



Operation Manual

SDR

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Solo Operation Manual DRAFT A

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1 Introduction

Solo is a lightweight, easy-to-use quadcopter optimized for capturing aerial video. This section provides an overview of the 3DR Solo system.

1.1 System Overview

The 3DR Solo system includes the Solo quadcopter, Solo controller, “3DR Solo” app, and the human operator. The operator interacts with the controller and app on the ground, and the controller communicates with the Solo quadcopter during flight.

1.1.1 Solo Quadcopter

Solo is a small unmanned aerial vehicle powered by four brushless motors and four propellers. Solo’s onboard computers control navigation, attitude, and communications in flight while sending real-time telemetry and video output and receiving control inputs over the 3DR Link secure Wi-Fi network. Solo is optimized for capturing aerial video using a GoPro® HERO camera.

1.1.2 Controller

The controller provides controls and displays in-flight data on a full-color screen. Using twin long-range dipole antennae, the controller acts as the central hub for all communication on the 3DR Link network, receiving all communications from Solo and the app, forwarding telemetry outputs to the app, and controlling the transmission of all control inputs to Solo.

1.1.3 App

The “3DR Solo” app outputs a live video stream from an onboard GoPro® camera to an Android or iOS device. The operator can use the app to view the live video with overlaid telemetry and access a simplified graphic interface for controlling Solo’s advanced functions. The app also connects to the 3DR Link network to receive video and telemetry outputs and send control inputs.

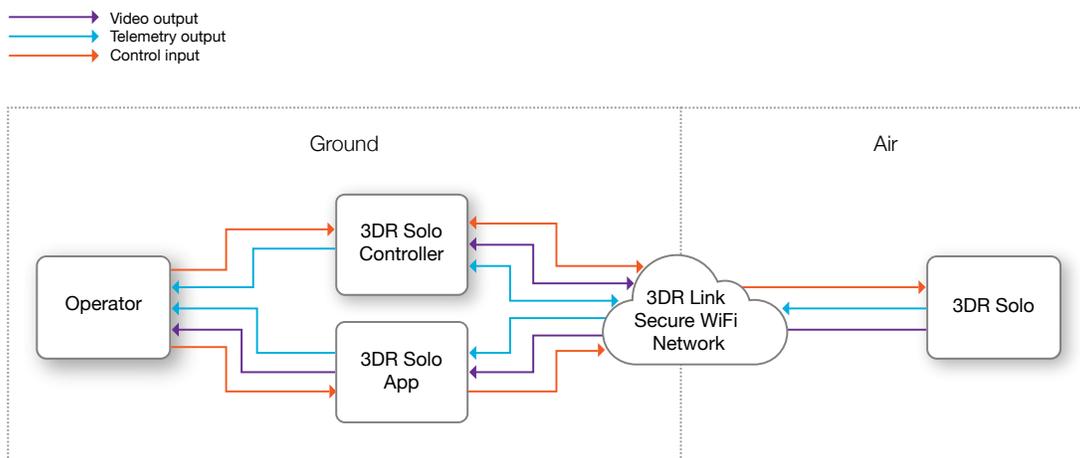


Figure 1.1.3.1: Solo System Context Diagram

1.2 Aircraft Overview

1.2.1 Smart Battery

The battery connects to Solo's battery bay. Solo's power button is located on the battery; Solo can only be powered when the battery is connected.

1.2.2 Motors and Propellers

Solo's arms are labeled one through four on the ends of the arms. Motors on arms #1 and #2 spin counterclockwise and use clockwise-tightening propellers with silver tops. Motors on arms #3 and #4 spin clockwise and use counterclockwise-tightening propellers with black tops.

1.2.3 Orientation LEDs

Each arm contains an LED for ground-to-air directional awareness; the two front arms (#1 and #3) display white, and the two rear arms (#2 and #4) announce red. This LED scheme mimics the headlight and taillight style of a car for easy association by any operator.

1.2.4 Fixed Camera Mount and HDMI Cable

Solo includes a GoPro® The Frame fixed mount to mount a GoPro® HERO camera. The HDMI cable connects to the GoPro® to output video during flight.

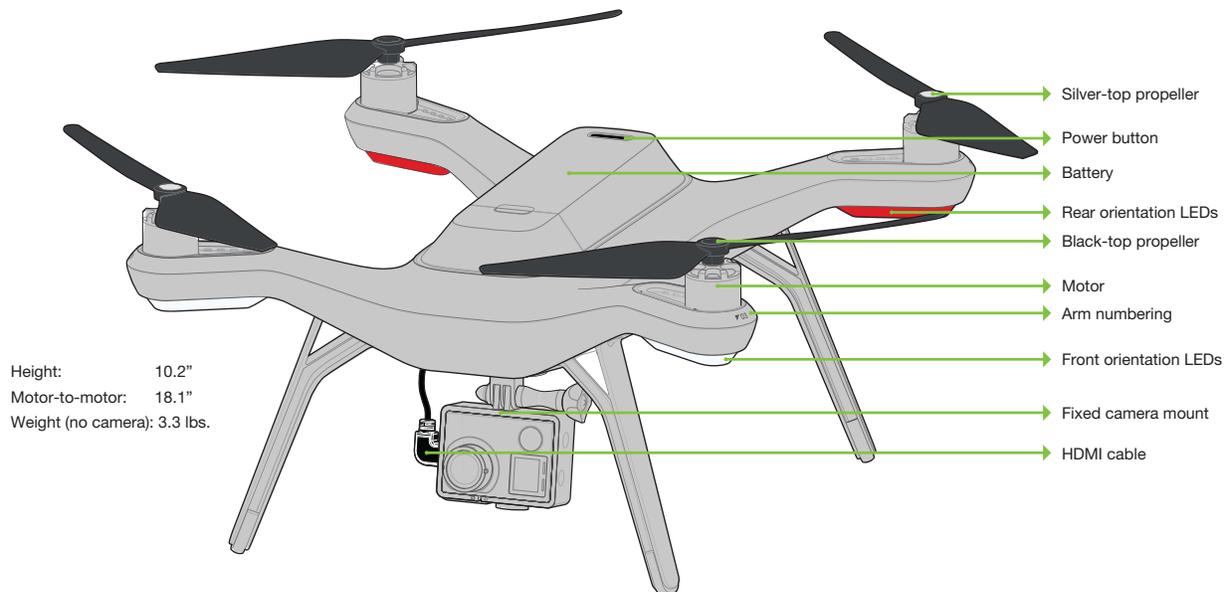


Figure 1.2.4.1: Solo Exterior Overview

1.3 Controller Overview

1.3.1 Mobile-Device Holder

Mount an Android or iOS device to run the Solo app and effortlessly integrate the app into the controller's operational flow. A user-supplied smartphone or tablet is required to initialize Solo.

1.3.2 Joysticks

The controller's left and right joysticks provide direct manual control of Solo and physical control mechanisms for using automated Smart Shots.

1.3.3 Screen

The controller's full-color screen provides prompts for correct operation of Solo, live in-flight data, and control over automated Smart Shots.

1.3.4 Power Button

The power button provides a quick check of the controller's power level when pressed once and powers on the controller when held. The controller provides vibration feedback to indicate that the power-up is successful.

1.3.5 Fly Button

The Fly button lets you control Solo's main flight functions: starting motors, takeoff, land, and activating standard flight.

1.3.6 Return Home

The Return Home button allows you to end your flight automatically at any point by returning Solo to its original launch point and landing.

1.3.7 Pause Button

The Pause button is Solo's emergency air brake. Press Pause to stop Solo and hover in place.

1.3.8 Option Buttons

The A and B buttons change functionality based on where you are in the operational flow. The screen will show the currently assigned functions of A and B at all times. You can program A and B to specific functions using the controller. By default, the A button is assigned to Cable Cam and the B button is assigned to Orbit.

1.3.9 Antennas

The controller's long-range antennas communicate with Solo during flight. As a general rule, configure the antennas so they are pointing skyward and at 20 degree angles for the strongest signal.

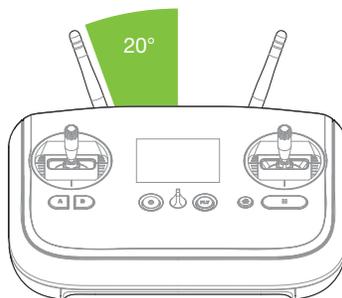


Figure 1.3.9.1: Antenna Configuration

1.3.10 Gimbal Controls

The paddle, buttons, and dial on the top of the controller are used to control the Solo Gimbal. They can also be used in some Smart Shots.

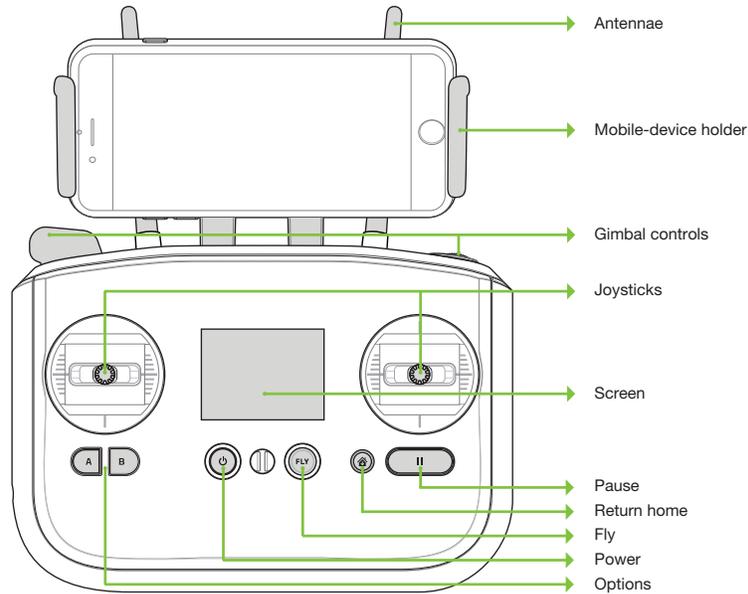


Figure 1.3.10.1: Controller Schematic Diagram

1.4 Operating Parameters

The following operating parameters apply to Solo. Always operate Solo within these parameters. Solo’s performance and behaviors are not guaranteed when conditions violate the parameters listed below.

Figure 1.4.10.1: Solo Operating Parameters

Estimated flight time	up to 25 minutes*
Maximum altitude	328 ft. (100 m) above ground level
Range	.5 miles** (.8 km)**
Payload capacity	1.1 lbs. (500 g)
Cruise speed	5 mph (2.5 m/s)
Maximum speed	55 mph (24.5 m/s)
Wind speed limitation	25 mph (11 m/s)
Operating temperature	32° F - 113° F (0° C to 45° C)
Operating relative humidity	0-85% RH
Max altitude above sea level	10,000 ft. (3,000 m)

*Flight time varies with payload, wind conditions, elevation, temperature, humidity, flying style, and pilot skill. Listed flight time applies to elevations less than 2,000 ft above sea level.

**Depending on environmental conditions

1.5 Autopilot

Solo uses a Pixhawk 2 autopilot running APM:Copter software. APM:Copter is open-source flight control based on the MAVlink communication protocol and part of the ArduPilot project. Pixhawk 2 runs an ARM Cortex-M4 STM32F427 processor with 2 MB of flash memory and 256 KB of RAM. Combined with an array of CAN, I2C, SPI, PWM, and UART interfaces, Pixhawk 2 uses a suite of onboard sensors to calculate Solo's orientation and motion in flight. This data is input into APM:Copter's inertial navigation and position estimation algorithms and combined with control inputs to send commands to Solo's propulsion system.

Figure 1.5.10.1: Solo Onboard Sensors Table

Location	Sensor	Manufacturer / Part Number	Data Type
Pixhawk 2 FMU	Accelerometer	InvenSense / MPU6000	Orientation
Pixhawk 2 FMU	Gyroscope	InvenSense / MPU6000	Motion
Pixhawk 2 FMU	Magnetometer	Honeywell / HMC 5983	Cardinal direction
Pixhawk 2 FMU	Barometer	Measurement Specialties / MS5611	Altitude
Pixhawk 2 Stabilized IMU	Accelerometer	InvenSense / MPU6000	Orientation
Pixhawk 2 Stabilized IMU	Gyroscope	InvenSense / MPU6000	Motion
Pixhawk 2 Stabilized IMU	Barometer	Measurement Specialties / MS5611	Altitude
Pixhawk 2 Stabilized IMU	Accelerometer	STMicroelectronics / LSM303D	Orientation
Pixhawk 2 Stabilized IMU	Magnetometer	STMicroelectronics / LSM303D	Cardinal direction
Pixhawk 2 Stabilized IMU	Gyroscope	STMicroelectronics / L3GD20	Motion
3DR Solo GPS	GPS	u-blox / NEO-7N	Longitude & latitude
3DR Solo GPS	GPS patch antenna	Taoglas / GP.1575.25.4.A.02	Longitude & latitude
3DR Solo Compass	Magnetometer	Honeywell / HMC 5983	Cardinal direction

1.6 Propulsion

Solo uses four brushless 880 K_v motors and four self-tightening propellers for propulsion. For control and aerodynamic efficiency, two motors spin clockwise and two motors spin counterclockwise. Navigation in the air is achieved by mixing propulsion of the four motors to actuate flight control along the roll, pitch, and yaw axes.

Each of the four motors is numbered by the marking on the arm. These numbers correspond to the autopilot calculations for these commands and are used for indicating motor replacement procedures. Each motor is controlled by an ESC (Electronic Speed Controller) that regulates the rotation of the motors to achieve the speed commanded by the autopilot.

