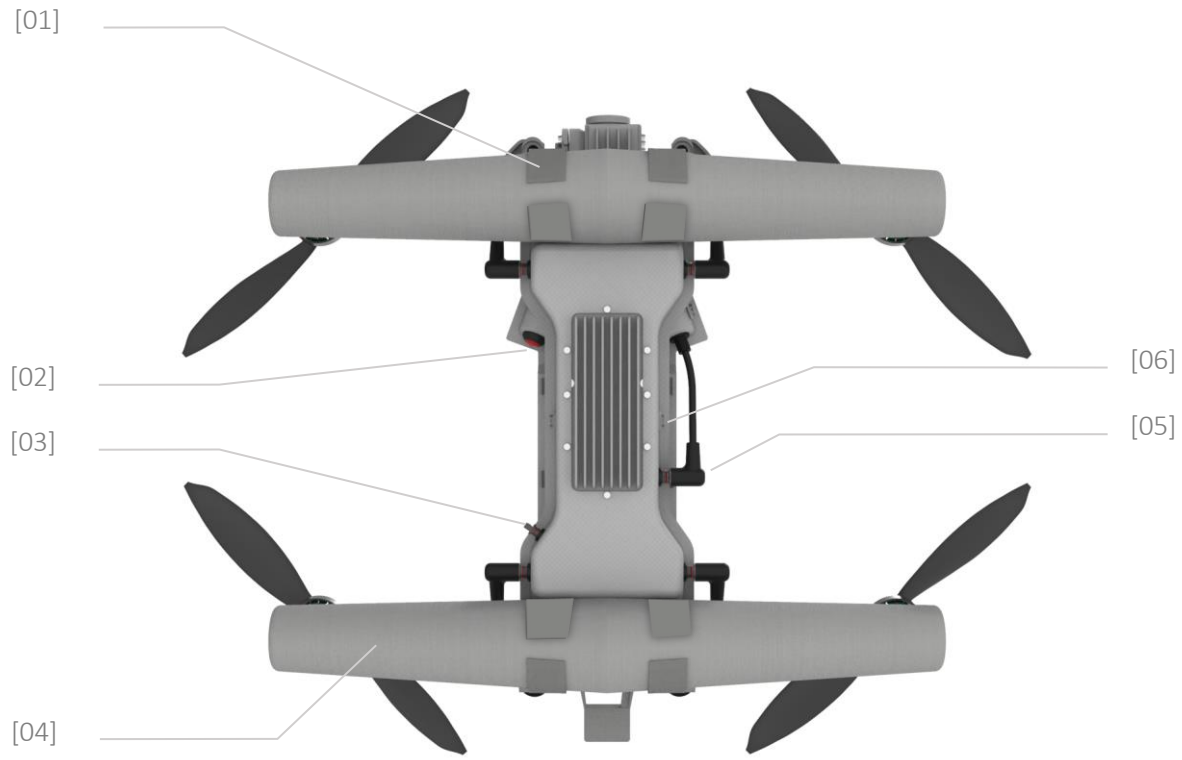


FIGURE 3 – BOTTOM VIEW LAYOUT OF THE DIODON HP30 DRONE

[01] Inflatable structure Velcro attachment
[02] Battery ON/OFF button
[03] USB mini - ODU plug-in
[04] Inflatable structure
[05] Battery connector
[06] Main case's cooling radiator

IP56+ EQUIVALENT PROTECTION

In standard use, the DIODON HP30 drone reaches an equivalent level of IP56+ protection when the device is equipped with the intelligent and waterproof batteries designed for this purpose. The DIODON HP30 is waterproof up to a Protection Index 56 (IP 56) level, which corresponds to :

5: Protection against dust and other microscopic residues.

6: Protection against heavy rain and partial immersion such as, but not limited to, submersion under waves.

Full or prolonged forced immersion may thus damage the drone.

To ensure this Protection Index, make sure that the main housing is in good structural condition, that all connectors are connected, and that the protective caps are plugged in. For example: all powertrain connectors, antennas, battery connectors or USB connector are either connected to the main enclosure or have a cap).[5]

This equivalence of protection index is an estimate made following numerous tests carried out by DIODON DRONE TECHNOLOGY[6].

PROPELLERS

The DIODON HP30 uses specially selected propellers to maximize flight performance while maintaining minimal noise.

The flight altitude limit is the maximum height at which the aircraft can normally fly when wind speed does not exceed 25 knots in sustained wind and 27 knots gust. Please note that the aircraft's braking and acceleration capabilities are reduced when the aircraft is close to the altitude limit in flight and in the presence of strong winds. The maximum altitude in standard operational conditions is set at 2200m AMSL (Above Mean Sea Level).

To ensure the integrity and durability of your DIODON HP30 drone, use only propellers approved by DIODON DRONE TECHNOLOGY and do not combine multiple types of propellers.

Before each flight, make sure the propellers are securely attached to the engines and are in good condition to allow nominal operation.

Never touch spinning propellers or motors. Doing so may result in heavy injuries.

[5] Any exposure to water of a damaged system could lead to short to long term damage of the system.
[6] It is not linked to a certification carried out to IEC 60529 standards. The estimate of this protection index may not be permanent and may decrease over time after a long period of use or depending on the use of the system.

DIODON GCS MK.2

PRESENTATION OF THE DIODON GCS MK.2 CONTROL STATION

The DIODON GCS Mk.2 remote controller is provided inside the system, each drone being paired with a specific remote controller. This smart controller was designed specifically to operate the DIODON HP30 drone. As such, it is completely waterproof and is designed to be user-friendly for a use in tough environments.

The DIODON GCS Mk.2 is designed around a 10.1-inch integrated touch screen, capable of providing an image with a resolution of 1024x600 pixels, with joysticks, buttons and switches specified for use with gloves and with relatively low sensitivity. It operates on a Linux system with many possibilities and has a maximum operating time of 180 minutes[7] with the built-in battery.

Capable of operating in all weather conditions, DIODON GCS Mk.2 has an equivalent IP67[8] protection rating thanks to its design.

The DIODON HP30 system was made to operate between 2 to 3 nautical miles. This operating range may be best reached in a barrier-free and electromagnetic interference-free area at an altitude above 300ft[9].

To avoid transmission interference, do not operate more than three devices in the same area.

FIGURE 4 – MODEL OF THE DIODON GCS MK.2

[7] The maximum operating time has been estimated in the laboratory at room temperature and is provided for reference.
[8] This specification is not certified and is dependent on the proper connection/protection of the different ports.
[9] Surrounding conditions may affect performances.

CONTROL OF THE DIODON GCS MK.2 – FRONT VIEW

FIGURE 5 – TOP VIEW OF THE DIODON GCS MK.2

[01] Telemetry/Video Antennas
Operates in 2.4 GHz.

[02] Engine shutdown button (left)
Press the left and right stop buttons twice simultaneously to manually stop propulsion.

[03] GNSS receiver

[04] Left joystick
In Mode 2:
- Throttle = Haut/Bas
- Yaw = Left/Right

[05] Flight mode switch 3 positions
3 Manually available flight modes:
1. ALT Mode (AltCtl),
2. GPS Mode (PosCtl),
3. Return mode.

[06] USB 3.0 Port[12]
To import/export data[13].

[07] RJ-45 Port[10]
To broadcast the screen view.

[08] Battery charging port[11]
To charge the controller before and/or during use.

[09] ON/OFF power button

[10] Right joystick
En Mode 2:
- Pitch = Up/Down
- Roll = Left/Right

[11] Engine stop button (right)
Press the left and right stop buttons twice simultaneously to manually stop propulsion.

[12] Integrated screen
10" one-touch screen display in 1024 x 600 pixels.

[10] Connect protection cap when not in use to ensure waterproof level.
[11] Connect protection cap when not in use to ensure waterproof level.
[12] Connect protection cap when not in use to ensure waterproof level.
[13] The DIODON GCS Mk.2 is not connected online, nor does it have Bluetooth options.

LAYOUT OF THE CONTROLS OF THE DIODON GCS MK.2 – REAR VIEW

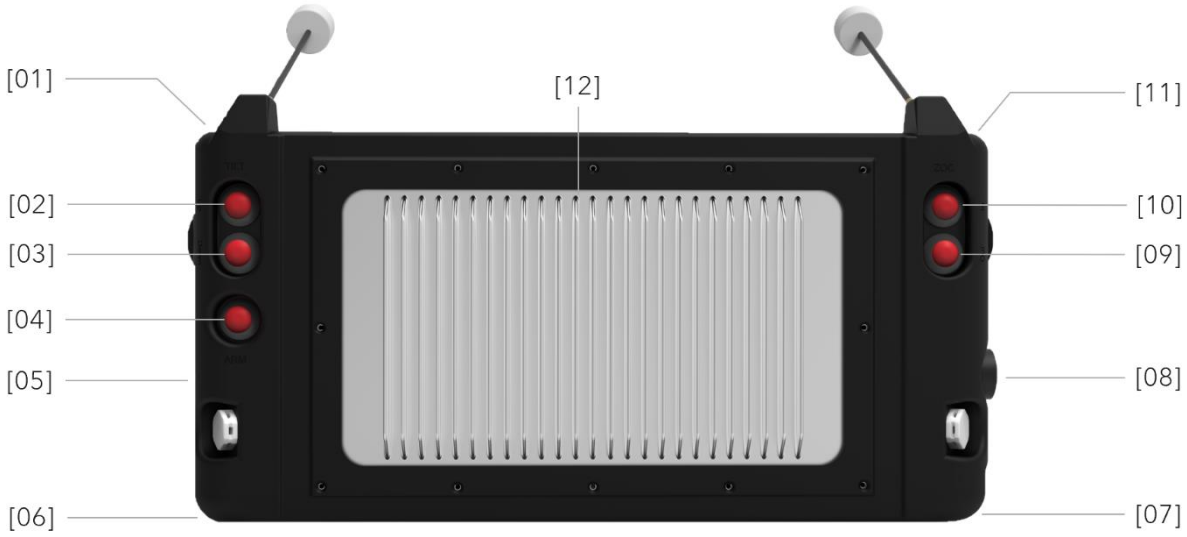


FIGURE 6 – REAR VIEW OF THE DIODON GCS MK.2

[01] Engine stop button (right)
Press the left and right stop buttons twice simultaneously to manually stop propulsion.

[02] Gimbal orientation button (Tilt Down)
Payload orientation downwards.

[03] Gimbal orientation button (Tilt Up)
Payload orientation upwards.

[04] Arm button
Arm the drone.

[05] ON/OFF power button

[06] Battery charging port

[07] RJ-45 Port
To broadcast the screen view.

[08] USB 3.0 Port
To import/export data[14].

[09] Zoom out button
Zoom out with the payload.

[10] Zoom in button
Zoom in with the payload.

[11] Engine shutdown button (left)
Press the left and right stop buttons twice simultaneously to manually stop propulsion.

[12] Controller cooling radiator

[14] The DIODON GCS Mk.2 is not connected online, nor does it have Bluetooth options.

DIODON HYSTRIX PILOTING INTERFACE

PRESENTATION OF THE DIODON HYSTRIX PILOTING INTERFACE

In order to collect and display information to maximize situational awareness and decision-making for all-sized boat, DIODON DRONE TECHNOLOGY has developed its own natively "maritimized" piloting interface: DIODON HYSTRIX[15]. The basic control functions remain accessible via the physical control interface.

FIGURE 7 – OPERATIONAL DISPLAY OF DIODON HYSTRIX

The DIODON HYSTRIX software is directly integrated into the supplied DIODON GCS Mk.2[16]. Once the controller is turned on, the control interface will be automatically launched[17].

[15] DIODON DRONE TECHNOLOGY has specially designed the DIODON HYSTRIX interface to match the DIODON GCS Mk.2 controller, and vice versa. DIODON DRONE TECHNOLOGY will not be held responsible for third-party software that would be installed in addition.
[16] DIODON Drone Technology is not responsible for the functionality or compatibility of third-party applications.
[17] Changes to the software provided without the express written consent of DIODON DRONE TECHNOLOGY is strongly discouraged.

GENERAL LAYOUT OF THE DIODON HYSTRIX CONTROL INTERFACE

FIGURE 8 – THE FEATURES OF THE DIODON HYSTRIX INTERFACE

[01] Advanced menu button
[02] EO/IR Camera Switch
[03] IR display configurations
[04] Controller lock-in-position
[05] Map-level zoom-out
[06] Basemap zoom level
[07] Map-level zoom-in
[08] Measuring tool
[09] Projection of the camera footprint on the ground
[10] Secondary screen display
[11] Payload opening and tilt angle
[12] Controller battery level estimation
[13] Map scale
[14] Drone-centred locked map button
[15] Orientation and wind speed estimator
[16] Main screen display
[17] Notification panel button
[18] GUI (Graphical User Interface) hide button
[19] Brightness selector
[20] Checklist/Mission parameters
[21] Fast payload view reset button
[22] Record/stream button
[23] Picture taking button
[24] GPS coordinats display
[25] Quality of the radio link
[26] Drone battery voltage
[27] Number of satellites detected
[28] Distance between Drone and the return point
[29] Height of the drone
[30] Drone's speed
[31] Drone orientation and return home
[32] Drone battery power estimation (in %)
[33] Flight mode display & selector
[34] Drone's arm/disarm button
[35] Drone battery power estimation (in min)

THE BASIC FUNCTIONS OF THE MAIN SCREEN OF THE PILOTING INTERFACE

[01] **Advanced menu**

Press the "advanced menu" button to access the advanced menu.

[02] **EO/IR Camera Switch**

Appuyez sur le bouton « commutateur de caméra EO/IR » pour passer d'une vue de capteur électro-optique à une vue infrarouge.

[03] **IR display configurations**

Press the "IR Display Configurations" button to view the infrared sensor configurations. Depending on the environment, specific heat modes can allow you to better detect movement/heat sources.

This menu also allows you to play on the DDE (Digital Detail Enhancement) parameter. This algorithm makes it possible to increase all the details of the same strap regardless of the area in the image.

This menu allows you to select the modes from the following list:

- White hot,
- Black hot,
- Rainbow,
- Rainbow_HC,
- Graded fire,
- Hottest,
- Globow,
- Arctic,
- Lava,
- Ironbow.

[04] **Controller screen lock-in-position**

Press the "controller lock position" button to lock the controller in action. No controller command will be considered when this mode is enabled **with the exception of the "Killswitch".** A message will inform the operator that the Killswitch is still enabled.

Long press the button to turn off the feature and regain control of the controller.

[05] **Zoom in basemap**

Press this button to enlarge the precision of the map.

[07] **Map zoom level**

Indication of the map zoom level.

[06] **Zoom in of basemap**

Press this button to narrow the precision of the map.

[08] **Measuring tool**

Press the “measuring tool” button to measure the distance between two points on the map. After pressing the button, simply touch the first point and the second point between which you wish to know the distance.

[09] **Projection of the camera footprint on the ground**

Press on the “drone’s view projection on map” button to have a trapezium automatically placed on the map indicating the viewed area[18].

The centre point of the trapezium is the point for which the coordinates are indicated in the “GPS coordinates display" inset.

[08] **Secondary screen display**

Depending on your choice, the map or sensor vision can be displayed. Works in parallel with the primary screen display.

[11] **Payload’s aperture & tilt angle**

Indication of the payload’s sensor’s aperture and the tilt of the payload in degrees.

[12] **Controller battery estimation**

Indication of the controller’s battery estimation in percentage and time[19].

[13] **Map scale**

Indication of the scale of the map

[18] The estimation is calculated without taking into account terrain elevation data.
[19] Il est recommandé d’attendre quelques secondes après la mise sous tension de la DIODON GCS Mk.2 pour avoir une indication fiable.

[14] **Drone-centred locked map**

Press the button to lock/unlock the drone in the center of the map. This will automatically move the basemap on the movements of the drone.

[15] **Orientation and wind speed estimator**

The wind estimate will display the wind speed perceived by the drone during its flight. Hystrix will display the speed and direction of the wind relative to the North. Units can be changed. To be able to make consistent estimates, the drone needs a small lapse of time and uniform rectilinear movements. A white bar shows how long this analysis has been done. If no new measurements are made, the white bar will disappear after 2 min.

[16] **Main screen display**

Selon votre choix, la carte ou la vision du capteur peut être affichée sur l'écran principal. Fonctionne en parallèle avec l'affichage de l'écran secondaire.

[17] **Notification panel button**

Press the button to access the notification panel and notification history.

To ensure visibility, critical messages are also displayed as pop-ups in the center of the screen. For a detailed list of notifications, access the drone logs.

To prioritize notifications and improve readability :

- A green, orange and red color code has been allocated to each notification.
- A colored icon per topic has been allocated to each notification.

FIGURE 9 – NOTIFICATION PANEL ON DIODON HYSTRIX

The notifications' on-screen time has been configurated. As such, high priority notifications will be displayed longer than low priority notifications.

[18] **GUI display button**

Press the "graphic interface's display" button to display/hide view of all the indications and buttons on the main display.

In the event of a press that is too long, the Hystrix application closes causing a radio fail-safe. Tap the Hystrix icon once to open the app again and retrieve the communication.

[19] **Brightness selector**

Press the "brightness selector" button to have access to the brightness levels. The selectable range is : "LOW", "MED." (Medium), "HIGH".

[20] **Easy access to the Checklist and flight settings**

Press on the "easy checklist access" button to display all necessary flight parameters. The latter may be changed from this submenu and will modify the parameters set on the advanced menu.

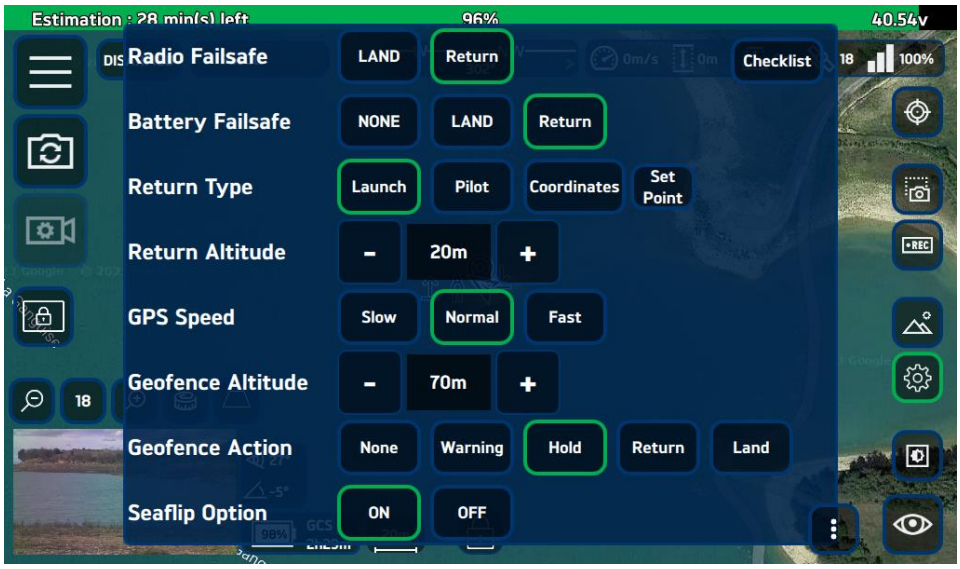


FIGURE 10 – DISPLAY OF THE FLIGHT PARAMETERS ON THE DIODON HYSTRIX

[21] **Fast payload view reset button**

Press the "quick payload view reset button" to move from a zoomed-in view on the sensor to a wide angled one preferable for piloting.

