Meet the X8+

Thank you for purchasing an X8+!

The X8 is a powerful octocopter platform for aerial video. Review this manual in its entirety before your first flight. Additional instructions can be found in the X8 information portal at 3DR.com/X8/info.

Happy flying!
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Parts

RC Controller

Propellers

- SF propellers (4)
- SFP propellers (4)

Battery Kit

- Flight battery
- Charger and accessories
- Guard bag

Ground Station Radio

- Radio
- USB adapter
- Android adapter

Tool Kit

- Propeller wrench
- Pixhawk micro-SD card adapter

Flight Checklist
X8+

GPS mast
Pixhawk autopilot
Front arms (blue)
Rear arms (black)

Antenna
Safety button
Status LED
Micro-USB port (not pictured, side of Pixhawk)
Setup: Assembly

The X8 arrives in travel configuration. Complete these steps to prepare the X8 for flight.

1 Unfold Arms

Remove the bolts and thumbnuts outside the two folded black arms (1). Unfold the black arms, re-insert the bolts, and secure with the thumbnuts (2).
2 Unfold Legs
Remove the bolts and nuts to the inside of the folded legs (1), unfold the legs, re-insert the bolts, and secure with the nuts (2).

3 Attach Propellers
The X8 uses SF and SFP propellers. These labels can be found on the individual propeller packages and on the propellers themselves. See the diagram below for which motors require SF or SFP propellers. The accuracy of this assembly is critical for the X8 to fly correctly.

To attach each propeller, remove the nut and washer from the motor, and add the correct type of propeller with the writing on the propeller facing the sky. (This will be a tight fit; apply pressure and twist the propeller onto the motor.) Replace the washer over the propeller, and tighten the nut on top using the propeller wrench.

Ensure that the writing on all propellers faces the sky.
Ground Station

A ground station is a laptop or tablet running an ArduPilot-compatible mission control application. In the field, a ground station helps you monitor the X8 during flight, plan missions, and troubleshoot issues. We recommend using a ground station at all times with the X8.

To set up a ground station, choose a platform below and visit 3DR.com/download_software to install the application.

- **DroidPlanner 2** (Android)
- **Mission Planner** (Windows)
- **APM Planner** (OS X)

**Important Note About Vehicle Setup in Mission Planner and APM Planner:**
Your X8 has been pre-configured at the factory and is ready to fly. Re-performing the calibrations on the Initial Setup screen, including the mandatory hardware configurations and setup wizard, can adversely affect the performance of your aircraft.

**iOS?** There are currently no ground station applications available for iOS.
Power Management

The X8 is powered by a rechargeable lithium polymer (LiPo) battery. When fully charged, the battery provides up to 15 minutes of flight time depending on payload, environmental conditions, and flying style. Flying with a gimbal, GoPro, and FPV system can reduce flight time by up to 5 minutes. Flying aggressively or in high winds can affect power consumption and reduce flight time. Monitor power consumption using the flight data display on the controller (press and hold the DN button).

When the battery reaches the low voltage limit, the X8 will initiate a low battery failsafe and land automatically at the current position. (See page 20 for more information about failsafes.) To avoid a low battery failsafe, monitor battery voltage during flight on the controller’s flight data display, and end your flight before the battery reaches the low voltage limit.

**flight battery level**

Full battery: 16.8 V
Low battery limit: 14 V

End your flight at 14.1 V.

**flight battery mAh consumed since armed**

Another way to monitor power consumption is by using milliamp-hours (mAh). Monitor the mAh on the controller, and ensure that it does not exceed 8,000 mAh (80% of the battery’s available capacity). Exceeding 8,000 mAh can render the battery permanently unusable.

Do not exceed 8,000 mAh for a fully charged X8+ battery.
Charge the battery before your first flight!

1. Connect the charger to the power adapter cable and a wall outlet. Connect the red cable to the + port and the black cable to the - port.

![Charger with power cable and split-wire charging cable]

2. Set the charger to LiPo and 3A.

![Charger settings]

3. Connect the white connector to the 4S port, and join the two yellow connectors together.

![Flight battery charging wiring]

4. Secure the battery inside the guard bag, and charge until the status indicator displays green.

![Charging in process]

Safety

Flying with a low battery is a safety risk and can render the battery permanently unusable. Always fly with a fully charged battery.

Charge the battery using a designated LiPo balance charger only. Always monitor the battery while charging. Protect the battery from extreme heat, extreme cold, puncturing, and flammable surfaces. Always transport, charge, and store the battery in the guard bag.

