

USER MANUAL PIXIE DRONE Model A



ixieDrone

TSC-ID-301-V01-EN

THE
SEARIAL CLEANERS
STOP WONDERING  START CLEANING

INTRODUCTION

The PIXIE DRONE is a marine robot designed to clear unwanted material trash, plastics, microplastics, invasive plants from inland and near-coastal water. The PIXIE DRONE also can be configured to collect water quality data from the marine environment.

The PIXIE DRONE Class A version is a autonomous machine which can swim along a defined path or within a defined area. It can also be piloted manually, by remote control. Depending on your customization, it may or may not be data-enabled: this means that data from connected customer-selected sensors is sent to the RanMarine Connect SaaS platform for analysis and visualisation.

This user manual will guide the user through the recommended start-up, operation, shut down and basic maintenance procedures required to safely operate and take care of a PIXIE DRONE Class A.

NOTICE

The following personnel must have the qualifications required to operate, maintain or transport the Pixie Drone.

OPERATOR

The operator should read this user manual before operating a Pixie Drone for the first time to understand the intended use, standard operating conditions and potential hazards. The operator should be of sound health and not under the influence of substances that impair mental or physical performance. The operator is not authorized to carry out any maintenance works that is not in this manual.

MAINTENANCE TECHNICIAN

The maintenance technician must be an employee of, or authorized by, RanMarine or its authorized channel partner. The maintenance technician is not authorized to modify or alter a RanMarine product in any way, except as required for authorized maintenance and repair.

MANUFACTURER'S TECHNICIAN

The manufacturer's technician is authorized to perform complex operations and deal with larger problems that cannot be fixed by the maintenance technician.

DRIVERS OF LIFTING AND MOVING VEHICLES

Personnel lifting and transporting the Pixie Drone should have the required certifications, licenses and training in the country of use.



BEWARE

This symbol denotes a potential hazard associated with a risk of personal injury to the operator, maintenance technician and/or other persons. The reader should observe the recommended safety measures.



WARNING

This symbol denotes a potential hazard associated with a risk of damage to equipment and/or other exposed materials. The reader should observe the recommended safety measures.

PROHIBITED MODIFICATION

Modification of Pixie Drone is expressly prohibited without RanMarine's prior written approval. Any interventions or changes can result in injury and a void in the warranty.

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IMPORTANT INFORMATION

Before starting the PIXIE DRONE :

- ensure the deck is properly fastened to the hull
- ensure the hull and deck have no leaks
- charge the Pixie Drone and remote-control unit batteries
- confirm the basket is properly mounted
- confirm the water area is safe and free of hazards

While operating the PIXIE DRONE :

- exercise continuous common sense and good judgment
- observe the recommendations in this manual
- drive safely to avoid colliding with other floating objects or people
- reduce speed when Pixie Drone is in busy water or far from operator
- do not put hands near the thrusters or thruster guards
- keep children and unauthorized people away
- do not transport people or hazardous substances in the basket or on the deck
- exercise caution and always use protective equipment when removing waste from the basket as it can be harmful or toxic

Before storing or servicing the PIXIE DRONE :

- press the emergency stop (e-stop) button
- rinse the Pixie Drone with fresh water
- perform a visual inspection of the thrusters and guards
- recharge the batteries as per this manual

Electrical hazards

- ensure Pixie Drone is in OFF mode before performing any maintenance or touching the thrusters
- do not charge batteries with a damaged charger or plug or with the charger outdoors while it is raining
- do not operate the thrusters for more than five seconds at a time out of the water to avoid overheating

Do not operate the PIXIE DRONE:

- unless authorized to do so
- under the influence of alcohol, drugs or medication that impairs human performance
- while using another device, or performing another activity, that might distract you from the Pixie Drone
- if it is not in operable condition

OPERATING CONDITIONS

Intended Use

The Pixie Drone is a marine robot designed to clear unwanted material plastics, microplastics, general trash, oils, invasive plants from inland and near-coastal water. The Pixie Drone also collects data from the marine environment.

The operator should be standing or sitting in a safe, stable place, free from hazards. The operator should maintain visibility of the Pixie Drone to avoid potential risks. The operator should never stand or sit on the Pixie Drone while operating it.

The Pixie Drone Class A is only intended to be used where line-of-sight can be maintained and under the following environmental operating conditions:



The Pixie Drone can be operated in salt or freshwater. Be careful when operating in frozen water as ice cover could puncture the hull.

Pixie Drone Class A is designed to collect biomass material. However, if the biomass material is too dense or strong, it can encumber the Pixie Drone and possibly cause harm to the thrusters or hull.

Reasonable outdoor operating conditions

It is not recommended that the Pixie Drone is deployed in adverse weather conditions that could cause safety issues for either other water traffic or the operator.

The Pixie Drone should be operated in outdoor temperatures ranging from -5°C to 50°C and wind speeds up to 40km/hr.

Location

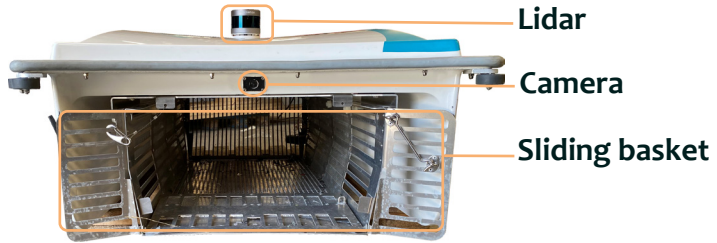
The Pixie Drone Class M is designed for inland and near-coastal waters – e.g. rivers, lakes, ponds, canals, lagoons, beaches, ports, harbors, marinas, waterfront, urban water and the built environment. It is not intended for large open water bodies or the ocean, where line-of-sight could be easily lost or strong wind/waves could overtake the robot.

For more information, see the Recommended Operating Conditions of this manual.

HARDWARE OVERVIEW

PIXIE DRONE OVERVIEW

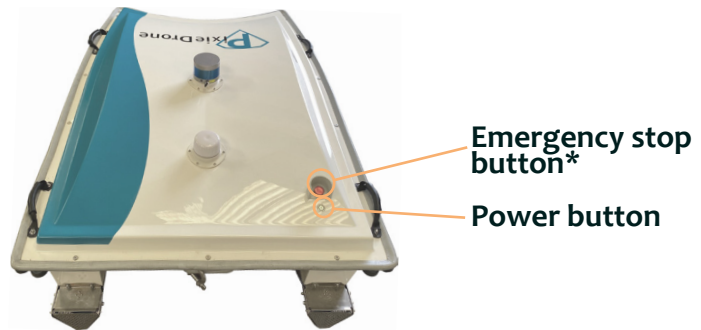
FRONT VIEW



REAR VIEW



TOP VIEW



* Thruster and emergency stop button design and placement may vary.