[22] **Record/stream button**

Press the "recording/broadcasting" button to start/stop the recording of the video feed. Every video is directly recorded on the DIODON GCS Mk.2. No media data is stored on the drone.

When the recording/broadcasting is on, the icon will flash red.

[23] **Picture taking button**

Press the "picture taking" button to take a picture. 3 pictures will be recorded: the view of the EO sensor, the view of the IR sensor, a print-screen of the entire display on the DIODON GCS Mk.2.

A notification will be indicated to confirm the screenshot success.

GPS coordinates display

Press on the "GPS coordinates display" button to display the GPS coordinates of the drone, the estimation[20] of the GPS coordinates of the centre point of view, and the distance between both coordinates[21]

[20] The DIODON HP30 drone performs a computation to estimate the GPS coordinates of the centre point of view. It is not equipped with a laser range finder to accurately indicate the GPS coordinates of the target point.

[21] The estimation is calculated without considering terrain elevation data. While precise at sea, absurd measurements may be displayed on hilly land. Horizontal aiming with the drone at a low altitude will also create inaccuracies.

[25] Digital drone/controller link quality

Indication of the quality of the numeric link between the drone and the controller. Low link quality may lead to connection link loss and activate a return fail-safe.

[26] Drone battery's voltage (in volts)

Real-time indication of the drone battery's voltage.

[27] Number of satellites detected

Indication of the number of satellites detected by the drone. 6 satellites are enough to evaluate a good GPS positioning.

[28] Drone's range

Indication of the distance between the drone and the return point.

[29] Drone's height

Indication of the height of the drone above take-off point.

[30] Drone's speed

Indication of the speed of the drone[22].

[32] Drone orientation and return home

Indication of the course of the drone.

A green home-facing arrow is added to facilitate piloted returns[23]. To pilot the drone back to the home point, make sure the arrow is in the middle of the indication.

Drone battery power estimation (in %)

Real-time estimation of the drone battery's remaining charge in %.

[22] GPS speed does not consider wind speed. If the wind blows stronger than the GPS speed of the drone, the drone will back off.
[23] This arrow is configurated from the drone's perspective.

[33] **Flight mode display & selector**

The "flight mode display & selector" displays the operating flight mode. Press it to display the list of available flight modes and operate in a different flight mode.

The list is as follows :

- *AltCtl* (Altitude control)
- *PosCtl*: (Position control)
- *Land*
- *Return*
- *GoTo/Look At*
- *Mission*

[34] **Drone's arm/disarm button**

The "drone's armed/disarmed" button displays the state of the drone.

See ref to arm/disarm the drone.

[35] **Drone battery power estimation** (in minutes)

Real-time estimation of the remaining flight time in minutes. To facilitate visibility, the color of the bar changes according to the estimated percentage:

- > 30%: Green
- 30% - 10%: Orange
- < 10%: Red

It is strongly recommended to initiate a return flight once the drone's autonomy drops below 30% (orange bar) or a "Return Advised" message appears.

DIODON HP30 DRONE'S SMART WATERPROOF BATTERY

The DIODON HP30 drone's smart, external, waterproof battery is made up of high-energy cells and features intelligent tracking of its recharge cycles. It was conceived to be easily changeable from a small Rigid-Hull Inflatable Boat with a quick-release system.

DIODON HP30 drone batteries are based on Li-Ion technology. DIODON DRONE TECHNOLOGY supplies 4000mAh/10S type batteries and their charger.

The DIODON HP30 batteries are equipped with an electronic circuit to perform several functions described below :

- Life cycle monitoring (number of cycles, serial number, key elements).
- Protection against cell unbalance automatically balances the voltage of each battery cell while charging.
- Overcharge protection: charging stops automatically when the battery is fully charged.
- Over-discharge protection: Excessive discharge can seriously damage the battery. The discharge will be interrupted when the battery cell is discharged at a voltage below 2.5 V. Once this protection is triggered, the recharge may be long. In this case, it is necessary to connect the charger and wait for the light to change to red indicating the start of the recharging phase. Avoid using batteries that match this description and avoid excessive discharge to avoid permanent battery damage.
- Short circuit protection: The power supply is automatically switched off if a short circuit is detected.
- The DIODON HP30 drone has IP56-like waterproofing and waterproofing when the battery is installed.

In addition to these protections, the battery communicates the current, the voltage, and the estimated percentage of charge remaining to the remote control.

Finally, a humidity and temperature sensor allows any overheating problem to be traced back to the drone and then to the remote control and any water[24] inlet to be detected.

The DIODON HP30 drone battery's baseplates and connectors are high density military-grade connectors. The proximity of the contacts makes it necessary not to make a connection/disconnection while these contacts are under voltage. It is therefore important to make any connection/disconnection of the connectors only when the battery button is in the high position (battery off).

[24] If a battery suffers a shock, do not use it anymore, as the battery may fail without any external signs (a leak in the battery's leakage might not be visible to the naked eye, for example).

POWER ON/OFF

It is recommended that you only turn on the battery when it is installed on the drone or to obtain its charge level using the battery tester. Avoid connecting/disconnecting the battery connector with a battery socket when the battery is powered on. The density of the contacts present in the connector could generate electric arcs and a risk of short-circuit.

To turn on the battery, plug the battery into a device (DIODON HP30 drone or battery tester) and press the power button on the battery once to press it down. The battery is then powered on.

To turn off the battery, press the depressed button when you turn on the battery to turn it off. After pressing this button, you can disconnect the battery from the equipment it is connected to. For a quick battery change in operation, be sure to turn off the battery before disconnecting it and turn on the new battery after connecting it.

LOW TEMPERATURE WARNING

Smart and waterproof batteries have significantly reduced performance when flying in low temperature environments (below 10°C). Before each flight, make sure that the battery is fully charged and that the cell voltage is close to 42 V (the 100% voltage can be between 41.6 V and 42 V due to the chemistry of the cells after charging).

Be particularly vigilant about battery life in low temperature environments. Autonomy of the battery may reduce much faster than normal in such environments. Battery life can be reduced by 30% if the initial battery temperature is below 10°C. Be careful on the first flights in cold environments and monitor the voltage level, which can drop quickly at the end of the flight. The battery percentage will adjust after the first flights to improve the evaluation of the remaining range in these low temperature conditions.

To ensure optimal performance, keep the battery temperature above 16°C. In low-temperature environments, it is recommended that batteries be kept warm before use to reduce performance loss. In very cold weather, the battery temperature may not be sufficient to power on. In this case, heat the battery before use.

BASIC PRINCIPLES OF FLIGHTS

FLIGHT ENVIRONMENT REQUIREMENTS

Before every flight, make sure that the operating conditions are favourable to fly your DIODON HP30 drone. Some of the systems limits are:

Wind resistance:	Max. 25 knots in sustained gusts Max. 27 knots in wind gusts
Temperature range:	Between -5°C and +40°C
Sea state:	Max. sea state 4

The DIODON HP30 drone was made to be used in wide open spaces. Flying in confined spaces and/or next to large buildings and/or metallic structures may affect the flight behaviour of the drone system. When doing do, adapt your flight mode accordingly and pay specific attention to the notifications panel.

When flying in coastal areas, avoid obstacles, crowds, power lines, electro-magnetic sources (e.g.: relay stations, radio transmission towers) and trees as much as possible.

When flying in extreme conditions and/or environments, such as but not limited to, polar regions, high altitudes, extremely humid regions, high temperatures, pilot carefully as battery estimation might vary quickly and compass/GPS positioning might work poorly in such regions. Alert messages will pop-up in the notifications panel if necessary.

FLIGHT REGULATIONS AND RESTRICTIONS

The products manufactured by DIODON DRONE TECHNOLOGY, including the DIODON HP30 system, do not have built-in restrictions and are designed to give you complete freedom (e.g.: over flight zones, flight parameters…). Make sure that you operate in full compliance with local laws and regulations established by the competent authorities and governing bodies before each flight[25].

Further than drone regulation, you are responsible for the safety and security of each of your flights. As such, avoid flying near airports, highways, railway stations, railway lines, downtowns and other sensitive and/or crowded areas.

[25] Each pilot is responsible for checking official sources and determining which laws and regulations apply to their flight. DIODON DRONE TECHNOLOGY shall not be held liable for any illegal use of its systems and/or flights in restricted and/or prohibited airspace.

START/STOP THE DIODON HP30 DRONE

PHYSICAL ARM/DISARM FROM THE DIODON GCS MK.2

To physically arm the DIODON HP30 drone, press the controller arming button once [04].

Similarly, you may stop the drone manually. In order to quickly stop the rotation of the motors, the remote control has a manual stop function.

To enable it, **press the two right and left STOP buttons simultaneously twice for at least half a second each time you press.**

FIGURE 11 – LOCATION OF ENGINE SHUT-OFF BUTTONS

In the event the two simultaneous pressing of the two left & right STOP buttons are too far apart and to prevent a handling error, a confirmation will be required on the piloting interface. To confirm the action, validate it by pressing both STOP buttons simultaneously[26].

This feature is particularly useful to disarm the system on the ground or on the water. It also enables you to have a sharper piloting if you land the drone on a boat.

Please pay attention while using this feature not to disarm the DIODON HP30 while flying. **Never use this feature when the DIODON HP30 is more than 10 cm above the ground.**

ARM AND DISARM FROM THE DIODON HYSTRIX CONTROL INTERFACE

Arming and disarming the drone may also be done via the piloting interface.

To arm or disarm the drone, press on the "Arm" button on the piloting interface. A slide to confirm your request will appear. Simply slide the bar from left to right to confirm the arming/disarming of the drone.

FIGURE 12 – ARM & DISARM SLIDERS

[26] If used in flight at high altitude, the rotors will also stop causing the drone to irrevocably crash.

BASIC FLIGHT MODES

SELECTABLE FLIGHT MODES ON THE DIODON GCS MK.2

The technical characteristics of the DIODON HP30 make it a particularly suitable drone for use at sea and in coastal areas. To do so, 3 basic flight modes are selectable from the flight mode selector switch on the DIODON GCS Mk.2 :

1. ALT "*AltCtl*": This flight mode corresponds to altitude control flight mode. When selected, the drone will be stabilized in altitude (vertically) thanks to its barometer but will drift horizontally depending on the wind[27].

   This mode is recommended when flying within visual line-of-sight, around large metallic objects (e.g.: ships) and for quick deployment, the home position being set once the GPS position has been acquired[28].

   This flight mode is selected when the selector on the DIODON GCS Mk.2 is pushed to the lowest position[29].

2. GPS "*PosCtl*": This flight mode corresponds to position control flight mode. When selected, the drone will be stabilized in altitude and in GPS position.

   This mode is recommended for operational beyond line-of-sight flights. It is also ideal to learn the behaviours of the DIODON HP30 drone. Switching this mode on requires enough satellites detected[30] and for the drone to be well calibrated. Should the first condition not be met, the drone will automatically switch back to *AltCtl* mode.

   This flight mode is selected when the selector on the DIODON GCS Mk.2 is pushed to the centre position[31].

[27] Due to the waterproofness of the drone, a slight oscillation of altitude remains to be noted. This delay is due to the slower equalization between the pressure inside and outside the drone's main case.
[28] Manoeuvring the drone in this mode may be complex beyond line-of-sight. Especially in the event the drone is around magnetic interference, and the communication link is lost, the drone could encounter difficulties to return to its set home position and trigger and immediate landing. The home position may not be acquired in flight.
[29] While manually selectable, keep watch of the operating flight mode displayed on the piloting interface as, depending on the conditions, it may not correspond to the requested flight mode.
[30] Indications of the number of satellites used are present on the pilot interface. A minimum of 6 satellites are recommended for reliable estimation.
[31] While manually selectable, keep watch of the operating flight mode displayed on the piloting interface as, depending on the conditions, it may not correspond to the requested flight mode.

3. Return *"RTH"*: This flight mode corresponds to return-to-home flight mode. When selected, the drone will automatically return to the home position/last recorded departure point (see RETURN MODES if needed).

   Once this function is activated, the drone will behave like so:

   a. The drone will rise to the set return altitude for safety precautions.
   b. After reaching said altitude, the drone will initiate a straight path towards its set home position[32].
   c. After reaching this position, the DIODON HP30 will begin its descent.
   d. When reaching the 20-meter altitude and 15-meter altitude mark, the DIODON HP30 will slow its descent speed to ensure the safety of the potential personnel below.
   e. The drone will automatically land on the surface and the rotation of the motors will slowly reduce. When it has detected the landing, the rotors will stop, and the drone will disarm.

   This flight mode is selected when the selector on the DIODON GCS Mk.2 is pushed to the highest position[33].

THE RETURN MODES

To ensure an optimal use in coastal and maritime environments, the DIODON HP30 disposes of 3 configurable home positions (RTH), which lead to the DIODON HP30 having 3 return modes:

1. *Return-to-Launch* (RTL): This return mode will result in the drone returning to the take-off point set as the home position and indicated on the map.

   This is the drone's default return mode[34]. It may be particularly useful when used from a fixed position from the shoreline.

2. *Return-to-Pilot* (RTP): This return mode will result in the drone returning to the last know position of the drone pilot[35]. This position is indicated on the map.

   This return mode is recommended when the DIODON HP30 is operated from a ship or a moving vehicle, with the operator's position likely to change between the time of take-off and the time of return. This mode can be set by default to be triggered automatically in the case of a low battery or a failsafe.

3. *Return-to-Coordinats* (RTC): This return mode will result in the drone returning to a chosen point of return set by the operator and indicated on the map.

[32] The DIODON HP30 does not have obstacle avoidance sensors. The operator is responsible for setting the consequent adequate altitude to ensure a safe return.
[33] While manually selectable, keep watch of the operating flight mode displayed on the piloting interface as, depending on the conditions, it may not correspond to the requested flight mode.
[34] As the default return mode, it is also the mode selected in case of a failsafe activation (provided it was not changed)
[35] The controller is equipped with an integrated GPS enabling this dynamic way of returning.

This return mode is recommended when a recovery point may be set beforehand and/or to organize the recovery of the drone when the related operation is finished. This mode can be set by default to be triggered automatically in the case of a low battery or a failsafe.

Be careful, the return position used does not consider the altitude of the return point. If the return point is higher than the drone's take-off position, the drone may have too much speed when it lands. The drone slows it's descend starting at 17meters above its take-off altitude.

Also, please note that the drone will not be able/have trouble returning when the GPS signal is weak and/or unavailable or in the presence of magnetic disturbances.

FAIL-SAFE

Two types of failsafe functions are present on the DIODON HP30 system which will automatically initiate a set action. In any case, you may take back the control of the drone by changing flight mode.

DRONE BATTERY FAIL-SAFE

The battery failsafe is a low battery protection feature. It is activated when the smart waterproof DIODON HP30 drone's battery charge reaches a critical threshold.

3 charge thresholds have been set by DIODON DRONE TECHNOLOGY to maximize safe landing and return of the drone:

1. <20% or 32V : A "Low Battery" alert will be displayed on the control interface and in the notification panel. You can choose to ignore this alert and continue flying, however for added safety we recommend starting a system return.

2. <18% or 30V : A "Critical Battery" alert will be displayed on the control interface and in the notification panel. You can choose to ignore this alert and continue flying. The automatic action of the system will depend on what the operator has preset in the Fail-Safe Battery menu, namely "None", "Return" or "Land".[36]

3. <12% or 29V : An "Emergency" alert will be displayed on the control interface and in the notification panel. An automatic forced landing procedure will be triggered regardless of[37] the preset made by the operator in the Battery Fail-Safe menu.

Note that you can choose to regain control of the drone by manually selecting a different flight mode (quick action on the flight mode selector on the GCS DIODON Mk.2) when the second and third battery level are reached.

[36] Note that depending on operational conditions and distance, this remaining load may not be enough to safely return and cause the drone to crash.
[37] Note that depending on the operational conditions and distance, this remaining charge may not be sufficient to make a safe return and cause the drone to crash.

However, if you ignore/cancel alerts and emergency procedures triggered automatically, the drone could crash and be lost in case of insufficient power.

As soon as you decide to ignore these alerts, you become responsible for any damage this may cause to the battery in terms of life or flight safety.

COMMUNICATION LINK FAIL-SAFE

The integrated safety procedure on the communication link allows the recovery of the DIODON HP30 drone when the connection between the drone and the DIODON GCS Mk.2 is lost.

In such a case, the drone will automatically trigger a return to the return point set on the DIODON GCS Mk.2.

You can try to regain control of the drone by manually selecting a different flight mode (quick action on the flight mode selector on the DIODON GCS Mk.2). If the connection link is restored, you will regain control of your DIODON HP30 drone.

EQUIPMENT PREPARATION

CALIBRATION OF THE DIODON HP30 DRONE MAGNETOMETER

The DIODON HP30 drone incorporates a magnetometer to position itself in space. The magnetometer continuously calibrates in flight to account for variations in its flight environment.

However, a significant change in the magnetic field, following a large distance movement or when the drone is close to a large source of magnetic interference for instance could make calibration necessary.

During the pre-flight checklist, it is strongly advised to check the correlation between the actual orientation of the system and the heading information on Hystrix to ensure consistency between the actual value and the indicated value. A difference > to 15° would require calibration. However, make sure to check this value in an undisturbed place, i.e. without the presence of metal elements, so as not to disturb the measurement.

CHECK OF THE BATTERY CHARGE LEVEL OF THE DIODON HP30 DRONE

With a battery specifically designed for the DIODON HP30, it is essential to check the correct operating condition of these batteries. An external device to the drone battery, called the "battery checker", has been developed to check the level of power of the battery and their voltage.

This checker also allows you to follow the lifecycle of the drone batteries, notably identify them with their serial number and indicate the number of cycles performed.

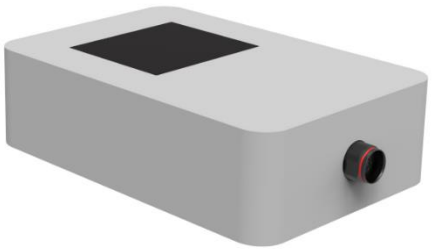


FIGURE 13 – DRONE BATTERY CHECKER MODEL

To obtain the level of power of the drone battery, follow the procedure below.

1. Make sure the battery is turned off (the ON/OFF power button is not pressed). If it is turned on, turn it off by pressing the ON/OFF power button once.
2. If the drone's battery has a protective cap, remove it and store it.
3. Make sure the connectors of the battery and checker are dry and free of foreign objects. If not, dry them with a piece of cloth.
4. Connect the battery to the checker by aligning the red dots with each other. It may be necessary to turn the checker connector slightly to align it with the battery connector.
5. Power on the battery by pressing the ON/OFF power button.
6. Wait for the battery information to appear on the battery checker.
7. After considering the relevant information, turn off the drone's battery by pressing the ON/OFF power button.
8. You can then disconnect the battery from the checker, put the protective cap back on the drone's battery connector and store the drone battery.

CHARGING THE BATTERY OF THE DIODON HP30 DRONE

The DIODON HP30 drone battery should be recharged using approved 2A/10S drone battery charger provided by DIODON DRONE TECHNOLOGY[38].

FIGURE 14 – 2A/10S DIODON HP30 DRONE BATTERY CHARGER

To recharge one of these batteries, follow the procedure described below.

1. Make sure the battery is turned off (the ON/OFF power button is not pressed). If it is turned on, turn it off by pressing the ON/OFF power button once.

2. If the drone's battery has a protective cap, remove it and store it.

3. Make sure the connectors of the battery and charger are dry and free of foreign matter. If not, dry them with a piece of cloth.

