VORTEX 150 Mini

150 Mini Getting Started Guide

International edition

Rev 1.0 - Dec 2016

Every Vortex 150 Mini is flight tested before leaving the factory.
Flight Tested By:

ImmersionRC
Real Virtuality

WARNING

Congratulations on your purchase of one of the hobby's first ARF pure-bred racing quadcopters. A product designed by FPV Racers, for FPV Racers.

Do not expect it to fly like a DJI Phantom™ . It does not have a return-to-home feature, no GPS, and it does not have stabilization features that will allow your little brother to fly.

Take it easy if you are new to the world of FPV racing, try to avoid slamming the quad into the first wall before you have mastered slaloming through the trees on the way to the wall.

Acro mode is something that should be learned as soon as possible, flying any other mode is a bit like driving a Lamborghini around a parking-lot in reverse... not exactly what you bought the Lambo for.

Please carefully read the recommendations in this getting started guide, as far as equipment/battery selection, and how to run the Vortex 150 Mini Wizard.

REMOVE PROPS

Mini-quad props can do serious damage when coming in contact with human skin, risk of deep cuts and lacerations should be avoided at all cost.

So when you are working on a quad with the battery connected, it is highly recommended to **REMOVE ALL PROPS**, unless you are just about to fly. Keep in mind that when setting up mini-quads, there is always a remote chance that a configuration change can spin up motors unexpectedly.

ImmersionRC accepts no responsibility, or liability, for any injury, or damage, to persons or property, caused by the use of the Vortex.

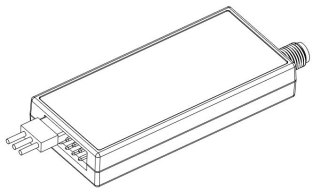
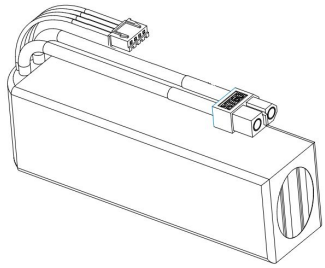
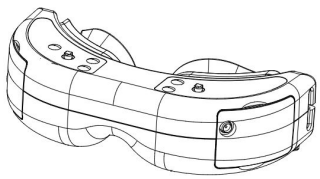
INSTALL ANTENNA

The Video Transmitter included in the Vortex may be damaged permanently if run without the supplied SpiroNET Antenna. Please take care to install this antenna before every flight, and when powering up the Vortex for even a short time period.

ImmersionRC accepts no responsibility for damage caused to the Vortex by operating without a suitable Tx antenna installed.

4 Steps: Unboxing to Racing

To get your ARF Vortex ready to race, follow the simple 4-step process below.

1) Install Compatible R/C Receiver	
2)Install suitable battery	
3) Setup the video link	
4) Run the wizard	

1) Install Compatible R/C Receiver

The Vortex 150 Mini is shipped with three receiver interface cables, supporting 4 commonly used interfaces.

a) 3-Pin 0.1” Servo Cable, for S-Bus, and CPPM (5V)
b) 5-pin Picoblade for FrSky XSR receivers (5V)
c) 3-pin JST-ZH for Spektrum DSMX receivers (3V)

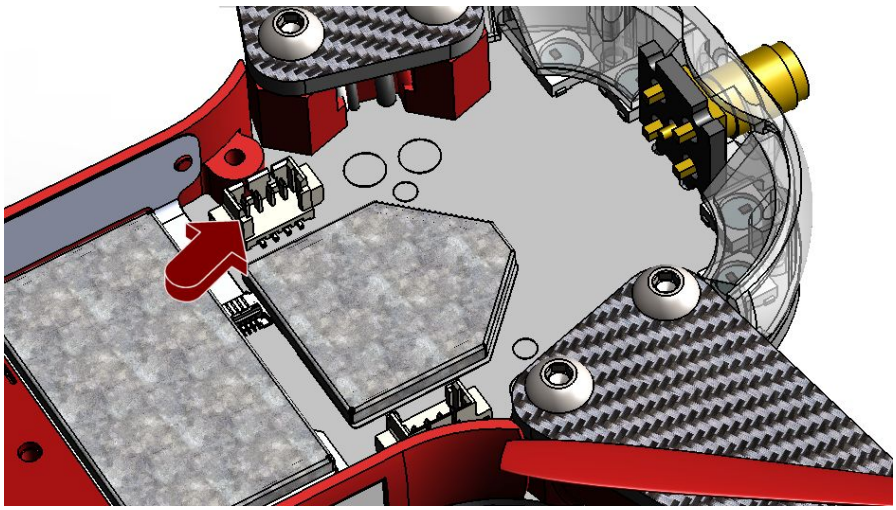
Receivers may be mounted externally on the tail-end of the quad, or internally. Internally is definitely the preferred solution but does require a suitably small receiver.

