FINGERTECH ROBOTICS

Viper

Starter R/C Robot Kit

USER MANUAL

FingerTechRobotics.com

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KIT CONTENTS

1	2.4GHz Transmitter
1	2.4GHz Receiver and Bind Plug
1	Aluminum Chassis
2	FingerTech "Spark" Gearmotors
2	FingerTech "tinyESC" Motor Controllers
2	Foam Rubber Wheels
2	FingerTech "Lite Hubs"
1	Power Jack and Plug
1	Polycarbonate Lid
4	2-56x3/16" screws
8	4-40x1/4" screws
2	4-40 setscrews
1	0.050" hex wrench
1	1/16" hex wrench

Tools Required

- Soldering iron & solder
- "Helping Hands" alligator clip soldering aid
- CA or Gorilla super glue
- Electrical tape or adhesive-backed velcro
- One or two 9V batteries
- Pliers

Safety

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!

Take every precaution when building your robots

- Have the robot's wheels off the ground before turning it on the first time. If settings are wrong the robot may drive right at you. Always make sure you have full control before doing a drive test.

Safety

For you combat enthusiasts:

Building combat robots can be dangerous!

- Wear safety glasses, hearing protection, and a dust mask when necessary.
- Make sure a responsible adult is present when building and operating your robot.
- It is a fact that more builders get injured in the construction process than during the combat tournament.

Safety

- Never test a combat robot's weapon unless it is clamped tight and unable to move. When you do activate it, stand behind a protective shield. A large sheet of wood with a polycarbonate window is best.
- 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.
- Keeping yourself in the game is rule #1!

Before You Begin

Make sure you have all of the kit contents plus one or two 9V batteries.

Your transmitter requires 8 AA batteries. If you plan to use it frequently but for short periods, you may want to purchase NiMH rechargeable AA batteries.

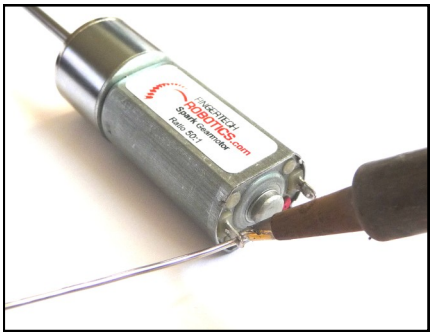
Before You Begin

Suggestion

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

Assembling Your Viper Kit

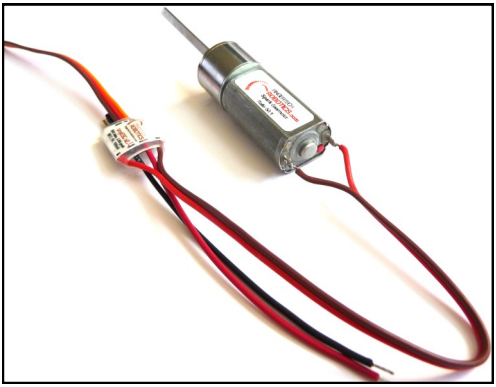
1. Melt a bit of solder onto each motor terminal. This is called "tinning" and makes soldering easier.



   The tinyESC wires come pre-tinned.

2. Solder the brown wire (labeled "M2") of one tinyESC to one motor's red terminal. Solder the red wire (labeled "M1") to the motor's second terminal. This will be the **left** motor.

3. Solder the red wire ("M1") of the other tinyESC to the **right** motor's red-dot terminal.

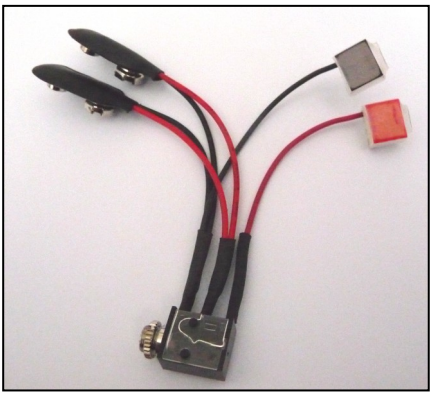


   Solder the brown wire ("M2") to the motor's other terminal.

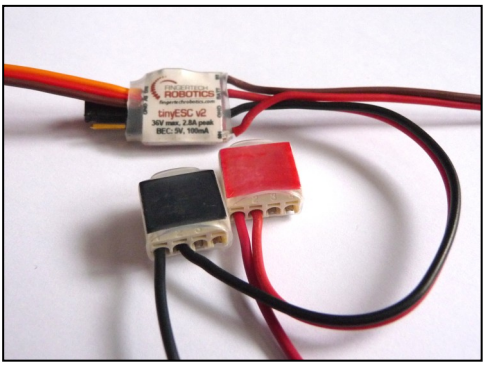
   That's it for soldering!