CONTROLLER OVERVIEW

Connecting Pixie Drone to Herelink RC unit

The Pixie Drone Class A consists of two primary pieces of equipment in order to operate, namely the Radio Control (RC) unit and the Pixie Drone drone. See below for labelled diagrams and terminology



QUICK START GUIDE

This quick start guide is to help you get started with the basics of Pixie Drone operation. Please make sure the user manual is read in entirety for more detail and extra important information.

Step 1: Putting Pixie Drone in Standby Mode

Press and hold the power button (page 10) and let go either after 12s or after the blue LED on the button has been glowing for 4s

Step 2: Charging

Unscrew the charging cap and plug in the plug on the charger (See page 10). Ensure the plug is twisted clockwise until you a click is heard and the plug can no longer be pulled out. Plug the harging unit into the wall. You should see the LED on the charger turn red and hear the fan come on. Charging is complete when the LED glows green.

Note: Charging is only possible in Standby mode which ensures the batteries are monitored during charging

Note: When charging for the first time, let it charge overnight to ensure battery cells are balanced and the state of charge is calibrated

Step 3: Turning the Pixie Drone ON

Turn the Herelink Remote Controller on by pressing and holding the power button on the unit for a few seconds. Wait for the app to boot up and then press the “C” button. You will hear a series of beeps which indicates the thrusters are connected properly. You will also see the live camera feed from the Pixie Drone show up on the screen. Perform a very short test of the thrusters by moving the joystick up or down for less than 5s. This is the mode where you can operate the Pixie Drone and move the thrusters. Do not charge or store the Pixie Drone in this mode.

Note: Keep hands away from thrusters and do not operate the thrusters dry for more than 5s to prevent overheating

Step 4: Operating the Pixie Drone

You are now ready to deploy the Pixie Drone! Deploy the drone in a safe manner (this is dependent on the use case). Use the joysticks to steer the drone and collect trash (see Page). Drive the Pixie Drone over the trash and it will collect in the basket for later disposal.

Step 5: Turning the Pixie Drone Off

When the Pixie Drone is out of the water, you can either press the “C” button the Herelink controller to return the Pixie Drone to “Standby” mode for charging or press the red “Stop” button on the Pixie Drone to turn it completely off for storage.

POWER MODES

The Pixie Drone Class A has three modes: Off, Standby and On. The modes are described below and this terminology will be used throughout the rest of the manual. The following page will describe how to switch modes.

OFF MODE

The Pixie Drone is in OFF mode when all functionality of the Pixie Drone is off. The only way to put the Pixie Drone in OFF mode is to press the emergency stop button located on the topside of the back of the drone. This is the safest mode in which to transport or store the Pixie Drone

STANDBY MODE

The Pixie Drone is in STANDBY mode when the low power electronics are functioning. In this mode, the batteries are being monitored by the battery management system and it is ready to be put into ON mode. While charging, the Pixie Drone must be in STANDBY mode or else plugging in the charger will have no effect.

ON MODE

The Pixie Drone is in ON mode when there is power to the thrusters and camera. It is now ready to move and collect trash. This mode is toggled with the remote controller. In this mode, the Pixie Drone should not be transported or charged. Never perform maintenance or touch the thrusters in this mode; make sure Pixie Drone is in OFF mode first.

MODE SWITCHING

OFF → STANDBY

Begin in OFF mode (the emergency stop at the rear of the vessel button is pressed in). Then pull the button towards you and it should lock in the out position – in this position the emergency stop is armed and ready.

The power button for the Pixie Drone is located at the rear of the vessel and is clearly marked with the universal power symbol. To put the Pixie Drone in STANDBY mode, press and hold this button for 12 seconds or until the button has glowed blue for 4 seconds. Once the button is released, the button should glow blue continuously. If it stops glowing, repeat this process but hold the button longer.

STANDBY → ON

To put the Pixie Drone in ON mode, you will be required to turn on the Herelink RC Unit. Press the power button located on the front near the center of the consol. When the remote controller is on, the power button will light up and the LCD telemetry screen will visible.

Once the Herelink unit is powered, you can now press button C. This establishes connection with the Pixie Drone. You will hear a beep sequence to indicate a successful connection and the video stream from the Pixie Drone should be visible on the screen. Now the Pixie Drone is in ON mode.

If the Herelink RC unit is powered down and rebooted while the Pixie Drone is still on, the Pixie Drone will automatically switch back into standby mode. You must then press C again to turn it on before continuing.

To test this connection briefly throttle the right or left stick to activate thrusters, You should hear the corresponding thrusters activate.

ON → OFF

At anytime, the emergency stop button can be pressed to turn all power off to the Pixie Drone.



WARNING – POWER UP ONLY ON DRY LAND

Activation and powering of the RC and Pixie Drone Units must be done on dry land. Failure to follow this procedure may cause the drone to be set adrift with no connection and no control of the unit in the water, creating a safety hazard to other traffic.

AUTONOMOUS & MANUAL MODE

Manual : remote controle device → Autonomous : path planning

The two modes are toggled using the Manual Override Switch on the handheld remote control (RC) device (see diagram below).

Flip the Manual Override Switch to switch into autonomous path-planning mode. If the PIXIE DRONE already had a path sent to it from the user interface, it will continue along this path until the manual override is switched on or the path is completed or cleared. If there was no existing path, a new path can be sent to the PIXIE DRONE using the customer portal as described elsewhere in this document.



Activating autonomous mode when the PIXIE DRONE is on dry land can result in the thrusters activating before the device is in the water (as the unit attempts to navigate to the first user-defined waypoint). If the thrusters activate on dry land they are prone to «burning out» as they rely on water cooling to prevent this from happening. **For this reason autonomous mode should only ever be activated when the PIXIE DRONE is in the water and the thrusters are submerged.**

Autonomous : path planning → Manual : remote controle device

To switch to manual mode, lift the Manual Override Switch to the UP position. Any path that the PIXIE DRONE was following will now be overridden by manually steering the PIXIE DRONE with the RC device. Manual mode can be useful for more accurate trash collection, or to help PIXIE DRONE if it is stuck in a confined space.

Manual Override Switch



ON → OFF

At anytime, the emergency stop button can be pressed to turn all power off to the PIXIE DRONE.

Manual : remote control device → Autonomous : path planning

The two modes are toggled using the Manual Override button on the Herelink remote control (RC) device.

Press the Manual Override button to switch into autonomous path-planning mode. If the PIXIE DRONE already had a path sent to it from the user interface, it will continue along this path until the manual override is switched on or the path is completed or cleared. If there was no existing path, a new path can be sent to the PIXIE DRONE using the RanMarine Connect portal (as described elsewhere in this document).

DEPLOYING THE PIXIE DRONE

Arrival On Site

1. Transport the fully charged Pixie Drone to the site according to the 'Transporting the Pixie Drone' section of this manual.
2. Place the Pixie Drone in a safe location to do a preliminary check.