4. Connect the battery connector to the charger by aligning the red dots together. It may be necessary to turn the charger connector slightly to align it with the battery connector.

5. Plug the charger into a power outlet if the charger was not already plugged in. A green LED lights up on the main housing of the charger indicating that the charger does not detect a battery to be recharged.

[38] DIODON DRONE TECHNOLOGY shall not be held liable for any third-party chargers.

6. Turn on the drone battery. The charger LED changes from green to red, indicating that it has detected a drone battery to be charged and charging is in progress. If possible, do not leave a charging battery unattended. In all circumstances, keep the drone battery charging away from flammable surfaces.

7. Charging is complete when the LED changes from red to green.

8. Press the ON/OFF button on the drone's battery to turn it off before unplugging the battery and storing it.

9. To store the drone battery, place the protective cap on the drone's battery connector.

10. Unplug the charger from the power outlet and store it as well.

Note that this procedure is suitable to prepare your system for operation. It is not suitable prior to long-term storage[39].

[39] A period of more than 2 months is considered long-term storage.

RECHARGE THE DIODON GCS MK.2

The DIODON GCS Mk.2 is powered by a Lithium-Ion integrated battery[40]. Once switched off and using the standard 3A/3S battery charger provided by DIODON DRONE TECHNOLOGY at room temperature, it takes about 180 minutes to fully charge the DIODON GCS Mk.2.

The DIODON GCS Mk.2 may be used when charging (and charges faster than it is used).

It is recommended that the battery be fully recharged at least once every three months to avoid any problem of excessive discharge. Beware, after long periods of storage, the controller's battery may be discharged.

FIGURE 15 – 3A/3S DIODON GCS MK.2 CHARGER

To charge the controller, perform the following steps :

1. Remove the controller and the 3S charger provided by DIODON DRONE TECHNOLOGY of the transport case.

2. On the controller, the charging port is located at the bottom right, remove the protective cap.

3. Plug the end of the charger into the charging port on the controller. The connection can only be made in a certain way. Feel free to rotate the cable to properly connect both ends.

[40] The type of Lithium-Ion batteries is nevertheless different from the drone's batteries. Do not use the same charger. The appropriate charger is provided inside your package.

4. Plug the charger into a power outlet. A red light on the main charger housing should be visible.

5. When the DIODON GCS Mk.2 has finished charging, the LED on the main charger housing turns green.

6. Disconnect the DIODON GCS Mk.2 from the charger and the charger from the socket.

7. To check the controller charge level, follow these steps :

    a. Check that the antennas are correctly plugged in.
    b. Switch the controller on and wait for the piloting interface to be launched. A light on the ON/OFF power button will be on when the controller is powered on.
    c. When the piloting interface is displayed look at the controller's charge level on the bottom left of the screen.

FIGURE 16 – DIODON GCS MK.2 POWER ESTIMATION DISPLAY ICON

8. You can then turn off the controller and store it with its charger in their appropriate location in the transport case.

PRE-FLIGHT CHECKLIST

Each time Hystrix is switched on, a pre-flight checklist will automatically appear. If the GCS has not been restarted, it is possible to open the checklist from the main menu.

FIGURE 17 - PRE-FLIGHT CHECKLIST ON HYSTRIX

Before each flight, perform the following checks:

1. Make sure the drone battery is fully charged and the controller battery is sufficient for a flight (>30%).

2. Make sure the inflatable arms are properly inflated. They must not be easily folded manually. Be careful not to inflate them too much at the risk of damaging the fixing scratches.

3. Make sure the battery is properly inserted into the intended slot and that all connectors are plugged in and other ports protected .

4. Check the overall integrity of the drone :

    a. The payload must be stabilised automatically,
    b. The stabilization skids of the payload must not show marked signs of wearing and/or tearing,
    c. The rotors must be able to rotate correctly,
    d. The propellers and structure must be intact.

5. Make sure the lenses of the electro-optical and infrared sensors are clean.

6. Be sure to check the "flight parameters" icon accessible from the pre-flight checklist or directly from the main screen to set up all the necessary functions related to the flight.

DEPLOYMENT PROCEDURE

This part details the preparation and deployment phase of your DIODON HP30 system to be ready to fly:

1. Remove the DIODON HP30 drone, the DIODON GCS Mk.2 and the inflation pump from the transport crate.

2. Check system charge status.

    a. The battery level of the DIODON HP30 drone. Only fully charged batteries should be used to ensure maximum battery life and nominal battery use.

    a. The level of the DIODON GCS Mk.2. It is recommended not to fly the drone if the estimated range of the DIODON GCS Mk.2 is insufficient for the duration of a flight (<30 minutes). Note that the autonomy of the DIODON GCS Mk.2. varies according to the workload such as the recording of the video stream, the broadcast, or the chosen brightness. Do not turn on the controller in their antennas. This could lead to significant deterioration of the system and operating range.

3. Unfold the omnidirectional antennas of the DIODON GCS Mk.2 controller. Remember to straighten them well (perpendicular to the remote control) to optimize the quality of the communication link.

4. Turn on the remote controller.

5. Set the flight mode selector to ALT or GPS (correct magnetometer calibration and GPS position required).

6. Unfold the drone from its foam mount by removing the center grip strap and sliding the propellers out of their holding straps.

7. Position the deflated DIODON HP30 on a flat surface without damaging the cooling plate and extend the drone arms perpendicular to the main drone housing.

8. Check the general condition of the inflatable structure and inner tube. Make sure the structure is not damaged (drilled, cut, worn) and that the inner tube is intact (no air leakage).

9. Make sure there is no water in the connectors and base plates[41].

10. Connect the connectors. Make sure they are properly compressed (they should require a lot of pressure to remove them, which can be done by placing two fingers between the bottom of the main case and the connector). It may be necessary to turn the connector slightly in order to align it with the base plate.

[41]When replacing batteries in a marine environment (on a small boat for example), be careful not to introduce water inside the connectors of the main case or battery. To do this, it is recommended that the connectors remain plugged in even if the system is not in use so that they are not exposed to seawater splashes. If seawater enters the battery connector, do not turn on the battery, dry the connectors to avoid damaging the contacts.

11. Inflate your arms. Open the valve of one of the two inner tubes and insert the pump to inflate the inner tube. Once the inflation is done correctly, plug the vales immediately afterwards.[42]

12. Repeat on the second arm.

13. Place the battery in its slot by placing the back of the battery under the rear spoiler (only the rear tab of the battery should be positioned below the spoiler). Make sure you don't leverage the GNSS support.

14. Make sure the battery latches are clipped correctly.

15. Make sure the battery is turned off and there is no water or foreign objects in the connectors[43].

16. Plug the battery connector into the main enclosure connector. It may be necessary to turn the connector slightly in order to align them with each other.

17. Make sure all motor and battery connectors are properly plugged in and that the USB protective cap is securely in place.

18. Turn on the drone by pressing the ON/OFF power button on the drone's battery.

19. Move at least 5 meters away and make sure no one is in front of or in the axis of the drone.

20. Pairing is done automatically. Once paired, you will be able to control the drone from the radio control and its interface. Check that the video stream is received on the ground.

21. After pairing, check the necessary flight parameters in the checklist (return point, fail-safe behaviors/maximum ceiling…)as well as the correspondence between versions.

22. Then arm the drone by pressing the *arming button motors*. The propellers will rotate at low speed giving you the opportunity to check the correct functioning of the engines.

[42] If the inner tube is underinflated, the drone will be difficult to control, which can damage the structure or even the personnel around it. If this is the case, land the drone immediately to re-inflate it and ensure a safe flight. Make sure that no damage to the main box has been caused. On the other hand, if the inner tube of an arm is overinflated, it can explode after a violent impact or any other event. If the inner tube is overinflated, deflate it slightly by opening the valve and pinching it weakly at the base.

[43]When replacing batteries in a marine environment (on a small boat for example), be careful not to introduce water inside the connectors of the main case or battery. To do this, it is recommended that the connectors remain plugged in even if the system is not in use so that they are not exposed to seawater splashes. If seawater enters the battery connector, do not turn on the battery, dry the connectors to avoid damaging the contacts.

23. Once the drone and interface parameters are verified[44], you can take off by pushing the left joystick to increase engine speed and get the DIODON HP30 off the ground. The system must be stable, no abnormal noise should be detected. Close to the ground, propeller effects can impact stability.

[44]It is recommended to leave the DIODON HP30 stationary ("PosCtl" GPS mode) away from all sources of magnetic interference (metal structures) and to check its stability in hovering flight before moving the DIODON HP30 away. This check will ensure a safe return in the event of a Fail-Safe procedure that requires a return to a return point in GPS mode.

RECOVERY PHASE: LANDING

The DIODON HP30's inflatable structure design will allow it to land on steep surfaces where other drones cannot land, or land on water. This is made possible by the structure which will act as a bumper and as a buoy and provide a large contact surface on the ground or in an aquatic environment, allowing it to be particularly stable in both environments.

To land on unprepared surfaces or land on water, use the following procedure:

1. Prepare a landing area by keeping all personnel at least 5 meters away. In order not to damage the propellers, or even the drone during landings, it is strongly recommended to land the drone on a surface of maximum inclination of 20°.

2. Bring the DIODON HP30 vertically from this position.

3. Reduce the throttle (vertical axis of the left joystick) until the DIODON HP30 touches the desired surface. Keep the joystick fully down until the engines stop.

4. Press both the right and left STOP buttons twice simultaneously for at least half a second if you want to turn off the engines faster.

5. In the event that the two simultaneous pressing of the two right & left STOP buttons are too far apart and to prevent a handling error, you will be asked for confirmation from the piloting interface. Validate it by pressing both right & left STOP buttons simultaneously.

6. Confirm visually that the drone's motors are indeed shut down.

7. Approach the drone and turn it off by pressing the battery button[45].

8. Turn off the remote controller by pressing the ON/OFF power button and confirming your choice on the control interface.

Once you have completed this procedure, you can safely manipulate the DIODON HP30 system.

In the event of a landing on a boat, use the inflatable arms as a bumper to parry the potential impact caused by the landing. Do not switch the rotors off more than 10 cm above the landing platform as this may permanently damage your drone.

Should it be in your possession, equip the DIODON HP30 drone with the special recovery strap. During the recovery procedure, this will enable you to land the drone on the water and pick it up thanks to the use of a navy hook.

[45] Never remove the battery from the drone until you have turned it off. This could damage the connectors.

FOLD AND STORE THE SYSTEM

Once the flights have been completed and the upkeep done, the DIODON HP30 system (drone and controller) must be properly stored to ensure maximum protection within the transport device (backpack or rigid transport case). To do this, follow the procedure described below.

1. Make sure the drone is turned off (battery button not pressed).

2. If you want, you can remove the battery from the drone. To do this, disconnect the battery from the main enclosure. Then, simultaneously wipe the two holding latches to open the battery from the front and remove it completely from its location on the drone.

3. Make sure that the controller is also switched off. To do so, shortly press the ON/OFF power button to switch the controller off. The indication light on the button should switch off to confirm the correct power off on the controller. A long press on the button, coupled with an on-screen confirmation will force the shutdown of the controller.

4. Fold the antennas on the back of the drone so that they can be folded over the system and properly housed in the foam mount.

5. Deflate the inner-tubes: open and pinch the non-return valves on each inner-tube, and then press, if necessary, on the arms to remove the remaining air.

6. Place the foam bracket on the system.

7. Turn the foam mount and drone upside down. Payload and antennas must be positioned correctly.

8. Pass the propellers through the side straps on either side of the foam support.

9. Attach the center strap to attach the DIODON HP30 to the foam bracket.

10. Once the drone is strapped, place it in the compartment of the transport crate, being careful not to damage the propellers.

11. Fold the controller's antennas by holding them with the GCS antenna protection flap and then lace the radio control into the transport case.

When storing in the hard case, make sure that the antennas fit into the spaces provided for this purpose so as not to damage them.

If the system has just been operated from wet surfaces (at sea or on rivers), remember to dry the system well before storing it for a long time. The latter will need to be dried and lubricated after the mission.

ADVANCED FLIGHTS AND INTERFACE SETTINGS

ADVANCED FLIGHT MODES

In addition to the 3 basic flight modes (ALT, GPS, Return) selectable from the flight mode selector of the controller, the DIODON HP30 can also be operated by means of other flight modes selectable from the flight interface by pressing the flight mode button .

Land: Activating this flight mode allows the drone to activate an immediate landing procedure.

POI (Point Of Interest): This flight mode includes two possibilities: GoTo mode and Orbit mode

GoTo (/Look At): This flight mode allows you to direct the drone to a single point of interest that you have positioned by long-pressing on the basemap.

This mode can be coupled with a "Look At" feature by briefly tapping on a point of interest on the screen.

If both options are activated at the same time, the drone will go to the coordinates of the selected GoTo while locking to the selected point of interest.

FIGURE 18 – ILLUSTRATION OF GOTO MODE COUPLED WITH LOOK AT FUNCTIONALITY

Orbit : This flight mode allows you to rotate the system around a point of interest in one direction or another. This makes it easier to monitor a coordinate in the air by predetermining the radius and height of the circle.

FIGURE 19 - ILLUSTRATION OF ORBIT MODE

Mission: Selecting the mission flight mode allows you to launch a scheduled and/or previously recorded mission.

FIGURE 20 - ILLUSTRATION OF MISSION MODE

ADVANCED MENU OF THE CONTROL INTERFACE

GENERAL PRESENTATION OF THE ADVANCED MENU

Submenus provide access to more advanced system functions.

It is recommended to use them when the drone is not in flight.

FIGURE 21 – ADVANCED MENU DISPLAY ON THE DIODON HYSTRIX CONTROL INTERFACE

LAYOUT OF THE ADVANCED MENU

FIGURE 22 - THE FEATURES OF DIODON HYSTRIX'S ADVANCED MENU

[01] Mission Planification
[02] Fail-Safe battery procedure
[03] Gimbal stabilization
[04] Configuring flight logs
[05] Magnetometer calibration
[06] Engine calibration
[07] Seaflip function
[08] Pre-flight Checklist
[09] Remote control test
[10] Units and settings configuration
[11] Broadcast settings
[12] LED Configuration
[13] Default return type
[14] Return Mode Altitude
[15] GPS mode speed
[16] Internal temperature/humidity sensors
[17] Channel modification
[18] Emission power
[19] Fail-Safe procedure communication link
[20] Geofence
[21] Annotating maps
[22] Map management
[23] Date and Time setting
[24] Media files
[25] Data storage capacity
[26] Update menu
[27] Date and Time information

[01] MISSION PLANIFICATION

The mission planning interface allows the user to create one or more missions. Each mission is composed of a set of Waypoints with a determined behavior between and on each Waypoint. The maximum altitude of a Waypoint is set at 500 m compared to the reference altitude when arming the system.

FIGURE 23 – DISPLAY OF THE MISSION PLANNING ON THE DIODON HYSTRIX CONTROL INTERFACE

[02] BATTERY FAIL-SAFE

This submenu allows you to set the behavior of the drone when its battery level drops below 30 Volts.

By default, if such an event were to occur, the drone would trigger a return procedure to the chosen point.:

- If the GPS position has been acquired before take-off : RTL, RTP, RTC.
- If no GPS position has been acquired before take-off : Automatic landing.

FIGURE 24 – BATTERY FAIL-SAFE SETTING

[03] GIMBAL STABILIZATION

This submenu allows you to enable/disable/restart payload stabilization.

This function can be useful to disable payload stabilization during manual manipulations where it would reach angle limits.

It is also recommended to disable payload stabilization when the drone is turned on, on the table to avoid the risk of overheating.

Payload stabilization is automatically disabled when the drone is upside down (and more specifically during a Seaflip function or during compass calibration).

In this same submenu it is also possible to adjust the degree of "offset" (compensation) if during the life of the nacelle, it was to destabilize. Indeed, over time, temperatures and factory values may deviate slightly. We are talking about a tenth of a degree. In order to avoid sending the system to the factory to readjust the neutrals, the operator can compensate for this slight deviation by compensating for the angle of the "pitch".

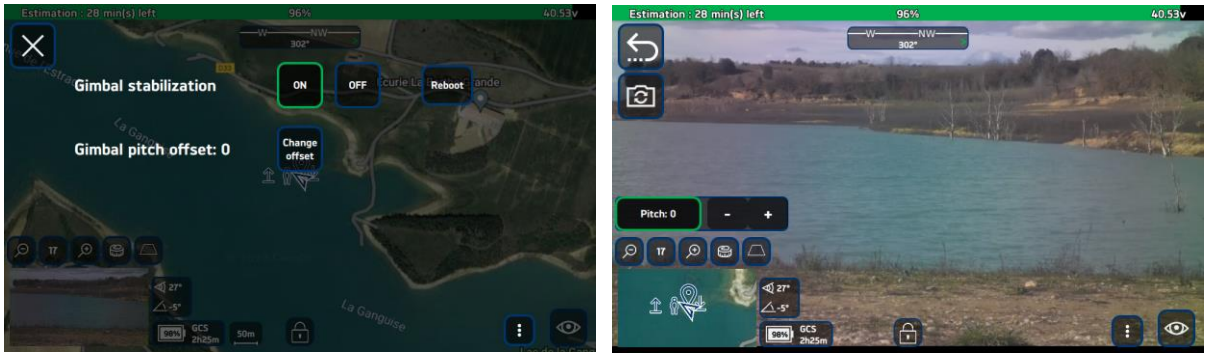


FIGURE 25 – GIMBAL SETTINGS MENU

[04] CONFIGURING FLIGHT LOGS

The flight data is automatically recorded on the internal storage space of the drone, depending on what you have wished to record. To recover flight data, you can connect the device to a computer via the USB port and export this data.

The submenu allows you to select the level of information stored on the system during its use.

FIGURE 26 – LOG CONFIGURATION DISPLAY ON THE DIODON HYSTRIX PILOTING INTERFACE

There are three levels of data logging on the device :

NO LOGS[46]: No flight information is recorded by the drone. Using this mode voids all warranty conditions.

LOGS WITHOUT GPS: This level records essential system information but does not record any information about the position of the device. This is the minimum level of recording required for warranty operation and understanding of failures that may occur in flight.

ALL LOGS: This level records all flight data.

After changing the flight log recording configuration, the controller must be restarted for the change to take effect.

[46] The "NO LOGS" level does not allow the warranty to work. Without flight information, it will not be possible to establish the causes of the failure in the event of a technical problem.

To facilitate any post operation system delogging, by yourself or that you may require from DIODON DRONE TECHNOLOGY, it is recommended to remain in “ALL LOGS” configuration. Should you wish to select the NO LOGS or LOGS WITHOUT GPS modes and a technical issue occur, DIODON DRONE TECHNOLOGY may not be able to determine cause of failure.

From this submenu, you may also choose to get or erase logs recorded. It is mandatory to first obtain the "Get logs count" logs to be able to modify the type of logs you want to record.

The "Reboot Controller" function allows you to restart the flight controller without having to turn off the battery. This is only possible when the system is already disarmed.

[05] MAGNETOMETER CALIBRATION

This submenu allows you to start a calibration of the magnetometer. To do this, follow the procedure detailed below :

1. Turn on the DIODON HP30 and the DIODON GCS Mk.2. If you are in flight, land and retrieve the drone.

2. Move away from metallic structures and/or magnetic sources and, when possible, deposit personal magnetic items (e.g.: mobile phone).