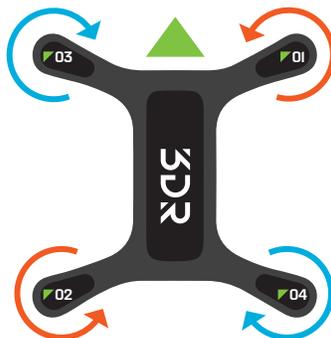


Figure 1.6.10.1: Solo Motor Order

Kv	880 RMP/V	Bearings	Double, R2-ZZ/R25-ZZ
Continuous Current	18 A Max	Mount Pattern	M3 x 4ea. - 16 mm x 19 mm
Continuous Power	260 Watts	Motor Weight	68 g
Maximum Efficiency	> 80%	Propeller Size	Up to 11"
Voltage Range	11.1 - 14.8 V	Motor Timing	22 - 30 deg

Figure 1.6.10.2: Solo Motor Specifications Chart

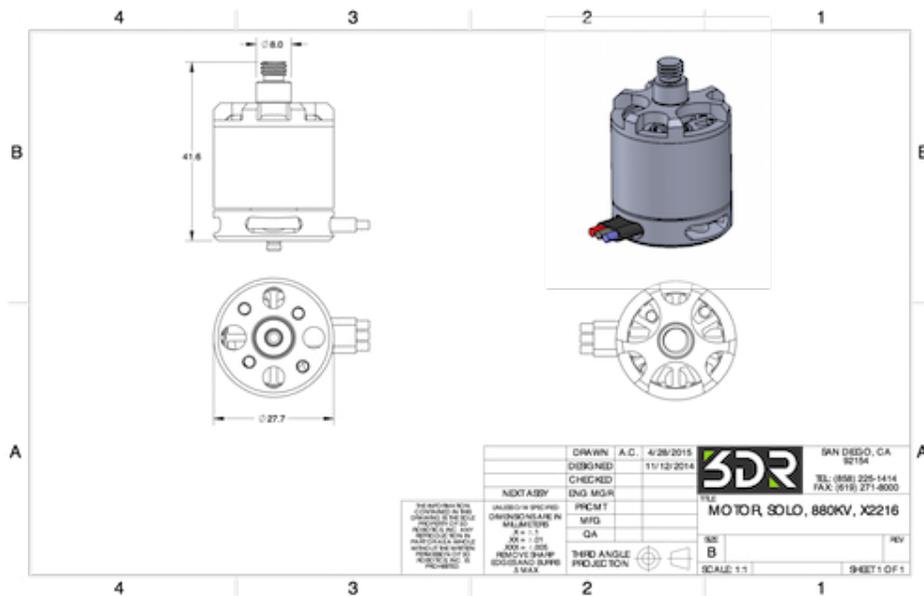


Figure 1.6.10.3: Solo Motor Specifications Diagram

1.7 Electronic Speed Controllers

An ESC (Electronic Speed Controller) is dedicated to each motor to apply power and change RPM as directed by the autopilot. The ESCs used on the Solo feature dynamic PWM and motor advance timing algorithms and 400 Hz refresh rate for high-speed response to flight control commands.

Refresh Rate	400 Hz	Voltage Range	11.0 - 17.0 V
Maximum Current	25A (5s burst)	Weight	32 g (54g with wires/bullets)
Maximum Power	425 W (5s burst)	ESC Lead	30 AWG, 8-wire DF13
Continuous Current	14+ A	Power Leads	18 AWG, 200 deg C
Continuous Power	238+ W	Motor Leads	18 AWG, 200 deg C

Figure 1.7.10.1: Electronic Speed Controller Chart

1.8 Remote Command and Control

Typically, with UAS radio systems the safety pilot (R/C) control, GCS telemetry data and video data are streamed separately. The Solo Link combines these three functions into one radio frequency (RF) stream. This is possible with the high bandwidth capability the Wi-Fi radio modem provides.

Figure 1.8.10.1 describes the RF link functionality and operating frequency.

Description	Transmission Device – Power Magnitude	Function	Frequency - Bandwidth
Solo Link v 1.0 Radio Frequency Broadcast	2x2 2.4Ghz 802.11n Wi-Fi at 25dBm transmit power per chain with WPA2 security	480p/720p/1080p video downlink with integrated telemetry and RC control	2.40 - 2.48Ghz – 20 MHz

Figure 1.8.10.1: Radio Frequency Matrix

2 Setup

This sections covers everything you need to set up Solo out of the box.

2.1 In the Box

Solo includes the quadcopter, controller, propellers (four plus two spares), Solo charger, and controller charger.

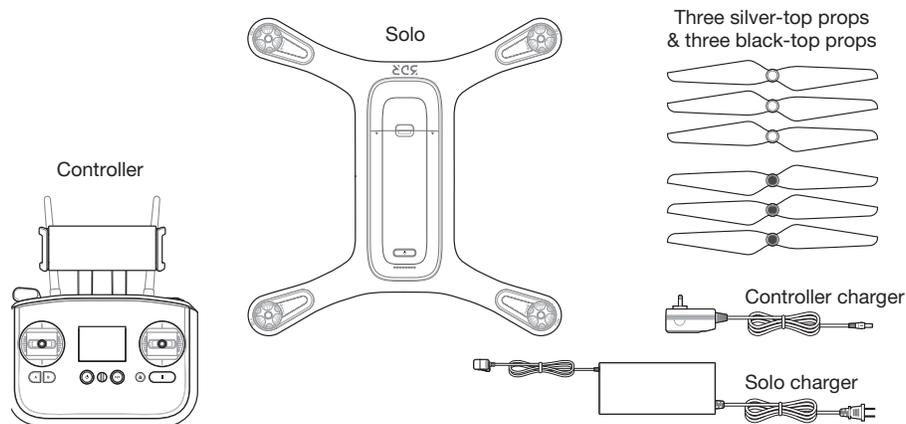


Figure 2.1.10.1: Solo Parts

2.2 Battery

Solo is powered by the rechargeable Solo Smart Battery that provides up to 25 minutes of flight time per full charge. (Keep in mind that flight time depends on payload, wind conditions, elevation, temperature, humidity, flying style and pilot skill, so the actual flight time may vary.) As a lithium polymer battery, the Solo Smart Battery requires specific handling practices to ensure safe operation and prevent accidents. For more information about battery safety, see Section 3.9

2.2.1 Charging

The level of the battery is indicated by the lights below the power button. Press the power button once to display the current power level. The Solo battery ships with approximately 50% charge, so charge fully before your first flight for maximum flight time.

Remove the battery from Solo before charging by holding the release button and sliding the battery towards the back of Solo. Charge the battery using the designated Solo charger only; using a different charger can damage the battery or cause a fire. Charge the battery in conditions between 32° F and 113° F.

To charge the battery, connect the Solo charger to the battery and a wall outlet. While charging, the indicator lights pulse at the current level, and when fully charged, the lights turn off. There is an additional indicator on the battery charger that turns from red to green when the battery is fully charged. The battery takes approximately 1.5 hours to charge to 100%.

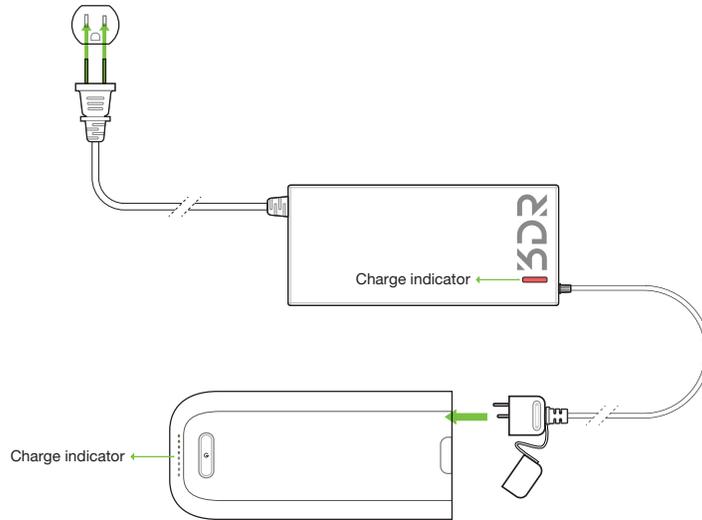


Figure 2.2.1.1: Solo Battery Charging

2.2.2 Powering

To power Solo, insert the battery into Solo's battery bay and slide the battery forward until it clicks into place. Press and hold the battery power button to turn on Solo. When Solo powers on, the battery will display an LED animation and you will hear the startup tone. Only power Solo using the designated 3DR Solo Smart Battery; using a different battery can permanently damage Solo.



Make sure Solo is level before powering on and keep Solo still during power up and while the sensors initialize. Moving Solo during this process causes the sensors to calibrate incorrectly and can create a preflight error or affect in-flight performance.

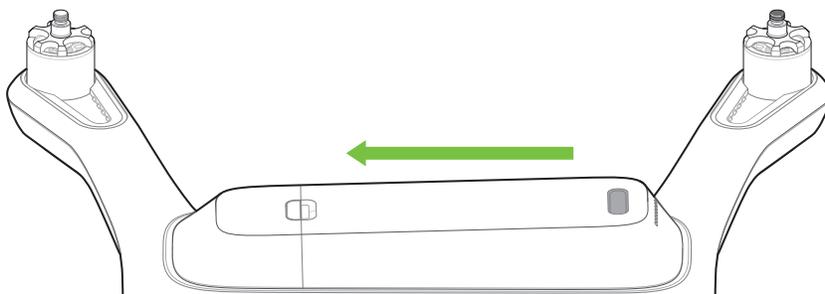


Figure 2.2.2.1: Powering Solo

2.3 Controller

The Solo controller includes a pre-installed rechargeable lithium ion (Li-ion) battery.

2.3.1 Charging

Charge the controller using the designated controller charger only; using a different charger can damage the controller or cause a fire. Charge the controller in conditions between 32° F and 113° F.

To charge the controller, connect the controller charger to the barrel jack on the side of the controller and to a wall outlet. To check the battery level of the controller, press the power button. A fully charged controller lasts for approximately 6 hours. Always check the controller's battery level before you fly, and recharge when prompted by the controller. The controller takes approximately 3 hours to charge to 100%.

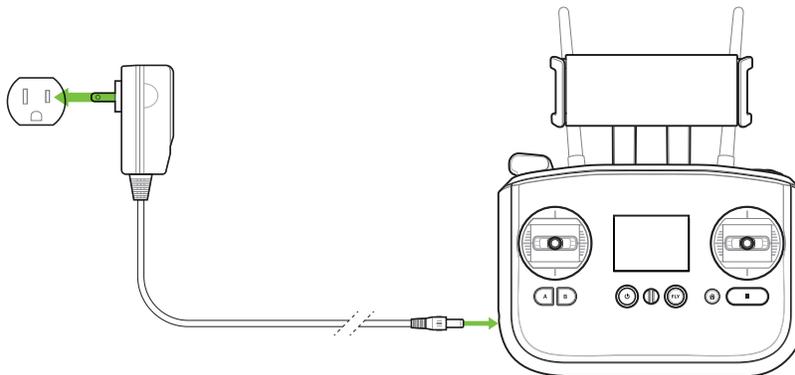


Figure 2.3.1.1: Controller Charging

2.3.2 Powering

To power on the controller, press and hold the controller power button until you receive the vibration feedback and see the startup screen.

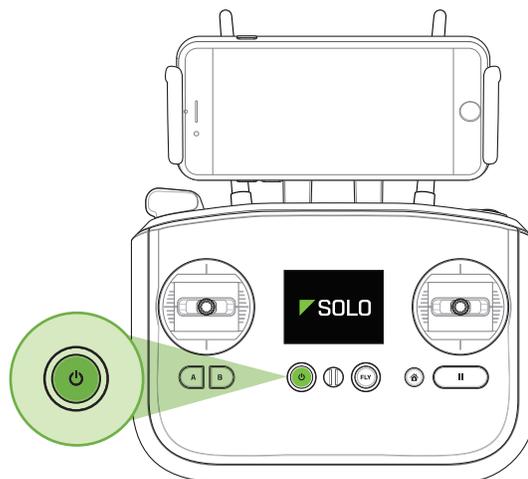


Figure 2.3.2.1: Power On Controller

2.4 Propellers

Solo uses two types of self-tightening propellers, indicated by the color of the circle at the center of the propeller.

2.4.1 Attaching

Attach the propellers with silver tops to the motors with a silver dot on the top of the motor shaft, and attach the black-top propellers to the motors with black dots. Make sure to remove the paper labels from the motors before attaching the propellers.

Silver-top propellers tighten clockwise; black-top propellers tighten counterclockwise. Check the lock and unlock icons on each propeller to see the correct directions for tightening and removing.

