



Viper

# R/C COMBAT ROBOT KIT



USER MANUAL

FingerTechRobotics.com

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**It is recommended to read through all of the instructions to familiarize yourself before starting.**

**INCLUDED IN YOUR KIT**

- 1 Anodized 6061 Aluminum Chassis
- 2 FingerTech "Silver Spark" 33.3:1 Gearmotors
- 2 FingerTech "tinyESC" Motor Controllers
- 2 FingerTech 2.25" Foam Rubber "Snap Wheels"
- 2 FingerTech "Snap Hubs"
- 1 Power Jack and Plug
- 1 7.4V lipoly battery
- 2 FingerTech Mini Terminal Blocks
- 2 Polycarbonate Armor (Top and Front)
- 4 2-56x1/8" screws
- 10 6-32x1/4" screws
- 1 0.05" hex wrench
- 1 5/64" hex wrench
- 1 Snap Ring Pliers

**Not Included:**

- 1 2.4GHz 6-Channel Transmitter (+ 8 AA batteries)
- 1 2.4GHz 6-Channel Receiver
- 1 Threadlock liquid (medium strength)
- 1 Lipoly battery charger

## SAFETY



**Take every precaution  
when building your robots**

The Viper kit itself does not pose much hazard beyond pinched fingers. As you surely will be adding new parts and upgrades in the future, it is important to know how to safely handle them. Batteries, motors and electronics each have their own dangers. If you are unsure how to safely handle them, ask someone who knows!

- 💣 Events must be run with strict rules to keep competitors and spectators safe, but it is up to you to keep your work area safe.
- 💣 More builders get injured in the construction process than during the combat tournament. Power tools can be dangerous if used incorrectly.

**SAFETY**

- 💣 **Make sure a responsible adult is present when building and operating your robot.**
- 💣 **Wear safety glasses, hearing protection, and a dust mask when necessary.**
- 💣 **Have the robot's wheels off the ground when turning it on. If settings are wrong the robot may drive right at you.**
- 💣 **Weapon testing should be done inside a heavy wooden box with a thick polycarbonate window to contain possible flying debris.**
- 💣 **Remember to always turn the transmitter on before powering on the robot, and always turn the transmitter off after powering down the robot. This way any spurious transmissions picked up by the receiver will not cause the robot to twitch.**

## ASSEMBLING THE VIPER



**An important note about lithium polymer (lipoly) batteries!**

Lipoly batteries have an enormous energy density which makes them fantastic for this sport - where a lighter battery can mean stronger armor or weapons. But this battery chemistry must be treated properly or could become dangerous.

If a lipoly pack is discharged below 3.3V per cell (6.6V for a 2S pack) then they will not be safe to recharge. If your robot starts to slow down, it needs to be recharged!



If a pack is ever damaged or seems puffed up, do not try to charge it. Replace the pack and recycle the old one.

The included Rhino 7.4V 360mAh pack can be charged at maximum 0.8A. (This is set on the charger.)

## BEFORE YOU BEGIN

- ⌚ Make sure you have all of the kit contents plus a lipoly charger for your battery.



- ⌚ Your transmitter requires 8 AA batteries. If you plan to use it frequently, you may want to purchase a rechargeable 3S lipoly transmitter pack or AA-size NiMH rechargeable batteries.