Preliminary Checks

1. Press and hold the power button to put the Pixie Drone in standby mode.
2. Press the C button on the Herelink RC unit to put it into ON mode and use the thrusters for **up to 5 seconds** to make sure everything is working properly before deploying it

Deployment

The method of deployment heavily depends on the use case and physical environment the Pixie Drone will be deployed in. For example, if there is a low dock or quayside, it can carefully be slid into the water with two people. If there is a high wall or dock, it may have to be deployed with a crane or SharkSlider. If operated in autonomous mode, it should be held by an operator or tied-off until it is ready to follow a route. Always be careful deploying it in the water to avoid damage to the hull. Never tip the hull more than 75 degrees as this can damage the batteries.

Operation

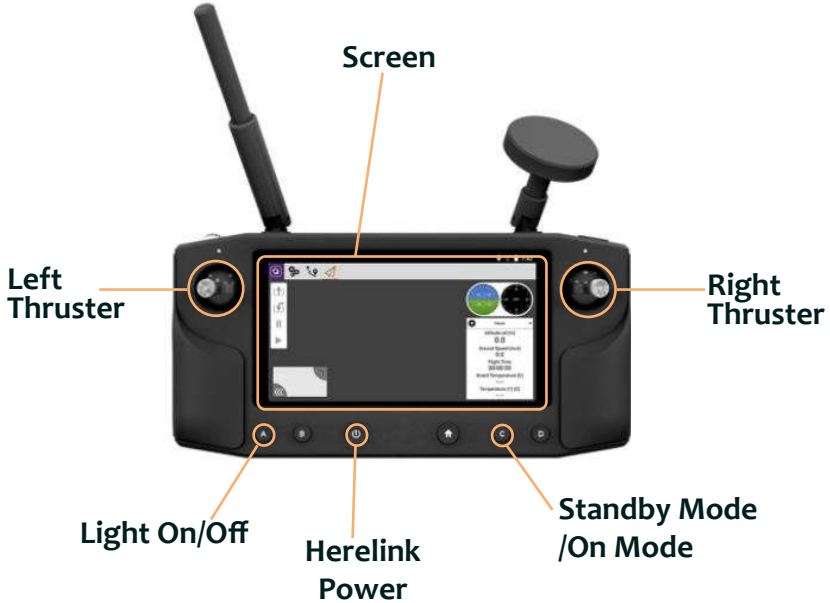
The Pixie Drone can now be operated according to the instructions on the following pages.

Autonomous Operation

Note that in order to return the PIXIE DRONE back to where it will be removed in the water, you must place it back into manual mode and drive it to the desired location.

HERELINK CONTROLLER

Button Layout



Operating the Drone

Turning On : press the Herelink power button to turn the remote controller on. Once the drone is in standby mode (by holding the power button on the drone), press button «C» on the remote controller to put it into ON mode. At this point you will hear a series of beeps from the thrusters, and it is ready to operate.

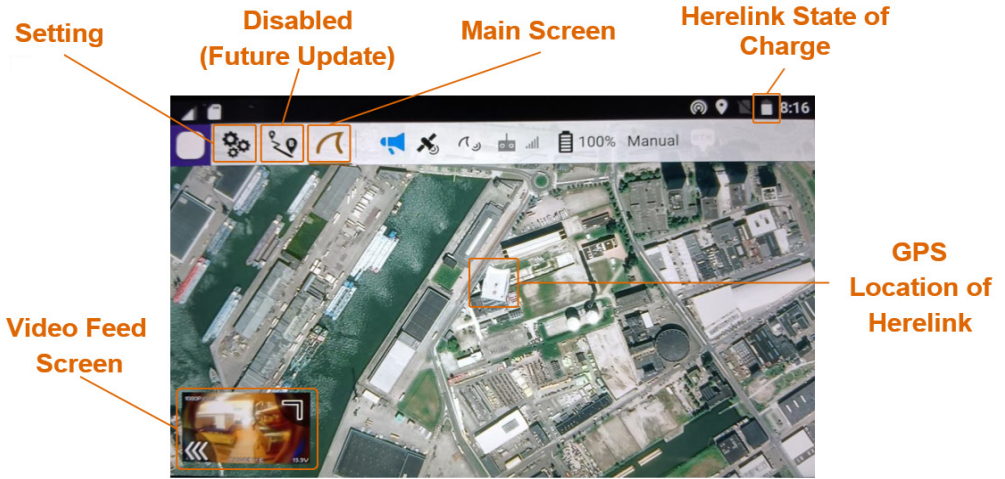
Steering & Control : In manual mode and when the drone is in the water, use the left and right joysticks to operate the corresponding thruster.



Manual & Autonomous mode : Press the “B” button to switch from manual mode to autonomous mode and vice versa. If the joysticks are moved and the thrusters do not move, you are in autonomous mode. The drone can then be controlled by the portal.

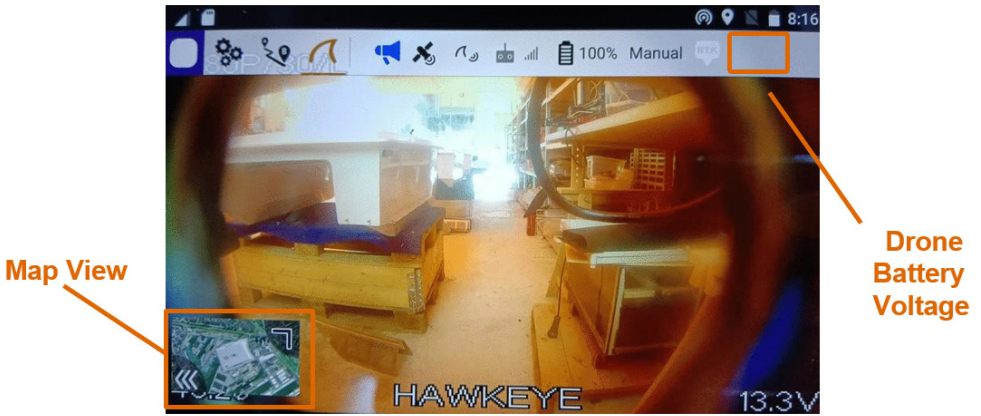
NOTE: If the Herelink RC unit is powered off and then back on, this will force the Pixie Drone back into Standby mode which may result in the Pixie Drone floating away while in Autonomous mode. If you are not using the Herelink RC and the Pixie Drone is ON, it is better to short press the power button to put it to sleep rather than turning it off.

Main Screen Layout



Settings	Do not change any settings
Main screen	Remain on the main screen to view the map or the video feed
Herelink State of Charge	Indicates the state of charge of the Herelink remote controller
GPS Location of Herelink	The image of the drone shows the current GPS location of the Herelink remote controller. In a future update, this will show the GPS location of the drone.
Video Feed Screen	Pressing this area on the screen will toggle between this map view and the live video feed from the drone

Video Feed Layout



Map View

Pressing this area on the screen will toggle between this live video feed from the drone and the map view

Drone battery Voltage

The voltage shown is the voltage of the batteries inside the drone. This can indicate the approximate state of charge of the drone.

