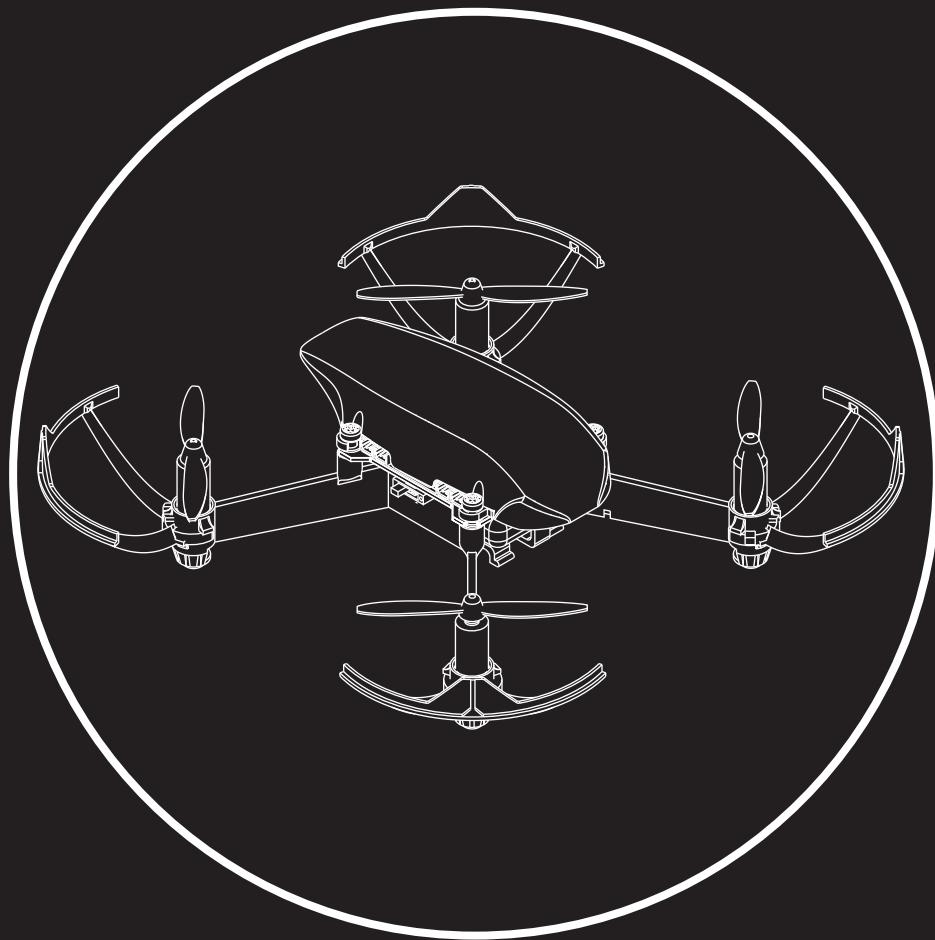


DRONA™
AVIATION

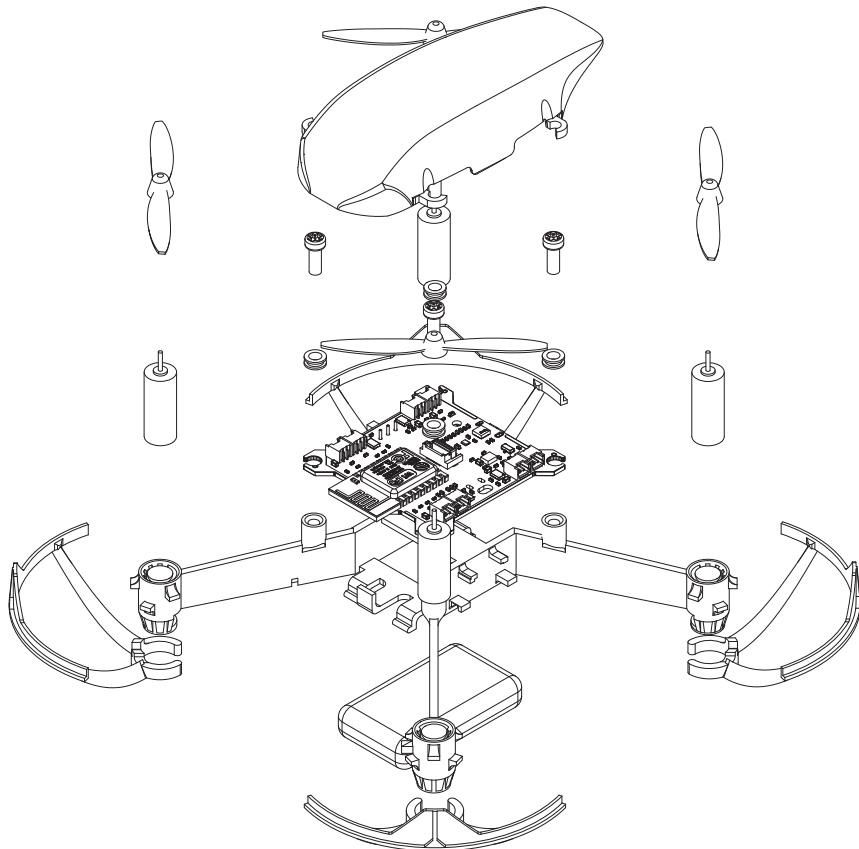
P L U T O®



Pluto1.2 User Manual

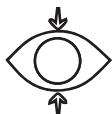
Pluto1.2

User Manual





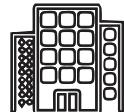
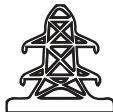
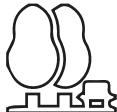
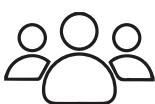
Fly in open areas



Maintain Line of Sight



Flying range - 60m



Avoid flying over or near obstacles, crowd, high voltage power lines, trees or bodies of water and near strong electromagnetic sources such as power lines and base stations.