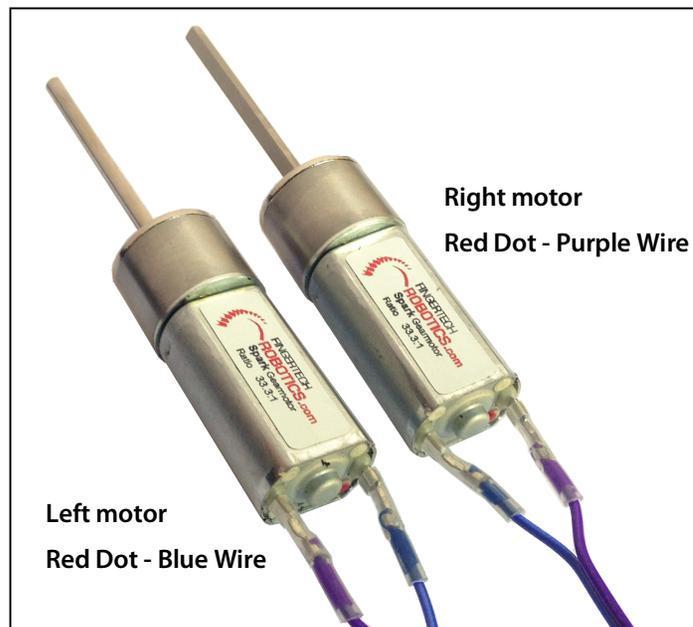


- ⌚ It is highly recommended to use a medium strength threadlock liquid on all screws and setscrews so they do not vibrate loose during combat. Threadlock takes a day to cure properly, so get your robot done and tested well before the event!



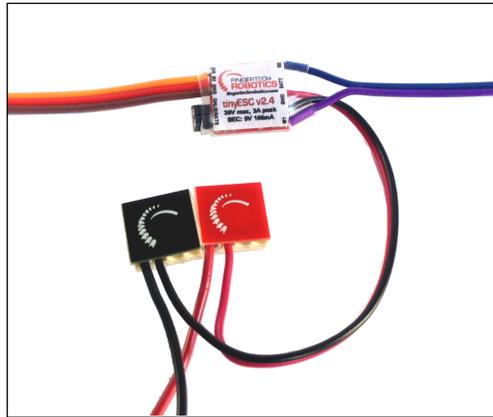
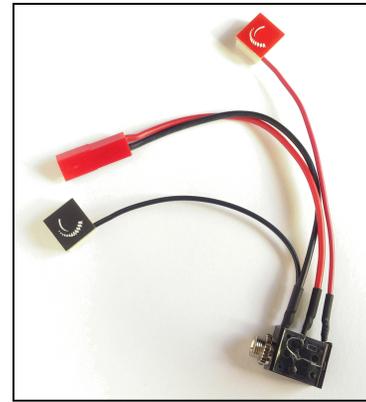
## ASSEMBLING THE VIPER

1. The tinyESCs in the Viper kit have special push connectors crimped onto the motor leads.
2. Connect the blue wire (labeled "M2") of one tinyESC onto one motor's red-dot terminal. Connect the purple wire ("M1") to the motor's second terminal. This will be the left motor.
3. Connect the purple wire ("M1") of the other tinyESC to the right motor's red-dot terminal. Connect the blue wire ("M2") to the motor's other terminal.



**ASSEMBLING THE VIPER**

4. The power switch comes with a female JST lipoly battery connector plus one red and one black wire.

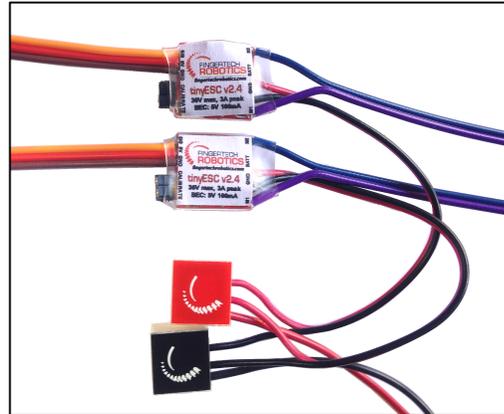


5. The red/black wires are plugged into the red/black terminal blocks. Plug the red/black wires from both tinyESCs into these terminal blocks too.