Assembling Your Viper Kit

4. The power switch comes pre-soldered with 9V battery snaps and one red and one black wire.



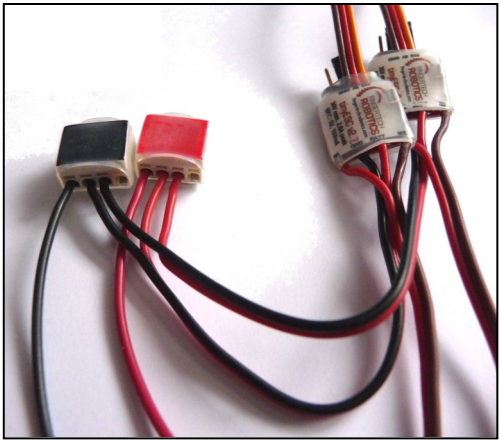
5. The red/black wires are plugged into the red/black terminal blocks. Plug the red/black wires from both tinyESCs into these terminal blocks too.



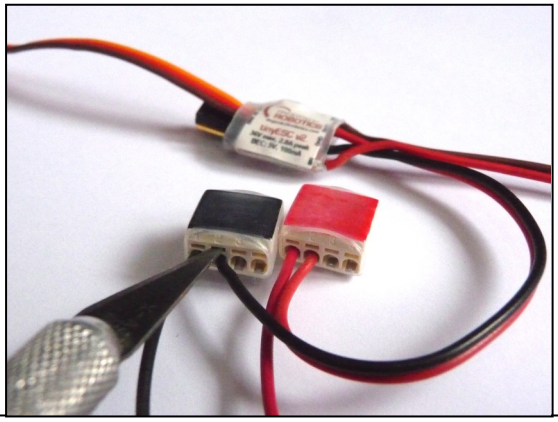
Note: This switch is wired so that rechargeable batteries can be charged through it (see pg24). Because both positive and negative battery leads are in this switch, do not use a solid metal rod in place of a lost power plug! Use only a "3.5mm Mono Headphone Jack" or you could cause a short circuit.

Assembling Your Viper Kit

With all the wires plugged in, there will be one free spot in each terminal block for future upgrades. (Each terminal slot is capable of 6A of continuous current.)

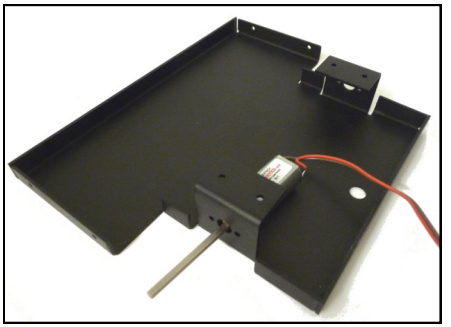


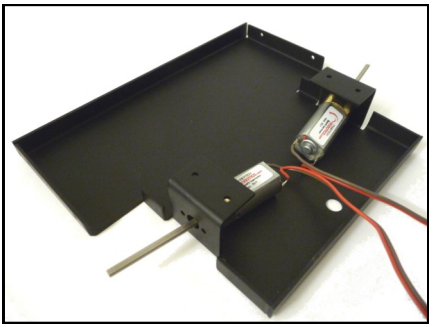
If you need to release a wire from the terminal block, push a flat tool into the slot above the wire and it will freely come out.



Assembling Your Viper Kit

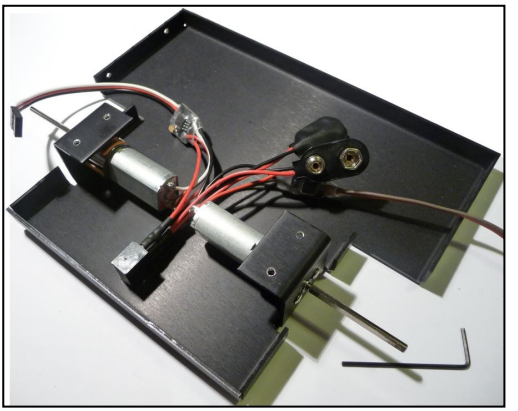
6. Slide the **left** motor into the left motor mount hole, and the **right** motor into the right motor mount hole.





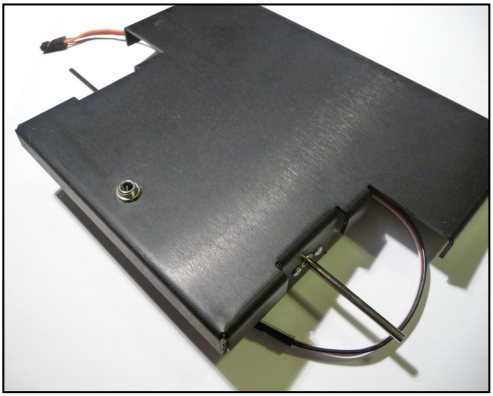
7. Tighten the motors into place with four 2-56x3/16" screws using the 0.050" (smaller) hex wrench.