Don't use Pluto1.2 in adverse weather conditions such as rain, snow, storm etc. and in high wind



STAY AWAY FROM ROTATING PROPELLERS

DON'T FLY IN NO-FLY ZONE

Battery Safety

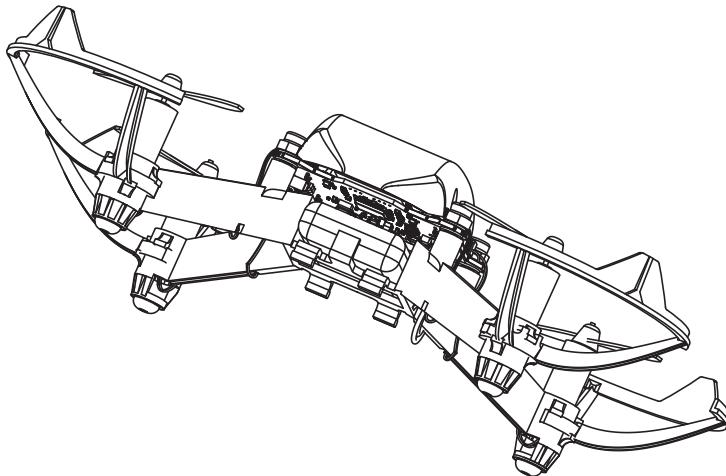
CAUTION: All instructions and warnings must be followed exactly. Mishandling of Li-Po batteries can result in a fire, personal injury and/or property damage.

LI-PO BATTERIES: Failure to charge the battery with a compatible charger may cause a fire resulting in personal injury and/or property damage.

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Introduction

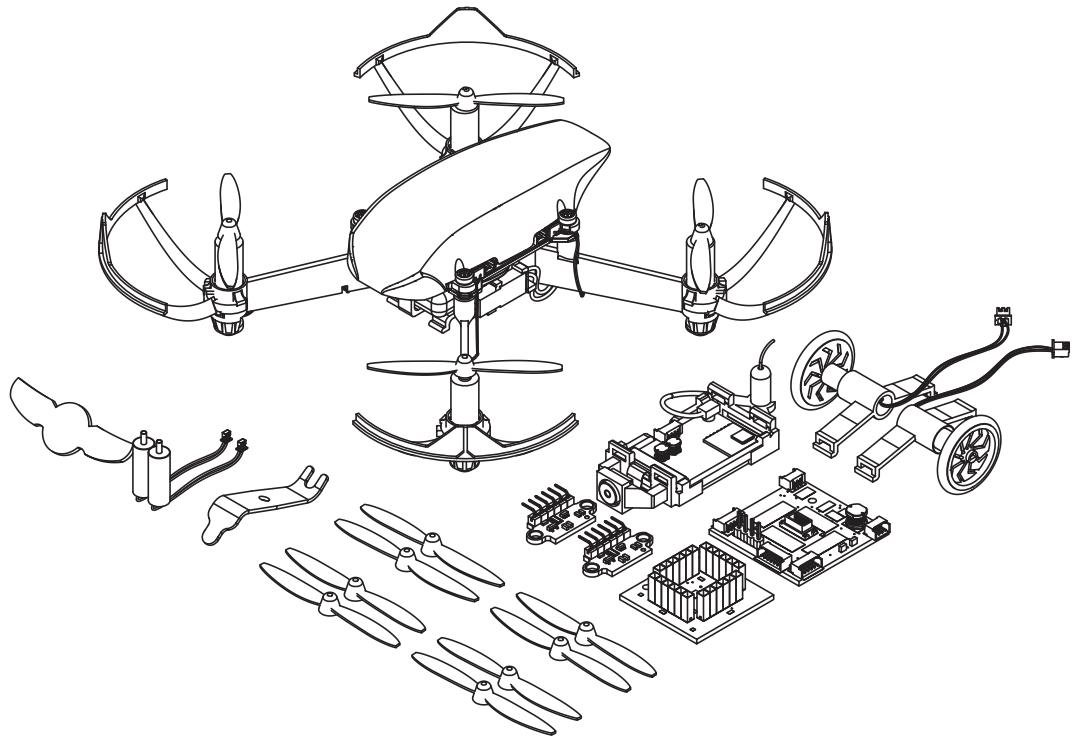


Note: Please read and understand this manual completely. Drona Aviation products are to be used by ages 14 and over. The instruction manual, warranties and other associated documentation is subject to change without notice. Drona Aviation assumes no responsibility for inadvertent errors in this manual.

Box Contents

Pluto1.2 is a DIY Drone Kit. The Kit contains all the parts required to build this into a nano drone and with some spares.