3. Click on the "advanced menu" icon on the DIODON HYSTRIX piloting interface.

4. In the advanced menu, select the "Magnetometer calibration" icon.

5. Launch the calibration process. The following screen should be displayed.

FIGURE 27 - MAGNETOMETER CALIBRATION INTERFACE DISPLAY

6. Lay down the DIODON GCS Mk.2 and move 3 meters away with the drone. Make sure you can see the screen of the DIODON GCS Mk.2

7. Follow the instructions on the controller. 6 rotational movements of the drone must be performed. First orient the system in the desired orientation and then wait for the icon to change from red to yellow. Rotate the drone until the rotation icon turns green.

8. Once the icon corresponding to the axis of rotation turns green, proceed to the next rotation.

FIGURE 28 - INTERFACE DISPLAY DURING MAGNETOMETER CALIBRATION

9. Repeat the procedure for the 6 rotational movements.

10. When all rotations are completed, the progress of the magnetometer calibration will reach 100%. **Once the calibration is complete, the control card of the drone will have to restart** to consider this new measurement of the magnetic environment. **The system will therefore go through a restart phase and temporarily lose communication**.

[06] ENGINE CALIBRATION

This submenu gives you access to the engine calibration tool.

The DIODON HP30 drone uses the "FOC" motor technology. This technology requires precise knowledge of the engine parameters to work properly. **It is therefore necessary, following an engine replacement, to initiate an engine calibration so that the drone can consider the magnetic and electrical state of the new engine to record it in the flight controller**.

Periodic engine calibration is recommended (every 10 hours of flight time or when ambient temperature varies greatly). Calibration is performed on all engines at the same time at the temperature corresponding to those you will have during your flights. This calibration must be carried out without a propeller for safety reasons. Disassemble all propellers before starting the calibration procedure.

After starting the engine calibration , it is important to ensure that the engines remain free in rotation during the calibration phase. If an element interferes with the rotation of the motors during calibration, it will be necessary to restart the calibration because the engine will have sent incorrect parameters to the ESC.

Message confirms completion of engine calibration.

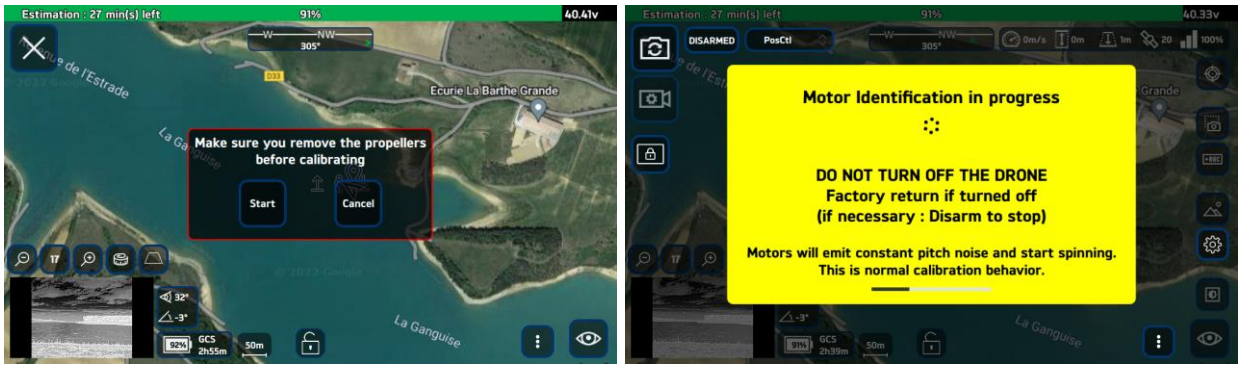


FIGURE 29 - ENGINE CALIBRATION INTERFACE

[07] SEAFLIP FUNCTION

This submenu allows you to enable or disable the automatic Seaflip feature. This function can also be activated from the flight settings menu.

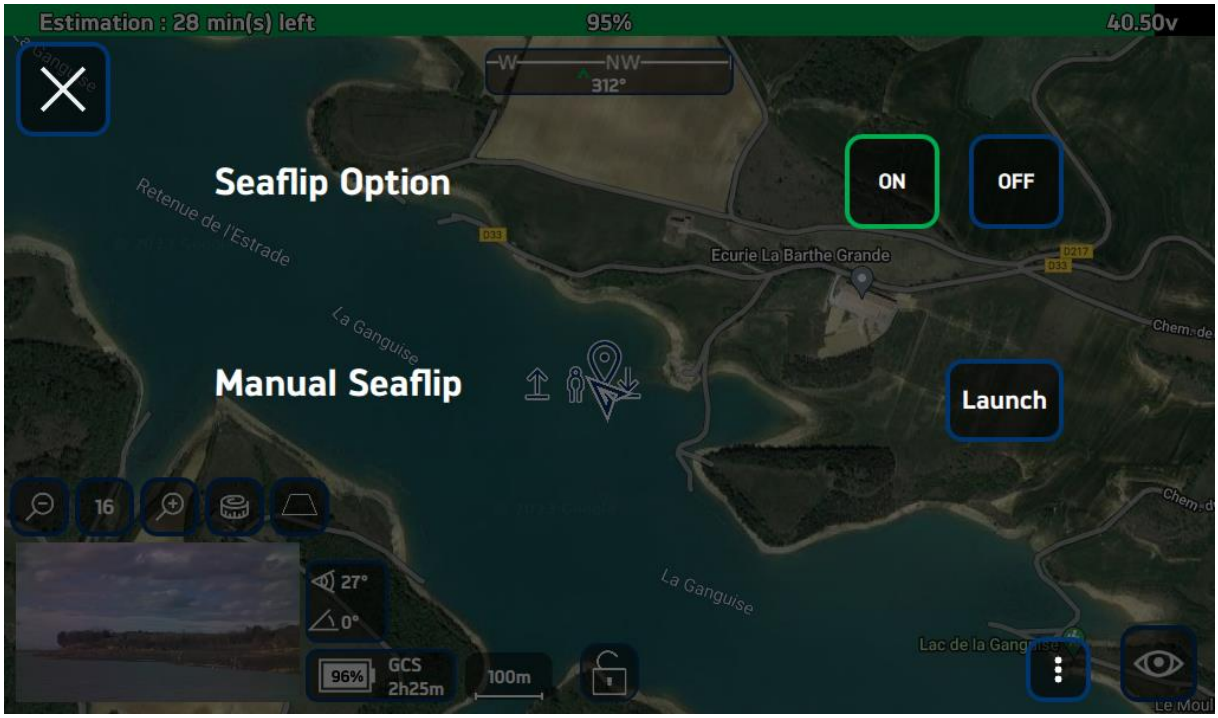


FIGURE 30 – DISPLAY OF THE SEAFLIP FUNCTION ON THE DIODON HYSTRIX CONTROL INTERFACE

[08] PRE-FLIGHT CHECKLIST

FIGURE 31 - ILLUSTRATION OF THE PRE-FLIGHT CHECKLIST

This menu allows users to ensure that all control points are filled in correctly.

This checklist is displayed each time the Hystrix app is turned on. This means that between two flights, the checklist will not be displayed automatically.

[09] REMOTE CONTROL TEST

This submenu allows you to display the controller's commands from the control interface and to check that all buttons and joysticks are correctly working thanks to visual feedback.

When you launch this feature, the buttons you click have no action on the system. These are circled in green to signify that the command responds well.

FIGURE 32 – REMOTE CONTROL DISPLAY ON THE DIODON HYSTRIX PILOTING INTERFACE

[10] UNITS AND SETTINGS CONFIGURATION

This window allows the operator to choose the units and activates settings to facilitate operations.

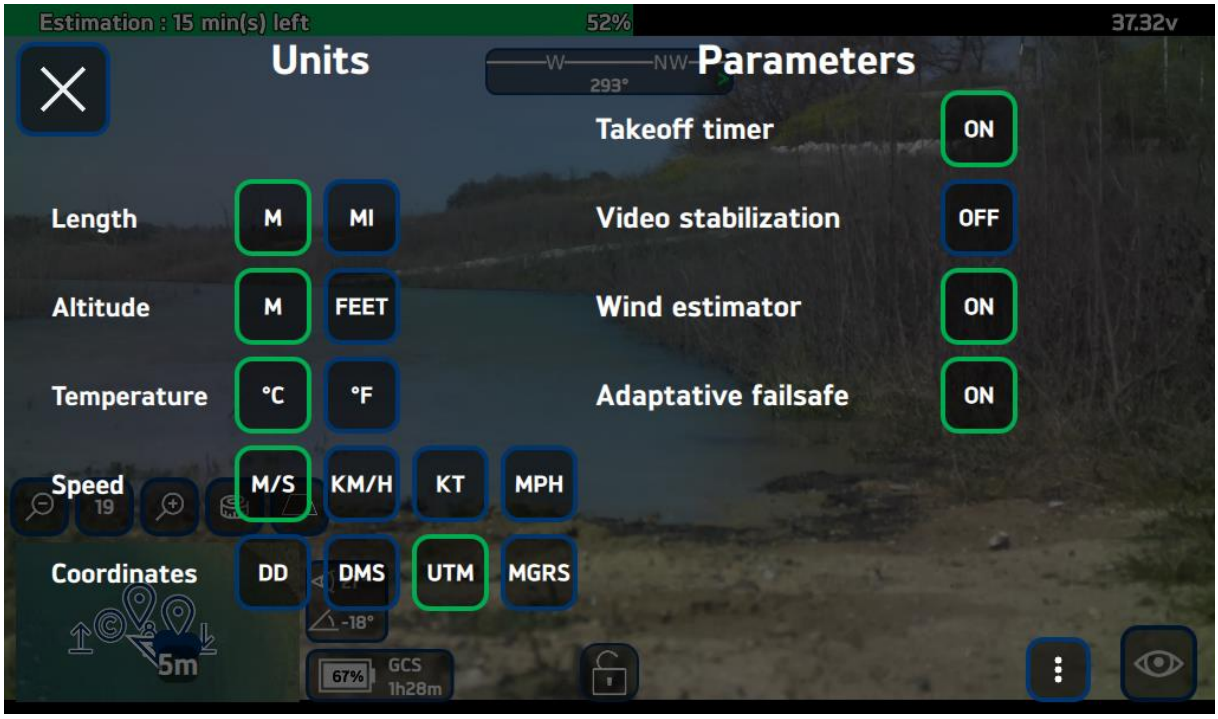


FIGURE 33 – DISPLAY OF THE CONFIGURATION OF S UNITS ON THE DIODON HYSTRIX INTERFACE

The possibility of **activating a timer** (Takeoff timer) following landing is also given. This timer makes it possible to balance the internal pressure with the external pressure. If the operator were to take off before the end of the 15 seconds, a variation in altitude could be felt at take-off making the system less stable on the vertical hold. This delay is essential at sea.

Live video stabilization (Video stabilization) improves video feedback viewing. This function does not record stabilized video. To achieve stabilization of the recorded video a post-flight stabilization function is available in the Media menu.

The estimation of the speed and direction of the wind (Wind estimator) relative to the north is activated through this menu. The operating principle of the wind estimator has already been described in the chapter dedicated to the description of the different functionalities of DIODON Hystrix.

Adaptive fail-safe allows for a gradual increase in communication loss time depending on the distance the system is located. Between 0 and 150m distance between the GCS position and the system, the maximum communication loss time is 0.7 seconds. It increases to 2 seconds beyond 150m distance, reducing fail-safe procedures during BVLOS flights. If this option is not enabled, the RF loss time before a fail-safe procedure will default to 0.7 seconds regardless of distance.

[11] BROADCAST SETTINGS

An appendix is used to describe the configuration of IP addresses in order to be able to broadcast the Hystrix interface on another medium.

[12] LED CONFIGURATION

This submenu gives you access to the configurations of Led indicator lights. The DIODON HP30 is equipped with two green LEDs (one at the top, one at the bottom) and a red LED (at the bottom). The green LEDs can be configured from the control interface on the controller. Multiple configurations are selectable:

None: The green LED does not blink, even when the drone is disarmed.
Blink : The green LED flashes.
Always : The green LED stays on.
Landed: The green LED only flashes when the drone is disarmed, making it easier to locate the drone when it is on the ground.

The red LED only flashes when the drone is flipped. It does not depend on the selected flashing configuration. The flashing of this LED alerts the user when the analysis of the Seaflip function has started and when a Seaflip action can be initiated.

If you hold the drone in your hand and the red LED lights up, immediately turn the drone back to the flight position to disable the Seaflip function.

This red LED will not light up if the Seaflip function has been disabled in the settings menu (Figure 10).

In addition, a "Press Leds" function makes it possible to check the proper functioning of all LEDs by forcing the flashing of each LED.

FIGURE 34 - DISPLAY OF LED SETTINGS IN THE HYSTRIX DIODON FLIGHT INTERFACE

[13] DEFAULT RETURN TYPE

This submenu allows you to define the desired return mode and therefore the position of the desired return point during a Fail-Safe.

You can choose between the return to the take-off position, the return to a coordinate or when the [47]GPS position of the remote controller has been acquired at the position of the remote pilot .

This parameter can be freely changed during the flight as long as the communication between the drone and the controller allows it.

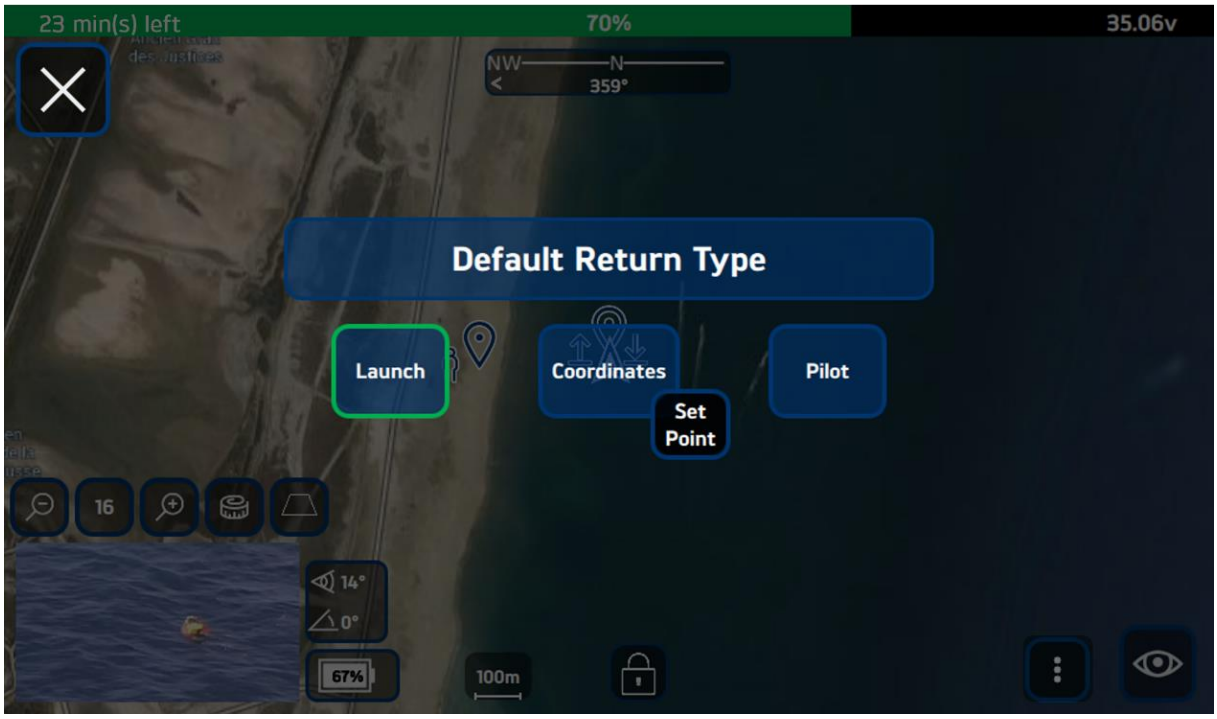


FIGURE 35 – DISPLAYING THE DEFAULT RETURN TYPE ON THE HYSTRIX DIODON INTERFACE

[14] RETURN MODE ALTITUDE

This submenu allows you to set the minimum return altitude when a return flight mode is activated.

If this mode is activated, the drone will climb to this height (if it is not already above) in order to avoid possible obstacles on its return journey.

It is important to note that the higher the altitude, the greater the energy consumption will be for the return phase.

[47] This mode can be selected provided you define a GPS point on the map.

[15] GPS SPEED SETTING

This submenu allows you to set the maximum ground speed for GPS mode (PosCtl). This speed is measured, using the GNSS receiver. It is restricted regardless of the direction and speed of the wind so as not to exceed the maximum speed programmed in this menu. The system will therefore adapt its RPM and inclination in order to remain within this limitation.

The "Slow" speed corresponds to a ground speed of 8.3m/s (30km/h). The "Normal" speed is equivalent to 12.5m/s (45km/h) in ground speed and the "Fast" speed is equivalent to 13.8m/s (50 km/h)

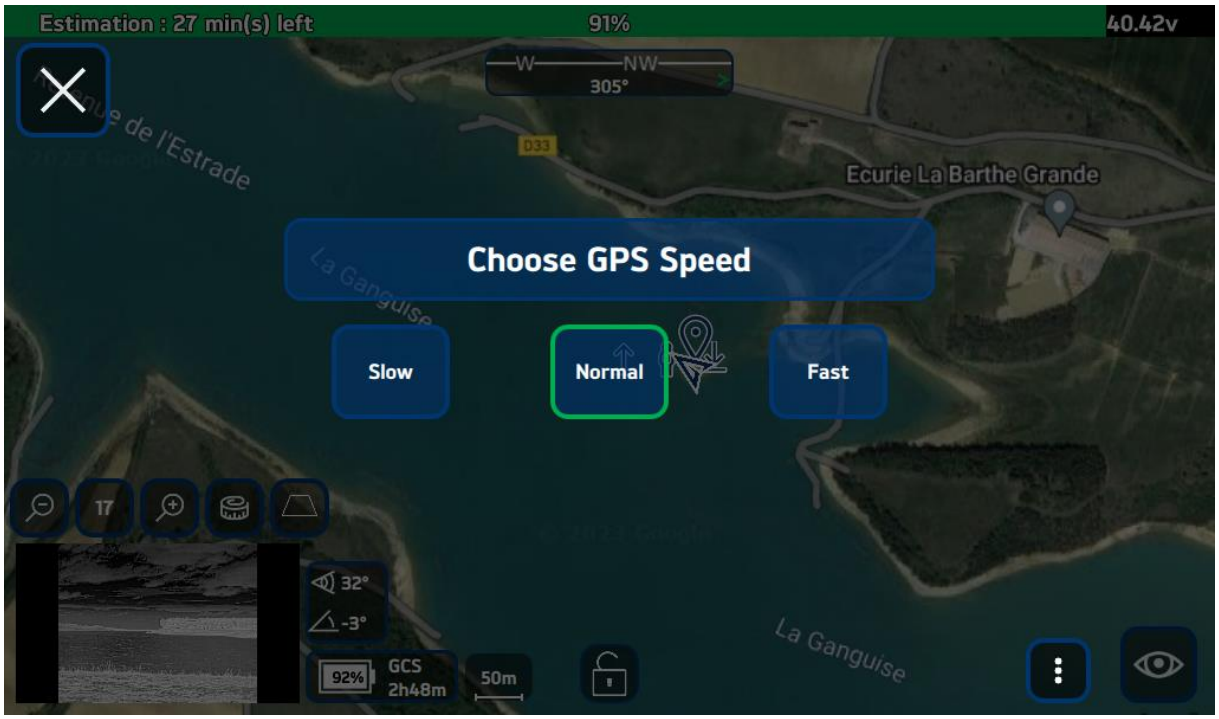


FIGURE 36 - SPEED DISPLAY IN POSCTL MODE ON THE DIODON HYSTRIX CONTROL INTERFACE

[16] INTERNAL TEMPERATURE AND HUMIDITY SENSORS

This submenu displays the temperatures and humidity recorded in the DIODON HP30 and its battery. The sensor will always detect a humidity level however if it reaches 60% in the battery or in the case, the integrity is then considered defective. The identifier, the number of cycles and the voltage of the battery are also entered in this submenu.