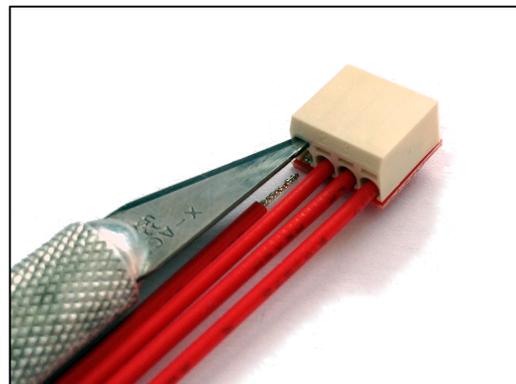
**Note:** This switch is wired so that rechargeable batteries can be charged through it (see page 19). Because both positive and negative battery leads are in this switch, do not use a solid metal rod in place of a lost power plug! Use only a “3.5mm Mono Headphone Plug” or you will cause a short circuit.

## ASSEMBLING THE VIPER

With all the wires plugged in, there will be one free spot in each terminal block for future upgrades.



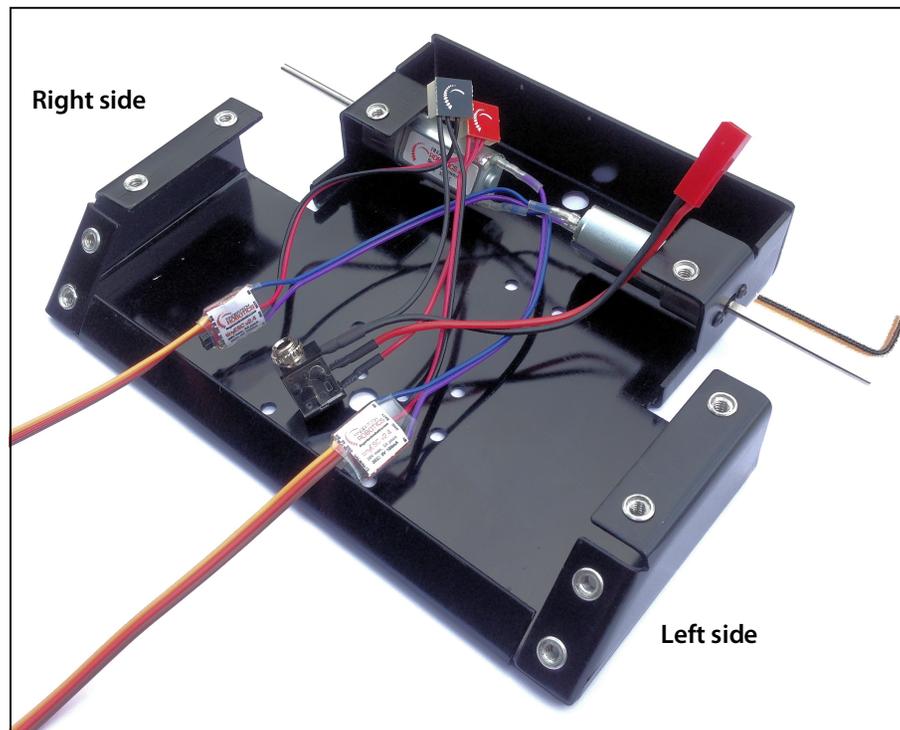
If you need to release a wire from the terminal block, push a flat tool into the slot above the wire and it will freely come out.



**ASSEMBLING THE VIPER**

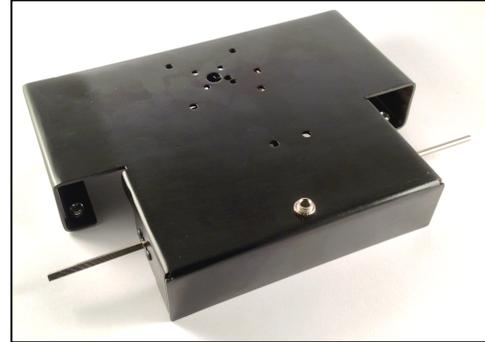
- Slide the left motor into the left motor mount hole, and the right motor into the right motor mount hole.
- Tighten the motors into place with four 2-56x3/16" screws using the 0.050" (smaller) hex wrench.