KIT	Quantity
PrimusV4 Flight Controller	1
Frame with Canopy	1
Motors	4
Set of Propellers	2
Battery	1
Screws and Damper	4
Propeller guards	4
Propeller Removal Tool	1
Pilot Badge	1

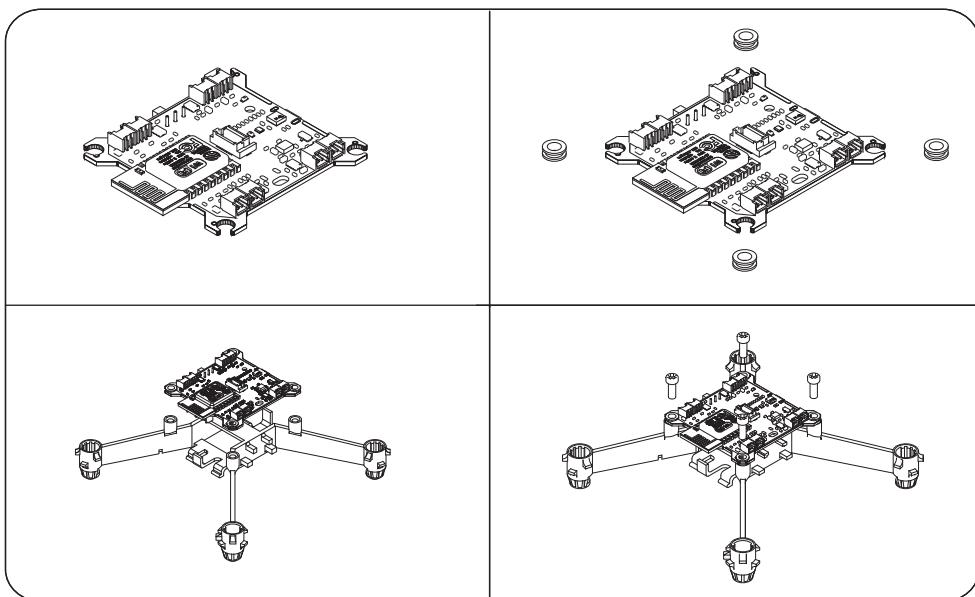


Assembly/Disassembly

Pluto1.2 is a DIY drone. It can be disassembled and assembled easily. Please follow these instructions for assembly/disassembly.

A. Flight Controller

1. Take the PrimusV4 flight controller. Identify the front of the board using the figure below.
2. Insert rubber dampers on four corners of the board.
3. Place the PrimusV4 board on the frame. Please ensure that the front arrow on the board matches with the arrow on the frame.
4. Insert the plastic screws and fasten the flight controller. Please ensure that the screws are not squeezing the dampers.

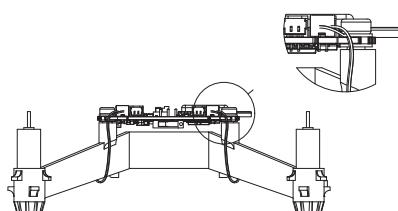
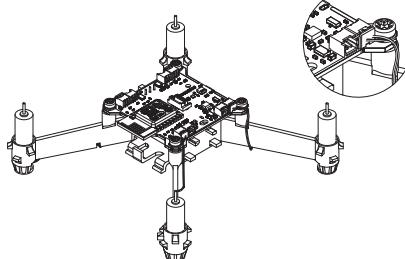
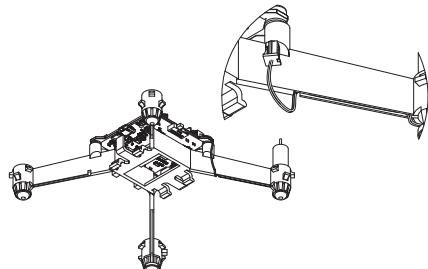
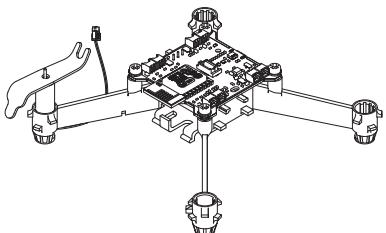
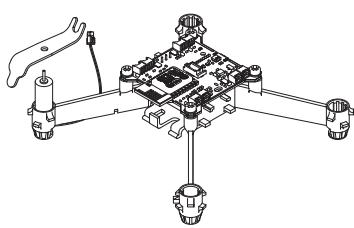
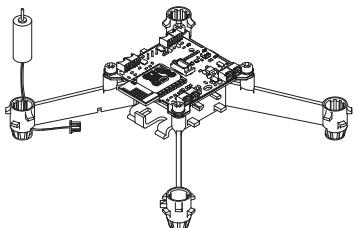


CAUTION

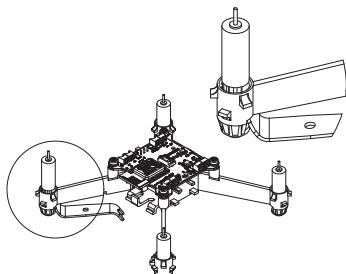
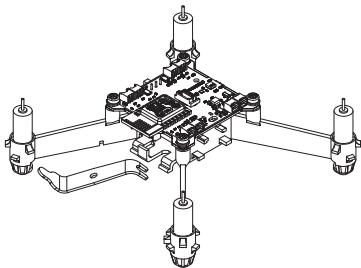
If the dampers are not used / improperly mounted, it will result in a poor performance of the drone.

B. Motor

1. Insert the motor connector through the end of the motor mount.
2. Place the motor in the motor mount.
3. Using propeller tool push the motors inside.
4. Harness the motor wires on the bottom side of the motor arm.
5. Connect the motor connector to the correct port (M5/M6/M7/M8).