Voltage (V)	State of Charge (approximative)
11	0%
12,5	10-15%
13,2	20-80%
14	90%
14,6	100%

CHARGING PROCEDURE

Charging Instructions

1. Place the Pixie Drone in a safe and secure area
2. **Ensure the Pixie Drone is in STANDBY Mode** (see page 15)
3. Plug the charger into the socket in the Pixie Drone - this is found at the rear of the vessel
4. Plug the charger into a wall socket and ensure you see a red light on the charger and hear it coming on
5. The battery management system will terminate the charging cycle. You will notice that it will turn off for a few seconds and back on again. This means the batteries are balancing but the charging is complete.
6. The charger can be unplugged from the wall and then unplugged from the Pixie Drone

Battery Management System

The Pixie Drone contains four (4) internal LiFePO₄ battery cells; these are prebalanced by RanMarine and are managed by a pre-fitted battery management system that is designed to prolong the use life of the product and increase overall safety of the product. Adherence to the charging procedure will increase product longevity.

DRONE & THE PORTAL

Using Ranmarine Connect : the Customer Portal

RanMarine's customer portal is used to see the status of your Pixie Drone and view data all in one user-friendly location. This section of the manual will show you the ins-and-outs of using the portal to give you the best possible user experience.

Creating an account & Logging In

Once your Pixie Drone has been added to our database, you will receive an email from noreply@ranmarine.io with a temporary username and password.

1. Navigate to <https://portal.ranmarine.io> (recommended browsers are Google Chrome and FireFox)
2. Enter your temporary username and password and reset your password
3. Once the password is changed, login using the new password

RANMARINE

Login

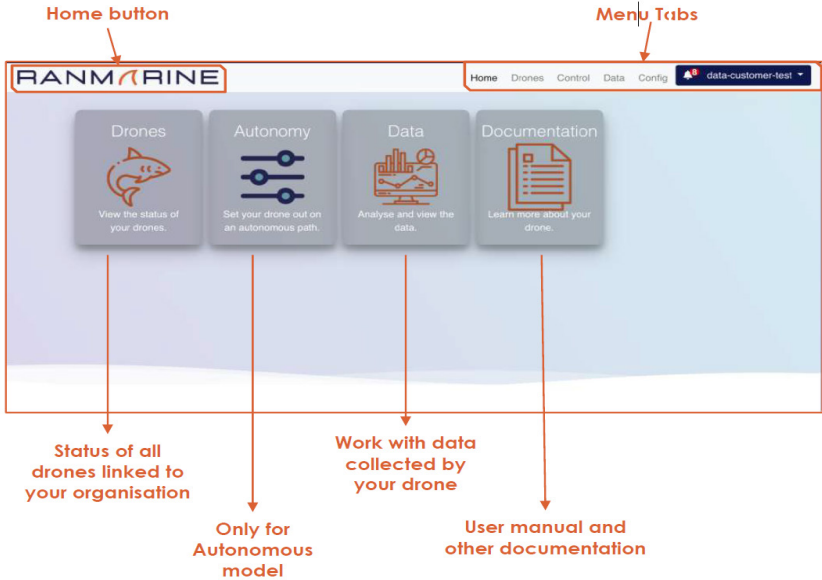
testaccount

Remember Me

Login

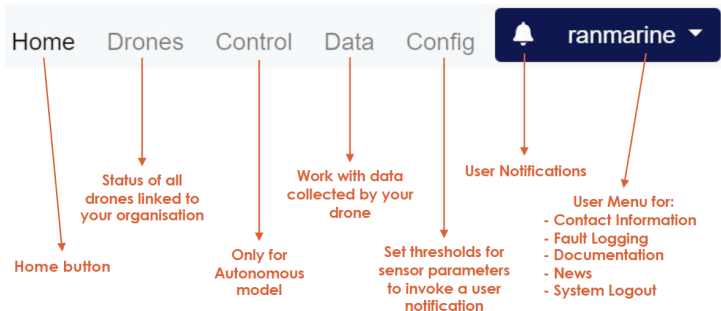
Landing (Home) Page

Once logged in, you will be directed to the landing page of RanMarine Connect. This page displays various function “cards” which will allow you to navigate to specific functional areas of the portal. There is also a menu of tabs at the top left-hand side of the screen which will allow you to access these functions.



Landing (Home) Page Menu

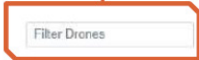
The menu tabs on the landing page (largely) allow you to navigate to the same functions that are accessible from the function cards, as well as some additional services.



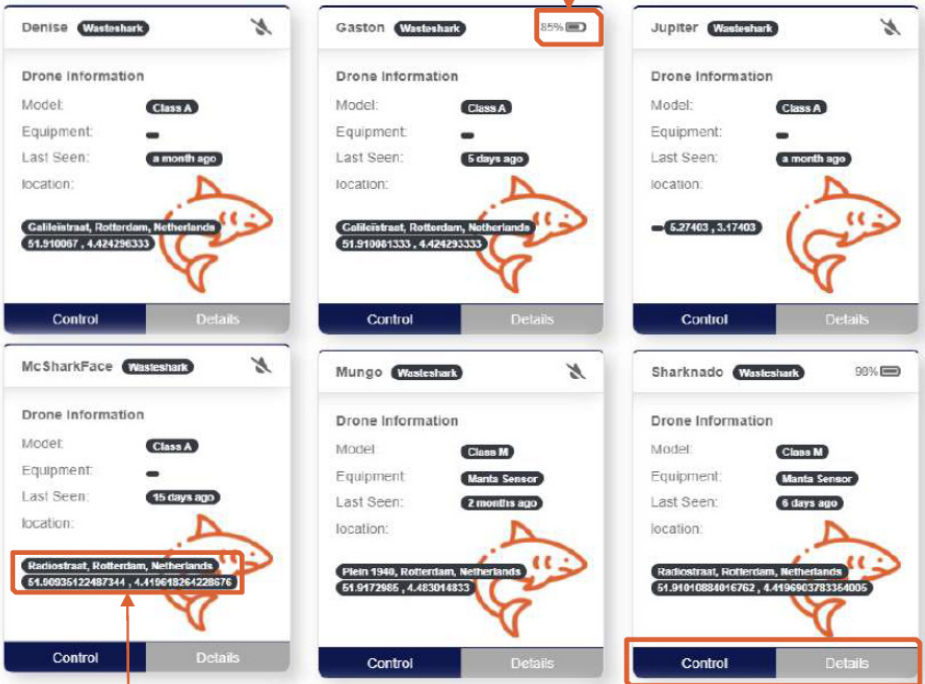
Drone Dashboard

After clicking on the “Drones” function card or menu item, you will be directed to the drones dashboard page. This page shows the name, status, state of charge, current location and health of all the drones associated with your organisation.