Inspect the battery for damage before and after flying. If you observe any swelling of the package or the battery ceases to function, do not use the battery; locate your local battery recycling center, and dispose of the battery. In the US and Canada, visit call2recycle.org to find a location. Do not dispose of the battery in the trash.
Controller Battery

The controller is powered by 8 AA batteries (included). The controller’s flight data display allows you to monitor the voltage of the controller. When fully charged, the controller will display 12 V; when completely out of charge, the controller will display 9 V. Replace the batteries when the controller displays 9.1 V.

Press and hold the **DN** button to view flight data.

Controller Flight Data Display: Screen 1

- Controller battery level (9-12 V)
- Replace controller batteries at 9.1 V.
Powering the X8

Follow these steps to power the X8.

1
Turn on the controller. Ensure that the switches are set to CH 7 OFF, STD, and RTL OFF.

2
Join the yellow connector on the battery with the yellow connector on the X8; this will power on the X8. Keep the X8 still and level while it powers on and initializes the sensors. Check the status LED; when it displays blinking blue, the sensors have completed initialization and you can move the X8.

3
When the initialization process is complete, turn over the X8 and secure the battery to the underside of the vehicle using the velcro straps.

Status LED indicators:
- Initializing, keep still and level
- Initializing complete

It is important to establish communication before powering on the X8. Always turn on the controller before connecting the battery. When powering off the X8, disconnect the battery before turning off the controller.
Connecting to a Ground Station

To connect the X8 to a ground station, connect the ground station radio to your laptop or tablet, and power the X8.

**Laptop (Mission Planner/APM Planner)**

1. Connect the ground station radio to your laptop using the USB adapter. Open Mission Planner or APM Planner.

![Ground station laptop with radio connected](image)

2. Select **57600** and **AUTO**, then select **CONNECT**. (When connecting directly to Pixhawk’s micro-USB port, set the rate to 115200.)

![Mission Planner Connect tool (top-right corner)](image)

3. Select **Flight Data** to view live data from the X8.

![Mission Planner Flight Data tab: connected to aircraft](image)

**Tablet (DroidPlanner)**

1. Connect the blue end of the Android adapter to your device and the black end to the radio.

![Ground station tablet with radio connected](image)

2. Select **Connect**.
Flight Basics: Safety

To ensure safe and successful flying, always fly in accordance with your location regulations and these best operating practices.

Before you fly, determine the boundaries of your safe flying area. If the X8 moves outside the designated area or exhibits instability in flight, switch to standard mode and land the X8 manually.

The X8 will not avoid obstacles on its own, including during missions. As the operator, it’s your job to recognize and avoid obstructions while flying. Always be ready to regain manual control of the X8 in the event of an unsafe situation.

Location

Always fly below 400 ft (120 m) and within your visual line of sight. Don’t let the X8 get too far away from you; make sure you can always see its orientation. Don’t fly in low light, heavy wind, rain, or other conditions that might impede visibility.

Propellers

Spinning propellers can cause serious injury. The safety button indicates the status of the motors to help you prevent hazardous contact with the X8’s high-speed propellers.

- When the X8 is powered on, the safety button will blink red, indicating that the motors are inactive and the propellers are safe to handle.
- When you’re ready to fly, press and hold the safety button until it shows solid red. This indicates that the motors are active and the propellers can spin if armed. To make the propellers safe to handle again, press and hold the safety button until it blinks red.

Always fly at least 100 feet (30 m) away from people, vehicles, and buildings. Make the safety of people and property your first priority!

Always fly at least 5 miles (8 km) away from airports and other areas where pilots operate manned aircraft.
Operating Limits

Always fly within the X8’s operating limits.

**X8+ Operating Limits**

<table>
<thead>
<tr>
<th>Maximum Altitude*</th>
<th>100 m (328 ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Range*</td>
<td>300 m (984 ft) from launch point</td>
</tr>
<tr>
<td>GPS Lock</td>
<td>GPS lock required at all times</td>
</tr>
<tr>
<td>Maximum estimated flight time</td>
<td>15 min</td>
</tr>
<tr>
<td>Payload capacity</td>
<td>800 g (1.7 lbs)</td>
</tr>
</tbody>
</table>

*While geofence enabled (default)*
Controls

Maneuver the X8 in flight using the controller’s two joysticks.

Throttle

Move the left stick vertically to control altitude.

To take off and to gain altitude, raise the throttle stick slightly above center position.

Set the throttle stick to center to maintain the current altitude.

Lower the throttle stick below center to decrease altitude.

Set the throttle stick fully down to land once the X8 is a few inches above the ground.
Yaw

Move the left stick horizontally to rotate the X8 and change orientation. For a slow rotation, move the stick slightly away from the center in either direction. Moving the stick farther from the center creates a faster rotation.