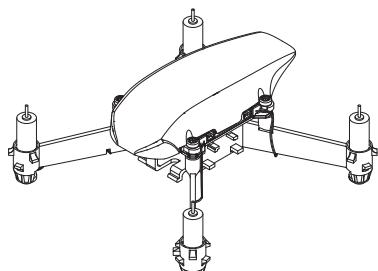
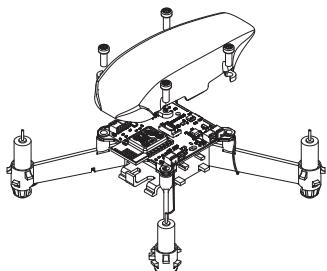


6. To remove the motors from the frame use the propeller tool to provide the right leverage.



C. Canopy

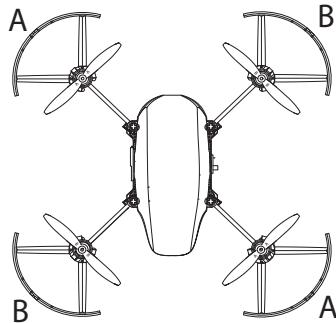
1. To assemble the canopy, loosen the four flight controller screws.
2. The canopy has four mounts which go between the screw and the damper.
3. By flexing the canopy, wiggle in the canopy between the screws and dampers.
4. Tighten the screws if required.



D. Propellers and Propguard

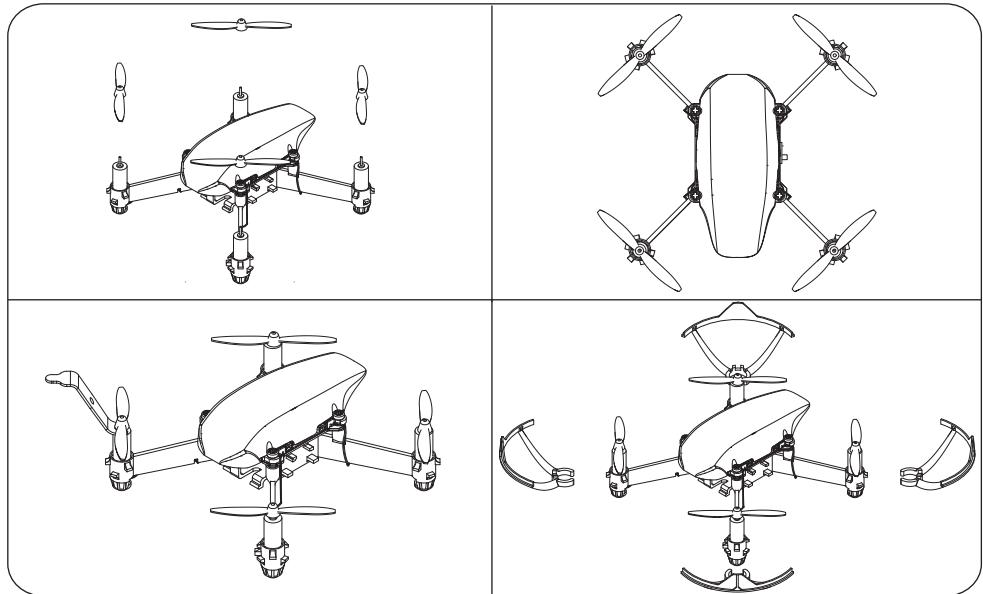
1. There are 2 sets of propellers labelled A & B. Please find the markings near the central hub of the propeller.

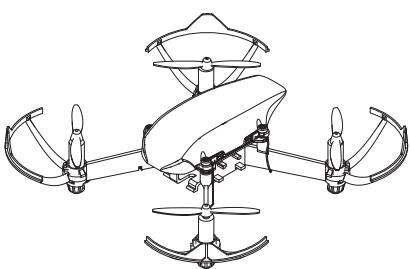
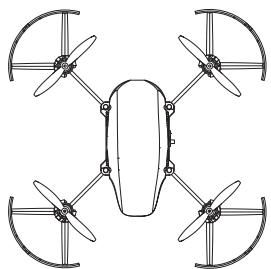
2. Place the propellers according to figure below.



3. If you need to take the propellers out, use the proptool for proper leverage.

4. Slide in the propguards are shown below.



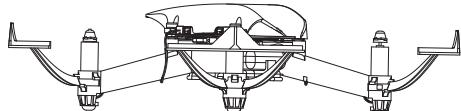
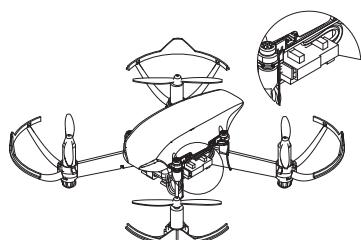
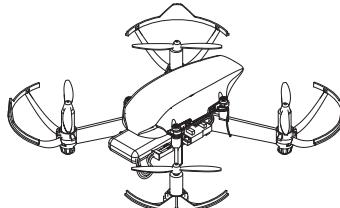
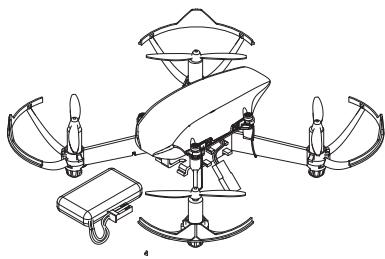


CAUTION

If the propellers are not placed propellery as per the A & B configuration, the drone will not take-off.

E. Battery

1. Insert the battery from the front of the drone as shown in the figure.
2. Carefully route the battery connector and connect to the board connector.
3. Use the connector holder to secure the connector to the frame.