Drone search bar



State of charge



Drone Name	Model	Equipment	Last Seen	Location	State of Charge
Denise	Class A	-	a month ago	Colfeistraat, Rotterdam, Netherlands 51.910087, 4.42429333	85%
Gaston	Class A	-	5 days ago	Colfeistraat, Rotterdam, Netherlands 51.910981333, 4.42429333	85%
Jupiter	Class A	-	a month ago	- 6.27403, 3.17403	
McSharkFace	Class A	-	15 days ago	Radiostraat, Rotterdam, Netherlands 51.00035122487344, 4.419648264228876	
Mungo	Class M	Manta Sensor	2 months ago	Plein 1940, Rotterdam, Netherlands 51.9172986, 4.48304833	
Sharknado	Class M	Manta Sensor	6 days ago	Radiostraat, Rotterdam, Netherlands 51.91010884016762, 4.4196903783354005	90%

Location of drone

Autonomously control the drone / View details of the drone

AUTONOMOUS PATH PLANNING

What is Path Planning?

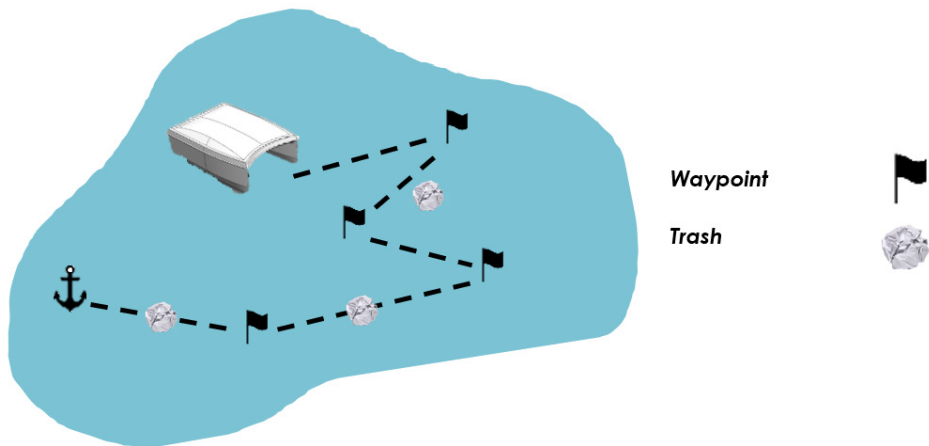
Path planning is achieved by the user setting waypoints on the user interface. The PIXIE DRONE will then calculate the best, most efficient path* to move to that waypoint. It will continue to follow the path, collecting trash on its way until the last waypoint. At this point, it will use the minimum amount of power to stay at this last position. This is called “virtual anchoring”.

**note that the “most efficient path” is calculated using PIXIE DRONE sensor inputs – this may mean that it is not the “straightest path”*

Sending mission

If the PIXIE DRONE is set to “Autonomous Mode”, and a mission has been sent from the portal, the PIXIE DRONE is now being controlled by a path that was sent to it through the customer portal (RanMarine Connect).

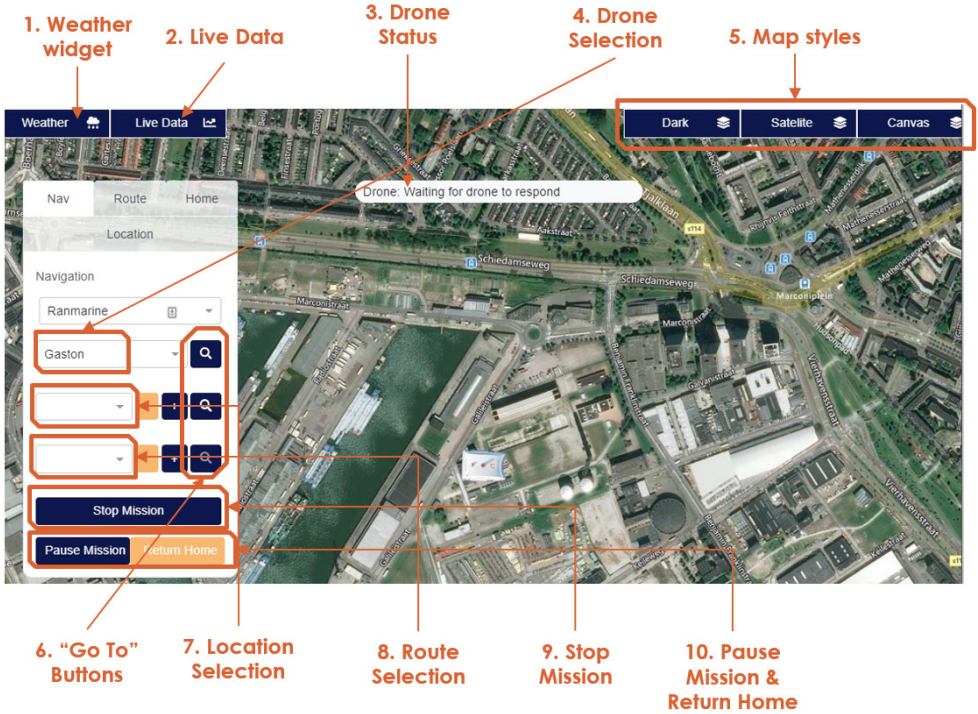
If the PIXIE DRONE already had a path sent to it from the user interface, it will continue along this path until the manual override is switched on or the path is completed or cleared. If there was no existing path, a new path can be sent to the PIXIE DRONE using the web-based user interface.



Autonomous control

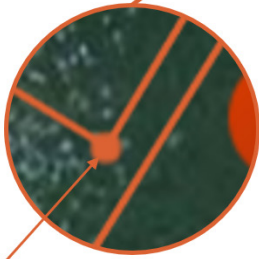
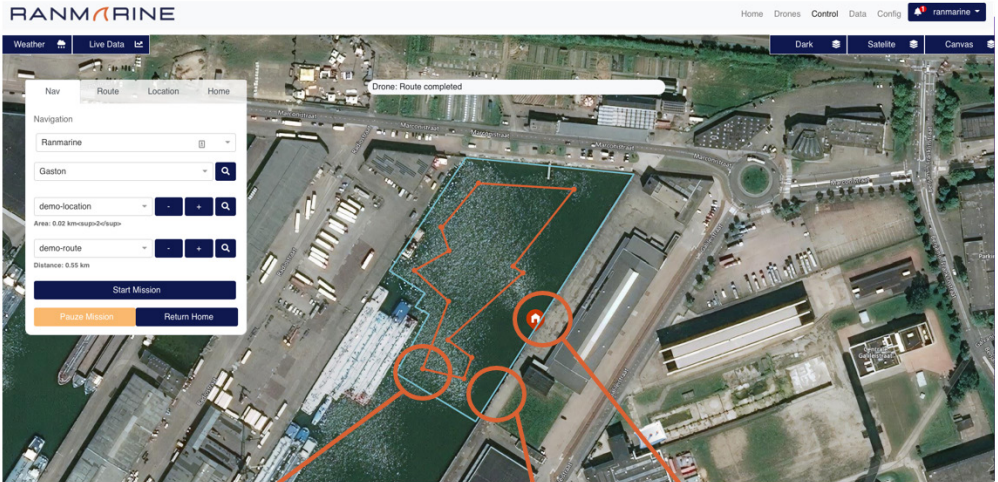
You can reach the autonomous control page by clicking on:

- The **Autonomy** function card in the home page
- **Control** on the Drone information card in the “Drones” page
- The **Control** menu item tab

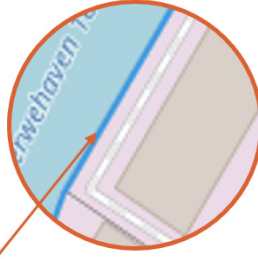


Elements

On the control page you are able to draw visual elements that will be sent to the drone as navigational data.