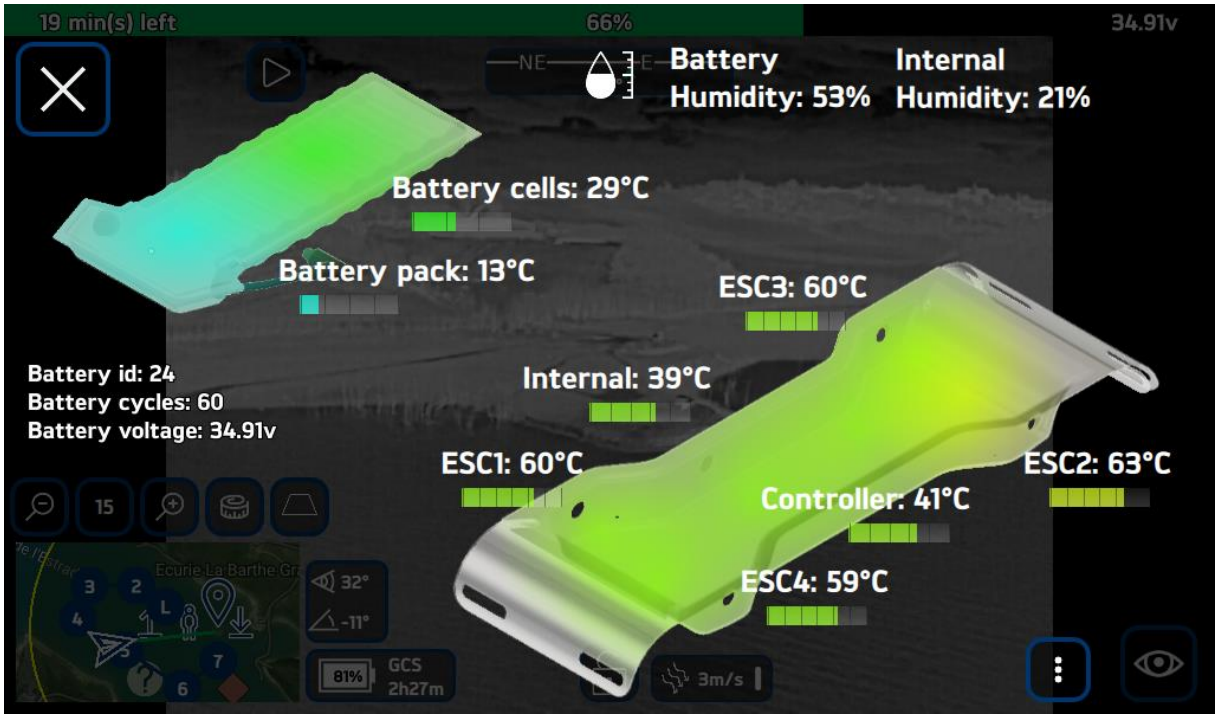


FIGURE 37 - DISPLAY OF INTERNAL TEMPERATURE/HUMIDITY SENSORS ON THE CONTROL INTERFACE

[17] « CHANNEL » MODIFICATION

FIGURE 38 - ILLUSTRATION OF THE CHANNEL CHANGE INTERFACE

Some environments can present radio disturbances when several devices use the same frequency (2.4Ghz or 2.2Ghz) and the same "Channel". This leads to a decrease in the quality of RF transmissions and therefore a decrease in radio range. Some channels are less used and therefore less disrupted. It is possible in this menu to manually switch from one "Channel" to another, to move away from disturbed "Channels".

To know the least disturbed "Channel", tools such as frequency analysers exist. It is also possible to be able to download an application on your phone that analyses the RF environment of the area and recommends the use of one or more "Channels".

The frequency change will be done automatically, first on the GCS and then on the system in a second step. When the change has been made, a message will indicate if the operation was successful. Please do not turn off or tamper with the system during this fully automated procedure.

[18] EMISSION POWER

This submenu allows you to change the transmission power of the communication modules of the drone and the controller. Any modifications must be made when the drone is on the ground and disarmed.

FIGURE 39 - TRANSMIT POWER DISPLAY ON THE DIODON HYSTRIX CONTROL INTERFACE

Depending on the configuration of your drone, several emission powers are available and allow to increase the range of the drone. The operator is responsible for compliance with the radio power regulations applicable in the area where he uses the equipment.

[19] COMMUNICATION LINK FAIL-SAFE

This submenu allows you to configure the automated safety actions (Fail-Safe) in case of loss of the communication link between the drone and the ground controller.

By default, if a loss of the radio link were to occur, the system would automatically switch to Return mode (RT L, RT C, RTP) in order to return to the return position, set by the operator during the checklist. If initially the drone has not had time to acquire a GPS position before takeoff, the drone will switch to landing flight mode to land at the current position.

When the fail-safe procedure is triggered, the communication link can be re-established spontaneously. In this case, it is possible to regain control of the drone in order to cancel the ongoing Fail-Safe procedure. To do this, a switch of the flight mode selector on the GCS will be necessary.

[20] GEOFENCE (GEOGRAPHICAL BARRIER)

This submenu, also selectable in the mission planning submenu, allows you to create inclusive or exclusive "Geofences ", simple (circular) or complex (polygons).

To do this, click on the "Fence" tab and choose the type of "Geofence" desired, as well as the action to be performed if the geographical barrier is reached or exceeded: Message from Alert, Return, Landing …

All the active "Geofence" will then be displayed on the right side of the screen and on the map.

The inclusive "Geofences" are yellow and the exclusive "Geofences" are red. Inclusive "Geofences" keep the system inside an airspace. Conversely, exclusive "Geofences" prevent the system from entering an airspace.

If the flight plan is set in contradiction with the Geofence, an alert message will inform the remote pilot that the flight plan does not comply with the volume constraints of the Geofence».

FIGURE 40 - DISPLAY OF GEOFENCE ON THE DIODON HYSTRIX CONTROL INTERFACE

[21] ANNOTATING MAP

In this submenu, you can annotate maps using a NATO symbol or a supplied color code.

Maps can be annotated by selecting the desired icon and then clicking on the map background to create a symbol on the map.

A long press on an already placed icon allows you to move or delete it.

A short press will allow you to display the GPS coordinates of the designated point.

FIGURE 41 - ANNOTATING MAPS ON THE HYSTRIX DIODON CONTROL INTERFACE

[22] MAP MANAGEMENT

This submenu allows you to either import maps downloaded for offline use from QGC (Q Ground Control) or import images in ". TIFF" internal to your services and georeference them.

When georeferencing an image, you are asked to fill in the coordinates of the upper left and lower right corners in decimal degrees so that this image can be superimposed on the standard satellite view.

FIGURE 42 - ILLUSTRATION OF BACKGROUND MAPS MANAGEMENT

A low-definition satellite view is included as the basis for the entire Earth in the system. However, it is possible to add high-definition satellite views via USB stick to specify flight areas before the mission.

To do this, follow the steps below :

1. Install **QGroundControl** (QGC) on your computer.
2. Launch the app and click on the "Q" icon located at the top left of your screen.
3. Select « Offline Maps ».

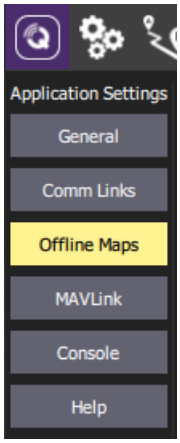


FIGURE 43 - OFFLINE MAPS MENU ON QGROUNDCONTROL

4. Move to the desired area. The area displayed on the screen will be the area where the "tiles" of the map will be downloaded.
5. Choose a title for your card.
6. Uncheck "Fetch Elevation Data". DIODON HYSTRIX does not manage terrain elevation data. As the system is made to be operated on a surface area (sea), ground elevation data is not necessary.
7. Select, inside the menu on the right the “Google Hybrid” map service, the minimum and maximum level of zoom you wish to have on the file. The higher the maximum zoom level and the lower the minimum zoom level, the heavier the file will be. If a warning “too many tiles” appears, you need to zoom more on the map to reduce the desired area, or to reduce the maximum zoom level. A minimum zoom level of 10 and a maximum zoom level of 18 are recommended. An overall file comprised between 300 Mo and 700Mo is highly recommended to ensure good functionality once imported.

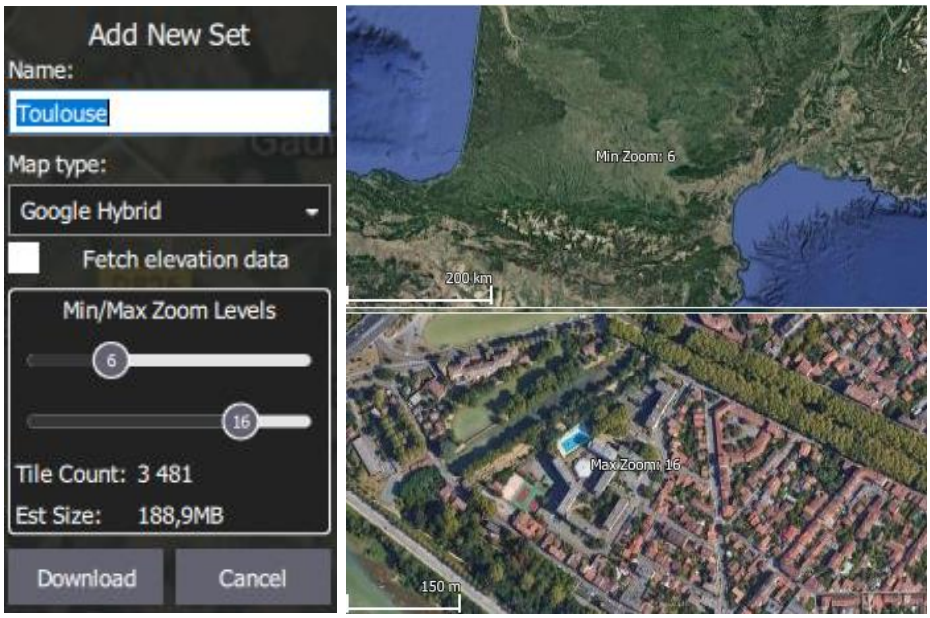


FIGURE 44 - CHOOSING SETTINGS FOR DOWNLOADING BASEMAPS WITH THE CORRESPONDING ZOOM LEVEL

8. Download the map by clicking on the "download" button. A screen displaying the current download will then appear. Wait for your download to complete.

9. Transfer the file to a USB stick by clicking on the "Export" button in the menu at the bottom of the screen. The name of the downloaded file must have the file extension ".qgctiledb" displayed in File Explorer. Add it to the end of the file name so that the file is correctly recognized by the control software as an importable card.

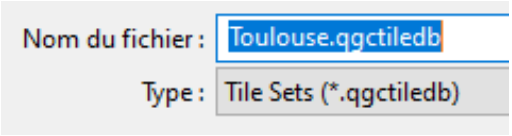


FIGURE 45 - FILE TYPE NAME ON QGROUND CONTROL

10. Properly disconnect the USB flash drive from your computer and plug it into the USB port on the GCS Mk.2 to view the downloaded files.

11. In the "Map" menu, select the map import and then the downloaded map before starting the transfer.

[23] Date & Time Setting

This menu allows you to set the date and time of the GCS in order to have a correct classification of the media files when recording.

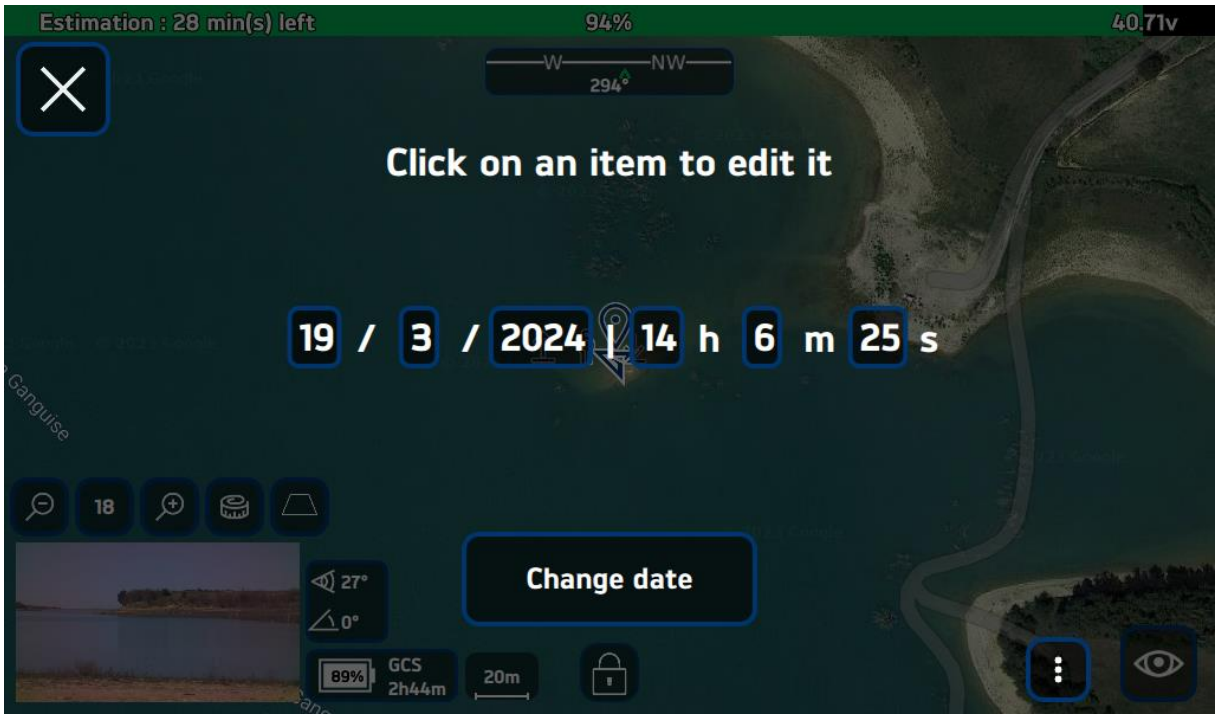


Figure 46 - MENU TO CHANGE THE DATE AND TIME

[24] MEDIA FILES

This icon provides access to the media player to view photos and videos saved on the DIODON GCS Mk.2.

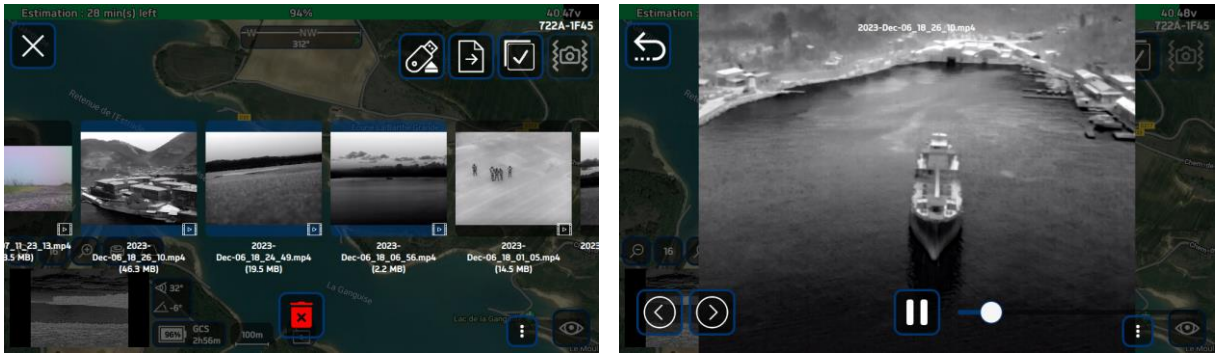


FIGURE 47 - MEDIA DISPLAY ON THE DIODON HYSTRIX CONTROL INTERFACE

Multiple files can be selected by long-pressing on one file and then briefly tapping on the following files. These files can then be transferred to a USB flash drive. It is possible to select everything at once by clicking on the global selection icon to the left of the USB eject.

It is possible to stabilize a video after flight by selecting the video you want to stabilize and clicking on the stabilization icon at the top right.

Caution : The video post-stabilization feature is not accessible when the drone is connected to the GCS. Once the video is stabilized, another video file will be created with a smaller size.

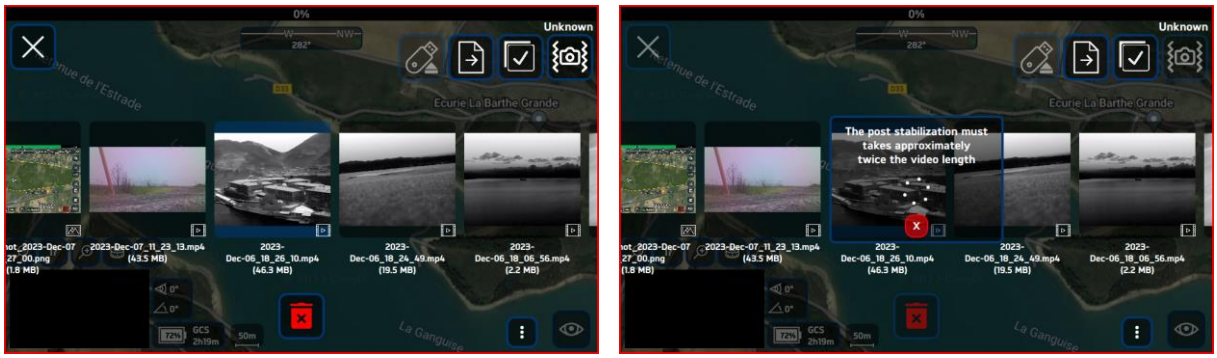


FIGURE 48 : POST-STABILIZATION PROCESS

[25] DATA STORAGE CAPACITY

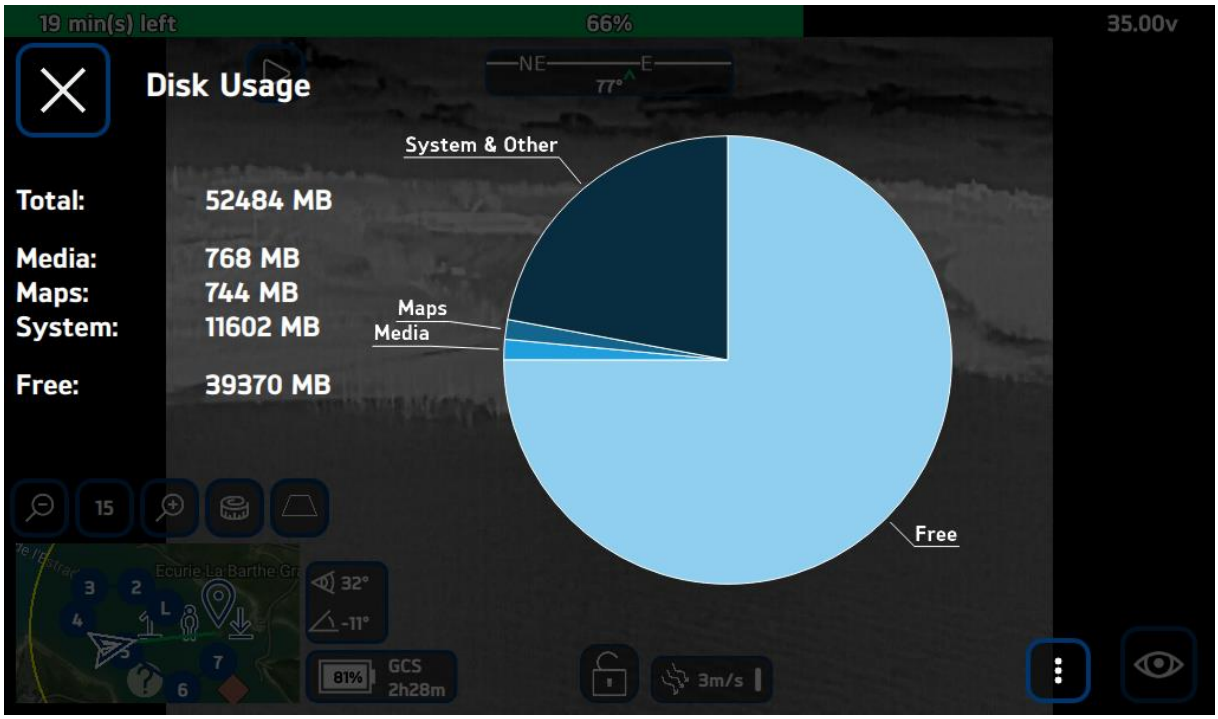


FIGURE 49 - DATA STORAGE CAPACITY ON THE DIODON HYSTRIX CONTROL INTERFACE

This submenu allows you to view the use of the controller's storage space.