Quick Flight

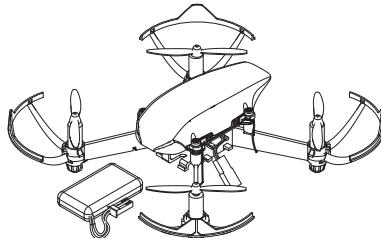
Step 1 : Install “Pluto Controller” App Controller



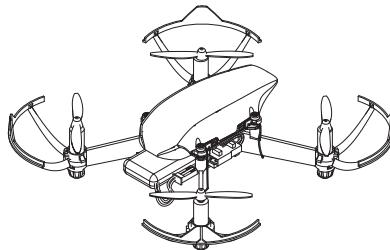
Tip: Select 'I am a Developer' while setting up profile to enable user based programming. Visit the section 'Developer options' for more details.

Step 2 : Plug in Battery

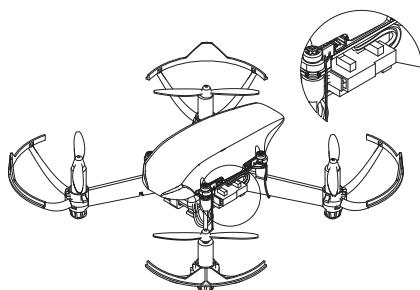
Insert the battery from the front of the drone as shown in the figure.



Carefully route the battery connector and connect to the board connector.



Use the connector holder to secure the connector to the frame.

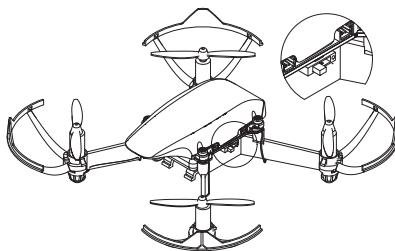


CAUTION

The battery provided in the kit is charged to 20%. It is recommended that you charge the battery before your first flight.

Step 3 : Turn the drone On

Switch On Pluto1.2 using the slide switch on the right side of the drone.



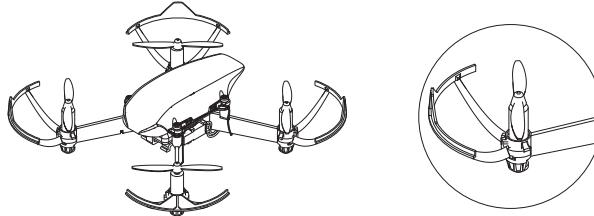
Step 4 : Connect to your drone

- A. Pluto1.2 generates its own wifi hotspot. Using wifi settings on your smart-phone, you will discover Pluto12_xxxx wifi hotspot.
- B. Connect to the hotspot using the password provided in the box.
- C. Open the Pluto Controller app.
- D. Click on the CONNECT button.

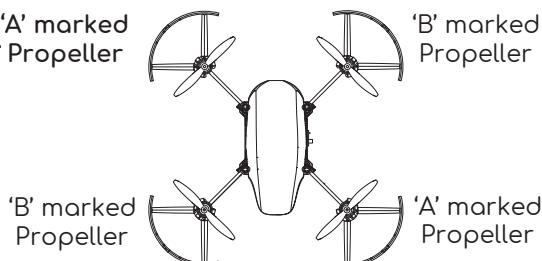
Step 5: Preflight Checklist

Please check the following:

- A. Prop-guards are attached securely.



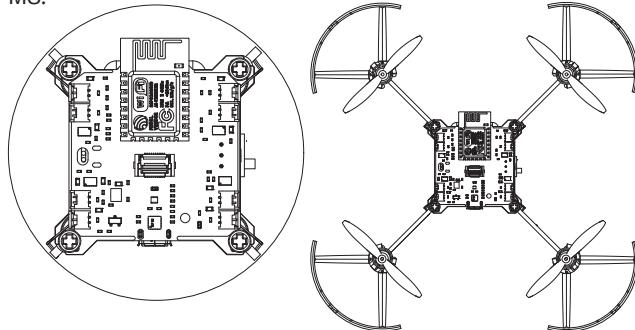
- B. There are two sets of propellers A & B. You can find the markings near the hub of the propeller. Make sure that the propellers are mounted as shown below.



C. Battery voltage before arming should be above 3.8V. This ensures good flight.



D. Please ensure that the motors are connected in the correct ports: M5, M6, M7, M8.



E. Perform motor test using “Pluto Controller”.

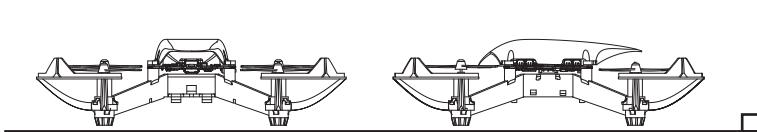
1. Go to Menu > Drone Settings > Motor test
2. Tap on “Spin all”
3. Verify if all propellers are rotating. If not, please verify step D.



F. Perform accelerometer calibration.

1. This calibration accounts for misalignment of the flight controller and frame.

2. Place Pluto1.2 on a perfectly level surface.
3. In the app, go to: Menu > Drone Settings > Acc. Calibration
4. This will reduce the drift, but not eliminate it completely. For eliminating the drift you will have to trim the drone (please refer to section: Trim).



Note: During control, the flight controller assumes that it is perfectly aligned to the ground. This results in drifts. To account for misalignment, we need to calibrate the accelerometer.