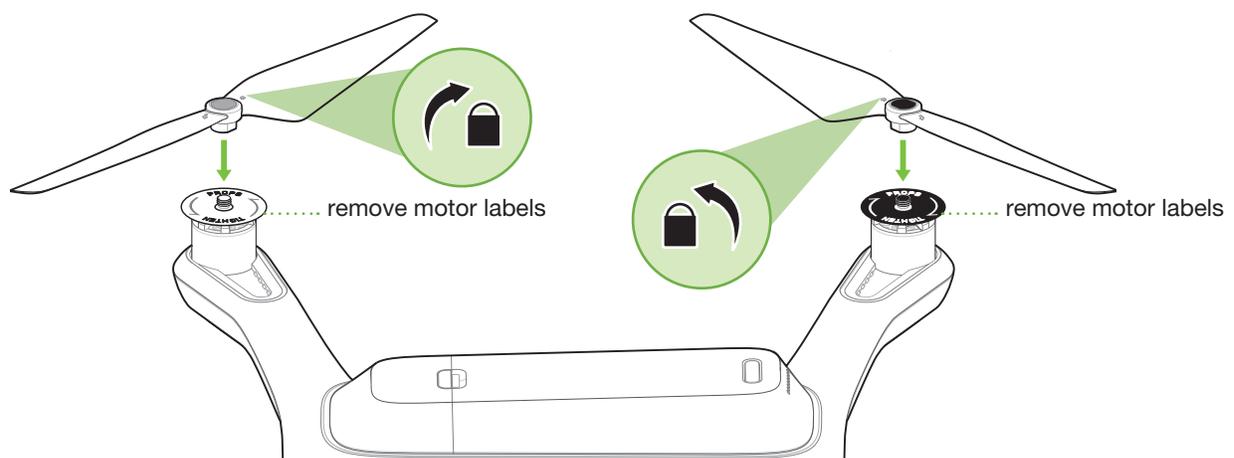


Figure 2.4.1.1: Attach Propellers

2.5 Camera

Solo includes a fixed GoPro® The Frame™ mount for your GoPro® HERO 3, 3+ or 4.

2.5.1 Attaching

To attach the camera to the GoPro® The Frame™ fixed mount, insert your GoPro® upside down and connect the Solo HDMI cable to the camera.

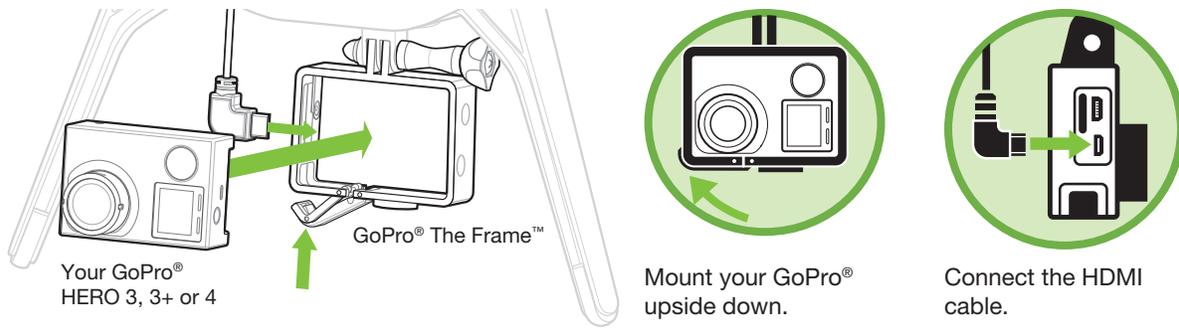


Figure 2.5.1.1: Attach Camera

2.5.2 Settings

For best results, adjust the camera settings for inverted orientation and medium field of view. (Setting the field of view to medium ensures that you won't see the propellers in the frame.)

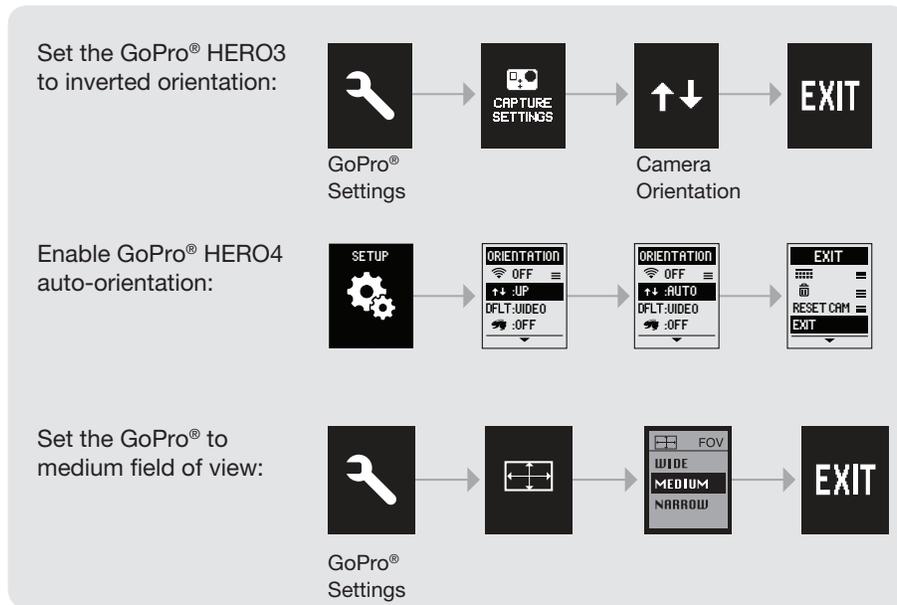


Figure 2.5.2.1: Camera Configuration Process



Make sure that the Wi-Fi on your GoPro® is turned OFF. It can interfere with Solo's communication signals and cause unexpected behavior.

2.6 Mobile App

“3DR Solo” provides a streaming video link to a mobile device and provides a simple graphic interface for interacting with Smart Shots and other advanced Solo features.

2.6.1 Install

Visit 3dr.com/soloapp or download “3DR Solo” from the App Store or Google Play Store. 3DR Solo works with iOS 8.0 or later and Android 4.3 or later. For Android, you must also install the “3DR Services” app to your device.

2.6.2 Connect to Solo

To connect the app to the 3DR Link Wi-Fi network, access the Wi-Fi settings on the mobile device and select Solo_Link-####. Enter the temporary password “sololink”. Once connected, return to the app to continue.

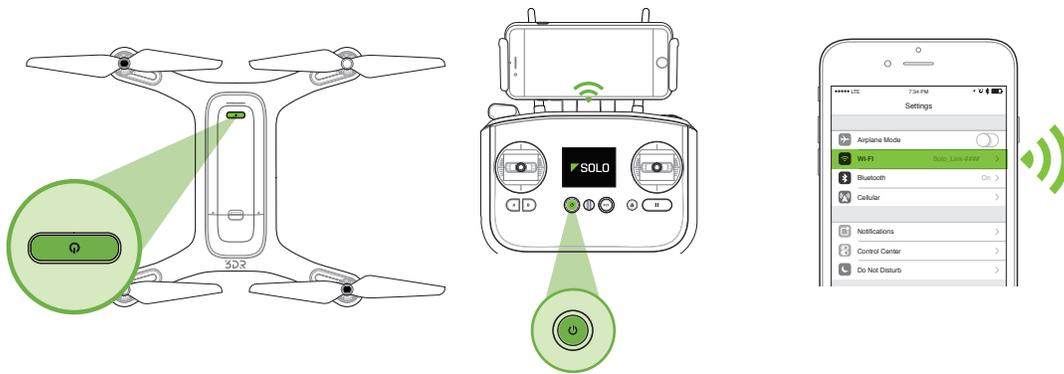


Figure 2.6.2.1: Connect to Solo Link

2.6.3 Change SoloLink Password

To connect to Solo Wi-Fi through the app, change your password to secure your SoloLink network. In the app, select the Settings menu from the top-left drop-down, and choose Solo to access the options for your vehicle.

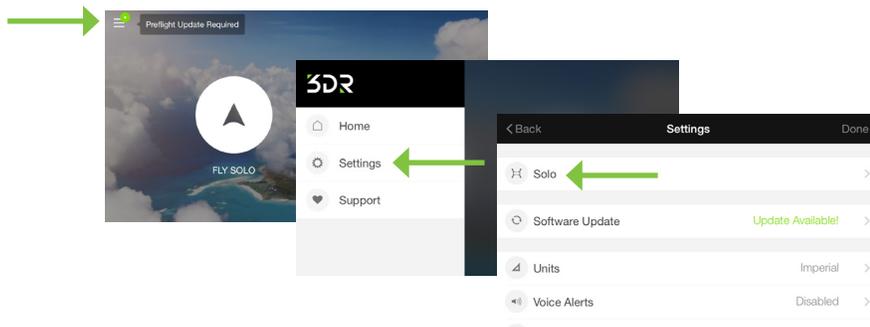


Figure 2.6.3.1: App - Settings Menu Access

In the Solo menu, select Wi-Fi Settings. Change the network name to something unique to you, and set a new password. The password should be between 8 and 32 characters with no spaces. Select Apply to enable your changes.

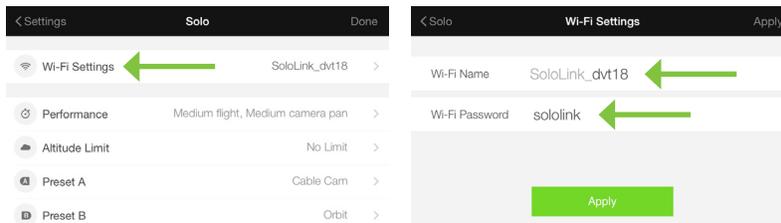


Figure 2.6.3.2: SoloLink Wi-Fi In-App Network Settings

2.6.4 Update

Before your first flight, perform the required first-flight update for Solo and the controller using the app. The controller will prompt you for the update with the preflight update alert. Ensure that both the controller and Solo are powered, the controller is charging, and the app is connected to Solo Wi-Fi.

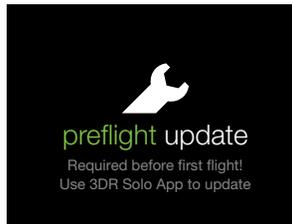


Figure 2.6.4.1: Controller Preflight Update Prompt

To start the update, open the Settings menu, and select Software Update.

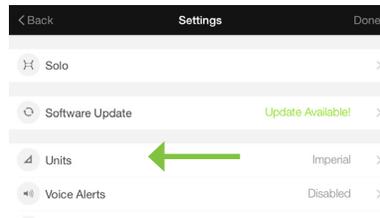


Figure 2.6.4.2: Solo App Update Process

While the update is in progress, the controller will show the screen shown the controller updating display. The controller will complete a full restart as part of the update process, which can take up to 10 minutes.

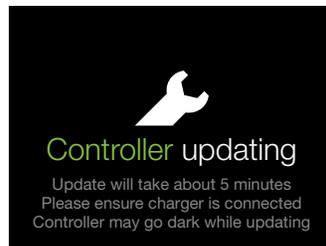


Figure 2.6.4.3: Controller Updating Display

When the controller update is complete, the controller will display the controller updated screen. Use the app to reconnect to Solo Wi-Fi, and press A on the controller to continue the update.



Figure 2.6.4.4: Controller Updated Display

After pressing A, the controller will display waiting for Solo while the update is in progress.



Figure 2.6.4.5: Controller - Solo Update Display

When the update is complete, Solo's LEDs will turn green, the controller will return to the standard takeoff screen, and the app will show that the software is up to date.

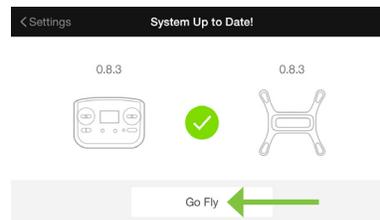


Figure 2.6.4.6: Update Success

2.6.5 View Video

After the update is complete, select Fly Solo to view video in the app. Solo, the controller, and the GoPro® must be powered to view video. Verify that you can view video before your first flight. If the video is inverted, see section 2.5.2.

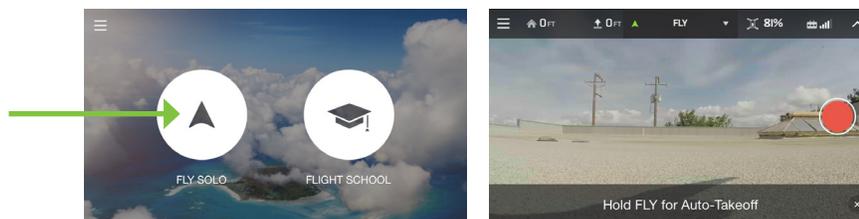


Figure 2.6.5.1: Viewing Video on the App

3 Safety

The following best practices will help ensure safe, successful flights and help reduce the risk of accident and serious injury. Always fly under adult supervision and with your full attention at all times. Do not fly under the influence or when your ability to operate Solo safely is impaired. Use your common sense to avoid unsafe situations and always operate Solo responsibly.



Read and understand these important safety instructions before your first flight to help reduce the risk of accident and serious injury.

3.1 Location

Don't fly Solo indoors. Always fly outside in clear, open areas at a safe distance from yourself, other people, power lines, animals, vehicles, trees, and buildings. When flying in areas with potential hazards, maintain 100 feet (30 m) from any people, vehicles, or structures. As the operator, you are responsible for navigating Solo to avoid obstacles, including during Smart Shots.

Don't fly within 5 miles of an airport or within any airspace restricted by your local, state, or national airspace authority. As the operator, you are responsible for knowing and understanding the regulations that govern small unmanned aircraft like Solo in your jurisdiction.

3.2 Environmental Awareness

Don't fly Solo in extreme weather conditions such as rain, high winds, snow, or fog. Environmental factors and GPS irregularities can cause instability in flight, and this can affect Solo's performance or cause an in-flight failure.

Before flying, determine the boundaries of the safe flying area at your location. Be aware of any risks, including bodies of water, structures, trees, power lines, etc, and designate a few areas where you can land Solo in case of an unsafe situation. Throughout your flight, be prepared to recover Solo manually or use an emergency procedure if Solo flies outside the safe flying area.