**Flight Tip**

When adjusting orientation, move the left stick horizontally without changing its vertical position.
**Pitch and Roll**

The right stick allows you to control the X8’s position in the air. Move the right stick to tell the X8 to move in that direction: forward (toward the blue arms), back (toward the black arms), left (toward the left arms), or right (towards the right arms). How far you move the stick from the center before releasing it tells the X8 how fast to move.

---

**Flight Tip**

The X8 moves according to its orientation. The blue arms face forward, and the black arms face backward. Before using the right stick, use yaw to keep the X8 facing in outward orientation so that the black arms face towards you and the blue arms and face away from you.
Modes

The X8 includes three flight modes: manual flight (STD-altitude hold), hover mode (LTR-loiter), and mission flight (AUTO). Use the switch on the right side of the controller to select a flight mode.

Standard (altitude hold mode)
STD

*fly manually*

Start your flight in standard to select altitude hold mode, and fly manually using the controller.

Loiter mode
LTR

*hower*

Select loiter to hover in place automatically. Use the controller to adjust the X8’s position then release the sticks to hold that position. Loiter is a great way for beginners to learn how to fly! If you’re new to flying, start your first flight in loiter instead of standard.

⚠️ To avoid sudden changes in altitude, set the throttle stick to center position before switching modes, including in the event of a GPS failsafe. See page 20 for more information about failsafes.
Auto mode

**AUTO**

*fly a mission*

Select auto mode to fly an autonomous mission. The X8 will automatically fly the series of waypoints saved to the autopilot. See the Missions section on page 28 for instructions on planning and flying missions.

![Warning]

Do not activate auto mode unless you have saved a mission to the X8 using a ground station application.

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Gimbal control

**TILT**

*tilt the camera up and down*

Connect a Tarot Gimbal (sold separately), and use the TILT knob to control the angle of the camera in flight. Visit 3DR.com/X8/info for instructions.

---

Land

**CH 7**

*land at the current position*

Set the CH 7 switch to ON to end your flight and land at the current position. Once you activate land, set the throttle stick fully down, and the X8 will automatically disarm after landing. The X8 will not disarm automatically unless the throttle stick is set fully down.

Reposition during landing: During landing, use the right stick on the controller to adjust the X8’s position.
Return to Launch

Set the RTL switch to ON to end your flight and return the X8 to the launch point automatically. Once you activate RTL, set the throttle stick fully down, and the X8 will automatically disarm after landing. The X8 will not disarm automatically unless the throttle stick is set fully down. Ensure that the RTL switch is set to OFF before takeoff.

When commanded to RTL, the X8 will:

1. Achieve minimum altitude of 15 m (50 ft) or maintain current altitude if above 15 m.
2. Move to launch point and loiter for 5 seconds.
3. Land at launch point. Wait a few seconds and disarm automatically.

Reposition during landing: During landing, use the right stick on the controller to adjust the X8’s position.

RTL returns the X8 to the location where it was armed. Always arm the X8 at a safe, unobstructed launch point.
Failsafes

The X8 is programmed with a set of failsafe behaviors to prevent a crash in the event of a loss of one of the data or communication channels required for flight. Although certain failsafes have assigned LED indicators and tones, it is unlikely that you will be able to see these at a distance. Monitor the ground station for failsafe indications. If a failsafe is triggered, the assigned behavior will activate. To override the failsafe behavior, use the controller to switch to standard mode and regain manual control.

**RC Controller Signal Failsafe**
Physical obstructions and interference from nearby wireless signals can affect the X8’s connection with the controller.

If the X8 loses contact with the controller, it will return to the launch point automatically and land, indicated by a blinking yellow status LED.

**Low Battery Failsafe**
Environmental conditions, payload, and flying style can affect power consumption. Use the controller’s flight data display to monitor the voltage of the battery during flight.

If the battery reaches 14 V, the X8 will land automatically at the current position, indicated by a blinking yellow status LED and a quick repeating tone.
GPS Failsafe
The X8 requires GPS lock before takeoff. Enclosed areas, physical obstructions, and lack of available satellites can affect GPS strength. If the X8 loses GPS lock in flight, it will trigger a GPS failsafe, indicated by a blinking blue and yellow LED with a high-high-high-low tone, and automatically switch to manual control (standard - altitude hold mode). Always be prepared to regain manual control at any time while flying and choose an unobstructed flying area to improve GPS signal strength. When flying a mission, we recommended changing the GPS failsafe behavior to land. (Visit 3DR.com/X8/info for more information about configuring the GPS failsafe.)

Altitude Failsafe
The X8 has a 100 m (328 ft) altitude geofence enabled by default. If the geofence is breached, the X8 will automatically RTL.