G. Perform Magnetometer calibration

1. This calibration accounts for stray magnetic fields. This is essential to achieve good yaw stability.
2. In the app, go to: Menu > Drone Settings > Mag. Calibration

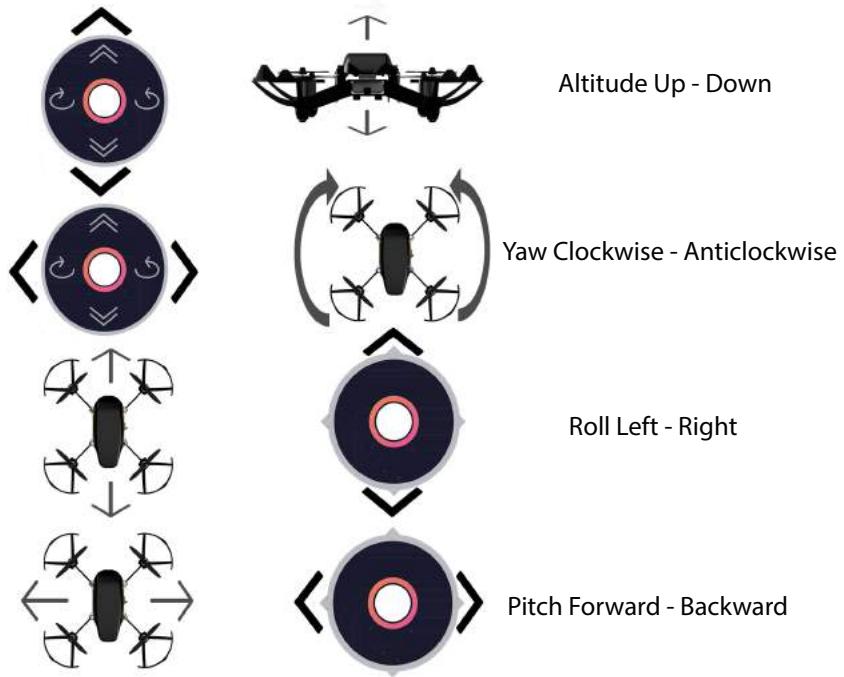
TIP: It's a good practice to perform Magnetometer calibration when:
a. Flying at new location
b. Replaced the motors

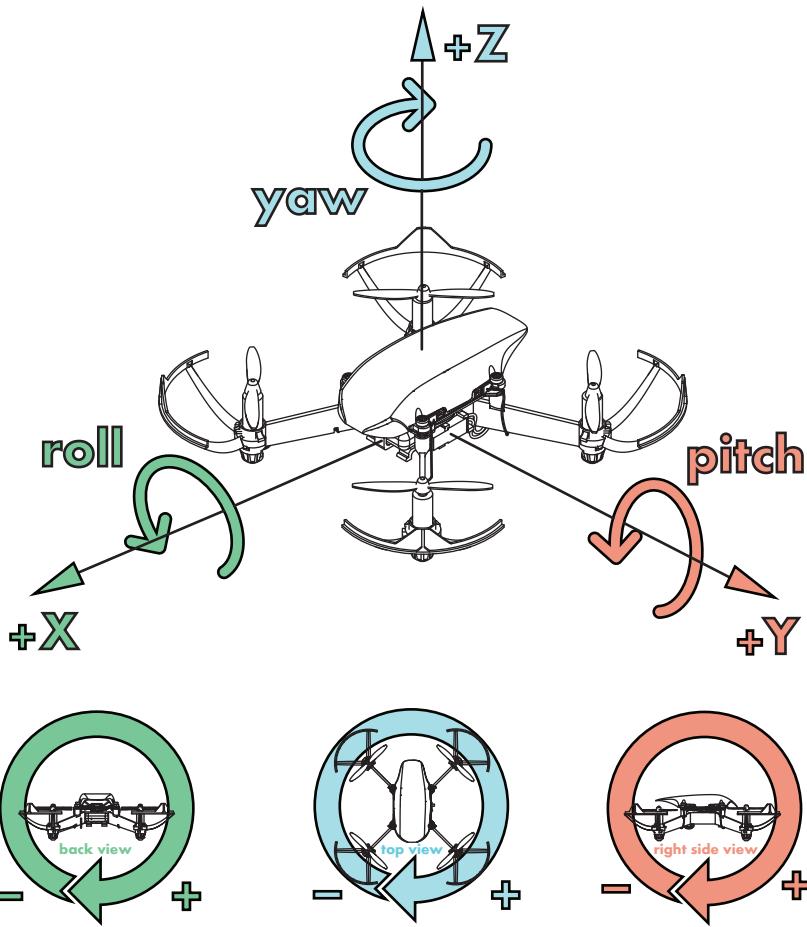
CAUTION

Without proper magnetometer calibration, the yaw performance of the drone is severely affected.

Step 6 : Understanding controls

It is very important to understand the controls before starting to fly.
Please go through the following:





Alternatively, go through a video tutorial in App :

Menu > Help > Flying Instructions.

NOTE: If you are a beginner in flying drone, we recommend you to switch to "Tilt mode". Go to Menu > Control Settings > Tilt mode

Step 7: Arming the Drone

The ARM switch controls power to the motors. It can be thought of as a safety switch. If during anypoint you want to shut the motors, you can use the ARM switch to do so.

Note: In case, the Arm button has not been activated, go back and recalibrate. A few steps could have been missed out during calibration.

Disarming the drone will stop all motors immediately. You can disarm by clicking on the disarm button.

Step 8: Fly it!