Have the motor wires angle towards the front of the robot.

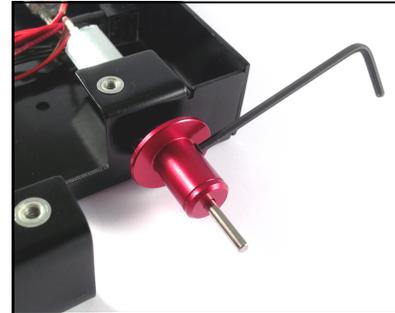


## ASSEMBLING THE VIPER

8. Tighten the power jack onto the baseplate using its finger-nut. Pliers can help get it tight.



9. Slide the Snap Hubs onto the motor shafts and tighten both setscrews. (Use threadlock.)



10. Push the tires over the hubs, then the washer.

11. Load a snap ring onto your Snap Ring Pliers. Squeeze and compress the tire and push the washer past the snap ring groove. Hold the washer in place with one hand and install the snap ring.



**ASSEMBLING THE VIPER**

12. Plug the right tinyESC into Channel 1 of the 2.4GHz receiver.

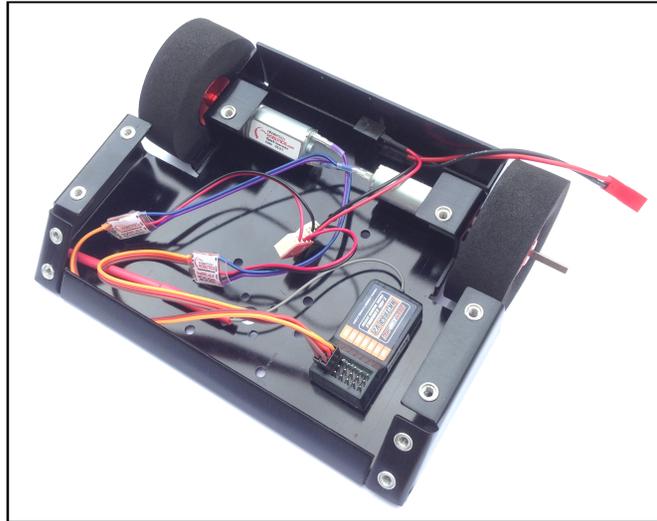
**\*Make sure the ground wire (black or brown for all motor controllers and servos) is closest to the edge of the receiver.**

13. Plug the left tinyESC into Channel 2 of the receiver.



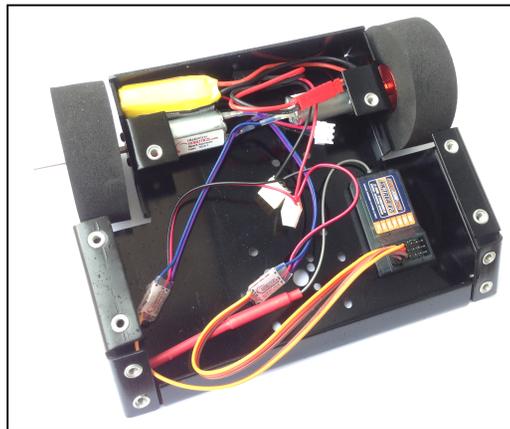
14. Fix down your receiver. Electrical tape, double-sided foam tape, or adhesive-backed Velcro all work well.

## ASSEMBLING THE VIPER



15. Time for a test! Make sure the power plug is inserted in the bottom of the robot (so the robot is off). Set the robot on something so that the wheels are off the ground.

16. Plug the lipoly battery into the connector and tuck it behind one of the motors.



**ASSEMBLING THE VIPER**

17. Remove the power plug to turn the robot on. When the robot is on, each motor controller's LEDs blink to say different things:

Slow blink (red)	No data coming from the radio. (Motor failsafes to off.)
Rapid blink (green)	Transmitter stick is in the forward half of its travel
Rapid blink (red)	Transmitter stick is in the reverse half of its travel
Solid on (green/red)	Transmitter stick is at full travel in either forward or reverse
Solid on (green)	If the calibration pins are jumpered, this indicates calibration mode.