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

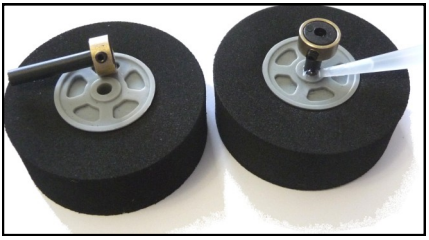


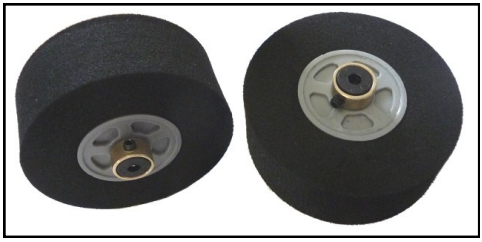
Assembling Your Viper Kit

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



9. Press the Lite Hubs part-way into the wheels. (One side of the wheel is smaller, so if they do not fit in, try the other side.) Do not force the hubs - they have a thin wall and may snap.



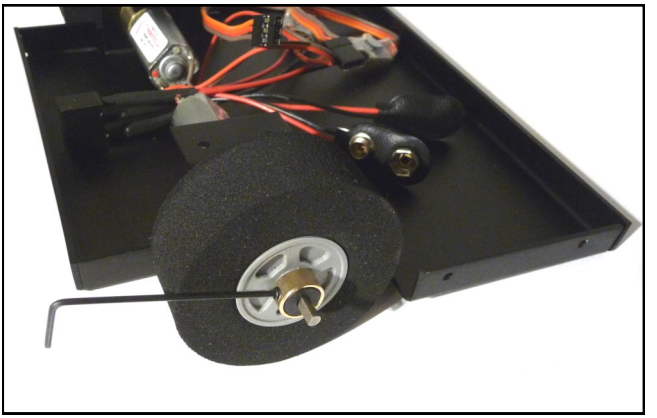


10. Put a small dab of CA or Gorilla super glue onto the shaft of one Lite Hub. Quickly turn the wheel over and press it down onto the hub. Repeat for the other wheel and hub.

Assembling Your Viper Kit

11. Slide the wheels onto the motor shafts.

    Using the 0.050" (smaller) hex wrench, tighten the setscrew in each Lite Hub to lock the wheels in place on the shafts.



Be sure that the setscrew tightens onto the flat side of the motor shaft. This will make sure the wheel cannot spin on the shaft.

Assembling Your Viper Kit

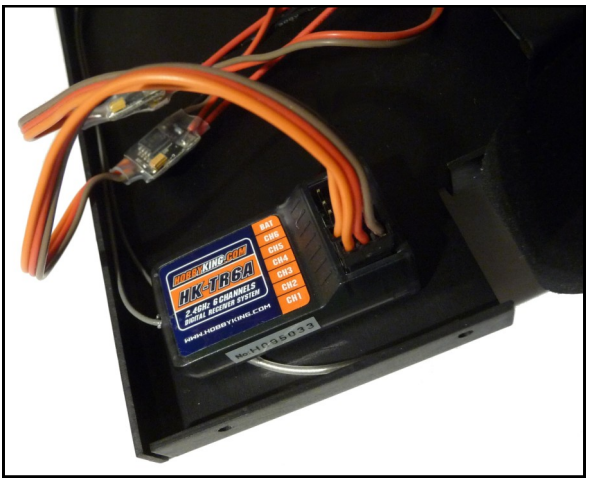
12. Plug the **right** tinyESC into Channel 1 of the 2.4GHz receiver.

    *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.

Assembling Your Viper Kit

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



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.

    Plug a 9V battery into one (or both) of the connectors. (Do not let the other connector short circuit by touching the metal chassis.)

Assembling Your Viper Kit

16. 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 (see troubleshooting)
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 Your Viper Kit

17. 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.