Range Failsafe
The X8 has a 300 m (984 ft) horizontal geofence enabled by default. If the X8 travels farther than 300 m from the launch point, it will automatically return to the launch point and land. If you plan to fly a mission that exceeds this range, you will need to disable the horizontal geofence. (Visit 3DR.com/X8/info for instructions.) The range failsafe will be disabled in the event of a GPS failsafe.
Status Indicators

LED

The Pixhawk LED indicates the status of the X8. During flight, the LED won’t be visible, so you will need to use a ground station to view the status of the X8. Visit 3DR.com/X8/info to listen to Pixhawk’s status tones.

![X8 Status LED](image)

- Initializing, hold the X8 still and level
- Acquiring GPS, please wait
- Autopilot ready, GPS locked
- Armed
- Loss of RC signal, automatic landing
- Low battery, automatic landing
- Loss of GPS signal, switch to standard mode (altitude hold)
- Pre-arm safety check failure. Connect to a ground station and see the troubleshooting section.
Safety Button

The safety button indicates the status of the motors to allow you to arm and disarm the X8 safely.

Motors inactive, safe to handle
Motors active, deactivate before handling
Flight Procedures: Takeoff

Follow these steps to take off.

Checklist

» Propellers are attached tightly to the motors in the correct order and the GPS mast is oriented vertically.

» The X8 is powered with the battery secured to the underside of the vehicle. (Remember to hold the X8 still and level while the sensors initialize.)

» The controller is set to CH 7 OFF, standard (STD) mode (loiter mode for beginners), and RTL OFF.

» The status LED displays blinking green, indicating that the X8 has acquired GPS lock. This can take a few minutes depending on your flying location.

» The X8 is situated at a safe, unobstructed launch point, facing away from you.
Arm

After completing the checklist, you’re ready to fly! Arming and disarming are important steps that must be completed before takeoff and after landing. There are two steps to arming the X8: the safety button and the controller.

1
Press and hold the safety button until it displays solid red. This indicates that the X8 is now active. **Stand back!**

- ○ ○ ○ Motors inactive, safe to handle
- ● ● ● ● Motors active, deactivate before handling

Safety button indicators

2
To arm the motors, hold the left stick down/right until the motors spin.

Controller left stick: arming position

The arming and disarming procedures ensure that you can safely start and stop motors without risk of injury. The X8’s motors will spin when armed! Make sure the propellers are clear of any obstructions, including your hands, before arming. Do not handle the propellers or pick up the X8 while the safety button is active (solid red).
Landing

If you end your flight using the Ch 7 land command or RTL, the X8 will disarm automatically; wait for the motors to stop, and proceed to powering off. Attempting to disarm the X8 in either land or RTL can cause the copter to flip.

Disarm

For manual landing in standard or loiter mode:

1. Press and hold the safety button until it blinks red. The motors are now inactive, and the X8 is safe to handle.

2. To disarm the motors, hold the left stick down/left until the motors stop.

---

Motors inactive, safe to handle

Motors active, deactivate before handling

Safety button indicators

Controller left stick: disarming position

---

Do not handle the propellers or pick up the copter while the safety button is active (solid red). Remember to disconnect the battery before turning off the controller when powering off.
Monitoring

Monitor the X8 in flight using the controller's flight data screens.

Press and hold the DN button to access the flight data screens. Press DN again to toggle between screens.

- GPS status
- current flight mode
- End your flight at 14.1 V.
- Do not exceed 8000 mAh for a fully charged X8+ battery (80% of available capacity).

- connection strength
- GPS signal strength in # of satellites
- flight battery level (14-16.8 V)
- flight battery mAh consumed since armed

- altitude in meters
- meters from launch point
- current latitude
- altitude in meters
- current longitude
- altitude in meters

- speed in m/s
- GPS status
- current flight mode
- End your flight at 14.1 V.
- Do not exceed 8000 mAh for a fully charged X8+ battery (80% of available capacity).

- flight time
- time
- controller battery level (9-12 V)
Missions

The X8’s Pixhawk autopilot is capable of flying an autonomous mission without operator input. Ensure that you feel comfortable operating the X8 manually before attempting an autonomous mission.

Environmental Awareness

Before you fly, assess the features of your flying area. Determine the boundaries of the safe flying area, and be prepared to recover the copter manually if it goes outside this area. Be aware of any risks at your location, including bodies of water, structures, trees, etc. Designate a few areas as safety zones where you can safely land the copter in case of an unsafe situation.

Radio Signal Conditions

Flying behind solid objects, like buildings and trees, will block radio signals. Always maintain visual contact with the copter to ensure that the radio signal is unobstructed. Radio towers, cell phone towers, and nearby WiFi signals can also cause interference with the radio system and decrease its range. Avoid flying in populated areas to avoid sources of interference.