The following are recommended for internal installation:

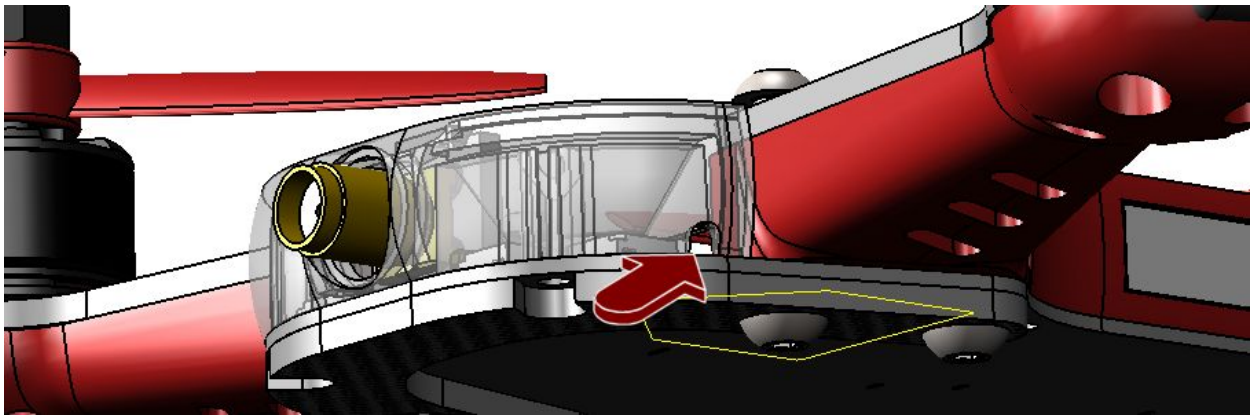
1) FrSky **XSR**, using the supplied XSR cable
2) FrSky **X4R-SB**, ‘Naked’ version with SBus output
   Requires some soldering to wire sbus cable
3) Spektrum **SPM4648** Auto-bind receiver with supplied DSMX cable
   Remove plastic case and heat-shrink for optimal fit
4) Spektrum **SPM9646** Carbon fuse receiver
5) Spektrum **SPM9649T** Telemetry receiver

To access the receiver bay for internal receiver mounting, remove the 8 screws which secure the top plate to the arms, and carefully remove the top assembly, which includes the camera unit.

The receiver connector is indicated by the red arrow below. To mount the receiver, a small piece of double-sided tape may be used on the top of the metal can in the receiver bay.



Finally, the receiver antennas may be routed through the two notches in the bottom of the LED diffuser.



Notes on Receiver Selection

One critical parameter to keep to a minimum in a race quad setup is latency. Latency from what the camera sees to the display device, and also from the control stick to the flight controller.

For minimum latency, with reasonable range, the Spektrum™ radios and satellite receivers are a great choice. Another good (and quite common) choice is the FrSky Taranis radio with a matched S-Bus receiver (X4R for example).

For longer-range FPV, the EzUHF system is a good choice. Due to the close proximity of the electronics and Video Transmitter on a mini-quad, and the lack of a suitable ground-plane, a diversity receiver, with dipole antennas is highly recommended.

Note: An update to all existing EzUHF systems will be available early Dec. 2015, which will enable an S-Bus output, as opposed to the more traditional PPM. This will greatly reduce latency.

Receiver Auto-Detection

A unique feature of the Vortex family of quadcopters is that the receiver type is auto-detected by the OSD when running the wizard.

With the Vortex 150 Pro, it is no longer necessary to manually specify the receiver type with the ImmersionRC Tools before running the wizard.

R/C Transmitter Configuration

The advanced wizard used in the Vortex 150 Mini is cable of detecting most transmitter configurations. Channel ordering, stick range, center position, etc. are all learned by the wizard.

In most cases it is better to start from a 'default' model on the R/C transmitter. On the Taranis, select the quadcopter option, and leave all settings as defaults.

2) Install a Suitable Battery

The Vortex 150 Mini has a flexible battery mounting system, and uses an industry-standard XT-30 connector. This allows it to use a wide range of different batteries.