Warning : Two alerts are issued when the remaining space is < 15% and < 5%. There is a risk of closing the Hystrix application if the operator does not free up space and fills the disk completely: Storage space = 0%.

[26] UPDATE MENU

This menu is used to update the ground station and flight controller software.

Beforehand, you will have copied an "AppImage" file with the DIODON Hystrix update to a USB stick. Once the key is detected on the GCS, a dialog box will offer you to update Hystrix or Drone Firmware. Choose Hystrix and follow the process. It is imperative to perform the Hystrix update before updating the flight controller (Drone firmware).

The old version will be automatically replaced.

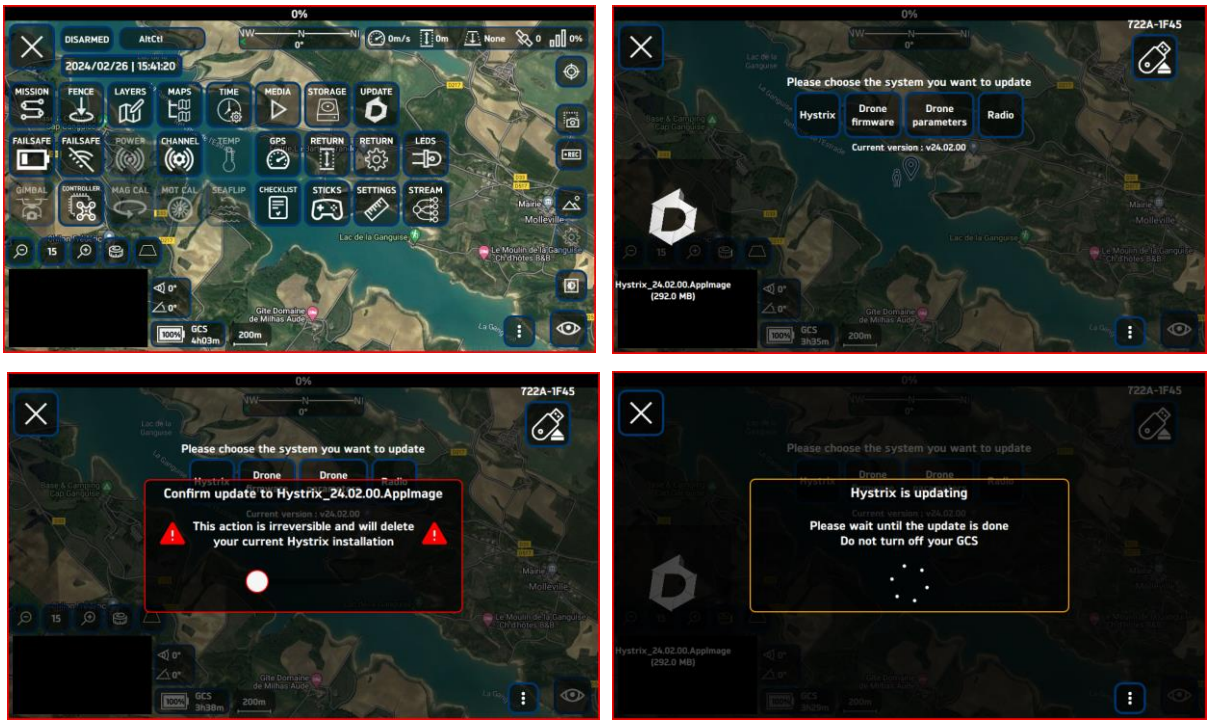


FIGURE 50 –DIODON HYSTRIX UPDATE PROCESS

Once the Hystrix update has been completed, please restart the GCS for the update to take effect. It will then be necessary to update the drone and settings.

OPERATIONAL MARITIME FLIGHTS

DEPLOYMENT FROM BOATS OF ALL SIZES

DEPLOYMENT FROM SMALL BOATS

Among the specificities of the DIODON HP30, it is possible to operate the system from any type of boat.

Indeed, the system does not need to be deployed from a stable surface. The boat can perfectly be in movement in order to deploy the system. The restricted appearance of some boats makes take-off phases risky. However, with the DIODON HP30, it is perfectly possible to "throw" the system into the water from the boat and use the water as a take-off surface.

The system can be dropped onto the water while the boat is in motion, avoiding interrupting the current operation.

DIODON HP30 SEAFLIP OPTION

The possibility of being able to “throw” the system into the water from a moving craft can cause the system to overturn at the time of impact. Waves can also be a source of overturning if the sea is very formed.

To address this, the Seaflip feature allows the system to detect that it is flipped and to initiate an automatic flip procedure that allows the operator to remotely take off the system without the need to manually flip the system. Finally, the automatic take-off function after Seaflip frees the operator from a communication link to get the system off the ground once it has been turned around.

TAKE-OFF AND LANDING FROM A MOVING BOAT

It is perfectly possible to operate the system from a larger ship and to recover it using a recovery blunder when the deck is too high.

Depending on the size of the deck, the speed of the boat and the operator’s experience it will also be possible to land directly on the moving boat.

To this end, the AltCtl mode will be preferred in order to better adapt the speed of the system to that of the boat.

UPKEEP

GENERAL POST-FLIGHT INSPECTION

After each flight, perform a general inspection of the DIODON HP30 drone. Before starting the inspection, always check that the DIODON HP30 battery is turned off (ON/OFF battery power button not pressed). Then, inspect the following:

- Check that the arms (structure and inner tube) are not pierced nor torn. Change them if needed.
- Check that the propellers are intact and in good condition. Make sure they are not cracked, broken, or have been permanently misshaped. Change them if needed.
- Check the overall state of the drone's and the GCS's antennas. Change them if needed.
- Check that the main housing of the drone is not broken or cracked, even slightly. Pay particular attention to weak points such as antenna bases and scratch attachments.
- Check that the drone battery is not damaged, that it is not deformed, that it has not suffered damage . If this is the case, do not use the battery, isolate it in an open and controlled area, and refer to the battery safety recommendations for the rest of the procedure.

In the event that any of the non-consumable parts of the drone is damaged, such as but not limited to the drone's main case, stabilized payload, and the plastic battery holder on the back of the system, do not use the drone anymore and contact DIODON DRONE TECHNOLOGY or its partners for the proper procedure.

In the event of a drone drop, it is recommended that you no longer use the battery used for the flight. Please also be particularly vigilant in the previous points as a poor inspection can lead to a malfunction of the drone. Humidity sensors are present in the DIODON HP30's main case as well as in each drone battery.

In the event of a leak following a shock, causing an inflow of water, a warning message will be sent from the controller indicating the rapid increase in humidity in the system. If this is the case, place the system in a dry place and isolate the battery.

ROUTINE UPKEEP

After each flight, particularly in the marine environment, routine maintenance is required to extend the life of the DIODON HP30 system. Several components of the DIODON HP30 are susceptible to corrosion (rust) following use in saline or corrosive environments.

These include : external motors and connectors (antenna bases, connector bases, battery base), payload gimbal motors .

To extend system life and maintain system performance, perform the following steps :

1. Before handling the drone, make sure it is turned off by checking the button on the battery.

2. Ensure that all connectors are plugged in and that protection caps are inserted before any operation (flight or maintenance).

3. Rinse all external parts of the drone that may have been exposed to seawater **with fresh water**.

4. Pay special attention to motors and payload (stabilization is done using motors). Rotate the motors when you rinse them to ensure optimal rinsing.

5. Ideally, in the event that the motors have been completely submerged, completely submerge the motors in a freshwater tank and rotate them to remove any saline residue.

6. Dry the drone in a dry, ventilated environment.

7. Once the drone is dry, apply engine lubricant provided by DIODON DRONE TECHNOLOGY. Apply it before (if lubricant has not been applied after the last flight, or if the system has not flown in a marine environment for a long time) and after each flight in a marine environment from above on the upper motor bearing, and also on the lower bearing via a channel provided for this purpose on the spacer located between the engine base and the inflatable structure. Rotate the motors to ensure optimal distribution.

8. Lubricate the 2 payload motors via the openings on the front or rear of the motors (provide a wiper to be placed between the nacelle and the case to absorb the excess lubricant.

9. Store the drone in a dry, ventilated environment so it can dry again.

DOWNLOADING FLIGHT LOGS

After each flight and/or during maintenance procedures, upload flight logs to storage. If you encounter any problems, this will allow DIODON DRONE TECHNOLOGY to have all the necessary information to solve these problems and upgrade the system. To do this, follow the procedure below:

1. Launch QGroundControl on your computer.
2. Connect to the drone with the USB cable and wait for the connection to be established with the drone.
3. Click on the QGroundControl logo in the top left corner of the screen.

FIGURE 51 - QGROUNDCONTROL ICON

4. Click on "Analysis tools".
5. Click on "Log Download" and then "Refresh" on the right side of the screen. A complete list of available logs will be displayed (this may take several minutes depending on the number of logs)
6. The latest logs are at the bottom of the list, select the logs you want to download and click "Download" on the right side of the screen.

A file in ".ulg" format with today's date is then available. A flight is usually more than 10MB. Logs with smaller sizes are usually simple ignitions for calibrations or updates.

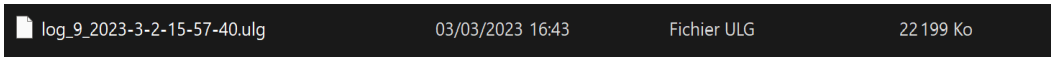


FIGURE 52 - LOG FILE EXAMPLE

Once the logs are retrieved, they can then be sent to DIODON DRONE TECHNOLOGY for further analysis. Do not hesitate to add to your analysis request any information that may be useful (problem encountered if any, weather and environmental conditions such as buildings or important structures near the flight area).

DIODON HP30 SOFTWARE UPDATES

FLIGHT CONTROLLER UPDATE

The update of the HYSTRIX DIODON application has been discussed and illustrated previously in this manual. If you turn on your system without updating the Drone firmware or its settings, a message will inform you that the connected system does not have a compatible version and will ask you to update.

The application update file is the same that will update the flight controller.

Once the application has been updated, please follow these procedures to update your system:

1. Launch DIODON HYSTRIX without turning on or connecting the DIODON HP30.
2. In the Menu then Update select the Drone firmware update.
3. Your system should not be connected at this step.
4. Connect the system using its USB connector once the app prompts you.
5. The update is done following 4 steps. Make sure you do not unplug the system during these steps.
6. Once the update is complete, the system will automatically restart.
7. Please unplug the system and turn it on to ensure match between HYSTRIX DIODON and HP30 DIODON update versions.

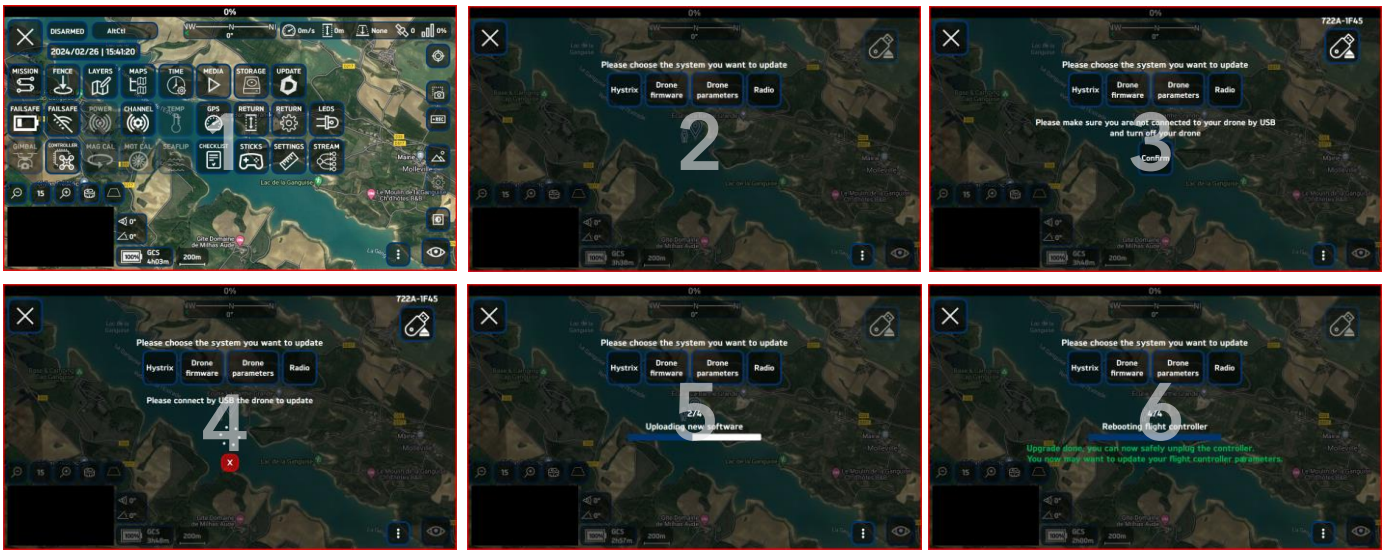


FIGURE 53 - DRONE FIRMWARE UPDATE PROCESS

UPDATING FLIGHT CONTROLLER SETTINGS

It is also planned not to have to update the entire flight controller but only certain parameters.

The procedure is the same as for a full update except that the system must be connected to the GCS. This update is done via the RF link and not wired.

1. Launch DIODON HYSTRIX by also turning on the DIODON HP30.
2. A message appears at the bottom if the system settings are not up to date, thus preventing any arming of the engines.
3. In the Menu then Update select the update Drone parameters.
4. Starts the update until you see a message that the settings have been successfully updated.
5. If a connection or compatibility error occurs an error message will appear.

FIGURE 54 - DRONE SETTINGS UPDATE PROCESS

In any case, a difference in versions or compatibility between Hystrix, the flight controller or the flight controller parameters will prevent the system from being armed.

UPDATING RADIO SETTINGS

It is also expected to be able to make changes to the radio's configuration, activate or disable a radio feature or simply update the radios' firmware. For this, a radio update option has been provided.

As with the parameters, the system must be connected to the GCS. This update is done via the RF link and not wired.

1. Launch DIODON HYSTRIX by turning on the DIODON HP30 as well
2. In the Menu, then Update, select the Radio update
3. Run the update until you see a message that the radio has been updated or that the radio has failed.
4. A message will appear to inform the user that the system has been updated correctly, the GCS and the two modems (Edge and Ground).

FIGURE 55 - PROCESS FOR UPDATING RADIO VERSIONS (ON-BOARD AND GROUND)

TRANSPORT AND STORAGE

The DIODON HP30 system may be transported in a backpack or in a rigid case. A specific packing disposition has been developed to best suit the unique design of the drone. A removable central protective foam, common to both the backpack and the rigid case, has been designed to allow easy unfolding and folding, while providing optimal protection to the value elements on the drone.

FIGURE 56 - DIODON HP30 FOLDED ON CENTRAL PROTECTIVE FOAM

The backpack, as well as the rigid carrying case, allow you to store the entire system: the DIODON HP30 drone, the DIODON GCS Mk.2, the DIODON HP30 waterproof smart batteries (up to 3), the necessary equipment for the drone and controller to work (pump, chargers, USB and Ethernet cables) and a complete maintenance kit .

Before storing all equipment for long periods of time, make sure connectors and surfaces are dry.

FIGURE 57 - CARRYING BACKPACK

FIGURE 58 - INTERNAL DECOMPOSITION OF THE RUGGED TRANSPORT PELICASE PELIAIR1605

MAINTENANCE

In order to keep the drone in operational condition for as long as possible, maintenance operations can be carried out easily in the field or in the room with a wide range of spare parts. The manual can be downloaded from the "Tresorit" platform.

The maintenance operations described in the maintenance manual are broken down into two types: **Preventive and Remedial.**

A level of technicality makes it possible to classify each operation, whether curative or corrective, into **3 technical levels of intervention.**

PREVENTIVE MAINTENANCE

THE DIFFERENT POSSIBLE ACTIONS

To allow you to extend the life of the drone, so-called preventive and simple maintenance operations are carried out by the operator.

This is maintenance carried out on a regular basis and is intended to prevent failures or detect incipient failures. Each operation is carried out according to several hours of flights carried out or a temporal frequency. This frequency is detailed in the spreadsheet below.

Before carrying out any operation, it will be necessary to ensure that the drone is properly switched off. If water or lubricant is used, it will be necessary to check that all connectors are properly protected (properly plugged in or plugged with caps) to ensure that the system is watertight.

ACTIONS	LEVEL	FREQUENCY	DURATION
Update (GCS Mk.2/DIODON HP30)	1	Minimum 2 times / year	5 min
Rinse & Dry Complete System	1	After every flight at sea	60 min
Engine lubrication (X6: Drone and Gimbal)	1	After every flight at sea	5 min
Engine Replacement	2	Every 50 flight hours	30 min
Magnetometer calibration	1	Geographic change	5 min
Engine Calibration	1	T° modification > ± 20°C (Min 2 times / year)	10 min
Full Inspection	2	1 time / 5 flight hours	5 min
Cleaning optics	1	Before each day of flights	5 min

These frequencies are provided for information purposes only. Some actions may be taken beforehand depending on the maintenance and conditions of use of the systems.

REMEDIAL MAINTENANCE

THE DIFFERENT POSSIBLE ACTIONS

This is maintenance that is carried out after a hardware/software or structural incident has been identified. An operator's doubt during visual and manual inspections can lead to remedial maintenance.

It is perfectly possible to have a maintenance operation that is considered both preventive and remedial.

ACTIONS	LEVEL	FREQUENCY	DURATION
Motor Alignment	1	In-flight instability	10 min
Arm Replacement	2	Structural Wear & Valve	30 min
Replacement of the nacelle brackets	2	Delamination after landing	10 min
Replacement of the nacelle slats	2	Delamination after landing	15 min
Replacement of shock absorbers	2	Leak	15 min
Propeller Replacement	1	Usury	5 min
Downloading logs	1	Incident/Accident/Observation	15 min
Engine Replacement	1	Hard point	15 min

POWERTRAIN REPLACEMENT

The replacement of a rotor, built on a propulsion group (rotor, spacer, flat composite support and connector), may be done by a trained operator. It is highly advised to carry out frequent upkeep operations on the rotors to prolong their life expectancy.