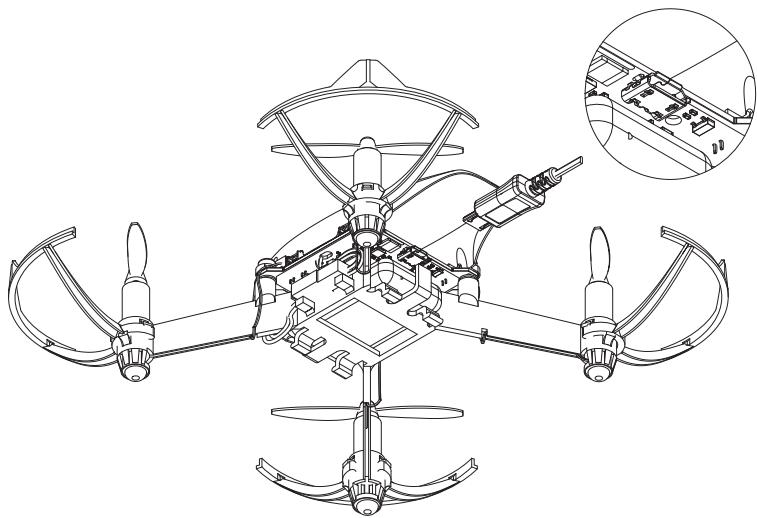
- A. Place the drone with its front pointing away from you.
- B. Click the ARM button.
- C. Make sure you have a lot of open space.
- D. Click on the Take-off button. PlutoX should take off to a height of about 3 feet.
- E. Try to control only the roll and pitch of the drone. This significantly makes the flying task easy.
- E. To land drone, press the Land button.

Note: If you are new to drones, you will crash a number of times before you learn how to fly. You don't need to worry about the crash as the drone is crash resistant.

Battery charge

Pluto1.2 provides an on-board battery charging feature. Pluto1.2 is equipped with a Micro-B USB port as shown in the figure. To charge the battery:

1. Switch Off the Pluto1.2
2. Connect a Micro-USB cable to the USB port.
3. Battery charging is indicated by a Red LED labeled D1.
4. When the battery is completely charged, the Red LED stops glowing.



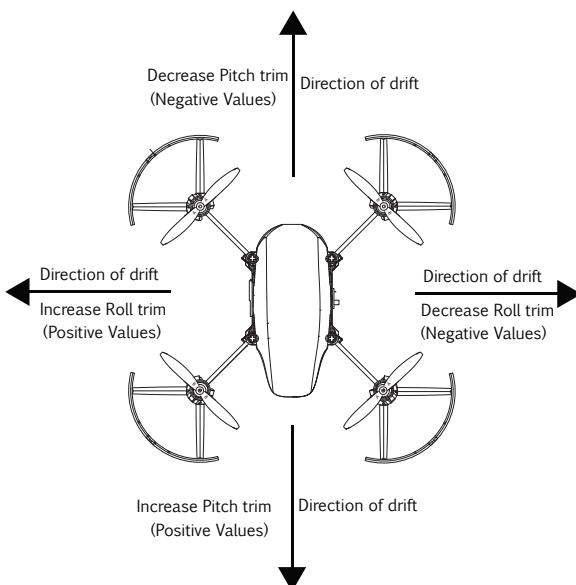
- Never discharge Li Po cells to below 3V under load.
- Never cover warning labels with hook and loop strips.
- Never charge batteries in extremely hot or cold places or place in direct sunlight.
- Never leave charging batteries unattended.
- Never charge batteries outside
- Never charge damaged batteries.
- Never allow minors to charge battery

Trim

Trim is a feature used to ensure very low drifts in your Pluto1.2. You might have observed that, when you take-off using the take-off button, the drone drifts in some direction. TRIM is used to ensure very low drifts in the XY-Plane.

Please perform the following steps:

1. Make sure that your have performed acc calibration before starting Trim.
2. Identify which direction is the drone naturally drifting towards.
3. Using Pluto Controller navigate to:
Menu > Drone Settings > Trim
4. Trim the Drone in units of 5 to see considerable change. The units of trim areas shown in the figure below.



Control Settings

Flight Modes

Pluto1.2 has various flight modes. Changing the flight mode will change the way you control your drone.

Althold / Throttle mode

This controls how you controls the drone in the Z-axis.

Throttle mode: When you choose this mode, you control the amount of power supplied to the motors. This essentially controls the acceleration of the drone in the Z-axis. This mode can be hard for a beginner as you would constantly need to provide input to maintain altitude.

Althold mode: When you choose this mode, you control the velocity of the drone in the Z-axis. This is much easier to control. When the control stick is in the center, the drone tries to maintain its altitude.

Headfree mode: This mode affects the way you control roll and pitch of the drone. When this mode is Off, the pilot needs to constantly monitor, the yaw of the drone. If the pilot loses orientation of the drone, it can be quite challenging to control the drone.

When headfree mode is On, the pilot doesn't need to worry about the yaw angle of the drone, the drone manupalites the roll and pitch inputs accounting for changed yaw. This mode is highly recommended for beginners.

Control Modes

Joystick/Tilt mode: This customises how you control the roll/pitch of the drone.

Joystick mode: In this mode, the roll/pitch of the drone is controlled by on screen joystick. As touch screen lacks tactile feedback, it required some getting used to.

Tilt mode: In this mode, the roll/pitch of the drone is controlled by the tilt of your phone. This mode is much easier to fly for beginners.

Sensitivity

Sensitivity refers to the level of response the drone gives to the controller inputs. For higher sensitivity, even a small input would reflect a huge difference and for lower sensitivity, large inputs would be required for noticeable change. Adjust the sensitivity according to the Pilot's style of flying.



Note: We recommend the beginners to keep the sensitivity levels to Low.

Max Altitude

This setting helps you limit the drone's maximum height. By default your drone does not limit the height.

CAUTION

1. This feature is still in beta, please use with care.
2. This feature only works in Althold mode.

External Controller

To use an external controller, connect controller to the phone using Bluetooth/USB. To change the external controller settings, go to Menu > Controller Settings > Gamepad icon



Steps 1 : Connect the controller to your phone.