Altitude

Select an appropriate altitude for your flying location and local regulations. Remember the X8 will not avoid obstacles during a mission; it will complete the mission as planned. Select altitudes that avoid any obstacles, such as trees, and comply with the safety information in this manual.

Speed

By default, the X8 will travel at 6.5 m/s (14.5 mph) during a mission.

Power

As the operator, it is your responsibility to ensure that all missions comply with the X8’s operating limits, including flight time. Don’t forget to take into account the effect of current wind conditions on power consumption.

Regaining Manual Control

During a mission, keep the controller easily accessible, and be prepared to regain manual control at any time. To regain manual control during the mission, switch to standard mode using the controller. If you observe instability in the X8’s flight behavior or it the copter moves outside your designated safe flying area, switch to RTL. Turning off the controller will automatically trigger an RTL and can be used in an emergency situation as a hard recall command.

Failsafes

The X8’s default failsafe behaviors are optimized for manual flight. For autonomous missions, we recommend re-configuring the failsafe settings for your flying location. For instructions, visit 3DR.com/X8/info.
Planning

To plan a mission, power the X8 and connect to your ground station. Ground station applications require an Internet connection to access maps.

**Tablet (DroidPlanner)**

Select the DroidPlanner icon, select *Editor*. Tap to add waypoints, or select the brush tool and draw a path for the X8 to follow.

![DroidPlanner: Edit waypoints](image1.png)

**Laptop (Mission Planner, APM Planner)**

Select Flight Plan, and click to add waypoints. Select the green arrows at the bottom of the screen to configure altitude and change waypoint types.

![Mission Planner: Flight Plan](image2.png)

**Takeoff and Landing**

Both ground station options provide the choice to configure automatic takeoff and landing into the mission. Missions without automatic takeoff and landing must be initiated and ended in flight.
**Saving**

After planning the mission, save the mission to the X8. The Pixhawk autopilot can store one mission at a time. When you initiate the mission, the X8 will start the mission stored to the autopilot at the time.

**Tablet (DroidPlanner)**

Select the option menu in the top-right corner, and select *Send Mission*. This will save the mission to the X8.

**Laptop (Mission Planner, APM Planner)**

On the *Flight Plan* screen, select *Write WPs* to save the mission to the X8. Select *Save WP File* to save the mission to your computer for future use.

![DroidPlanner: Send Mission (option menu)](image)

![Mission Planner: Flight Plan](image)
**Initiating**

Once you’ve saved the mission to the X8, follow these steps to fly the mission.

1 **Perform a pre-mission test flight.**
   Follow the standard takeoff procedure, and fly a brief test flight to verify that all controls (throttle, yaw, roll, and pitch) are responding normally.

2 **Arm in standard mode.**
   When you’re ready to start the mission, arm the X8 in standard (STD) mode.

3 **Switch to auto mode.**
   For automatic takeoff, arm the X8 in standard mode. Then switch to auto mode, and raise the throttle to initiate the mission.

   For manual takeoff, initiate the mission in flight by switching to auto mode.

**Ending**

End the mission according to the type of landing configured in the mission.

**Automatic Landing**

For missions configured with a land waypoint, the X8 will disarm automatically after landing. Ensure that the throttle stick is set fully down during landing; the X8 will not disarm automatically unless the throttle stick is set fully down.

**Manual Landing**

For missions without a land waypoint, switch to standard or loiter mode in flight then land manually.

![Controller: mode switch](image1)

![Controller: mode switch](image2)

![Controller: left stick](image3)

---

**To avoid sudden changes in altitude when switching from auto mode to standard mode, ensure that the left stick is set to the center position.**
Appendix: Troubleshooting

Pre-Arm Safety Check Failure

If the status LED displays blinking yellow, the X8 is failing one the pre-arm safety checks. To determine the specific failure, check the heads-up display on the ground station. There will be an error message specifying the failed check.

- Radio Calibration Failure: Perform Radio Calibration or RC controller re-binding
- Accelerometer Calibration Failure: Perform Accelerometer Calibration
- Compass Calibration Failure: Perform Compass Calibration
- GPS Failure: Wait for improved GPS signal or move to a more open area

Video tutorials for performing calibrations can be found at 3DR.com/X8/info.

Maintenance

Replacement parts for the X8 can be purchased at store.3DR.com.