The waypoints the shark will navigate to.



Blue Line Shows Bounding Box of Location



Home

Autonomous control

Each of the page elements on the Drone Control Page is outlined below:

1. Live Weather

This is a pop-up showing a live weather feed, based on your location.

2. Live Data

When a drone is fitted with a water sensor, this data can be viewed in near real-time (also in a pop-up window)

3. Drone Status

The status bar provides information about the current state of the drone. “Waiting for the drone to respond” indicates that the drone is not on an active autonomous mission (drone could be powered off / in manual mode).

4. Drone Selection

When your drone has multiple autonomous drones, this allows you to select the drone that you would like to manage from this page.

5. Map Style

Allows you to adjust the viewing style of the map that is presented in the interface.

6. “Go To” Buttons



Go To Drone : Shifts the focus of the map to depict the drone in its last known position, as recorded by the drone’s GPS at that time. Note that if the drone is powered off, “go to drone” will show the “last known reported position” as at the most recent time this was sent and recorded.



Go To Route : Centers the view on the currently selected route.



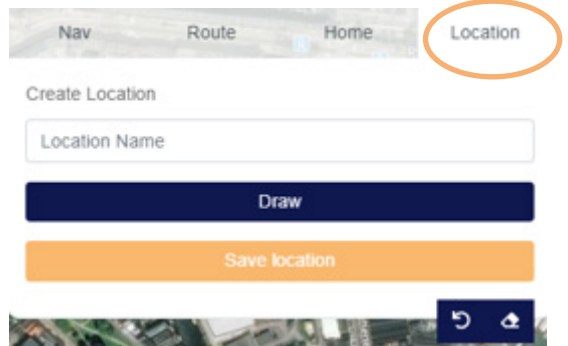
Go To Location : Centers the view on the currently selected location.

7. Location Selection

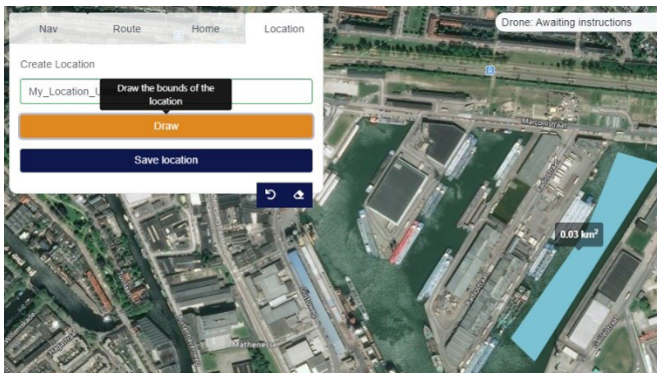
A drone is sent on missions along pre-defined routes within pre-defined locations. You need to define an operating location before an autonomous route can be defined. A location defines the operating area for the drone. In order to delete a predefined location that has been selected in the drop-down list, you simply need to click the “subtraction” sign to the left of the drop-down. To add a new location, click on the “addition” (+) symbol:



Alternatively, you can click on the «Location» tab in the box above.



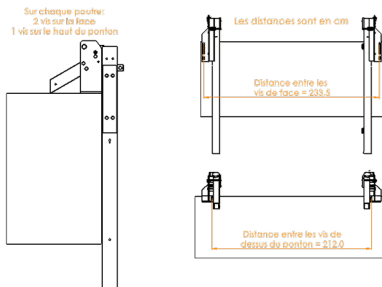
- Press ‘Draw’ to start drawing
- Use your cursor to draw a boundary around the new area.
- Ensure that you close the box by clicking the last point at the same point as the first point.
- Once the box is closed, it will turn solid blue.
- Enter a name of the location and press ‘Save Location’ to save the location for future reference. Use a unique “Location Name” that makes sense to you. Remember that you may want to define many operating locations, so make this a name that has meaning for you, and which you will easily be able to find again.



- Once saved, the new location should show up in your dropdown list under the “Current” tab.

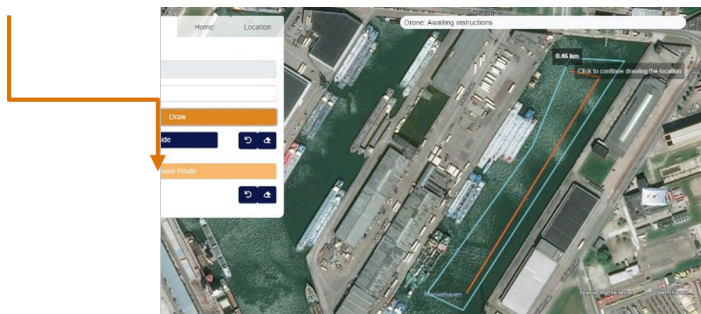
8. Route Selection

Route Selection You can create a new route attached to a location by selecting the “Route” tab immediately after creating a location. Alternatively, when you select a location from within the “Nav” tab, you can click on the “addition” (+) symbol to create a new route



When the correct location is displayed in the “Route” tab:

- Click “Draw”
- Use your mouse to click waypoints in the order you’d like the PIXIE DRONE to follow them
- Give the route a name that will make sense to you for that specific location and click “Save Route”



9. Stop mission

If your drone is on a route at any time and you wish to stop it, you can do this by clicking on “Stop Route”. The drone will stop moving along the predefined route. You will need to.

10. Pause mission & Return home

Pause Mission can be used to interrupt your drone’s progress along a predefined route. When the drone has been paused the “pause mission” button will change to “resume mission”. Upon resuming the mission, the drone will continue to the way point that immediately follows the “last successfully reached” waypoint before “pause mission” was initiated.

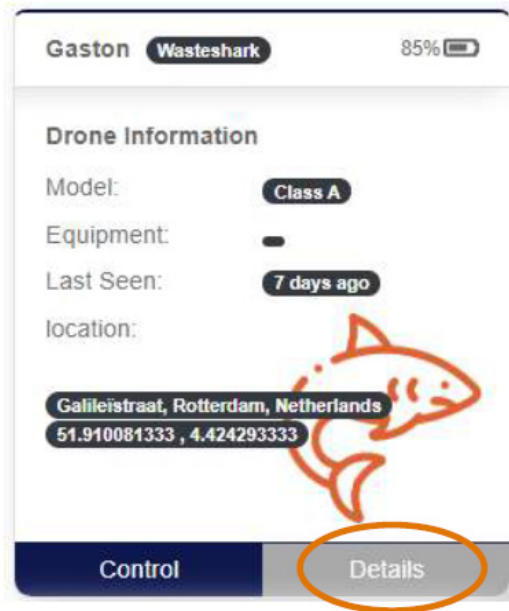
To make use of the “Return Home” functionality of the drone, a Home Point at a location will need to be configured.