3.3 Visual Line of Sight

Always fly Solo within your visual line of sight. Don't let Solo get so far away from you that you cannot see its orientation or so that any physical obstructions block your view of Solo.

3.4 Flight School

If you're new to flying, review the video tutorials in the Flight School area of the app before your first flight. Flight School provides useful tips for learning to operate Solo safely and correctly.

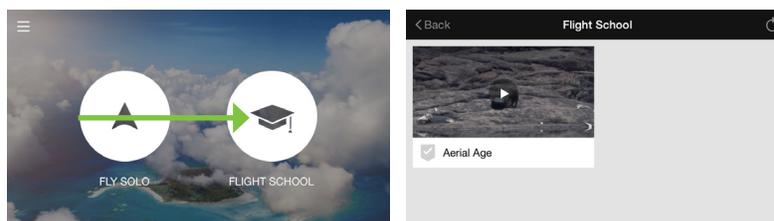


Figure 3.4.5.1: App Flight School

3.5 Propellers



Spinning propellers can cause serious injury! Never touch moving propellers or place any objects in the way of the propeller arcs while Solo is powered.



To avoid hazardous contact with Solo's high-speed propellers, always power off Solo before handling Solo or the propellers. When prompted to start motors before takeoff, always ensure that the propellers are clear of any obstructions and away from any people, animals, or property before activating. Do not touch moving propellers or approach Solo while the propellers are spinning.

After landing or returning home, Solo will automatically detect the landing and stop the motors. Do not approach Solo until the propellers stop spinning, and power off Solo before picking it up.

3.6 Home Position

Solo's home position is the latitude and longitude coordinates of the launch point used by the autopilot as the end point of a return-home command. The autopilot saves the home position at the location where the motors are started *only after achieving GPS lock*. Always take off from an open location with a clear path for Solo to return home safely. For home position safety in advanced mode, see section 4.4

3.7 Altitude Limit

Always fly at appropriate altitudes for your flying location and local regulations. Solo cannot avoid obstacles on its own, so always select altitudes that avoid any obstacles, such as trees, buildings, and power lines.

Solo includes a safety fence enabled by default at 328 ft. (100 m). This altitude reflects current FAA regulations to avoid potential conflicts with manned aircraft and represents a safe line-of-sight altitude. If Solo reaches the altitude limit, Solo will stop ascending and limit throttle input to stay below the altitude limit. The controller will display the following alert in the event that Solo reaches the maximum altitude.



Figure 3.7.5.1: Controller Maximum Altitude Warning

To adjust the altitude limit, connect to the app (Section 2.6) and select Altitude Limit from the Solo Settings menu. If you choose to select No limit, ensure that you always operate Solo within your visual line of sight and in compliance with local regulations.

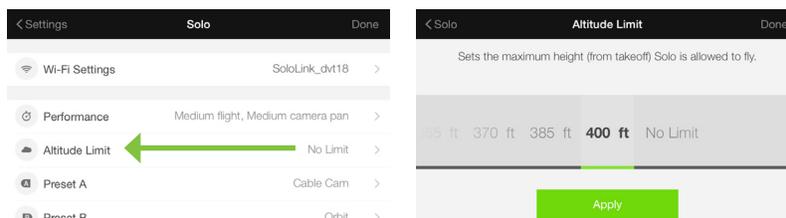


Figure 3.7.5.2: App - Altitude Limit

3.8 Emergency Procedures

If you experience a problem in flight, use one of the following emergency procedures to stop Solo, end your flight, or shut off the motors.

3.8.1 Pause

The controller's Pause button allows you to stop Solo mid-air. Solo will hover at the paused location until given another command. Use the Pause button to stop Solo from hitting an obstacle or to re-orient Solo for navigation. Press Pause during Return Home or Land to pause Solo and stop the landing. Pause is available only with GPS lock.

3.8.2 Regain Manual Control

Keep the controller easily accessible at all times during flight, including Smart Shots, and be prepared to regain manual control at any time. To return to standard flight during Smart Shots, Return Home, or Land, press the Fly button.

3.8.3 Return Home

If Solo acquired GPS lock prior to takeoff, press the controller's Home button to return Solo to the launch point and land. Use return home after receiving a low battery notification or to end your flight easily. Solo will not avoid obstacles while returning home; always verify that the return path is clear before activating Return Home.

3.8.4 Land

To land Solo at its current position, press and hold the Fly button. If Solo does not have GPS lock, there will be no automatic positioning as Solo descends, and drifting may occur depending on environmental conditions.

3.8.5 Motor Shutoff

In the event that Solo's motors do not stop after landing or for an emergency in-flight kill switch, Solo includes an emergency motor shutoff procedure. To shut off the motors at any time, either in flight or on the ground, hold the A, B, and Pause buttons at the same time. An initial screen will appear on the controller to confirm the shutoff command; continue to hold A, B, and Pause buttons to activate motor shutoff.

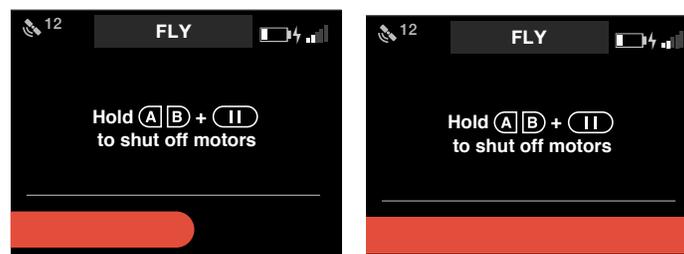


Figure 3.8.5.1: Motor Shutoff Displays

3.9 Flight Battery

Use caution when handling the Solo Smart Battery; lithium polymer batteries can cause a fire if handled incorrectly. Never alter, puncture, throw, bend, or impact the battery. Keep the battery away from liquids, fire, microwaves, and other hazardous or combustible materials. Don't expose the battery to extreme temperatures. The battery functions optimally when used in -4°F to 140°F . If the battery is hot to the touch, wait for it to cool before using or charging.

Inspect the battery before and after each flight. It is possible for the battery to be damaged in shipping, use or charging. If you notice any abnormal features such as damage to the exterior shell, swelling, deformation of the battery, abnormal smell, leakage, or other unexpected behavior, do not use the battery! These can be signs of serious damage that can cause the battery to catch fire. In this case, do not use the battery again. Disconnect the battery, place the battery in a safe area outside of any buildings or vehicles and away from flammable materials to prevent a hazard in case of fire or explosion. Do not dispose of the battery in the trash; dispose of the battery at local battery recycling center as soon as possible. In the US and Canada, visit call2recycle.org to find a location.

For long term storage, store the battery in an 64°F to 82°F environment, between 45-85% relative humidity and with 50% charge. Always make sure to store the battery in a place where it won't be exposed to extreme temperatures or direct sunlight.

3.10 Controller

The rechargeable lithium ion (Li-ion) controller battery is housed inside the controller, accessible by the battery door at the back of the controller. The controller battery is pre-attached to the controller, and shouldn't be disconnected unless:

- You plan to store the controller for over three months without using it. In this case, disconnect the battery from the controller and leave the battery inside the controller to store it.
- You need to switch the controller battery for a new or upgraded controller battery. Upgraded controller batteries with double the capacity are available from store.3dr.com. In the case where you need to store the extra controller battery, store it in location where it will not come into contact with metal objects or other batteries. If the battery's connector comes into contact with a metal object, it can short circuit the battery and cause a fire.

Keep the controller away from liquids, fire, microwaves, and other hazardous or combustible materials. Don't expose the controller to extreme temperatures. The controller functions optimally when used in -4°F to 140°F . If the controller is hot to the touch, wait for it to cool before using or charging.

Perform periodic visual inspections of the controller battery to check for any damage, and handle the controller battery using the same safety precautions as the Solo Smart Battery.

3.11 Antenna Configuration

For the strongest connection to Solo, position the antennas down and away from the controller so they are approximately perpendicular with Solo in flight, and tilt each antenna out and away from one another at a 20° angle.



Figure 3.11.5.1: Controller Antenna Orientation

4 Operating Procedures

This section covers complete procedures for flying Solo, including preflight checks, manual control, and automatic recall.

4.1 Preflight Checklist

Before flying, check the following operating conditions.

4.1.1 Location

- » Your current location and environmental conditions are suitable for flight. (Section 3.1)
- » Solo is on a level surface at a clear launch point a sufficient distance from yourself and others. (Section 3.1)

4.1.2 Components

- » The propellers are correctly attached. (Section 2.4)
- » The propellers can spin smoothly and without obstruction when turned.
- » No components on Solo appear loose or damaged.

4.1.3 Power

- » The controller is powered on with at least 50% charge. (Section 2.3)
- » Solo is powered on with a fully charged battery. (Section 2.2)

4.1.4 Video (Optional)

- » The Solo app is connected to Solo and streaming video. (Section 2.6)
- » The GoPro® is recording.

4.2 Takeoff

The takeoff process has two steps: start motors then take off. Always place Solo at a clear launch point for takeoff, at least 20 feet away from you, other people, and structures.

4.2.1 Activating Motors

When Solo is ready to fly, the controller will prompt you to hold the Fly button to start Solo's motors. Hold Fly until the propellers spin. Solo is now active, ready for takeoff, and needs to be treated with appropriate caution to avoid safety hazards. Press the Pause button anytime Solo is on the ground with the motors spinning to stop the motors.

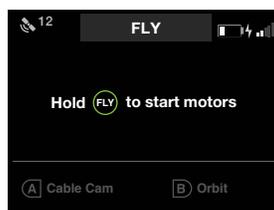


Figure 4.2.1.1: Controller Start Motors Prompt



Spinning propellers can cause serious injury! Always make sure Solo is clear of any obstructions and all people and animals are away from Solo before spinning the props.



4.2.2 Initiating Takeoff

Hold Fly again to initiate takeoff. Solo will rise to 6 feet (2 m) and hover until receiving further control inputs.

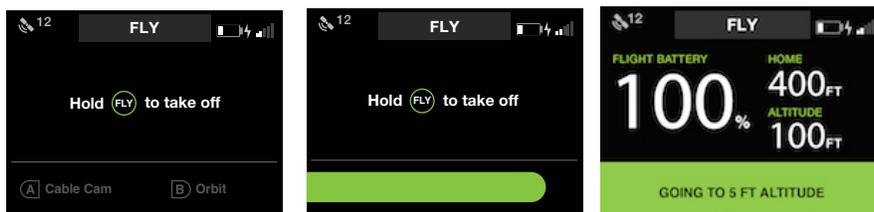


Figure 4.2.2.1: Controller - Takeoff Prompts



Be aware of Solo's orientation before takeoff, so you can safely navigate Solo up and away from you once it's in the air. If Solo is facing towards you at takeoff, move the right stick back; if Solo is facing away from you, move the right stick forward.

4.3 Landing

Hold the Fly button to land Solo at its current location.



Figure 4.3.2.1: Controller - User-Initiated Landing



When commanded to land, Solo will land at the current location, wherever it is. Always make sure there is a clear path to a safe landing point directly below Solo before landing.

After landing, the propellers will stop spinning automatically; wait until the propellers stop spinning before approaching Solo.



Never approach Solo while the propellers are spinning. After an auto-landing or return-to-home, always wait until the propellers stop before approaching or touching Solo.

4.4 Return Home

The Return Home button ends your flight automatically by first returning Solo to the home position (launch point) then landing.

When commanded to return to home, Solo:

- 1 Achieves a minimum altitude of 98 feet (30 m) or maintains current altitude if above 98 feet.
- 2 Moves to launch point and loiters for 5 seconds.
- 3 Lands at the home point.

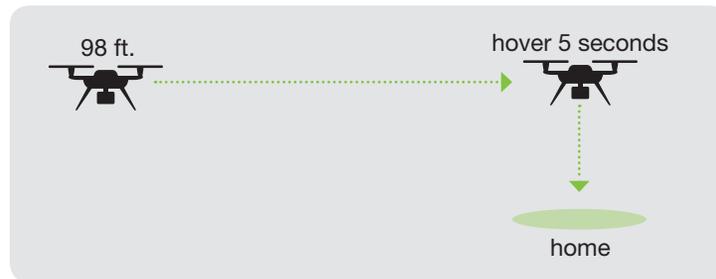


Figure 4.4.2.1: Return Home Behavior

4.5 In-Flight Data

Use the controller's main data display to monitor Solo's status in flight.



Figure 4.5.2.1: Controller In-Flight Data Display

- 1 Flight battery percentage remaining
- 2 GPS signal strength and number of active satellites
- 3 Active mode or Smart Shot
- 4 Controller battery level
- 5 Solo Wi-Fi signal strength
- 6 Distance from the home position (launch point)
- 7 Current altitude
- 8 Currently assigned functions of controller A and B buttons

4.6 Joystick Control

The controller's two joysticks allow you to navigate Solo in flight. The left stick controls Solo's altitude and rotation.