Instructions for replacing the wiring, plates, motors, and legs of the X8 can be found at 3DR.com/X8/info.
### Specs

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<th>Spec</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>Battery</td>
<td>4S 14.8V 10,000 mAh 10C</td>
</tr>
<tr>
<td>Battery Dimensions</td>
<td>6.6 in x 2.6 in x 1.4 in (16.7 cm x 6.5 cm x 3.5 cm)</td>
</tr>
<tr>
<td>Battery Weight</td>
<td>803 g</td>
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<tr>
<td>Autopilot hardware</td>
<td>Pixhawk v2.4.5</td>
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<tr>
<td>Autopilot firmware</td>
<td>ArduCopter 3.2</td>
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<td>GPS</td>
<td>3DR u-blox GPS with Compass (LEA-6H module, 5 Hz update)</td>
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<tr>
<td>Ground Station Radio</td>
<td>3DR Radio v2 (915 MHz or 433 MHz)</td>
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<tr>
<td>Motors</td>
<td>SunnySky V2216-12 KV800 II</td>
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<tr>
<td>Frame Type</td>
<td>X</td>
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<td>Propellers</td>
<td>APC Propeller 11x4.7 SF (4)</td>
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<tr>
<td></td>
<td>APC Propeller 11x4.7 SFP (4)</td>
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<tr>
<td>Vehicle Dimensions</td>
<td>13.7 in x 20.1 in x 11.8 in (35 cm x 51 cm x 20 cm)</td>
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<tr>
<td>Payload Capacity</td>
<td>800 g (1.7 lbs)</td>
</tr>
<tr>
<td>Vehicle Weight with Battery</td>
<td>2.56 kg (5.6 lbs)</td>
</tr>
<tr>
<td>Maximum Altitude*</td>
<td>100 m</td>
</tr>
<tr>
<td>Range*</td>
<td>300 m from launch point (1 km when geofence disabled)</td>
</tr>
<tr>
<td>Maximum Estimated Flight Time</td>
<td>15 min</td>
</tr>
</tbody>
</table>

*While geofence enabled (default)*
Resources

Thank you for being a responsible drone operator. For more information about the X8, visit the pages below.

Online information portal: 3DR.com/X8/info
3DR Support: help@3DR.com
Terms and Conditions: 3DR.com/terms

Happy flying!

3D Robotics
1608 4th Street, Suite 410
Berkeley, CA 94710
3DR.com
PARTS

1 Pixhawk
2 Buzzer
3 Safety switch
4 Micro-SD card and adapter
5 Micro-USB cable
6 Six-wire cable x2
7 Power module
8 I²C splitter module
9 Four-position I²C splitter cable
10 Three-wire servo cable
11 Mounting foam

GETTING STARTED

With the help of APM firmware, Pixhawk turns any RC plane, copter, or rover into a full-featured personal drone. Once you have a fully-assembled frame, follow this guide to install Pixhawk.

1 Mount
2 Connect
3 Load firmware
4 Calibrate

1 MOUNT

Use the provided foam to mount Pixhawk as close as possible to your vehicle’s center of gravity. Make sure to orient the board with the arrow pointing forward.

Attach the foam squares to the corners of the board.
2 CONNECT

(Required) Connect the buzzer and safety switch.

(Optional) Connect a 3DR Radio to Pixhawk’s Telem port using the 6-wire cable provided with your 3DR Radio Kit to receive data and communicate with the autopilot in flight.

(GPS or GPS+Compass required) Connect a 3DR GPS+Compass to provide the autopilot with positioning data during flight. This kit includes a 6-wire cable to connect the GPS ports. Connect the MAG to the I²C port using the 4-wire cable provided with the 3DR GPS+Compass.

(Required) Connect the 3DR Power Module to the Power port using the 6-wire cable to direct power from your lithium polymer (LiPo) battery to the autopilot.

(Optional) The I²C splitter expands the I²C port to allow up to four additional peripherals to connect to Pixhawk. Use the 4-wire cable to connect the I²C splitter and add a compass module, external LED, digital airspeed sensor, or other peripherals to your vehicle.
LOAD SD CARD INTO PIXHAWK

If the SD card is not preloaded into Pixhawk, insert the micro-SD card into the slot at the bottom end of the board.

CONNECT RADIO CONTROL

FOR PPM RC RECEIVERS AND FUTABA S.BUS RECEIVERS

Connect the ground (-), power (+), and signal (S) wires to the RC pins using the provided 3-wire servo cable.

FOR SPEKTRUM SATELLITE RECEIVERS

For a Spektrum DSM, DSM2, or DSM-X Satellite RC receiver, connect to the SPKT/DSM port.

For a complete list of RC systems compatible with Pixhawk, visit the APM wiki page here.

FOR PWM RECEIVERS

Purchase a PPM Encoder module to connect a PWM RC receiver to Pixhawk at store.3dr.com.
LOAD FIRMWARE

APM firmware is the brains of your autopilot operation and must be installed before using Pixhawk. To load firmware onto Pixhawk, install a mission planner application on your ground station computer. Choose either Mission Planner (Windows) or APM Planner for (Windows, OS X, and Linux). Both applications are available for free download from ardupilot.com.