If you are using a USB based controller, you will need an OTG Cable.

Step 2 : Configure your controller.

To change the external controller settings, go to

Menu > Controller Settings > “Gamepad Icon”

If your joystick controller is supported by your phone, the icon turns green instead of red.

Step 3 : Assign proper channel.

Move the sticks and buttons of your controller to identify and assign the right controls.

Note: Depending on your phone there are different controllers supported. We have tested to find that microsoft game controllers are generally detected on all Android smartphones.

Updating firmware

To update firmware on Pluto1.2, follow these steps:

Step 1 : Go to Menu > Update firmware

Step 2 : Tap on ‘Get Latest Firmware’

Step 3 : Tap on ‘Magis-X2’. This firmware is a stable firmware for Pluto1.2

Step 4 : In case you have downloaded the firmware from internet, you can also load the firmware using ‘Browse’ button.

Step 5 : Make sure that App is connected to PlutoX and Tap on ‘Flash’ button. This will start flashing your Pluto1.2

CAUTION

1. Please do not flash ‘Magis-V3R’ on Pluto1.2 This will freeze Pluto1.2 microcontroller. If it does happen by mistake, choose the current version ‘Magis-X2’ from the app and flash your drone.
2. Do not turn off Pluto1.2 while Flashing

Developer options

Pluto1.2 is meant for tinkering. When user want to program the drone, use the Cygnus IDE to write user code. Along with Cygnus IDE, enable developer mode on App. For more information on programming, use Project Book.

Please follow the steps to enable developer mode on App:

Step 1 : Go to Menu > Pilot Profile

Step 2 : Tap on the pencil option to edit your profile.

Step 3 : Tap on 'I am a developer'

Step 4 : Go to the home screen of Pluto Controller app. '</>' button will be visible. Tap on this button to enable the user code.

Step 5 : Tap on '</>' button to disable user code.



Tip: In android phone, you can also enable the user code by pressing the volume up button instead of pressing </> button on the screen. You can disable the user code by pressing volume down

Troubleshooting

Led status

For reference: R - Red LED, G - Green LED, B - Blue LED

LED Status	Indication	Action required
G On	Connected with App. Ready to ARM	-
B On	Drone is Armed.	-
R On	Low battery	Charge the battery
Cyclic R, G, B	Waiting for the app to connect.	Connect using App
G Toggle	Pluto is not of a flat surface	Keep pluto on flat surface.
B Toggle	Signal loss	Reconnect to pluto
R Toggle	Low battery In-flight	Land & Charge the battery
Pink Toggle	Gyro not calibrated	Keep Pluto undisturbed / Perform Acc calibration
Yellow Toggle	Mag not calibrated	Perform Mag calibration
R long toggle & short toggle	MPU error	Contact support
G long toggle & short toggle	Baro error	Contact support
B long toggle & short toggle	Crystal error	Contact support

Failsafe Information

Failsafe	Condition	LED	Behavior
Low Battery (Not armed)	Batt voltage < 3.4V	Solid red LED	Does not let you ARM the drone
Low Battery (In-flight)	Batt voltage < 3.0V	Blinking red LED	-
Loss of range	No signal for 2s	Blinking blue LED	Land drone at the current position
Crash	Acceleration > 2g or Roll/Pitch > 50 degrees	Blinking pink LED	DisArms the drone

FAQ

Q: Some motors are not rotating.

This could happen due to multiple reasons. Please check the following:
Make sure that motor is inserted in the default motor ports: M5 / M6 / M7 / M8.

Check if the motor cable is damaged. If damaged, replace the motor.

Check if propeller is able to freely rotate on the motor shaft. If not, use the proptool to create some gap between motor and hub of propeller.

Q: Drone is not taking off

Please check the following:

Ensure that your battery is fully charged.

Propellers are mounted as recommended. Check “assembly / disassembly” section for more information.

Check if you are connected to your Pluto’s wifi.

After you ‘connect’ to Pluto1.2 using the app, ensure that you are getting a solid green LED. If not, please use the “LED status” section above to correct for any errors.

Q: Drone keeps drifting

The drone controls angles and not velocities. Some drift can be expected. In order to reduce this drift you can try the following:

Perform Accelerometer calibration on a flat surface.

Please follow the “Trim” section to reduce drift as low as possible.

Q: Altitude Hold performs erratically.

To maintain altitude, the drone uses a mems barometer. You can expect the altitude to vary +/- 50cm. This is normal. If the drone is very erratic in Z-axis, one possible cause is excessive vibration. Please ensure the following:

Replace propeller if the propeller is damaged. Very little damage can also cause excessive vibrations

Make sure that the PrimusX board is not in contact with plastic part but only the dampers.

Q: Cannot see the wifi Hotspot.

Please try restarting the drone.

Q: Drone keeps rotating / yawing.

Make sure that the drone’s magnetic calibration is performed properly.

Specifications

Drone Specifications

Height	50 mm
Frame Size	160 mm
Clock	72 MHz
Wireless communication	Wi-Fi Interface
Propulsion	Brushed
Propeller	Bi-Blade 55 mm
Weight with battery	60 g
Max Range	60 m

Battery Specifications

Manufacturer	Tattu
Rated Capacity	600 mAH
Discharge rating	25 C
Chemistry	Lithium polymer

Support



www.dronaaviation.com

For questions and technical help:

Email: support@dronaaviation.com

GitHub: <https://github.com/DronaAviation>

Forum: <https://www.dronaaviation.com/forum>