## ASSEMBLING THE VIPER

### 18. Test the drive motors.

The transmitter has been preprogrammed with Channels 1 and 2 mixed for single-stick driving.

With the robot facing away from you, move the right stick up. Both motors should turn forward.

Moving the stick to the right should reverse the right motor and vice versa for the left. If either motor turns the wrong way, see the troubleshooting section.

If the motors are spinning while not pressing the transmitter sticks, adjust the Trim levers on the transmitter (located just beside the stick) until the motors stop. Trims are for fine adjustments.

### 19. When everything is running correctly, turn the robot off by reinserting the power plug.

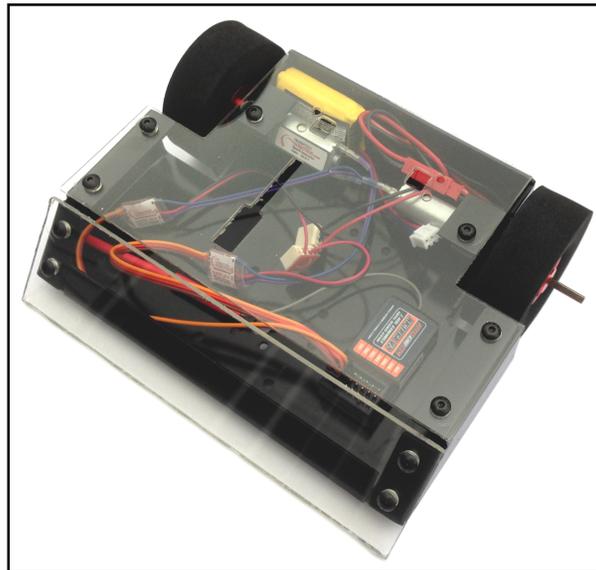
Don't forget to turn the transmitter off too.

## ASSEMBLING THE VIPER

20. Fasten the top and front armor on using ten 6-32 x 1/4" screws with the 5/64" hex wrench (the larger wrench).



21. Your kit is complete!  
Power it up and take it for a test drive!



## **BINDING YOUR RADIO**

This process is already done for you, but for future robots it is good to know how to bind your transmitter to more receivers.

The 2.4GHz radio set included with your kit does not use crystals to pair the receiver to the transmitter like older radios. Instead they are “bound” together by programming. To bind, insert the included “bind plug” into the battery port (BAT) of the receiver.

Power on the receiver by removing the robot’s power plug. A dim red LED inside the receiver will start flashing.

Holding the BIND button on the transmitter, turn on the transmitter, and wait for the red LED inside the receiver to go from flashing to solid-on. Remove the bind plug, and it’s done! Turn the transmitter off, robot off, transmitter on again, and lastly the robot on again. (Always follow this order.)

## UPGRADES

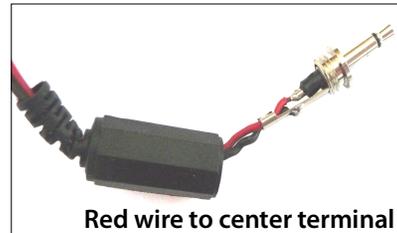
### Lithium Polymer Batteries

Your kit comes with a 2-cell (2S, or 7.4V) lipoly battery. For more power and speed, it can be upgraded to a 3-cell (3S, or 11.1V) pack. If you are adding a servo or other electronics, make sure they can handle the higher voltage! (Most servos cannot.)



### Modifying a Power Plug for Recharging

If you lose your Power/Charge Plug, here is how to solder a “Male JST connector” to a 3.5mm mono plug for recharging batteries:



Now you can plug your charger into the power switch and recharge without removing the Viper’s lid!