To help select a suitable battery for your flying-style, read this section carefully:

Voltage

First things first, voltage. For starting out with the Vortex, a **3s** (11.1V) pack is recommended.

A Vortex running **4s** (14.8V) is an extremely fast race-quad, which can easily get a pilot into trouble.

A **3s** pack calms things down a bit, and is a good way to ease into the hobby, hence novice pilots should certainly start out on **3s**.

Note that the 16A ESCs installed in the Vortex 150 Mini do support 'LiHV' packs, with a cell voltage of 4.35V as opposed to the standard 4.20V cell voltage with LiPo packs.

Capacity

For capacity, there are a few things to remember. Firstly, keeping weight down on a mini-quad is the best way to increase crash survivability as well as improve acceleration, climb speed and general agility of the quad.

Also remember that most races are just a few laps, so a huge capacity battery is just dead weight, and will never be drained in the typical race.

650-850mAh packs, or similar, are ImmersionRC's choice for racing. 3s for beginners, 4s for pros.

NOTE: We do not recommend the use of 1300mAh+ batteries used on 250 quads on the 150. The extra weight of the battery can cause serious damage in crashes with the lightweight 150 frame.

‘C’ Rating

Battery ‘C’ rating is a particular problem for high-performance, lightweight quads. Pick the highest C rated pack available.

For a 250 quad, a 65C 1300mAh pack can be run at 85A continuously.

A 150 quad with a 45C 850mAh pack can manage 38A, which is fairly easy to exceed in high-power manoeuvres.

NOTE: Ensure that the battery is securely mounted on the anti-slip pad. The battery should not be able to move around in flight. Also make sure the plastic liner on the anti-slip pad is removed!

ANOTHER NOTE: Ensure that your main battery cables, and also the balance leads are secured in the straps, and cannot, under any circumstances, touch the props.

Sliced battery cables and/or balance leads are a cause of expensive shorts, fires, and crashes!

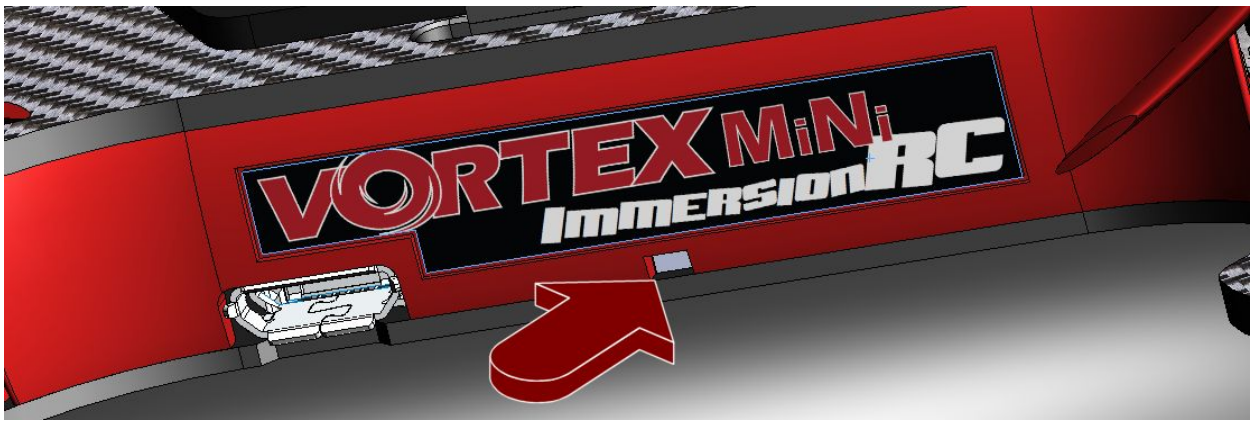
3) Setup the Video Link

To avoid the traditional 'dip-switch chaos' at race events, the Vortex does not use a DIP switch to define Video Tx channels. Instead, the OSD is responsible for setting the channel, and band.

The Vortex ships with a default Tx frequency of **5740MHz**, which corresponds to ImmersionRC/FatShark frequencies, Channel 1.

If you are running ImmersionRC receivers, or a FatShark headset using the standard 5.8GHz module, just select Channel 1, and the wizard image should be shown.

If you are running non-ImmersionRC/FatShark gear which cannot tune to 5740MHz, it may be necessary to switch bands on the Vortex before the wizard image is displayed. To do this, set your receiver to Channel 1, and use the small button on the left side of the quad.