After roughly 50 hours of flight time, especially at sea, or anytime the rotor shows signs of weakness, it is highly recommended to change a propulsion group.

The replacement of a motor power unit is done thanks to a hexagonal screwdriver provided in the maintenance kit. Like propellers, two types of powertrains exist (CW and CCW), depending on the direction of rotation and their location.

Rotor tilt angle, connector orientation and white eye-indicator help position the right powertrain in the right places.

The rotor is held by two ways on its support (which is itself in turn attached to the inflatable structure): by the plastic spacer/crosspiece present under the rotor, which is screwed with the rotor and the support, and by the cables enabling the powering of the rotors.

When replacing a powertrain, the spacer will be unscrewed from its bracket, so that the rotor will be held only by its power cables. Particular attention should be paid to the cables so as not to apply too much effort.

To remove and replace a powertrain, follow the steps below.

1. Deflate the arm on which the propulsion group to be replaced is located.
2. Disconnect the propulsion group connector from the main case.
3. Shift the sock into the inflatable arm so that you can unscrew the fixing screw of the motor spacer with a 2.5 hexagonal screwdriver. Be careful not to damage the structure and not to lose the screw and its washer.
4. Be careful not to exert torsional forces on the cables.
5. Using a non-pointed screwdriver, peel the fabric off the carbon plate for ease when removing the plate from the sheath.
6. Slide the flat carbon holder outwards to make it easier to remove it from the inflatable structure sleeve .
7. Screw the spacer onto its carbon support plate to avoid stress on the motor cables when the motor is not attached to its bracket.

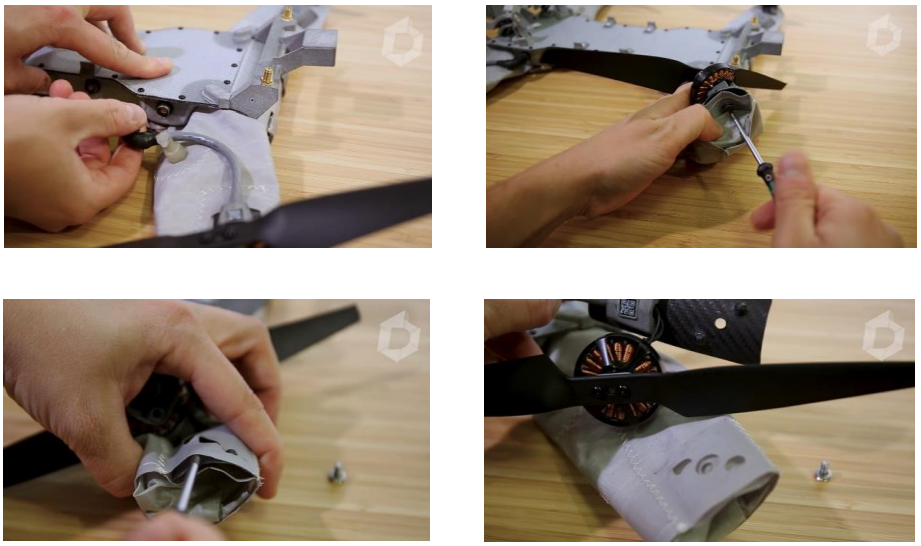


FIGURE 59 - THE DIFFERENT STEPS TO REMOVE THE PROPULSION GROUP

To install a powertrain, follow the steps below:

1. Take the new propulsion group possessing a spacer oriented the same way (tilted right or left). You will now need to do the removing procedure backwards to replace the propulsion group.
2. Unscrew the crosspiece from the flat composite support outside the structure and make sure the rotor is not pulled to far apart from the flat composite support so as not to damage the cables.
3. Lift the spacer and slide the forward part of the flat composite support under the structure until it blocks. The aiming cones should help you put the support in the correct position.
4. Hold the propulsion group to the structure and introduce a screw in its dedicated spot inside the structure close to the sock.
5. Screw the spacer to its support from the bottom thanks to the 2.5 hexagonal screwdriver. The propulsion group is now in place.
6. Pull the sock inside the structure towards the outside.
7. Plug the propulsion group connector to its associated baseplate on the central compartment of the drone.
8. Slowly inflate the arm to make sure the propulsion group is well positioned and aligned with the arm.
9. At the first switch on of the drone after this procedure, calibrate the rotors from the piloting application.

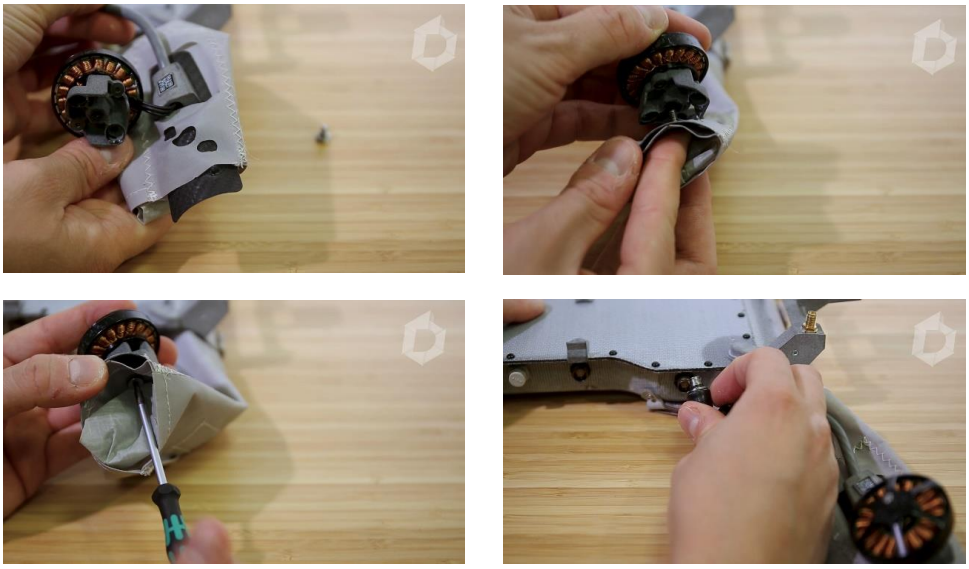


FIGURE 60 - THE DIFFERENT STEPS TO INSERT A NEW PROPULSION GROUP

ARM REPLACEMENT AND ADJUSTMENT

Each arm is attached to the main housing thanks to 4 fixing straps. The length of each mounting strap of the DIODON HP30 has been adjusted to correctly orient the arm. To disassemble and replace an arm of the DIODON HP30, follow the procedure described below.

1. Disconnect all powertrain connectors.
2. Unless you also change both propulsion group, remove them from the structure to integrate them on the new structure.
3. Unless you also change the inner tube, remove it a to integrate it on the new structure.
4. Detach the 4 straps and remove the structure.
5. Obtain a new structure and equip it, if necessary, with a new inner tube and propulsion units.
6. Place the structure in the place provided for this purpose on the main box and then fix it with the fixing scratches.
7. Inflate the inner tube to make sure the arm is properly placed.
8. Adjust the arm if necessary by stretching or relaxing the attachment scratches.
9. If the arms are not correctly placed, repeat until you reach a nominal position.

It is important you check that the straps are properly scratched at the end of the operation and are not too stretched to ensure that the arm is properly held on the composite structure over time.

PROPELLER REPLACEMENT

The replacement of a propeller is done with a hexagonal screwdriver (2) provided in the maintenance kit. To change a propeller, follow the procedure described below.

1. Unscrew the 2 screws that hold the propeller on the engine.
2. Take an identical new propeller (CW or CCW). Pay close attention to the direction of rotation to choose the right propeller.
3. In the same way as for engines, a white mark is located under the propellers rotating clockwise.
4. Place the propeller with its spacer on the motor and turn it until the screws are aligned with the holes on the motor .
5. Screw firmly to fix the propeller.

The illustration below shows the direction of rotation of each propulsion group.

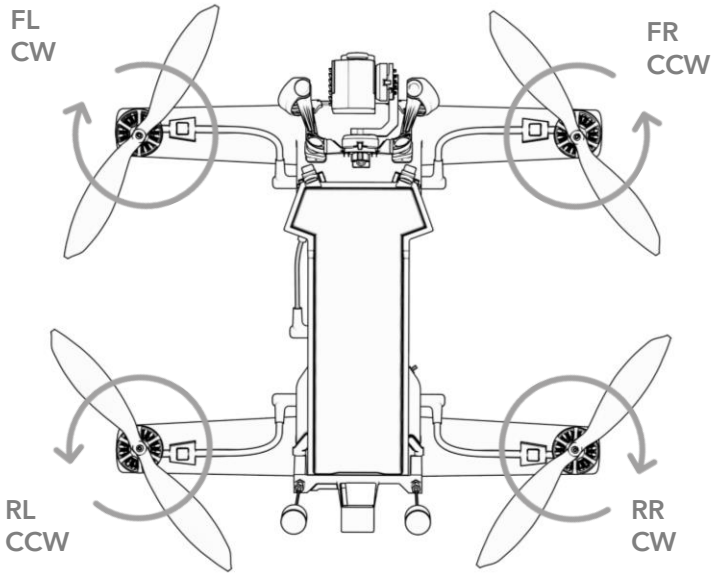


FIGURE 61 - DIRECTION OF ROTATION OF MOTORS

ANTENNA REPLACEMENT

The antennas on the DIODON HP30 and the DIODON GCS Mk.2 have been specially designed for each element. Make sure you select the same antenna size you are changing. An antenna present on the DIODON HP30 will not be able to go on the DIODON GCS Mk.2.

The drone's antennas are shorter than the controller's. The antennas are polarized and are named RHCP and LHCP. The direction of polarization can be switched, i.e. an RHCP antenna will not necessarily be positioned to the right of the drone or GCS. However it will be important to ensure that the GCS and the drone are each equipped with an RHCP antenna and an LHCP antenna.

To replace an antenna, follow these steps.

1. Make sure the GCS or drone is not powered. The handling of live connectors presents a high risk of sparks.
2. Unscrew the damaged antenna by the baseplate.
3. Screw in the new antenna. Make sure not to introduce dirt of water inside any of the baseplates during this operation.
4. Turn on the systems and make sure the communication link has been established correctly.

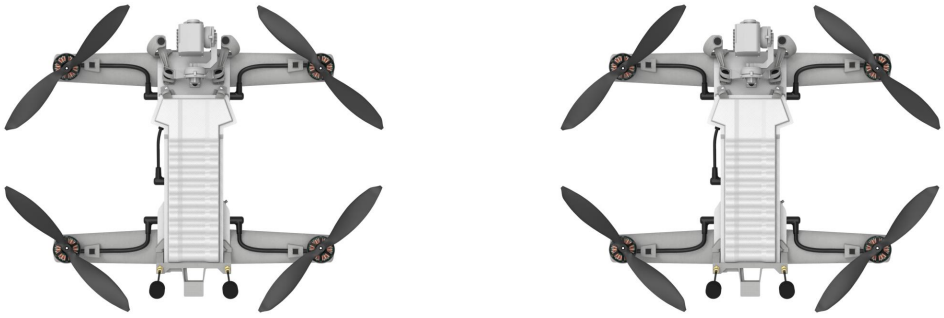


FIGURE 62 - ANTENNA POLARIZATION REVERSAL

TROUBLESHOOTING

A list of issues has been drafted with the associated first verification steps should you encounter operational challenges with your drone system. Make sure to carry out these actions before contacting your point of contact or DIODON DRONE TECHNOLOGY's support for more information.

DIODON DRONE TECHNOLOGY CONTACT INFORMATION

Opening hours: Monday to Friday, 9:00 am to 6:00 pm (CET)

Email: support@diodon-drone.com

Telephone: +33 (0) 9 81 18 77 59

TROUBLESHOOTING LIST OF THE DIODON HP30 SYSTEM

NO CONNECTION CAN BE ESTABLISHED WITH THE DRONE

1. Check that the system is powered on correctly: check that the battery connector of the DIODON HP30 drone is properly connected to that of the main box and that the ON/OFF button on the drone battery is pressed.

2. Check that you are using the DIODON GCS Mk.2 paired with the DIODON HP30 drone.

3. Make sure that two Hystrix apps are not open at the same time.

4. Check that the drone and controller antennas are properly screwed.

5. Check the emission powers. If these are too powerful and the drone is too close to the GCS, saturations can be observed.

6. Keep the drone and GCS away from surrounding electromagnetic and radio sources to avoid interference.

7. Restart the drone and controller and make sure you're on the same channel».

THE DRONE DOES NOT TAKE OFF

1. Check that nothing is blocking the rotation of the propellers. Rotate the motors manually to check for abnormal resistance.

1. Check that the battery is not completely discharged.

2. Check the direction of rotation of propellers.

3. Check engine tilt (see "Drone is not stable on its yaw axis") and the direction of mounting of the propellers.

4. The flight mode is "HOLD", reselect “ALT” or “GPS”.

5. Check that there are no safety measures blocking the armament of the engines, such as insufficient number of satellites, low positioning accuracy, or a version difference between the GCS and the system.

A MOTOR IS RUNNING ABNORMALLY

1. Perform a motor calibration (remove propellers first).

2. If the problem persists, change the motor and calibrate the motors.

THE DRONE IS NOT HORIZONTALLY STABLE IN GPS MODE (POSCTL)

1. Try to improve GPS signal reception:

    a. By waiting for more satellites to be detected,
    b. By limiting proximity to obstacles such as buildings.

2. If applicable, move away from potential sources of magnetic interference, such as metallic structure.

THE DRONE DESCRIBES CIRCLES FASTER AND FASTER IN GPS MODE OR POSCTL

1. Calibrate the magnetometer away from magnetic interference (e.g.: metallic structures).

2. Keep the drone away from magnetic interference (e.g.: metallic structures).

THE DRONE IS NOT STABLE IN ALTITUDE MAINTENANCE

1. Check the four vents on the system for obstructions. The vents are located on the side of the drone and next to the quick-release latches.

2. Check propeller and motor condition. Vibration may degrade system stability in flight.

THE DRONE IS NOT STABLE ON ITS YAW AXIS

Check the correct inclination of the motors; The inclination must be homogeneous:

1. Front motors should be tilted backwards, while rear motors should be tilted forward.

PRESENCE OF FOG ON THE SENSOR LENS

The waterproofness of the payload is potentially compromised, check the absence of shocks or marks on the case of the payload. Contact DIODON support immediately.

THE HUMIDITY LEVEL IN THE DRONE IS HIGH

Check the drone's main case for any shocks or marks. If water inside the main case is suspected:

1. If there are no visual signs, check the humidity submenu and note the humidity level. If humidity is high (>60%) or that the rate value increases, turn off the system and contact DIODON support.

THE BATTERY TEMPERATURE IS HIGH

1. Monitor the temperature, in hot environments and with low cooling (hovering), the battery temperature can reach up to 70°C. In this case, stop your flight. Continuing to fly can permanently damage the battery or even cause the battery to malfunction immediately.

2. Cool the battery with water, having resealed the connector beforehand to avoid compromising the seal.

TROUBLESHOOTING LIST ON THE DIODON GCS MK.2

THE SCREEN DOES NOT TURN ON

1. Check the LED indicator on the power button of the DIODON GCS Mk.2. It must be activated after a short press.
2. If the LED is not active, recharge the DIODON GCS Mk.2 and try again.

NO CONTROL INTERFACE APPEARS / THE INTERFACE HAS DISAPPEARED

Press the interface icon (DIODON logo).

ONE OF THE SWITCHES/SELECTORS IS NOT WORKING

1. Go in the advanced menu of the DIODON GCS Mk.2 and select the "controller stick" icon.

FIGURE 63 - DIODON GCS MK.2 CONTROLLER STICK VERIFICATION TOOL

2. Use the mode to check the correct reaction of the actuator. If the actuator action is not visible, contact DIODON support.

GPS POSITIONING IS BAD

Try improving your reception:

a. Wait for more satellites to be detected.
b. Move to an open area and/or away from obstacles (e.g.: buildings) which could interfere with GPS positioning.

THE LINK BETWEEN THE DRONE AND THE GCS IS NOT STABLE (ACTIVATION OF THE FAIL-SAFE UNTIMELY)

Try improving the connection between the drone and the controller:

1. Orient the controller towards the drone's position and/or re-orient antennas if necessary.
2. Try positioning the drone to limit obstacles between the drone and the controller (buildings, terrain, people)
3. Rise the altitude of the drone.
4. Should the drone be vertically positioned from the controller, move the drone away horizontally.
5. Change the antennas on the drone and on the controller.

THE ALTITUDE OF THE DRONE IS UNSTABLE FOLLOWING A TAKE-OFF OF THE WATER

The internal pressure of the drone did not have time to balance. After a water landing, wait at least 15 seconds before taking off again for the internal pressure to equalize.

THE DRONE DOES NOT RESPOND TO FLIGHT COMMANDS

1. The drone is in Fail-Safe mode or another flight mode. Take control again by selecting an "ALT" or "GPS " flight mode via the left flight mode selector of the GCS DIODON Mk.2 or directly on the Hystrix application.

2. The "Panic Mode" button is activated. Long press the "Controller Lock Position" button to unlock the mode and regain control.

AFTER THE DRONE ROLLS OVER IN THE WATER, THE SEAFLIP FUNCTION DOES NOT WORK

1. The function is disabled in the flight menu.

2. The depth of the water is insufficient to allow the Seaflip.

3. The sea state (too calm) does not allow the system to detect a water turn automatically.

THE PAYLOAD NO LONGER STABILIZES NORMALLY (OR NOT AT ALL)

1. Stabilization has been disabled in the Gimbal menu.

2. A payload reboot is required via the “Gimbal stabilization” submenu.

3. A full reboot of the drone is necessary.

THE IR OR EO RETURN IS NOT CLEAR

1. The encoder system was unproperly initialized.
2. Land and reboot the system.
3. Check if the video stream has got back to normal state.
4. If the problem persists, please contact DIODON support.

APPENDIX

APPENDIX 1 : GENERAL NETWORK PARAMETERS

INTRODUCTION

Before you begin, it is important to define what an IP address is and how important it is in networks. The IP is a unique number assigned to each device on a network. IP addresses identify computers and devices and allow them to communicate with each other. In our case, this will enable the GCS to exchange information with one or more pieces of equipment on the same network: This is the principle of real-time broadcasting. Streaming the Hystrix interface (from the GCS) to another system (Single computer or Computer Network).

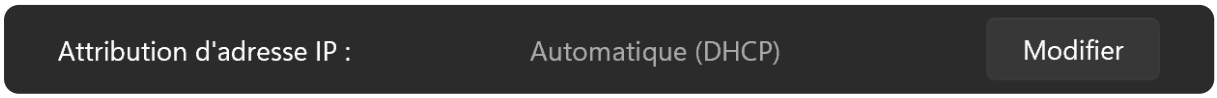
There are 2 types of networks: Static or Automatic (DHCP - Dynamic Host Configuration Protocol).

The choice of one or the other lies in the equipment you will have. For a fixed network, the IP address is set manually and will be the same all the time. Conversely, on a DHCP network, the IP address of media that will connect to the server (such as the Livebox) will have IP addresses that are automatically generated and allocated.

In both cases, there is a configuration of the broadcast system (single computer or server) and the GCS.