FOR COPTERS

Connect each signal wire from the PDB to the main output signal (S) pins by motor number. Connect one wire for each motor to the corresponding pin.

- Pin 1 = Motor 1
- Pin 2 = Motor 2
- Pin 3 = Motor 3
- Pin 4 = Motor 4
- Pin 5 = Motor 5
- Pin 6 = Motor 6
- Pin 7 = Motor 7
- Pin 8 = Motor 8

FOR PLANES

For planes, connect the control channel wires to the main output signal pins.

- Pin 1 = Aileron
- Pin 2 = Elevator
- Pin 3 = Throttle
- Pin 4 = Rudder

FOR ROVERS

For rovers, connect the throttle and steering wires to the main output signal pins.

- Pin 3 = Throttle
- Pin 4 = Steering
After selecting the correct file, read the safety information and select Download.

Open the file to run the setup wizard. Proceed through any security warnings, and install all suggested drivers. When the installation is complete, open the application, and connect Pixhawk to your computer using the micro-USB cable.

Your computer will automatically install the correct drivers. Do not select Connect at this time; Pixhawk can only load firmware while unconnected to Mavlink.
When prompted, follow the directions to load the firmware. Once the status bar shows that the download is complete, power cycle the board by disconnecting and reconnecting the USB.

If you hear a musical tone, your firmware installation is complete. If you hear a series of tones followed by three beeps, disconnect the USB and reconnect while holding down the safety button. Upon restart, listen for a series of tones followed by two beeps indicating that your firmware has loaded successfully.

Select Initial Setup, Install Firmware, and select your vehicle.

CALIBRATE

With Pixhawk connected to your computer, select the communication option from the drop-down menu for PX4 FMU, set the rate to 115200, and select the Connect icon. Select Initial Setup and Mandatory Hardware to access the calibration wizards.

Remove propellers before performing calibration.
SELECT FRAME TYPE (COPTERS ONLY)

For copter, select your frame orientation.

CALIBRATE COMPASS

Select the options to enable the compass; to allow automatic declination calculation; and to specify Pixhawk. Select Live Calibration to launch the wizard, and follow the prompts.

Show Me videos demonstrating live calibration techniques at 3dr.com/learn.
CALIBRATE ACCELEROMETER

Select Accel Calibration, check the box for AC 3.0+, select Calibrate, and follow the prompts to calibrate Pixhawk’s accelerometer. Make sure to wait a couple of seconds before and after changing the positions of the vehicle.

RC CALIBRATION

Select Radio Calibration to teach Pixhawk to work with your RC transmitter. Turn on your transmitter, select Calibrate Radio, and move all sticks and switches to their extreme positions. Select Click when Done once the red bars are set for all available channels.

SELECT FLIGHT MODES

Move each switch on your transmitter to its available positions. The mission planner will indicate the currently selected position with green highlighting. Select a mode for each switch position, and select Save Modes to assign.
LED MEANINGS

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PORTS

1 Spektrum DSM receiver
2 Telemetry (radio telemetry)
3 Telemetry (on-screen display)
4 USB
5 SPI (serial peripheral interface) bus
6 Power module
7 Safety switch button
8 Buzzer
9 Serial
10 GPS module
11 CAN (controller area network) bus
12 I²C splitter or compass module
13 Analog to digital converter 6.6 V
14 Analog to digital converter 3.3 V
15 LED indicator

1 Input/output reset button
2 SD card
3 Flight management reset button
4 Micro-USB port

1 Radio control receiver input
2 S.Bus output
3 Main outputs
4 Auxiliary outputs
IMPORTANT NOTE

Please note that these instructions describe basic setup for Pixhawk and do not represent the complete set of configuration procedures required to build a copter, plane, or rover.

For more information on ESC calibration, battery monitoring, failsafes, mode descriptions, and more, visit [ardupilot.com](http://ardupilot.com). Do not operate your vehicle without a complete understanding of the online instructions.