To switch bands, press the button on the LED board for approx. 2 seconds until you hear the first beep, and release. .

The Vortex will beep a number of times, representing the band number. Each time the button is pressed, the band number will be incremented.

The band/beep order is as follows:
Band 1: IRC/FS (5740MHz)
Band 2: RaceBand (5658MHz)
Band 3: Band E (5705MHz)
Band 4: Band B (5733MHz)
Band 5: Band A (5865MHz)

For a full list of channel frequencies for each band, please refer to the full Instruction Manual.

4) Run the Wizard

In the world of R/C, there is little standardization between equipment manufacturers as far as control stick to channel mapping. There is also little agreement between users as to which of the 4 control modes should be used.

Since in the Vortex, both the OSD, and the Flight Controller need to know the channel mappings, a 'Tx Setup Wizard' is included to greatly simplify the process.

This wizard also configures various flight controller parameters which would normally require a personal computer, with a USB connection to the quad copter.

NOTE: The wizard should allow a brand-new, unconfigured Vortex, to be removed from its shipping box at a race event, and prepared for flight in less than a minute, with no tools, or USB hookups required.

For the techies, there is a full description of the configuration steps performed near the end of the full user's manual, under 'Appendix A: The Wizard - Details'.

The first time the Vortex is powered up, the **Tx Setup Wizard** is presented, as shown after the mode 1/mode 2 control descriptions below.

Following the instructions on-screen, 5 simple steps, will configure the 4 flight channels, and one auxiliary control (CH5) which will control the flight mode.

Mode 2 Controls

Mode 2, arguably the most common stick mode, is common in the USA, and is a natural fit to helis, and multirotors.

A Mode 2 transmitter is easily identified with the un-sprung (i.e. doesn't return to center) throttle control on the left stick.

For this mode, the multi-rotor controls are typically as follows:

Mode 1 Controls

Mode 1 is common in Europe.

A Mode 1 transmitter is easily identified with the un-sprung (i.e. doesn't return to center) throttle control on the right stick.

For this mode, the multi-rotor controls are typically as follows:

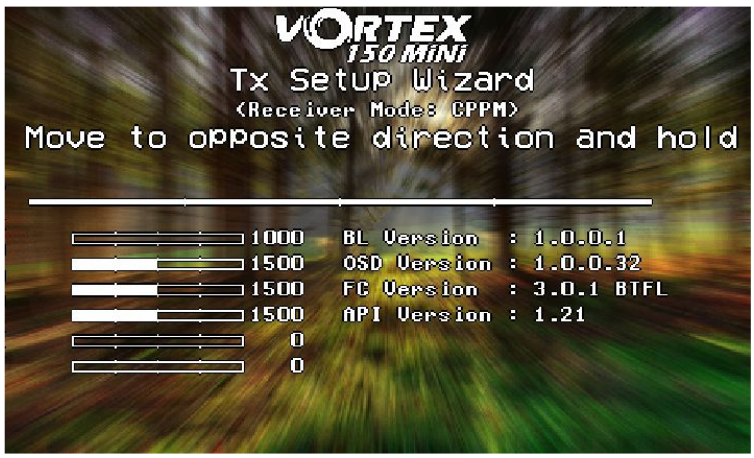
Note: Modes 3 and 4 are intentionally left out of this abbreviated Getting Started guide. It is assumed that pilots flying these more 'uncommon' modes, are already very familiar with their remote, and their control mapping.

Following the Wizard

The wizard is used primarily to let the Vortex learn the flight channel order, and R/C Tx mode (1, 2, 3, 4). 'Left' refers to moving the stick left, and 'Back' refers to moving the stick back towards you.

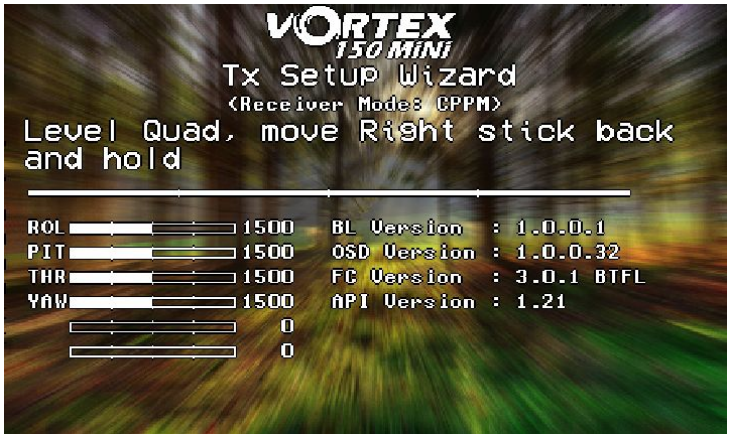
Follow the prompts, ensuring that the correct stick is moved each time. As each control is recognized, it's name will appear to the left of the servo bar.