A user-defined Home Point for a location can be set on the “Home” Tab.

With the selected location displayed in the “Nav” tab, the home waypoint for that location can be set in the “Home” tab by clicking on “Create Home”, and then placing the home location pin on the map. You can also “Delete Home” in the “Home” tab if required.

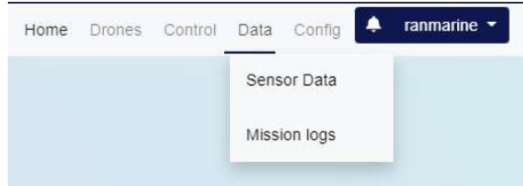
Viewing Drone Details

Information about your drone’s software and hardware can be viewed by clicking on “Details” in the relevant drone card available on the “Drones” page.



This information is largely relevant to a technical person. In addition to build- and hardware-specific information (e.g. BMS version and on-board router SSID), this page also allows support personnel to upload documents and pictures which are relevant to the drone’s build, software and performance.

Data on your Pixie Drone

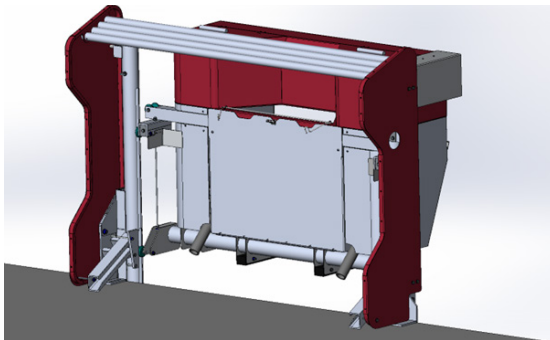


Data collected by a drone is geo-tagged, which means that datapoints for most variables can be linked to longitude and latitude coordinates at the moment this is captured. You can access data collected by using the “Data” function card in the home page of RanMarine Connect, or by using the “Data” menu item. There are two types of data collected by the drone: “Status drone” & “Sensor Data”.

Your drone is capable of being fitted with a water quality sensor, and it will record and send collected sensor data to the portal for storage and future reference. Even if your drone is not fitted with a water monitoring sensor, it will still send data about routes undertaken that have a duration of more than 2 minutes.

Mission Logs

When you navigate to mission logs, you will be presented with a chronologically ordered list of all missions stored in RanMarine Connect for all drones that are associated with your organisation:



Data on your Pixie Drone cont.

On the “Mission Logs” page you can currently filter the logs by drone name or “date” of the mission undertaken.

The mission log table displays the drone name, mission start date & time, end date and time and the duration of the mission. Log data can be sorted in ascending or descending order y these columns, simply by clicking on the arrows at the top of each column.

ASV Name ▾	Start Time ▾	End Time ▾	Duration(HH:mm:ss) ▾
Gaston	2021-09-30 08:00:02	2021-10-08 10:04:41	194:4:39
Gaston	2021-09-22 15:06:12	2021-09-22 17:25:41	2:19:29
Gaston	2021-09-22 09:02:59	2021-09-22 09:50:30	0:47:31

Sort Data (desc or asc)

When you view the data (click on the eye symbol) you are taken to the log details page :

Log details

Start Time: 2021-09-30 08:00:02

End Time: 2021-10-08 10:04:41

Duration: 194:4:39 Hours

Download CSV

Filter Data

- Temperature
- pH
- Conductivity
- D.Osat
- pOmgI
- All

The “log details” page will allow you to download a comma-separated file containing the datapoints collected over the duration of the route/mission undertaken by the drone at that time. For a drone that is not fitted with a data sensor, the information may not be very interesting, but at the very least this provides some visibility and a record of the drone missions undertaken over its lifetime.

TRANSPORTING THE PIXIE DRONE



Always exercise proper care and attention when moving Pixie Drone. Be mindful of weights and sizes and do not attempt any physical activity that is beyond your capability.

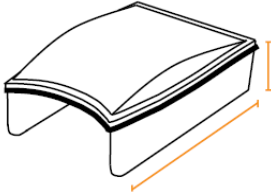
Pixie Drone secure packing case: has handles for lifting and is mounted on wheels to enable rolling. Estimated weight of this case with a Pixie Drone drone inside will be 140-160 kilograms.

Carrying Pixie Drone by hand: estimated weight of the drone is 70 kilograms; recommended that two or more able-bodied people are required to lift and carry it. Clear the walking path before carrying the Pixie Drone to the desired location to avoid obstacles. Do not lift the Pixie Drone if you have health issues that prevent you from lifting heavy objects.

Moving Pixie Drone by cart/trolley/forklift: ensure the Pixie Drone is securely fastened. During transportation, it is recommended to keep the Pixie Drone as close to the ground as possible to avoid the risk of falling from a great height.

Moving Pixie Drone by van or truck: if the drone is not packed inside its secure case, place a blanket or other protective mat on the bed of the van or truck. Place the Pixie Drone on the mat and secure it with ratchet straps. The Pixie Drone should not bounce, leave the ground or slide when the vehicle drives over a bump or turns a corner. It is recommended to place padding on top of the Pixie Drone to prevent damage from the straps or other objects in the vehicle.

SPECIFICATIONS

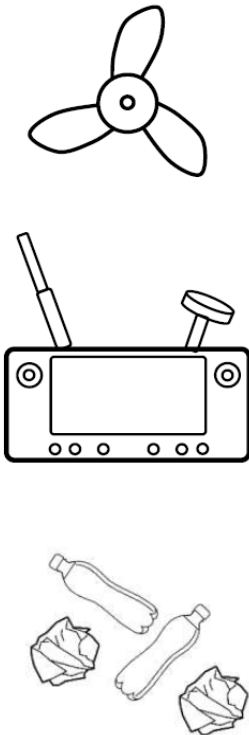


PHYSICAL SPECIFICATIONS

PARAMETER	VALUE
Length	157 cm
Width	109 cm
Height	52 cm
Draft (Depth Underwater)	20 cm
Weight	72 kg

PERFORMANCE

PARAMETER	VALUE
Maximum speed	3km/hr
Thrust (per thruster)	5,25 kg _f
Thrust reverse(per thruster)	4,1 kg _f
Maximum Operating Time on One charge*	8 hrs
Maximum charging time	5 hrs
Camera Video range	300 m
Remote Control range	500 m
Basket volume capacity	160L
Basket weight Capacity	60 kg
Range (Distance travelled on one charge)*	12 km
Coverage capability*	10,000 m ² /workday
Recommended coverage area/drone	25,000 m ²
Trash collection capacity*	500kg/workday



* Value depends on the operator experience, wind and water conditions, trash density, collection speed, complexity of cleanup, etc

**Only with line-of-sight. Upgradeable.

RECOMMENDED OPERATING CONDITIONS

PARAMETER	VALUE
Wave height (max.)	0,5m
Wake wave height (max.)	1,5m
Wind speed (max.)	40km/hr
Water speed (max.)	3km/hrs
Water depth (min.)	30 cm
Outdoor Temperature (max.)	50°C
Outdoor temperature (min)	-15°C
Can operate in saltwater, freshwater and brackish water	
Exercise caution operating at night	

Note: These are estimated values. The weather and operating environment is complex and everchanging. Do not operate the Pixie Drone if the conditions feel unsafe.