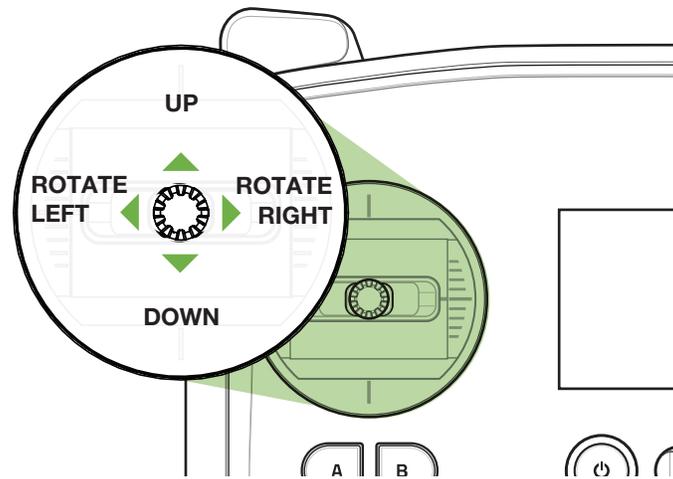


Figure 4.6.2.1: Controller Left Joystick

Move the left stick vertically to control Solo's altitude and acceleration.

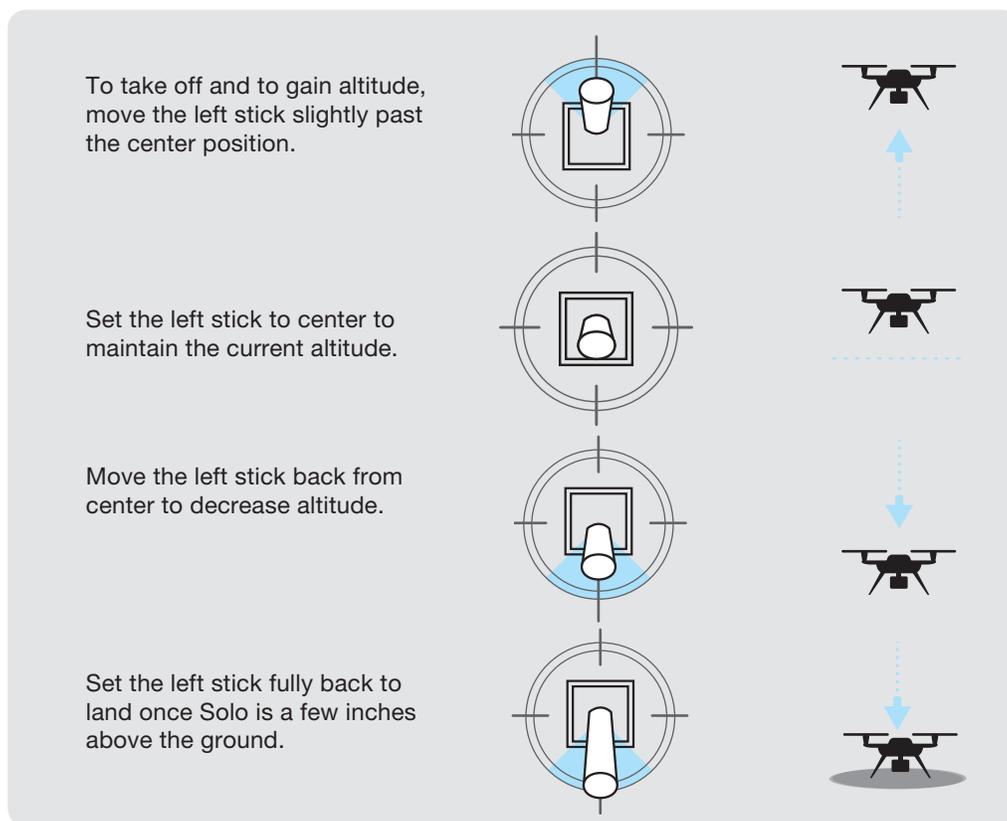


Figure 4.6.2.2: Throttle Joystick Behaviors

Move the left stick horizontally to rotate Solo and control orientation.

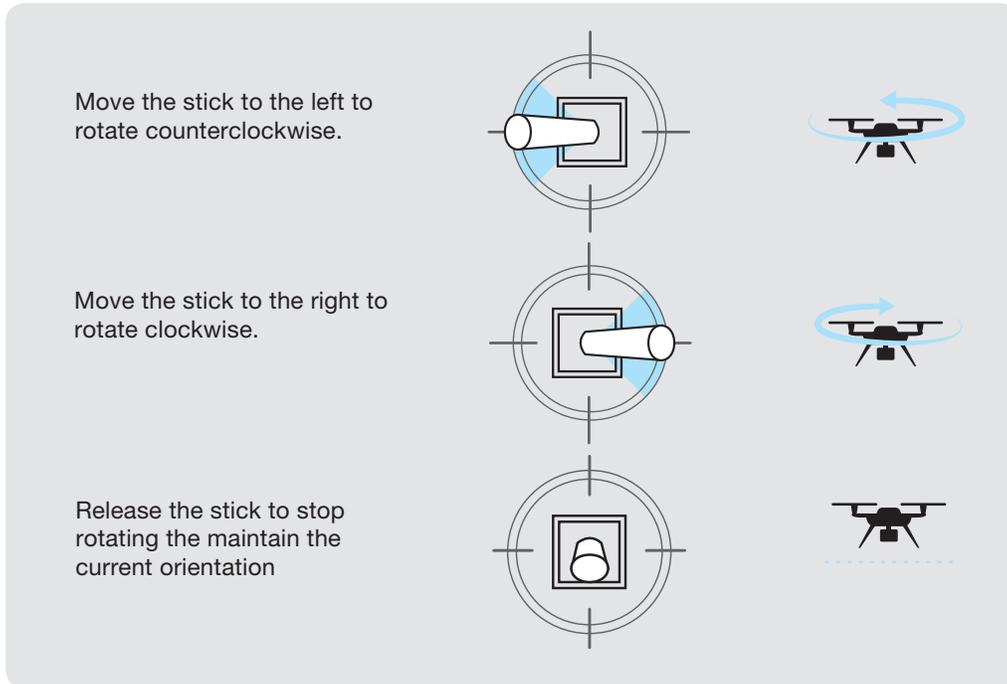


Figure 4.6.2.3: Yaw Joystick Behavior

Use the right stick to fly Solo forward, back, left, and right. These movements are relative to Solo's current orientation, so always maintain awareness of Solo's forward-facing direction before using right-stick controls.

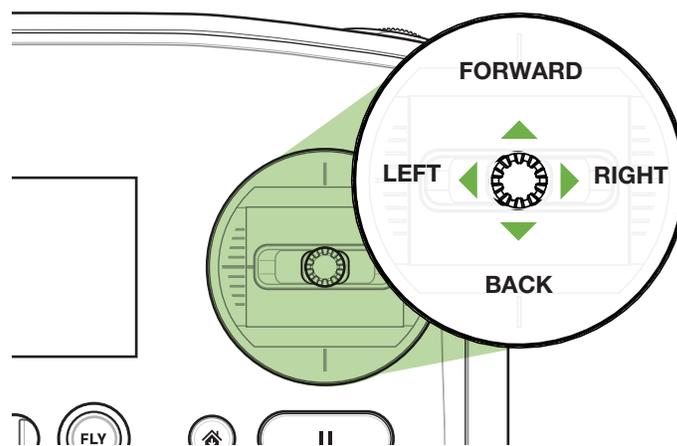


Figure 4.6.2.4: Controller Right Joystick Controls

Move the right stick vertically to control pitch.

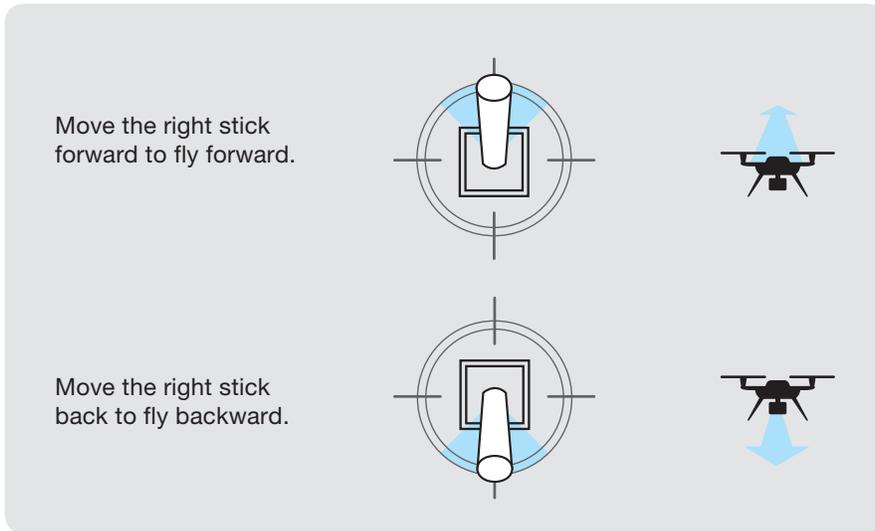


Figure 4.6.2.5: Pitch Joystick Controls

Move the right stick horizontally to control roll.

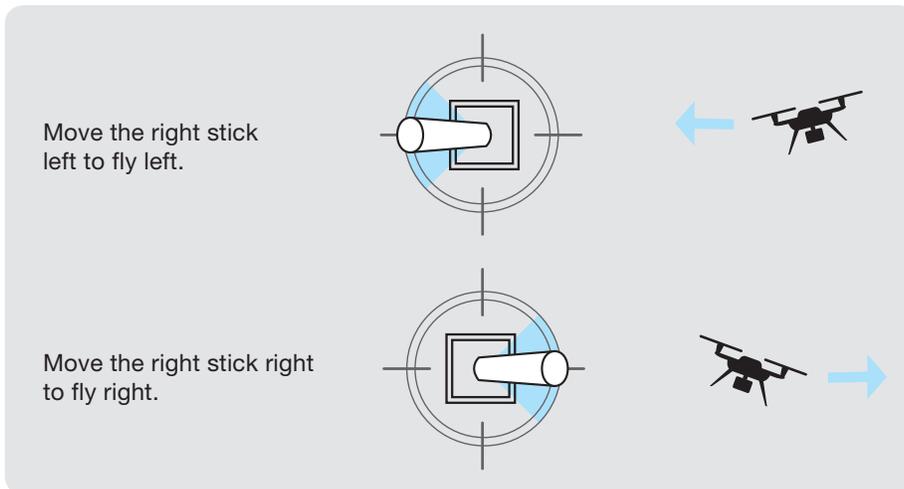


Figure 4.6.2.6: Roll Joystick Controls



If you're new to drones, take some time to learn the basics before your first flight. Visit 3dr.com/solo/info or check out Flight School in the Solo app to learn about flight controls and best practices.

4.7 App Interface Overview

The Solo app provides a simplified interface for viewing Solo's video feed and managing Smart Shots.

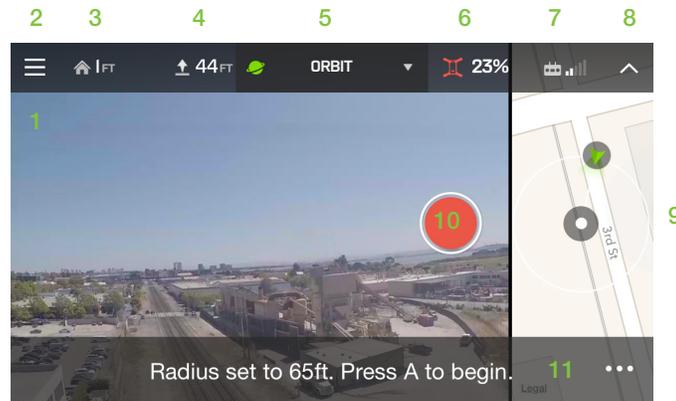


Figure 4.7.2.1: App - Main Interface

- 1 Live video feed
- 2 Main menu
- 3 Horizontal distance from home
- 4 Altitude
- 5 Shot List
- 6 Flight battery percentage remaining
- 7 Controller signal strength
- 8 Hide telemetry bar
- 9 Map view
- 10 Start/stop recording to device
- 11 Alerts and instructions

4.7.1 Map View

To access the small map view, swipe left from the right edge of the app. Swipe left again to full-screen the map, and tap the map to hide it. The map view is available only with GPS.

4.7.2 Shot List

To access the Shot List, select the active mode or shot from the title bar. Choose from Selfie, Cable Cam, Orbit, and Follow to start a shot, or select Fly for standard flight.

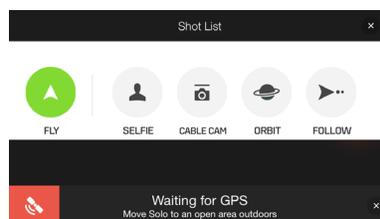


Figure 4.7.2.1: App - Shot List

5 Smart Shots

Solo's Smart Shots automate video capturing to make it easy to replicate traditional filming techniques. Smart Shots can be useful for designing artistic video or for automating flight to restrict Solo to within a designated area. Cable Cam and Orbit are automatically assigned to the controller's A and B buttons. Use the app to access Selfie or Follow. You cannot use Smart Shots without the Solo app.

When using Smart Shots without a Solo Gimbal, Solo cannot ensure that the subject is in the frame at all times. When attempting Smart Shots without a Solo Gimbal, adjust the camera mount so the camera is fixed at an appropriate angle for the following distance to improve the chances of keeping the subject in the frame.

5.1 Selfie

In Selfie, Solo performs an automated maneuver to capture a subject in a cinematic establishing shot. Before starting a selfie, always ensure that there is a clear path 200 feet (61 m) behind and above Solo. Once Selfie is activated, Solo will fly up and away from the subject to a point 164 feet (50 m) from the subject at 82 feet (25 m).