Take your time with this step, if the wrong stick movements are fed to the wizard, it will be difficult to navigate the OSD to complete the setup.



Once the four primary flight controls have been learned, place the quad on a flat and level surface and move the right stick back. This will calibrate the accelerometer.

It is important that the quad is level when this step is performed, or the auto-level flight modes will not function correctly.



NOTE: To restart the wizard at anytime, power up the quad, press and hold the button on the led board until vortex beeps 2 times (first beep after ~3 seconds, second beep after ~5 seconds). Alternatively you can also enter tx Wizard via OSD menu

Once the wizard is finished, various Cleanflight settings will be configured, including enabling oneshot, motor_stop, and failsafe.

Another setting which is automatically made is the assignment of CH5 to the flight mode, Acro, Horiz, and Angle. To complete the setup, configure your R/C Tx to link CH5 to a 3-position switch.

Ensure that the switch correctly switches between the three flight modes, reflected in the top-right corner of the OSD main landscape .

Note that It is highly recommended to attempt the maiden flight in either **Angle**, or **Horiz** mode. **Acro** takes a little getting used to.

NOTE: Even though the flight controller failsafe has been set by the wizard, it is important to also set the R/C Rx failsafe.

see https://github.com/cleanflight/cleanflight/blob/master/docs/Failsafe.md for cleanflight specific failsafe test procedure.

On the EzUHF this is as easy as setting the controls in a 'safe' position (very low throttle for example) and holding down the bind button on the EzUHF Tx until a beep is heard.

Flyaways with mini-quads are almost always caused by incorrect failsafe settings!

NOTE: Currently there is no 'servo reverse' feature in Cleanflight. This means that if one of the R/C transmitter channels is reversed, the wizard will not complete correctly.

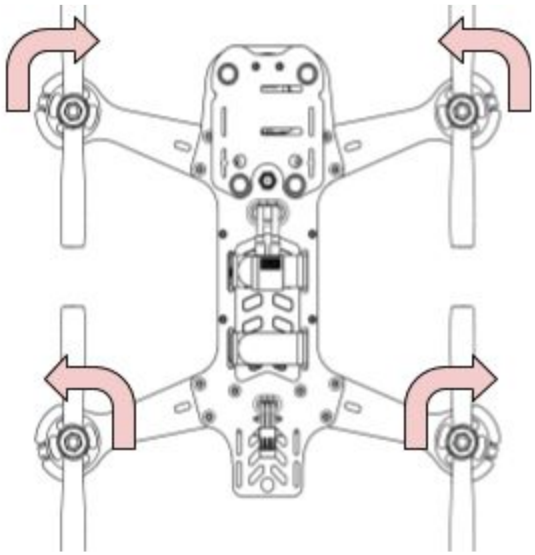
It is highly recommended to start the wizard with a 'new' profile in the R/C radio, without any channel reversing, and also without any expo. Expo is all handled within the Pro-Tuning profiles.

All Done, Time To Fly

At this point in the Getting Started manual, the Vortex Mini should be ready for its maiden flight.

The Wizard has setup the flight controller with our default Pro-Tune, generated by one of our expert team pilots. PIDs and gains are unlikely to require major changes to achieve precise flight.

If the props were removed during setup (as we highly recommend), please re-install taking care of the prop directions below:



Take it easy for the first few LiPos, and get used to your new Vortex.

P.S. To arm the flight controller after running the wizard, for mode 2, move the throttle stick down and to the right. See 'Flight Controller Stick Commands' in the main manual.

The ImmersionRC Team wishes you many hours of enjoyment with your new Race Quad, and welcome any feedback that you may have at: feedback@immersionrc.com

The Getting Started Manual should have got you airborne. It is a good idea to read the full Instruction Manual also, which contains many more details than this abbreviated manual

Spares and Repairs

As with any Race Quad, the first items likely to break on your Vortex are the props.

The props shipped with your 150 Mini are HQ 3030 tri-blade 3".

Other props that have been tested with the 150 Mini and survive the occasional knock are RaceKraft 3030 tri-blade, or for a little more punch, the quad-blade version.