MAINTENANCE & CLEANING

MAINTENANCE

RanMarine offers the maintenance recommendations listed below based on its best available knowledge and is not liable for any damages incurred due to adhering to, or ignoring, this list. Maintenance schedules and payment terms are to be agreed by the owner of the Pixie Drone and the local distributor only.

Maintenance Procedures :

- For all maintenance operations, ensure the Pixie Drone is OFF
- For technical and software support please contact your local distributor
- Separation of deck and hull, or penetration of deck or hull, by an unauthorized person will result in an immediate and absolute voiding of the warranty

Frequency	Responsible	Part or System	Procedure
Daily or after use	Owner/User	Thrusters	Rinse with fresh water; check free movement
Weekly	Owner/User	Hull and basket	Rinse with fresh water; check for damage
Semi-Annually	Qualified Maintenance or Technical Agent	Safety and parts check (incl robotics)	Check with local distributor
Annually	Qualified Maintenance or Technical Agent	Full technical inspection of unit	Check with local distributor

Cleaning the Pixie Drone

- Ensure Pixie Drone is in OFF mode
- Use a hose to rinse the deck, hull, basket, nylon bolts, thrusters and thruster guards
- If needed, use a sponge with a gentle soap to clean any biomass or garbage that may be stuck to the hull or basket
- Rinse any residual soap with the hose

Removing Marks & Scuffs

- Pour a small amount of acetone on a clean microfibre cloth
- Rub the cloth on the scuff until it comes clean

LIDAR CLEANING

It is important to clean the lidar if there is dirt, mud, water stains, or anything that could cloud the view of the lidar. The following is RoboSense's recommendation on how to clean the lidar.

Required materials :

1. Clean microfiber cloths
2. Mild, liquid dish-washing soap
3. Spray bottle with warm, clean water
4. Spray bottle with warm, mildly soapy water
5. Isopropyl alcohol

Cleaning method

If the sensor is just covered by dust, use a clean microfiber cloth with a little isopropyl alcohol to clean the sensor directly, then dry with another clean microfiber cloth. If the sensor is caked with mud or bugs, use a spray bottle with clean, warm water to loosen any debris from it. Do not wipe dirt directly off the sensor. Doing so may abrade the surface. Then use warm, mildly-soapy water and gently wipe the sensor with a clean microfiber cloth. Wipe the ring lens gently along the curve of the sensor, not top-to-bottom. To finish, spray the sensor with clean water to rinse off any remaining soap (if necessary, use isopropyl alcohol and a clean microfiber cloth to clean any remaining dirt from the sensor), then dry with another clean microfiber cloth.

THRUSTER CLEANING

The Pixie Drone is designed to have minimal operational servicing needs. However you may need to occasionally deal with blockages and thruster-related challenges. In general we recommend that all repairs be done by your service agent to avoid voiding of warranty .

Tools Required

1.5 mm, 2 mm, 2.5 mm hex keys

Phillips screwdriver with small tip

Step 1 Remove the thruster and guard from Pixie Drone mounting bar and carefully remove the internal thruster.

Step 2 Remove the four Phillips-head screws from the outside of the nozzle. Remove the nozzle from the rest of the motor and set aside.

Step 3 Using the 2.5 mm hex key, remove the screws securing the nose cone. Remove the nose cone and set aside.

Step 4 Manually turn the propeller until the shaft collar set screw is aligned with the notch in the plastic. Using the 1.5 mm hex key, loosen the shaft collar set screw.

Step 5 After being used in water, the shaft collar can be difficult to remove. Do not try to pry it up. Instead, pull on the propeller from the opposite side to remove the shaft from the shaft collar.

Step 6 Remove the propeller screws from the rotor with the 2 mm hex key and pull the propeller away from the rotor.

Step 7 Repeat these steps in the reverse direction to reassemble the thruster.

- While the thruster is taken apart, wipe down all of the parts with a cloth and freshwater to remove any fouling and mineral deposits.
- To replace and refit a thruster please call your service agent or distributor.



QUICK REPAIRS

REPLACING A THRUSTER

If the entire thruster unit needs to be replaced, please follow the directions below.

Tools Required

2.5 mm hex key, 10mm wrench/socket wrench, plug removal tool

Phillips screwdriver with small tip

STEP 1 : Unplug the thruster connector from the Pixie Drone



STEP 2 : Unscrew the bottom of the connector to release the cable gland



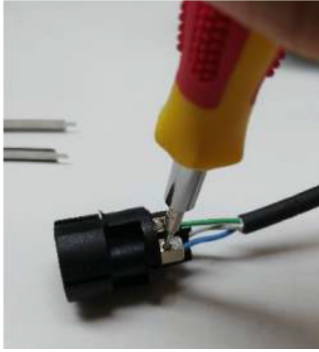
STEP 3 : Use the plug removal tool to remove the outer shell from the inner module. Push the tool all the way in and squeeze the tool while you pull the shell down the wire. This may take some practice.



STEP 4 : Write down which coloured wire goes in each pin socket. You will see the letters “L, E, N” written on the module.



STEP 5 : Unscrew the wires from each pin socket and remove the entire plug assembly



STEP 6 : Using the 2.5 mm hex key, remove 4 bolts holding the thruster to the thruster guard.



STEP 7 : Pull the cable through the hole in the thruster guard to completely remove the thruster



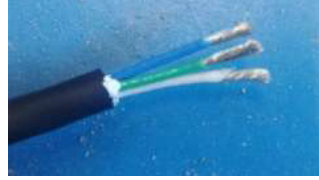
STEP 8 : Feed the wire from the new thruster through the hole in the thruster guard

STEP 9: Usin the 2,5 mm hex ky and the old fasteners, bolt the new thruster to the thruster guard

STEP 10 : Place the plug parts on the thruster cable as shown



STEP 11 : Strip the black cable back about 1.5-2cm. Strip each wire about 7mm or according to the length of the metal on the ferrule.



STEP 12 : Use the crimping tool to crimp a wire ferrule onto each wire then screw them back into their respective pin sockets.



STEP 13 : Slide the plug housing over the inner module until it clicks and can't move. Screw the glands into the end of the connector



STEP 14 : Plug the thruster back in and test

MANUFACTURER

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The Netherlands

support@ranmarine.io
www.ranmarine.io

Warranty information and terms of sale can be found
<https://www.ranmarine.io/terms-and-conditions/>

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