Figure 5.1.2.1: Selfie Path and Settings

- 1 Distance out (default 164 ft.)
- 2 Altitude up (default 82 ft.)
- 3 Flight path



Always ensure that there is a clear path 200 feet (30 m) behind and above Solo before starting Selfie. Press Pause at any time during Selfie to stop Solo. Press Fly at any time to switch to manual control.

5.1.1 Selfie Setup

To start Selfie, fly Solo to a starting point, facing the subject from approximately 10 feet away, and select Selfie from the Shot List. The app will prompt you to press the right arrow to start the selfie.

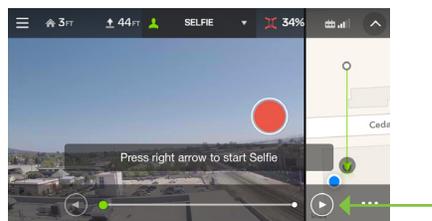


Figure 5.1.1.1: App - Selfie Activation

5.1.2 Selfie Operation

Use the controller's right stick to move Solo forward and back along the Selfie path, or tap the forward and back arrows in the app. The left stick is inactive in Selfie. Press Pause at any time to stop Solo along the flight path, and press Fly to exit to manual control. The default cruise speed when using the app to control Solo in Selfie is set to 9 mph (4 m/s).



Figure 5.1.2.1: Selfie Control

5.1.3 Settings

Use the Solo app to edit Selfie settings. To access the settings from the in-flight Selfie interface, select the option icon with the three dots in the bottom-right. Use the sliders to adjust distance out, altitude up, and cruise speed. Select Selfie How-To for instructions and tips.

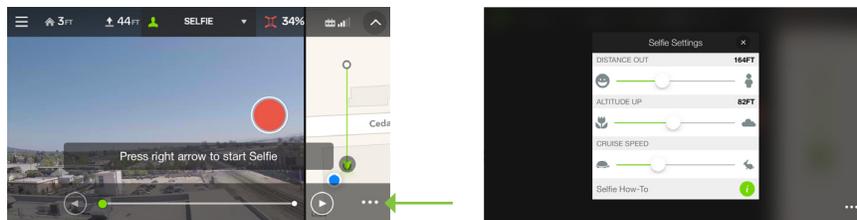


Figure 5.1.3.1: App - Selfie Settings

5.2 Cable Cam

Cable Cam creates a smooth shot by flying Solo along an invisible cable between any two preset points. Cable Cam can only be started in flight.

5.2.1 Starting Cable Cam

Press A on the controller, or select Cable Cam from the Shot List on the app. Both devices will prompt you to fly Solo to your first point and press A then fly to your second point and press B. Try adding a difference in altitude or orientation between the two points for an impressive cinematic effect.

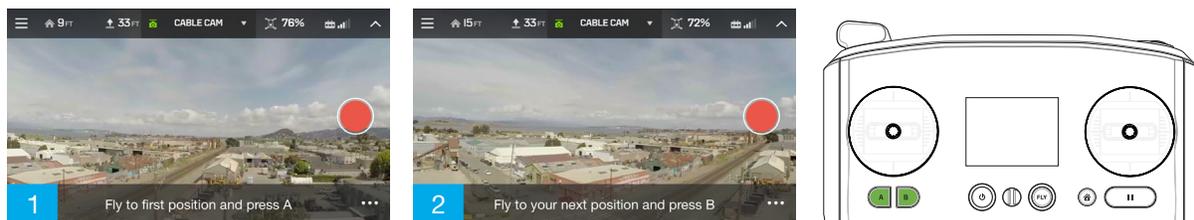


Figure 5.2.1.1: App - Cable Cam Setup



Always ensure that there is a clear path between points A and B before starting Cable Cam. Press Pause to stop Solo at any time during Cable Cam. Press Fly to return to standard flight.

5.2.2 Cable Cam Operation

Use the controller's right stick to fly along the cable. Move the right stick to the left to fly towards point A and to the right to fly towards point B. Release the right stick to pause along the cable. Use the left stick to temporarily override the camera and look left and right. Use the controller to set Solo's speed manually, or use the app to use a constant, preset speed. To control Cable Cam through the app, tap the right arrow to move towards point A and tap the left arrow to move towards point B. Cable Cam's default cruise speed is set to 9 mph (4 m/s). Press Pause to stop Solo, and press Fly to exit to standard flight.



Figure 5.2.2.1: Cable Cam Controls

5.2.3 Cable Cam Settings

To adjust Cable Cam's options, select the settings menu in the bottom-right corner. Automatic view lock prevents left-stick camera control during Cable Cam. Choose Fly Counterclockwise and Fly Clockwise to customize the direction Solo rotates between your A and B points. Select Cable Cam How-To for instructions and tips.

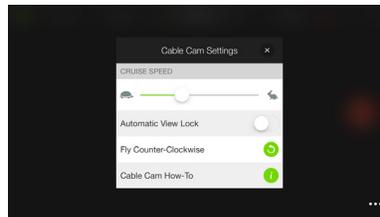


Figure 5.2.3.1: App - Cable Cam Settings

5.3 Orbit

Use Orbit to fly Solo along a preset circle while fixing the camera on a central target. Orbit requires the app to set the subject and can only be started from the air.

5.3.1 Starting Orbit

Select Orbit from the Shot List. The app will display the currently set radius of the orbit and show the location of the subject on the map. Fly Solo to correct the subject's position on the map if necessary then press A on the controller to lock onto the subject. The app will display a Subject Locked confirmation once the orbit subject is set. To adjust the position of the subject during Orbit, move the center point on the map.

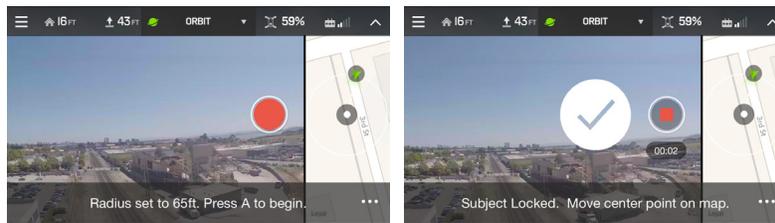


Figure 5.3.1.1: App - Orbit Setup

5.3.2 Orbit Operation

Move the right stick left and right to fly Solo along the orbiting flight path. Move the right stick up to reduce the radius of the orbit and move Solo closer to the subject; move the right stick down to increase the radius and move Solo away from the subject. Be aware of any elevation changes in Orbit's path.

Move the left stick left and right to temporarily override the camera's lock on the subject and look left and right. Move the left stick up and down to adjust Solo's altitude. Use the paddle on the top of the controller to raise and lower the altitude of the target. Press Pause to stop Solo at any time, or press Fly to exit to standard flight.



Figure 5.3.2.1: Orbit Controls

 Solo will orbit at a constant altitude relative to its launch point, not taking into account changes in ground level. Be aware of any elevations changes at your location that would affect Solo. Always ensure there is a clear path for Solo before starting Orbit.

5.3.3 Orbit Settings

Select the Orbit Settings Menu to adjust Solo's default cruise speed in Orbit. The default cruise speed for Orbit is 2.2 mph (1 m/s).

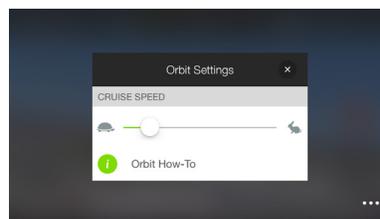


Figure 5.3.3.1: App - Orbit Settings

5.4 Follow

Follow creates a virtual tether between Solo and your mobile device, allowing Solo to track you as you move. If the Follow subject is engaged in an activity that prevents them from using the controller, you are required to use an additional safety pilot during Follow. The subject will carry the mobile device and be followed by Solo, and the safety pilot will hold the controller and be ready to regain manual control at any time.

 Always ensure that there is a clear path for Solo during Follow. It will not avoid obstacles that come into the flight path as a result of following the subject.

5.4.1 Follow Setup

To start Follow, take off normally and select Follow from the Shot List in the app. Tap the instructional bar to begin following.

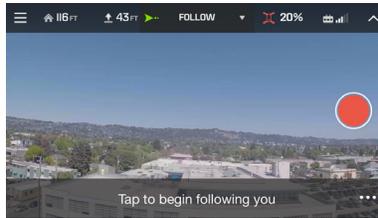


Figure 5.4.1.1: App - Follow Setup

5.4.2 Follow Operation

Once activated, Solo will automatically follow the mobile device wherever the subject carries it. In the app, press the left and right arrows in the app interface to orbit Solo around them. On the controller, move the right stick forward and back to adjust the following distance, and move the right stick left and right to orbit around the subject. Use the left stick to adjust Solo's altitude during Follow and to override the camera tracking and temporarily pan the camera left and right. At any time during Follow, press Pause to stop Solo and the camera will continue to track the subject. Press Fly to return to standard flight.



Figure 5.4.2.1: Follow Controls

5.4.3 Follow Settings

Select the settings menu to adjust the default cruise speed during Follow. Follow's default cruise speed is set to 2.2 mph (1 m/s).

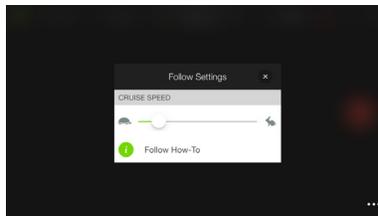


Figure 5.4.3.1: App - Follow Settings

6 Alerts

The following alerts will appear on the controller in the event of a preflight or in flight error. Always monitor the controller for alerts and perform the recommended actions.

6.1 Preflight Errors

Before starting the motors, Solo runs a series of automatic checks to ensure that the system is ready for flight.

6.1.1 Calibration

The following errors indicate that a preflight check is in progress: altitude calibrating, calibrating solo, and calibrating compass.



Figure 6.1.1.1: Controller - Calibration in Progress Alerts

If Solo is not placed on a level surface, you will receive the following alert to move Solo to a level surface for takeoff.

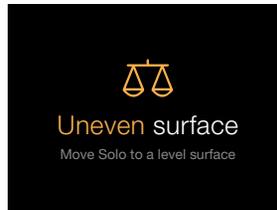


Figure 6.1.1.2: Controller - Uneven Surface Alert

If Solo requires manual calibration, the following alert messages show the displays for compass and level calibrations. Refer to Section 7.2 for compass and level calibration instructions.

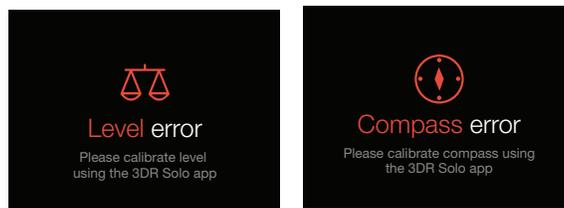


Figure 6.1.1.3: Controller - Re-Calibration Required Alerts

In the case of a calibration or sensor error during startup, restart Solo to clear the following alerts.



Figure 6.1.1.4: Controller - Calibration Error Alert

6.1.2 Service Alerts

The following alerts indicate a system error that requires service. Use the app to submit a trouble ticket with 3DR Support or contact an authorized Solo Service Center to service Solo and clear the alert. A control stick error can occur either in flight or before takeoff. If the control stick error is received in flight, Solo will return home and land.

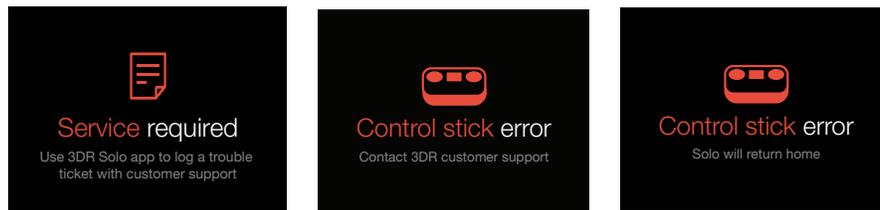


Figure 6.1.2.1: Controller - Service Alerts

6.2 In-Flight Errors

During flight, the controller monitors Solo's GPS signal, controller signal, flight battery level, and controller battery level.

6.2.1 Altitude Limit

If Solo reaches the altitude limit during flight, it will maintain and not exceed that altitude and the controller will display the following alert. Refer to Section 3.7 for instructions on setting the altitude limit and choosing safe altitudes for flight.

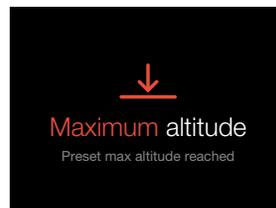


Figure 6.2.1.1: Controller - Altitude Limit Alert

6.2.2 App Connection

The controller will display the following banner-style alerts in the event that the Solo app is connected to or disconnected from Solo. We recommend having an active connection to the Solo app at all times during flight. Refer to Section 2.6 for connecting to Solo Wi-Fi with the app. Solo will not return home if the connection to the app is lost during flight, see Section 6.2.4 for more information on losing GPS.

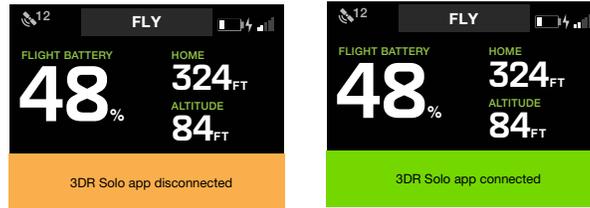


Figure 6.2.2.1: Controller - App Connection Alerts

6.2.3 Controller Signal Alerts

Flying behind solid objects, like buildings and trees, blocks communication signals between Solo and the controller. Always maintain visual contact with Solo to ensure that the signal is unobstructed. Cell phone towers and nearby Wi-Fi signals can cause interference with the communication system and decrease its range. Avoid flying in populated areas to avoid sources of interference.