Part numbers for other spare parts may be found on the ImmersionRC website, on the Vortex 150 Mini product page.

Specifications

Flight Controller	
IMU	Invensense MPU6000, 3 axis Gyro, 3 axis Accelerometer (SPI)
Altimeter	N/A
CPU	STM32F303 32-bit ARM processor
Firmware	Cleanflight/Betaflight compatible *(with API version matching that of the OSD)*
OSD	
CPU	STM32F373 32-bit ARM processor
Resolution	440H x 280V
Style	White, with black surround around all pixels
Output	Programmable Black/White levels
Video Tx Features	
Transmitter Module	Custom Tramp HV, integrated on FC/OSD board (Synergy)
Channels	40 Initially, programmed via OSD
Bands	5, including the ImmersionRC/FatShark bands, and RaceBand
Frequency, IRC/FS	5740, 5760, 5780, 5800, 5820, 5840, 5860, 5880 MHz *
Frequency, RaceBand, CH1..8	5658, 5695, 5732, 5769, 5806, 5843, 5880, 5917 MHz *
Frequency, 'A' Band, CH1..8	5865, 5845, 5825, 5805, 5785, 5765, 5745, 5725 MHz *
Frequency, 'B' Band, CH1..8	5733, 5752, 5771, 5790, 5809, 5828, 5847, 5866 MHz *
Frequency, 'E' Band, CH1..8	5705, 5685, 5665, 5645, 5885, 5905, 5925, 5945 MHz *
Power Output	350mW +/- 1dB (EU version of the 150 Mini limited to 25mW)
Audio	Stereo, Right channel used for Telemetry, Left channel for onboard mic.
Recommended Antenna	Supplied SpiroNET Omni, Skew Planar, 4 leaf
Power Train	
Standard Prop	HQ 3030
Maximum Prop Size	3"
Motors	OEM 1306-3100kV
Recommended Battery	850mAh 4s 65C
ESC	

Type	ImmersionRC EzESC 16A
Rating	16A continuous, 20A peak
Features	OneShot125, Multishot, and Motor Braking
Processor	32-bit ARM running custom ImmersionRC ESC Firmware
R/C Receiver	
Channels Required	Absolute minimum four. Five recommended to support mode switch.
Interfaces	3.3v-5v PPM Sum, SBUS, Spektrum, XBus, SumD, SumH
Receiver Power	+5V or +3.3V @ 200mA max.
Flight Characteristics	
Flight Time	Depends upon battery, and flight style
Maximum Range	Highly dependent on battery, and flying style
Maximum Speed	TBD (Fast!)
Weight and Size	
Weight, as Shipped, ARF	~215g (249.99g with 500mAh 4s pack)
Size	155mm between diagonal motors

** Note: Certain 5.8GHz channels may be restricted depending upon the target region, and reseller requirements.*

Support

First line of support is handled by the reseller. If you encounter any problems with your ImmersionRC product please contact them first.

For Warranty, and non-Warranty repairs, email repairs@immersionrc.com . We have repair centers in the UK, US, and Australia.

Peer support is available in several places:
https://www.facebook.com/groups/ImmersionrcVortex/
http://fpvlab.com/forums/forumdisplay.php?22-ImmersionRC

We actively monitor these groups/forums and provide support here.

Regulatory notice

The use of this product may be prohibited in your country/region/state, please verify that the RF output power and frequencies used by this transmitter comply with local rules and regulations, this product may require a license to operate.

Directions on safety

ImmersionRC advocates the safe use of their products, always make sure you equipment is in proper working order, is checked prior to every flight and that your are familiar with and respect the equipment's capabilities and limitations. Do NOT fly recklessly, do NOT fly near airports, freeways, towns, people, etc, basically anywhere where a equipment failure or pilot error can result in injury or damage to people and/or property.

Even a lightweight mini-quad, when travelling at high speed, can do some serious damage to property, or persons, please always consider what could possibly go wrong and plan your flight and selection of location responsibly.

Warranty

For warranty claims or repair requests please consult the retailer that you purchased this product from, they will be able to help you with your warranty claim or repair request.

Social Networks

Like Us

We would like thank you for purchasing this ImmersionRC product.

Like ImmersionRC's Facebook page and be kept up-to-date with news, product releases, firmware updates, tips and tricks, and other information relevant to the FPV hobbyist.

http://www.facebook.com/ImmersionRC

You can also follow us on Google Plus

google.com/+immersionrc

We have even been known to Tweet on occasion

https://twitter.com/@immersionrc