SPECIFICATIONS

Processor
32-bit ARM Cortex M4 core with FPU
168 Mhz/256 KB RAM/2 MB Flash
32-bit failsafe co-processor

Dimensions
Weight 38 g (1.3 oz)
Width 50 mm (2.0”)
Height 15.5 mm (.6”)
Length 81.5 mm (3.2”)

Sensors
ST Micro 16-bit gyroscope
ST Micro 14-bit accelerometer/magnetometer
MEAS barometer
MPU6000 accelerometer/magnetometer

Power
Ideal diode controller with automatic failover
Servo rail high-power (7 V) and high-current ready
All peripheral outputs over-current protected, all inputs ESC protected

Interfaces
5x UART serial ports, 1 high-power capable, 2x with HW flow control
Spektrum DSM/DSM2/DSM-X Satellite input
Futaba S.BUS input and output
PPM sum signal
RSSI (PWM or voltage) input
I2C, SPI, 2x CAN, USB
3.3 and 6.6 ADC inputs

SUPPORT

For more information about Pixhawk and other documentation, visit [3dr.com/learn](http://3dr.com/learn).

For more instruction on using APM firmware and planner software, visit [ardupilot.com](http://ardupilot.com).

For customer support, contact us at help@3dr.com or call our support line at +1 (858) 225-1414 Monday through Friday, 8 am to 5 pm, PST.
SAFETY

Operating a powered vehicle of any kind can be a lot of fun, but it carries certain inherent risks. Regulations governing the use of powered vehicles, including aircraft, vary from locale to locale, even within the same country or district. It is your responsibility to ensure that you understand and comply with all local laws and regulations.

Safety basics:
- Never operate the vehicle or software in a way that could be dangerous to you, other people, or property.
- Always keep propeller arcs free of objects and body parts while the vehicle is live.
- Keep in mind that software and hardware failures happen. Although we design our products to minimize such issues, you should always operate with the understanding that a failure could occur at any time and without warning. Accordingly, you should take the appropriate precautions to minimize danger in case of product failure.
- Never use the software or hardware for manned vehicles.
- Always operate within local laws and regulations.
- Do not operate the aircraft if you are under the age of 18.

Additional safety information:
- Be sure to maintain safe distances between people and your aircraft.
- Never operate your aircraft if your ability to do so with the utmost attention to safety is impaired in any way. Do not operate your aircraft while tired, under the influence of drugs or alcohol, or otherwise unable to operate it with the highest attention to safety.
- Environment conditions can change rapidly and can make operation difficult. If this occurs, land your aircraft and discontinue use immediately. Do not operate your aircraft if operating conditions are not ideal. This includes, but is not limited to, rain, snow or excessive wind.
- Always ensure the battery cable is disconnected from the aircraft until you are ready to fly, and ensure that your batteries are fully charged prior to use.
- Always turn on the transmitter and ensure the throttle stick is all the way down before connecting the battery.
- After landing, disarm your vehicle immediately and disconnect the battery cable.
- Do not turn off the transmitter until after you have disconnected the battery.
- Always remove the propellers while testing the motors.
- When the battery is connected, always assume the vehicle is live and the motors are armed.
- Do not attempt to fly longer than the battery’s safe capacity.
- Do not operate the vehicle with excess weight attached.
- Ensure that all vehicle components are well maintained before each flight. Ensure that components are firmly attached and operating properly.
- Replace any worn or damaged components before each flight. Never operate with any damaged or worn components.
- SAFETY IS THE FIRST PRIORITY. Take all precautions necessary to ensure your own safety as well as the safety of other people and property.
DISCLAIMER

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Flight Checklist

1. Power on controller; set to STD and RTL OFF.

2. Connect charged battery.
   - Hold the X8 still and level while powering on.
   - Hold left stick down-right until motors spin.

3. Place the X8 at launch point.
   - Choose a clear launch point, and face the X8 away from you.

4. Press and hold safety button until solid red.
   - The motors are now active.
   - Stand back!

5. Check LED.
   - Initializing, hold the X8 level
   - Loss of RC signal, automatic landing
   - Acquiring GPS, please wait
   - Low battery, automatic landing
   - Autopilot ready, GPS locked
   - Loss of GPS signal, switch to manual
   - Armed
   - Pre-arm safety check failure

6. Arm motors.

LED

- Motors inactive, safe to handle
- Motors active, deactivate before handling (see reverse)

Safety Button

Flight Modes

- Standard position (altitude hold mode)
  - STD fly manually
- Loiter mode
  - LTR hover
- Auto mode
  - AUTO fly a mission
- Return to launch
  - RTL land at the launch point
- Control gimbal
  - TILT tilt the camera down and up
- Land
  - CH7 land at the current position
- X8
Controller Flight Data
Press and hold the DN button to access the flight data screens. Press DN again to toggle between screens.

Flight
Raise left stick above center to take off and gain altitude.
Set left stick to center to maintain altitude.
Move left stick left and right to rotate.
Use right stick to fly forward, backward, left, and right.
Lower left stick below center to descend.
Set left stick fully down to land when near the ground.

Postflight
1. Disarm motors.
2. Press safety button.
3. Disconnect battery.
4. Power off controller.

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