If the controller loses power or becomes unpaired from Solo during flight, the controller will display the following alert and Solo will Return to Home. See Section 7.3 for pairing instructions.



Figure 6.2.3.1: Controller - Controller Disconnected Alert

If the signal between Solo and the controller is lost during flight, the controller will display the controller signal lost alert and Solo will return home. If signal is recovered while returning home, the controller will display the signal recovered alert and provide the option to regain manual control by pressing the Fly button.

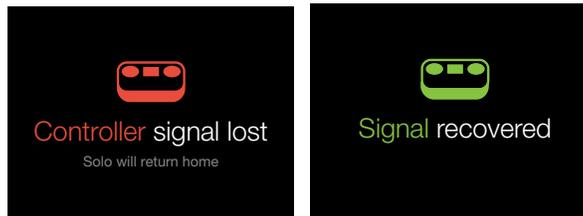


Figure 6.2.3.2: Controller - Controller Signal Alerts

6.2.4 GPS Signal Alerts

If GPS is lost during flight, Solo will switch into Fly:Manual. In Fly:Manual, Solo uses the same joystick controls as in standard flight (displayed as “Fly”), but it does not include any GPS positioning. Therefore, in Fly:Manual, Solo will not hold its position when the right stick is released, and the operator must maintain close control over roll, pitch, and yaw. Without GPS, Pause, Return Home, and Smart Shots are not available. During Land, Solo will not be able to maintain position due to the lack of GPS positioning and will drift according to wind and other environmental conditions. If another alert occurs while Solo is in Fly:Manual, Solo will not be able to Return Home and will instead initiate a non-positioned landing at the current location. We recommend landing Solo in the event of a loss of GPS and waiting to acquire GPS lock before taking off again.

When GPS is recovered, Solo will switch from Fly:Manual to standard flight (Fly), and GPS positioning will activate. The following displays show (from left to right) the GPS lost alert, Solo in Fly:Manual, and GPS recovered alert. Always choose a location with a clear view of the sky to improve GPS signal strength.

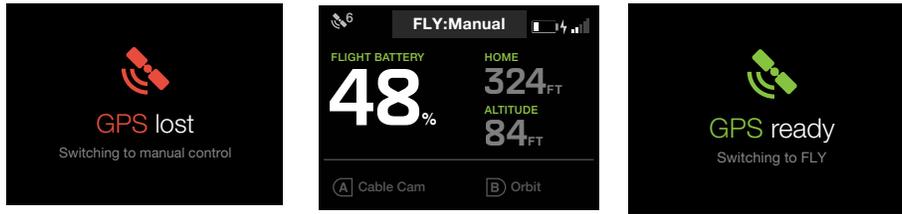


Figure 6.2.4.1: Controller - GPS Signal Alerts

6.2.5 Flight Battery Alerts

The controller monitors the Solo battery during flight and provides alerts when the battery reaches critical levels. At 25% and 10% power remaining, the controller will provide a land-soon alert recommending that you end your flight to prevent an automatic landing.



Figure 6.2.5.1: Controller - Low Battery Alerts

If the battery reaches 5%, Solo will initiate an automatic landing at the current location to prevent a crash. If the battery level reaches 0% while in use, irreversible will occur and the battery should be discarded.

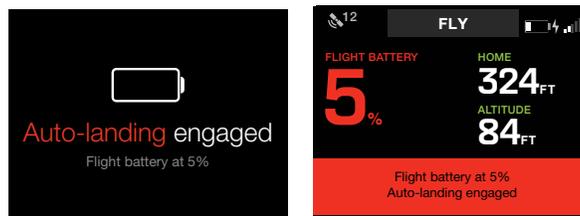


Figure 6.2.5.2: Controller - Critical Battery Alert

6.2.6 Controller Battery Alerts

When the controller battery reaches 10%, the controller will display an alert to notify you to charge the controller at your next opportunity. At 5%, the controller will prompt the operator to end their flight and charge the controller. If the controller battery reaches a critical level in flight, Solo will Return to Home. The following displays show (left to right) the 10%, 5%, and 0% alerts



Figure 6.2.6.1: Controller - Controller Battery Alerts

7 Maintenance

This section covers basic operational maintenance procedures for Solo. For repairs not covered in this manual, contact 3DR Support or an authorized Solo Service Center.

Solo’s exterior components are designed to absorb impact from hard landings and protect the core electronics. If damage is sustained to Solo’s legs or motors, replace them with official 3DR parts from store.3dr.com or an authorized retailer. 3DR offers an extended controller battery upgrade with double the capacity so you can fly more between charges. Before opening the battery bay or performing any maintenance on Solo, always ensure that Solo is powered off with the battery removed.

7.1 Controller Battery Replacement

To replace the controller battery, open the battery door on the back of the controller. Remove the foam block and disconnect the battery from the port in the side of the battery compartment. To install a battery, connect the battery to the controller, and, for standard-size controller batteries, use the foam block to pad the empty space in the compartment. See Section 3.10 for information on safely storing spare controller batteries.



Figure 7.1.6.1: Controller Battery Installation

7.2 Calibrations

Use the Solo app to perform compass and level calibrations when prompted by the controller. Remove Solo’s propellers before performing calibrations.

7.2.1 Compass Calibration

To calibrate Solo’s compass, connect the app to Solo Wi-Fi and select Compass Calibration from the Solo menu. Ensure that Solo and the controller are powered on with the propellers removed. Solo requires an interference-free environment for compass calibration, so ensure that you are away from metal buildings, reinforced concrete, or other metal structures before starting calibration.

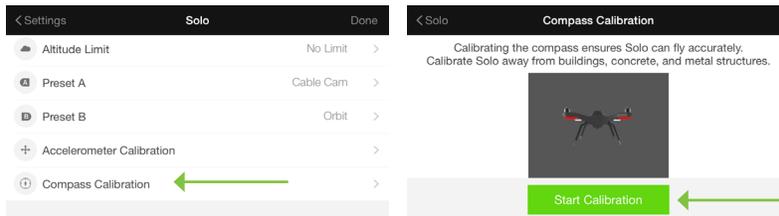


Figure 7.2.1.1: App - Compass Calibration Setup

The app will prompt you to rotate Solo end-over-end multiple times until the bar at the top of the screen is completely green. If the calibration fails, move to a different location and try again.

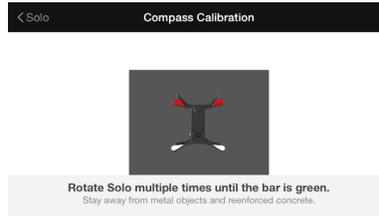


Figure 7.2.1.2: App - Compass Calibration Procedure

7.2.2 Level Calibration

A level calibration zeros Solo's accelerometers to recognize static states. To perform a level calibration, remove the propellers from Solo and connect the app to Solo Wi-Fi. Select Level Calibration from the Solo menu, and follow the prompts to place Solo perfectly still on each side in turn. In each step, wait a few seconds after moving Solo to press Next.



Figure 7.2.2.1: App - Level Calibration

7.3 Pairing

To pair a controller with Solo, first power both the controller and Solo. Power off any other Solos or controllers in the vicinity. Once powered, use a paper clip to press the pair button on the underside of Solo to activate pairing mode.



Figure 7.3.2.1: Solo Pair Button

The controller will automatically detect Solo and prompt you to pair. Hold the A and B buttons on the controller to start pairing. To cancel pairing, press B.

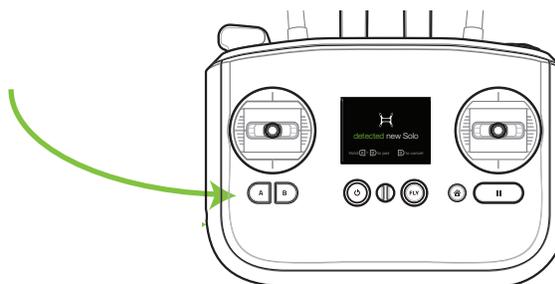


Figure 7.3.2.2: Controller Pairing Procedure

7.4 Legs

Solo uses three unique types of legs: 2 legs with an antenna module (#1 and #2), a leg without any electronic components (leg #3), and a leg with a compass module (leg #4). Replacements for all types of leg can be purchased from store.3dr.com or an authorized retailer.

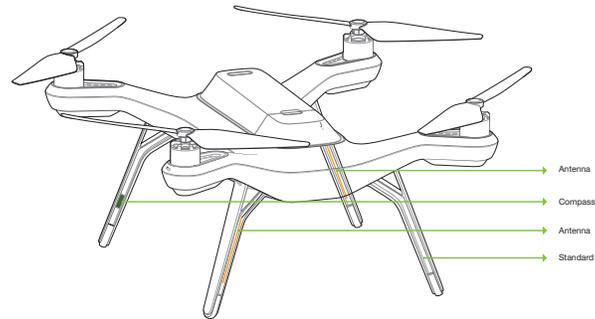


Figure 7.4.2.1: Legs Contents

7.4.1 Leg #3

To replace a standard leg, use a #2 Phillips screwdriver to remove the two screws, detach the old leg, and attach the new leg using the provided screws.

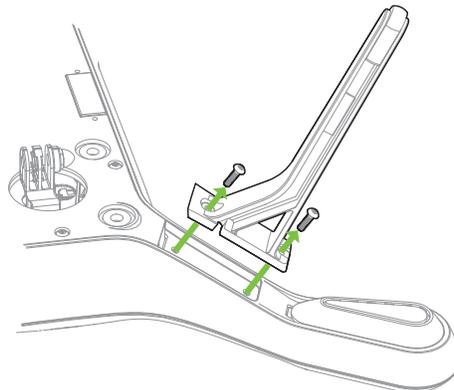


Figure 7.4.1.1: Standard Leg Replacement Process

7.4.2 Legs #1 and #2 with Antennas

To replace a leg with an antenna module where the antenna is physically undamaged, you'll need to remove the antenna from the old leg before replacing it.

To detach the antenna, remove the plastic sheet from the leg (1) and detach the antenna from the Velcro by carefully pulling the cable (2). Follow the standard leg replacement procedure to detach the old leg (3).

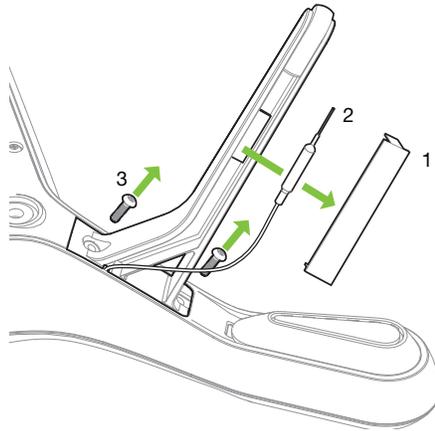


Figure 7.4.2.1: Detaching the Antenna from the Leg

Attach the new leg (1) by threading the antenna cable through the notch in the top of the leg (2).

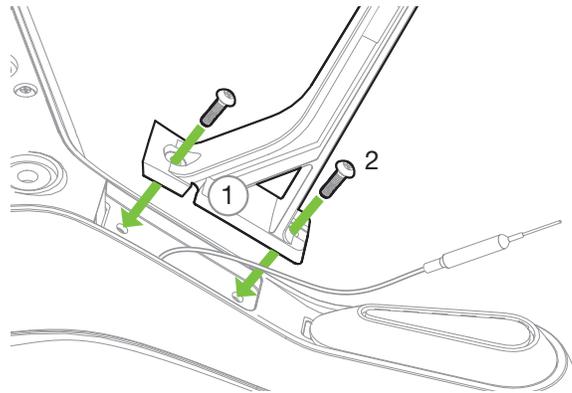


Figure 7.4.2.2: Attaching a New Leg with an Existing Antenna

To secure the antenna to the new leg, use the provided Velcro to attach only the yellow-backed Velcro strip to the Velcro on the antenna (1). Then remove the backing and attach the Velcro and antenna to the inside of the leg, placing the tip of the antenna 5 mm from the edge of the rubber foot (2) as shown below. Fold the ends of a provided plastic sheet at right angles (3), remove the adhesive backing, and stick the plastic sheet to the leg so it secures the antenna in place (4).

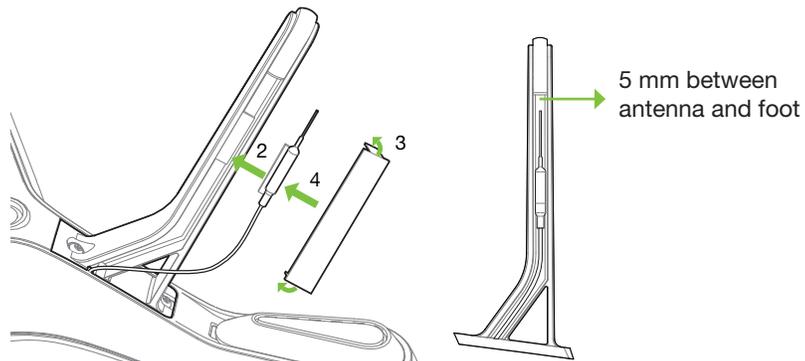


Figure 7.4.2.3: Attaching an Existing Antenna to a New leg

7.4.3 Leg #4 with Compass

Solo's right-rear leg (#4) contains the compass module. Detach the leg from the arm as you would a standard leg, but the leg will not be removable until you disconnect the compass from Solo. To access the compass connector, you'll need to remove the battery tray from Solo. See Section 7.5 for battery tray removal instructions. With the battery tray removed, locate the compass connector in the corner of the board closest to the leg being replaced. Disconnect the compass connector from the board by holding down the tab on the far side of the connector and lifting up the connector. Since the space between the arm and the connector is limited, it may help to use the screwdriver to press the tab.