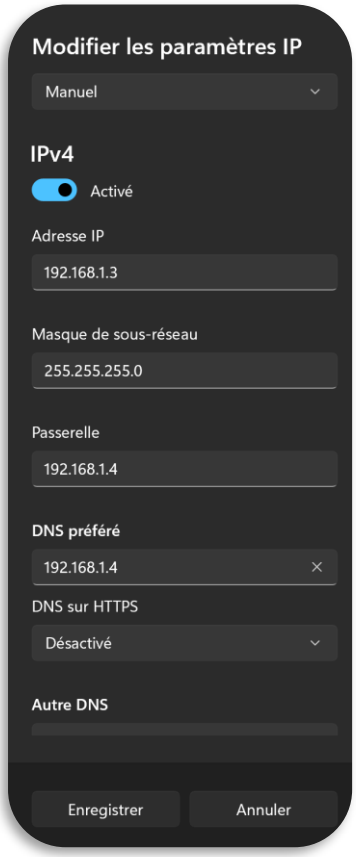
STATIC NETWORK: BROADCAST TARGET CONFIGURATION

In the network and internet settings, enter the Ethernet menu and change the IP address assignment not to Dynamic but to manual.



Select IPv4.

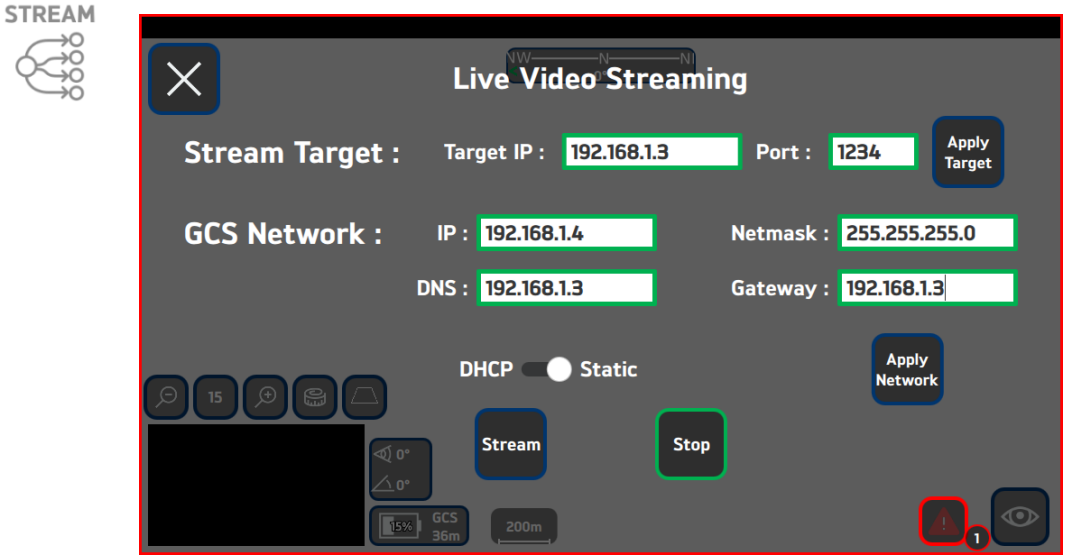
Enter the following parameters on the target stream system (the PC on which the stream will be broadcasted) :



- Static IP of the target stream system
- Possibility to change only the last digit
- Choosing a fixed IP for GCS (Only the last digit is different)
- Server on which to retrieve the information: GCS therefore same IP address as the GCS

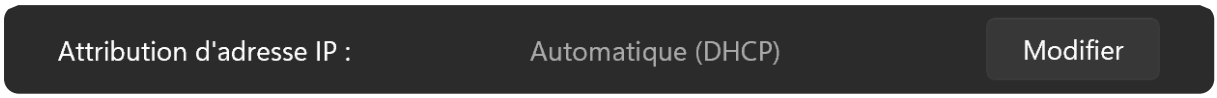
STATIC NETWORK : GCS CONFIGURATION

In the stream menu, fill in the target IP address (IP adress of the target streaming system), the port 1234 (always), GCS IP, the netmask (same as before), the stream target and the gateway. Do not fortget to select « Static » and not « DHCP ».



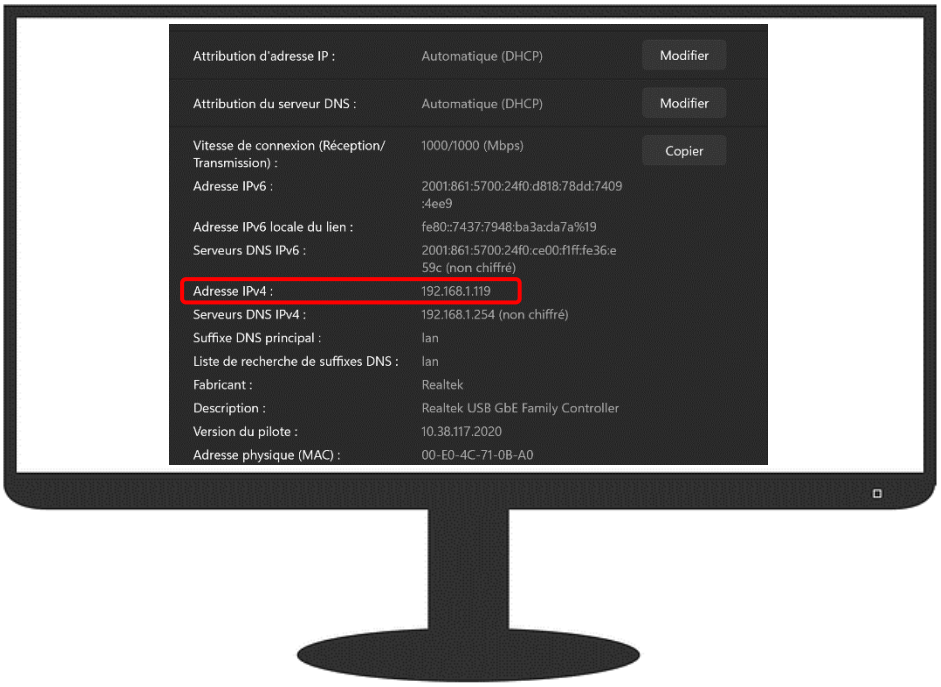
AUTOMATIC NETWORK: BROADCAST TARGET CONFIGURATION

In the network and internet settings, enter the Ethernet menu, and change the IP address assignment to Dynamic (DHCP), not manual.



Switch back to automatic for IP address assignment if you were manual.

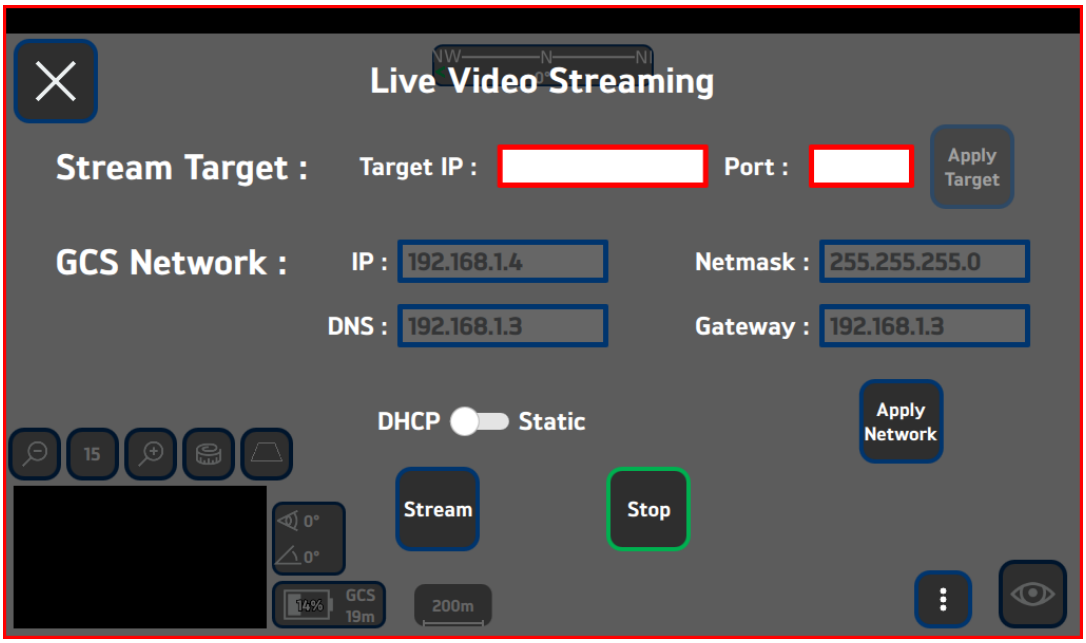
In the same menu retrieve the IP address of the target system that you will need to populate the target IP address on the GCS.



AUTOMATIC NETWORK : GCS CONFIGURATION

Select DHCP. The target IP will be the server IP.

The "Target IP" and "Port" fields must be populated with the broadcast port you have chosen and the IP address of the computer being used. The target IP address is the IP address that you just picked up (for example 192.168.1.119). You must choose a port, such as 1234 or 5678, and make sure that those ports are open on the server side



PLAYING THE STREAM

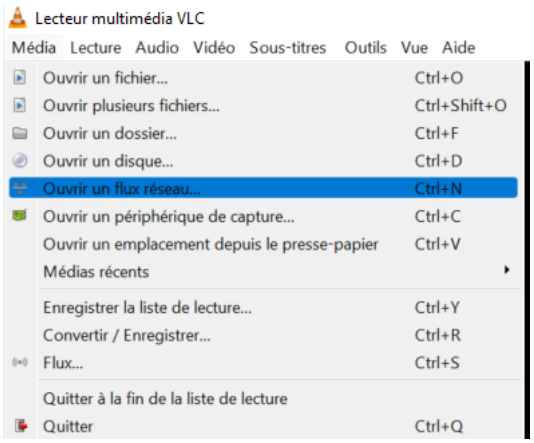
To play the broadcast video, we will use the VLC software. Make sure you have VLC version 2.2.5.1 and not newer versions. For this you can either download the version for your machine via the link below or find .exe on the USB key provided when shipping your HP30 Drone and the GCS Mk.2.

http://download.videolan.org/pub/videolan/vlc/2.2.5/

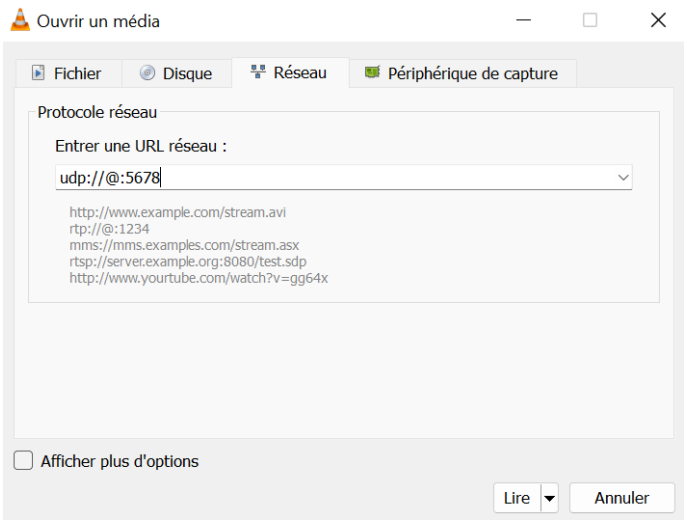
CAUTION: VLC can ask you for permissions.

Once the software and the correct version is installed, the video stream must be opened.

1. Once in VLC, click on media then "open a network stream"



2. Type the lines below where 5678 corresponds to the destination port of the broadcast. Then press Play, you should see the GCS video stream on your computer screen or after a few seconds (5 to 10s)



APPENDIX 2 : PHILOSOPHY OF PROCEDURES AND EMERGENCY MANAGEMENT

GENERALITIES

This appendix explains the philosophy of emergency management. These situations can be processed **automatically** with the flight controller or **manually** through the operator.

It is the operator's responsibility to anticipate possible emergency situations and to adapt the action to be taken according to his experience and, above all, to the current situation It is therefore essential for an operator to know the philosophy of alarm reporting and to know how to interpret them in order to better react when they occur.

Many sensors can be used to analyse different sub-elements of three major assemblies, namely :

- The DIODON HP30 system (UAV)
- The communication link (Radio link)
- The DIODON GCS Mk.2 (Ground station)

An alarm panel is available and can be displayed on Hystrix. A colour code highlights the level of importance of the various alarms.

LEVELS	SIGNIFICATIONS	ICON/COLORS
Failure	The requested action failed (in flight or on the ground)	
Success	The requested action has been completed successfully. Nominal condition, everything is working normally.	
Info	The app sends information back to the drone or GCS without taking immediate action	
Critical	Procédure de sécurité intégrée ou demande d'attention de l'opérateur ou préparation à l'atterrissage. **Surveillance requise de la part de l'opérateur.**	
Emergency	Atterrissage automatique forcé ou atterrissage manuel immédiat ou FTS (Flight Terminaison System). **Action requise de la part de l'opérateur.**	

When there is no **color**, it means that no information is available. This makes it possible to detect a loss of the communication link between the system and the GCS. No information is transmitted to the ground.

It is important to note that what can be considered mission-critical is not necessarily critical for flight safety.

The critical aspect may well concern the inability to continue a flight within a defined legal framework or for an operational need. For example, triggering a radio fail-safe leads to a return procedure that is not at all critical to flight safety, but may be for legal reasons (since autonomous flights are not permitted beyond a certain time). It is also considered critical to the interest and purpose of the mission. In fact, real-time surveillance without a communication link is not critical to flight safety, but it is critical to the mission.

SYSTEM STATUS PANEL

FIGURE 64 - ILLUSTRATION DU PANNEAU D'ALARME

In this case, a fail-safe procedure (Return To Launch type) was automatically triggered. This is a "Critical" alert that terminates the flight due to a range considered insufficient.

TRIGGERING METHODS

Alarms are used to inform an operator about the status of different systems that are either detected automatically or that result from an environmental analysis by the operator.

Related procedures are triggered **automatically** or **manually**.

For example, in the context of a masking of GNSS reception, there are two possibilities :

The operator is focused on his mission and therefore on the video feedback on the ground, he does not detect the disturbed area in which the system is evolving. The flight controller detects a sudden drop in the number of satellites or in horizontal and vertical accuracy on board. The autopilot will initiate an auto-landing procedure by informing the operator of the reason for the flight abort. **This is a so-called automatic triggering procedure.**

During another flight, the operator knows that he or she may enter an area of satellite signal interference. It constantly monitors the number of satellites picked up and detects a sudden drop in the number of satellites (16 to 9 for example). In order to avoid an automatic landing procedure, he takes the initiative to manually activate the Return Home mode on the GCS. **This is a manual triggering procedure.**

For the same alarm cause, the system is recovered either automatically or manually.

THE DIFFERENT EMERGENCY PROCEDURES

To terminate a flight or manage an emergency, there are 3 procedures with manual or automatic triggering for each of them.

1. **Return** procedure
   This procedure can be triggered automatically (e.g. if the communication link is lost) or manually (via the flight mode switch: Return or via the Hystrix interface in the flight mode menu).

   During this procedure, the system returns directly to its return point set by the operator before or during the mission: RTP/RTL/RTC.

2. **Automatic Landing** procedure
   This procedure is triggered automatically (during a battery alarm, for example) or manually via the Hystrix interface (in the flight mode menu: Land).

   During this procedure, the system lands where it is at the time of the initiation of the procedure.

3. **Safety Crash** procedure
   This procedure can be triggered automatically (e.g. in the event of a permanent engine stall) or manually using the "Killswitch" switch on the GCS or the "Disarm" button on the Hystrix interface.

   During this procedure, the system shuts off the power supply to the motors, resulting in a safety crash at the location where it is located at the time the procedure is initiated. No recovery of the system is possible during the rapid descent phase.

With the exception of certain cases, such as the shutdown of the engines in flight (safety crash) or an automatic landing following a emergency level of autonomy on the drone, the operator is able to cancel the triggered procedure. **He then takes responsibility for managing the emergency manually.**

ACTIONS ASSOCIATED WITH CERTAIN EMERGENCIES

This section summarizes actions related to the most common or critical emergencies.

1. RF Link

A symbology shows the quality of the communication link in real time. When the signal quality = 0%, this means that the radio link between the ground modem (RF module in the GCS) and the onboard modem (RF module in the UAV) has been cut.

When the communication loss time is > 0.7 seconds, then the system initiates a fail-safe procedure resulting in either a **return** or a **landing** at the current position. In case of recovery of the communication link between the GCS and the drone, the operator can cancel the procedure and regain control of the system.

The adjustable adaptive time in the "Settings" menu allows you to adjust the communication loss time according to the distance to the GCS. This avoids a fail-safe procedure for a loss of communication < 2 seconds during BVLOS scenarios.

2. Autonomy

- **DIODON GCS Mk.2 :** A low level of autonomy on the GCS will lead to a power cut of the GCS and therefore a loss of the radio link with the drone. The procedure is identical to that described above.

- **DIODON HP30 :** A low level of autonomy on the drone (analysis made on the percentage or voltage remaining) leads to different alarm management procedures. The last level results in an automatic landing procedure when the percentage or voltage reaches: 12% or 29 Volts.

We recommend a return to first alert procedure of 30%. It is important to bear in mind that at 12%, the system will not be able to fly for more than a few seconds. If this level is reached, the operator will have cancelled 2 alarms beforehand. This level should not be considered as a level at which the system can continue to fly, but only as a means of descending and conserving a little energy with a view to later recovery.

3. Temperature

- **Battery :** A temperature that is too low can lead to a wrong estimate of the remaining time in %, in this case prefer the analysis of the voltage, which remains a real measurement. When the temperature drops below 0°C, this may indicate a leak. Land in a dry place as soon as possible.

  On the other hand, if the temperature is too high, one or more cells may be damaged and there is a risk of a short-circuit. Land in a safe place as soon as possible and isolate the battery concerned.

- **Drone :** The temperature sensor is located on the power management board in the main casing. As with the battery, low temperatures may indicate a leak in the main unit. Land in a dry place.

  If the temperature is too high, this may mean that the system has been exposed for too long to a source of heat without cooling (sun, static ignition, etc.). Land the system and cool it down with water or by positioning it in the shade.

- **ESC :** When temperatures are too cold, this could mean a problem with the waterproofing in the main casing. After ignition, if the temperatures do not rise, land.

  When temperatures are too high, cool the system (shade, water, etc.)

4. Humidity

- **Drone :** If the humidity level rises rapidly and exceeds 60%, a leak would be to be feared. Land as soon as possible and contact DIODON support

- **Battery :** In the event that the humidity level rises rapidly despite a stable or increasing temperature, a leak would be to be feared. Land as soon as possible and contact DIODON support

5. GNSS

In the event of a lack of satellites at the GCS level, RTP mode will not be accessible. Choose an RTC return mode.

In flight, a problem with GNSS signal reception or accuracy (horizontal/vertical) will result in an automatic landing procedure which the operator may, if he wishes and can do so, cancel by switching to ALT flight mode to return manually using the magnetometer.

6. Motors

Depending on the maintenance carried out on the engines or the correct calibration of the engines (particularly between two environments with wide variations in temperature), stalls may be observed.

These stalls can be one-off or permanent. A permanent engine stall will lead to a system crash. In the event of a one-off stall, land as soon as possible, making sure that the area below the position of the system is safe (no risk to people on the ground). If possible, position the system above the water to cushion the possible fall.

7. Magnetometer

On the ground, disturbances to a magnetometer would make it impossible to arm the system. Keep away from metal sources that could interfere with the magnetometer.

In flight, a disturbance on the magnetometer means that you can no longer navigate, but this does not prevent you from flying. The system automatically switches to AltCtl, land while anticipating the possible effects of instabilities of the drone, especially in strong winds.