## UPGRADES

### Adding Active Devices

Your radio transmitter has four channels besides the two for drive that you can use to control additional active devices.

Some combat robot events have added “Sportsman” weight classes that require active weapons. This is defined as “a weapon or device intended for use in attacking the opponent, independent of the robot drive train.” These include (but are not limited to) lifters, hammers, clamps, flame weapons and spinning weapons.

The Viper combat kit has two optional add-on packages for turning the basic Wedge robot into either a Lifter or a Spinner. Visit our website for more information!

### Shedding Weight

If you want to add things, you may need to make some weight for them! You can drill holes in the baseplate, shorten the motor shafts, remove the plastic case of the receiver, shorten/sharpen the front wedge, and shorten/solder all the wires. You can swap the 0.75” thick wheels for 0.5” thick, change the 360mAh lipoly battery for a smaller one, or even replace all the steel screws with aluminum ones! Every gram counts!

## MOVING FORWARD

### The SPARC Forum



### The SPARC forum

is where builders from across the globe discuss robot designs, share progress reports, ask questions, and find out about combat robot events. The people there are very knowledgeable and helpful.

<http://sparc.tools/forum/>

### The COMBAT ROBOTICS Facebook Page

The Facebook logo, consisting of the word "facebook" in white lowercase letters on a blue rectangular background.

A more public page to chat about robot designs and events. You will need to ask to join the group—it's how they keep out spammers!

<https://www.facebook.com/groups/RobotCombat/>

### FingerTech Robotics Facebook Page

Find out about new products and see pictures of other peoples' creations. Send us your robot pictures and we will post them in our album!



<https://www.facebook.com/FingerTech>

## MOVING FORWARD

### For More Information:

Here is a list of some other online forums and websites dedicated to hobby robotics.

#### SPARC.tools

<http://sparc.tools>

#### Society of Robots

[www.societyofrobots.com](http://www.societyofrobots.com)

#### Lets Make Robots!

<http://letsmakerobots.com>

#### Trossen Community

<http://forums.trossenrobotics.com>

#### Parallax Forums

<http://forums.parallax.com/forums>

#### Robots.net

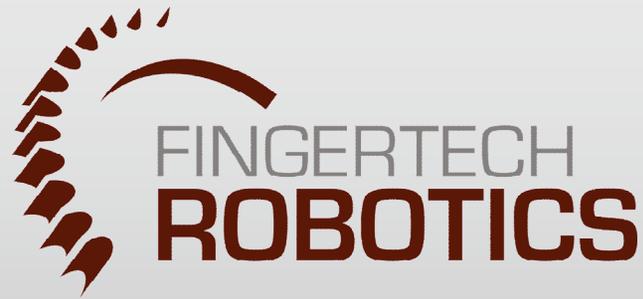
<http://robots.net>

#### Servo Magazine Forum

<http://forum.servomagazine.com>

**TROUBLESHOOTING**

Problem	Solution
Motor controller LED is blinking slowly.	Check that your transmitter is on. Try re-binding the receiver to the transmitter.
Motor turning the wrong direction.	Re-solder the motor wires to the opposite motor leads.
Motor spins slowly when not holding transmitter stick.	Adjust the transmitter's Trim lever for the corresponding channel.
No Response with power switched on.	Make sure the bind plug is out of the receiver. Try re-binding the receiver to the transmitter.
Batteries getting hot.	Make sure no red/black leads are connected to each other. This would create a short circuit.



**HANDS-ON INNOVATION**

Motors and Servos ■ Motor Controllers

Connectors and Switches ■ Wheels

Radio Equipment ■ Hardware

Pulleys and Belts ■ Battery Chargers

Autonomous and R/C Robot Kits

**FINGERTECHROBOTICS.COM**

Questions or comments regarding our products or your purchase can be directed to [sales@fingertechrobotics.com](mailto:sales@fingertechrobotics.com)