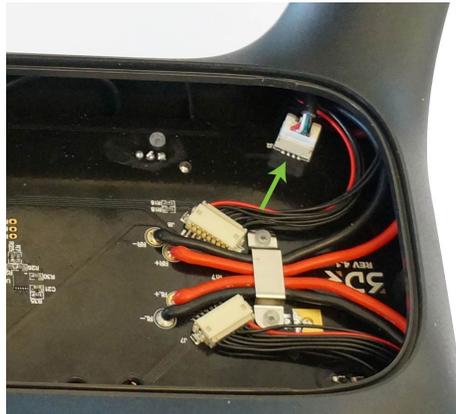


Figure 7.4.3.1: Compass Connector on Mainboard

With the compass disconnected, remove the old leg and cable from Solo. Place the new leg into position and thread the new compass cable through the arm where it can connect to the board. Connect the compass connector in the same place as the old compass.



Figure 7.4.3.2: Insert New Leg with Compass

Secure the new leg in place and replace the battery tray.

7.5 Battery Tray

The battery tray holds the battery and GPS in place, and allows you to access the main electronics bay. This section covers how to remove the tray to access the interior of Solo.

7.5.1 GPS Cover

The GPS cover is the flat, black end cap in front of the battery tray. To remove it, use a small, flat prying tool to remove the GPS cover from the front of the battery bay by loosening the four clips along the back edge of the cover.



Figure 7.5.1.1: GPS Cover Removal

7.5.2 Battery Tray Removal

To detach the battery tray and access Solo's main electronics bay, use a small Philips screwdriver to remove the 7 screws securing the battery tray to Solo.



Figure 7.5.2.1: Battery Tray Removal

The battery tray will still be connected to Solo via the GPS cable, so carefully lift out the tray just enough to access the board beneath.



Figure 7.5.2.2: Battery Tray Detachment

7.6 Motors

Replacement motors are available as clockwise and counterclockwise Motor Pods. Use a counterclockwise Motor Pod to replace motors #1 and #2, and use a clockwise Motor Pod to replace motors #3 and #4.

First, use a small, flat prying tool to remove the LED cover from the underside of the arm.

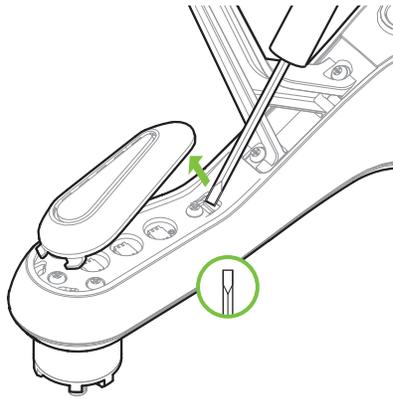


Figure 7.6.2.1: LED Cover Removal

Use a #2 Phillips screwdriver to remove the four screws securing the pod to the arm.

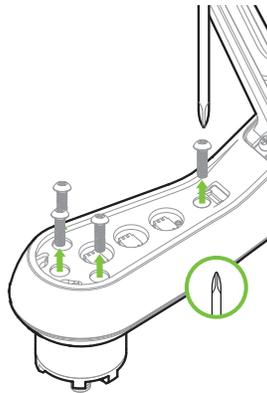


Figure 7.6.2.2: Motor Pod Removal

Disconnect the wide beige connector, the red wire and the black wire to remove the old motor pod. To remove the wide beige connector, carefully lift the edges of the connector away from the pod until they pop out, then remove the connector. Don't pull on the wires! The connector can break easily if force is used to remove it.

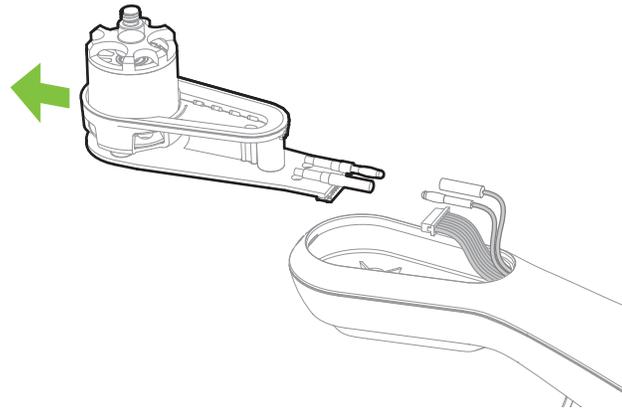


Figure 7.6.2.3: Motor Pod Disconnection

Connect the 3 cables from the arm to the new motor pod. Tuck the cables inside the arm and set the new pod into place.

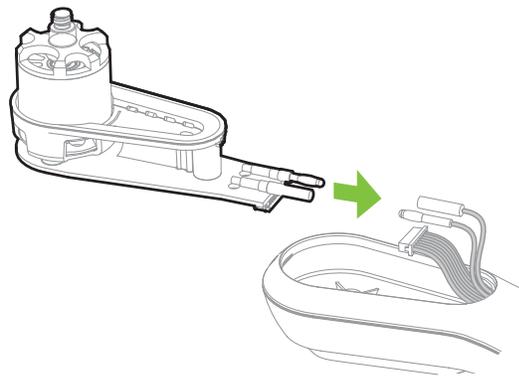


Figure 7.6.2.4: Motor Pod Connection

Turn over Solo and replace the 4 provided screws to secure the new motor pod into place. Finally, snap the LED cover back into place.

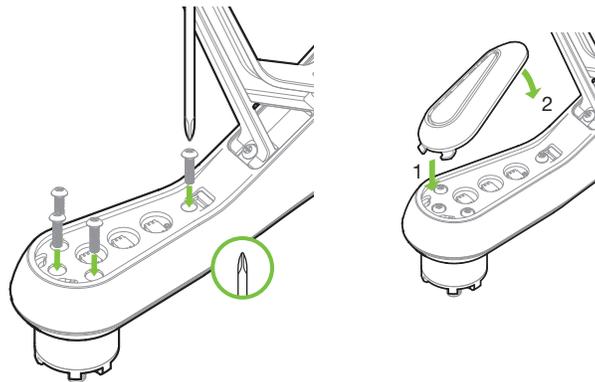


Figure 7.6.2.5: Motor Pod and LED Cover Attachment

7.7 Inspection and Maintenance Schedule

In order to maintain optimal performance, Solo requires regular inspection and maintenance. See Figure 7.7.1.1 for a general inspection and maintenance schedule.

Solo Inspection and Maintenance Schedule			
Interval Service	Before Every Flight	As Needed	150 Hours
Propellers Inspect for Damage	X		
Electronic Speed Controllers		X	
Motors Inspect for Wear	X		
Propellers Replace		X	
Motor Pods Replace			X

Figure 7.7.1.1 Solo Maintenance Schedule

8 Appendix

8.1 Specifications

Solo is a quad-rotor aerial vehicle powered by the 3DR Pixhawk 2 autopilot system and APM:Copter flight control software. Solo communicates with the controller and Solo app over the 3DR Link secure Wi-Fi connection.

Autopilot:	3DR Pixhawk 2
Flight code:	APM:Copter
Control:	3DR Solo Controller
Wireless communication:	3DR Link 1.0
Frequency:	2.4 GHz
Height:	10 in. (25 cm)
Motor-to-motor dimension:	18 in. (26 cm)
Propulsion:	880 K _v motors, two clockwise rotating motors and two counterclockwise rotating motors
Propeller:	10 in. x 4.5 in. (25 cm x 11.4 cm)
Weight with battery:	3.3 lbs. (1.5 kg)
Controller battery life:	3 hours
Extended controller battery life:	6 hours
Controller battery:	Li-ion 2600 mAh 7.2 Vdc (5200 mAh for extended battery)
Power:	Electric (rechargeable lithium polymer battery)
Battery:	Lithium polymer, 5200 mAh, 14.8 Vdc
Battery weight:	1 lb. (.5 kg)
Estimated flight time:	25 minutes*
Maximum altitude:	328 ft. (100 m)
Range:	.5 miles** (.8 km)
Payload capacity:	1.1 lbs. (500 g)
Cruise speed:	5.7 mph (2.5 m/s)
Maximum speed:	55 mph (25.5 m/s)
Maximum climb rate:	11 mph (5.0 m/s)
Maximum descent rate:	5.5 mph (2.5 m/s)
Headwind limitation:	25 mph (11 m/s)
Crosswind limitation:	25 mph (11 m/s)
Camera:	Streaming video compatible with GoPro® HERO 3, 3+ or 4 Full compatibility with GoPro® HERO 3+ or 4
Solo app compatibility:	iOS 8.0 or later / Android 4.3 or later
Operating temperature:	32° F - 113° F (0° C - 45° C)
Operating relative humidity:	0-85% RH

*Flight time varies with payload, wind conditions, elevation, temperature, humidity, flying style, and pilot skill. Listed flight time applies to elevations less than 2,000 ft above sea level.

**Range varies with location, antenna orientation, background noise and multi-path.

8.2 Warranty

3D Robotics warrants to the original retail purchaser of Solo (the “Product”) that at the time of purchase that this product is free from material defect in materials and workmanship. Should this Product fail during normal consumer usage and conditions due to defective material or workmanship within one year from the date of purchase, or such longer period as is required by applicable law (“Warranty Period”), such defect(s) will be repaired or replaced at 3D Robotics’ option, without charge for parts or labor directly related to the defect(s). The complete terms of the limited warranty applicable to Solo can be found at 3dr.com/terms.

This Warranty extends only to consumers who purchase the product from a 3D Robotics authorized reseller and is not transferable or assignable. This Warranty does not apply to: (1) Product subjected to abnormal use or conditions, accident (including without limitation, collision, crash or fire), alteration, or improper repair; (2) damage from exposure to moisture or extreme environmental conditions; (3) damage from use with any accessory, software or other product not expressly authorized by 3D Robotics; (4) damage from external causes such as dirt, sand, battery leakage, blown fuse, or improper usage of any electrical source; (5) commercial use; or (6) use in violation of law or ordinances in effect in the jurisdiction in which the Product is used.

3D Robotics assumes no liability for any accident, injury, death, loss, or other claim related to or resulting from the use of this product. 3D Robotics makes no other warranties for Solo, and makes no warranties whatsoever for service, software, maintenance or support for non-3D Robotics branded products. Such products, service, software, maintenance or support is provided by 3D Robotics “As Is” and any third-party warranties, products, software, services, maintenance or support are provided by the original manufacturer or supplier, not by 3D Robotics.

Software is subject to the separate software license agreement accompanying or made available to you in connection with the software. A portion of the software contains or consists of open-source software, which you may use under the terms and conditions of the specific license under which the open-source software is distributed. You agree that you will be bound by any and all such license agreements, and that your usage of this product indicates your acceptance of those agreements. Title to software remains with the applicable licensor(s). In no event will 3D Robotics be liable to you for damages, including any general, special, incidental or consequential damages arising out of the use or inability to use the software.

THE EXTENT OF 3D ROBOTICS’ LIABILITY UNDER THIS WARRANTY IS LIMITED TO THE REPAIR OR REPLACEMENT PROVIDED ABOVE AND, IN NO EVENT, SHALL ITS LIABILITY EXCEED THE PURCHASE PRICE PAID BY PURCHASER FOR THE PRODUCT.

8.3 Regulatory Compliance

8.3.1 U.S. - FCC (Federal Communication Commission)

3DR Solo FCC:	2ADYD-S111A
3DR Solo Controller FCC:	2ADYD-AT11A

This device complies with Part 15 of the FCC rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

Changes or modifications not expressly approved by 3D Robotics could void the user’s authority to operate the equipment.

Radiation Exposure Statement:

The Solo system has been tested to ensure compliance with FCC-mandated limits for general population radio frequency (RF) exposure for an uncontrolled environment. These limits ensure that no harmful effects will result from operating Solo according to the standard operating procedures described in this manual.

The body's Specific Absorption Rate (SAR) for the Solo controller is 1.33 watts per kilogram (W/kg) in compliance with the FCC limit of 1.6 W/kg. To reduce exposure to RF energy, hold Solo at least 20 cm away from your body at all times during operation. Do not operate the Solo controller co-located or in conjunction with any other antenna or transmitter.

This device complies with Part 15 of the FCC Rules. Operation is subject to the condition that this device does not cause harmful interference.

8.3.2 Canada - Industry Canada

3DR Solo IC: 12768A-S114A
Model number: S110A

3DR Solo Controller IC: 12768A-AT14A
Model number: AT10A

This device complies with Industry Canada license-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes : (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

IC Radiation Exposure Statement:

The Solo system has been tested to ensure compliance with IC-mandated limits for general population radio frequency (RF) exposure for an uncontrolled environment. These limits ensure that no harmful effects will result from operating Solo according to the standard operating procedures described in this manual. To reduce exposure to RF energy, hold Solo at least 20 cm away from your body at all times during operation. Do not operate the Solo controller co-located or in conjunction with any other antenna or transmitter. Changes or modifications not expressly approved by 3D Robotics could void the user's authority to operate the equipment.

3DR