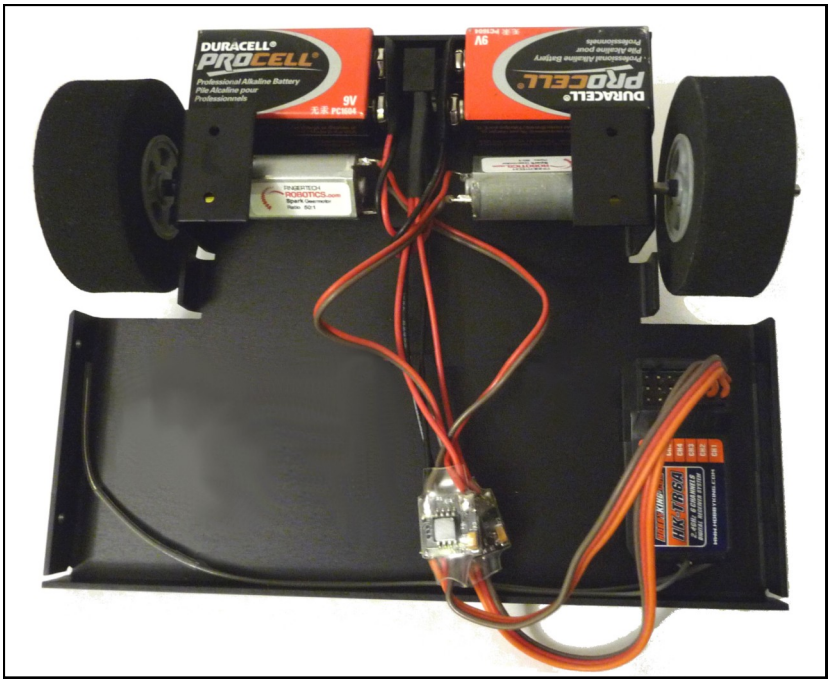
    If the motors are spinning while not pressing the transmitter sticks, adjust the Trim levers on the transmitter (located just beside the stick) until the motors stop. Trims are for fine adjustments.

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

    Don't forget to turn the transmitter off too.

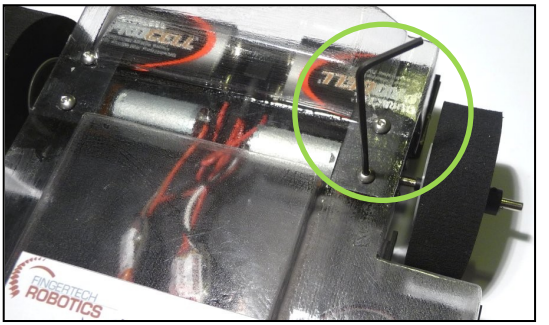
Assembling Your Viper Kit

19. Fix down your one or two 9V batteries on either side of the power jack.



Assembling Your Viper Kit

20. Fasten the lid on using eight 4-40 x 1/4" screws and the 1/16" hex wrench (the larger wrench).



21. Your kit is complete!

Power it up and take it for a test drive!

Assembling Your Viper Kit

Safety Note

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.

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 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!

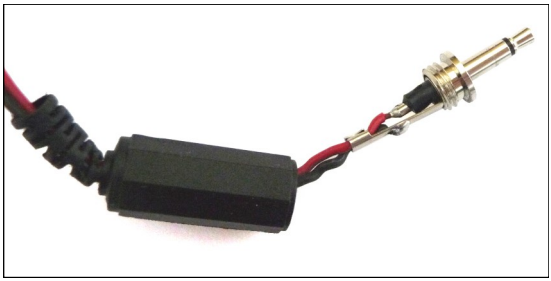
Construction Tips

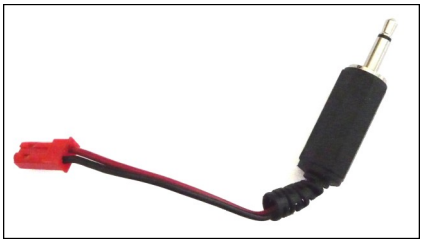
Upgrades

Larger wheels, lower ratio gearmotors, and higher voltage batteries will speed up the robot.

Lipoly batteries can source more current for power-hungry weapon motors and servos, and are rechargeable. You will need to replace the 9V snaps with an appropriate connector.

Here is how to wire your power plug for recharging batteries:





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

Construction Tips

Adding Active Devices

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

Use your imagination! You can add servos, motors, or switches that activate lights, solenoids, water pumps, electromagnets, almost anything!

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.

Construction Tips

Combat Armor

If you are attending a combat event that features opponents with weapons (most do), you will want some extra protection against them. Garolite is an excellent material for its stiffness. Plastic such as lexan (polycarbonate) or UHMW (polyethylene) are easy to work with. Aluminum makes good lightweight armor. Steel and titanium are good in weapons.

Find these upgrade parts and armor materials at **www.FingerTechRobotics.com**

Moving Forward

The ROBOT FIGHTING LEAGUE Forum

The RFL forum is where builders from across the globe discuss robot designs, share progress reports, ask questions, and find out about combat robot events. More than 10 years of helpful posts!

http://forums.delphiforums.com/THERFL/

The ROBOTICS COMMUNITY Facebook Page

A more public page to chat about robot designs and events.

www.facebook.com/groups/RoboCommunity/

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.

Society of Robots
http://www.societyofrobots.com

Lets Make Robots!
http://letsmakerobots.com

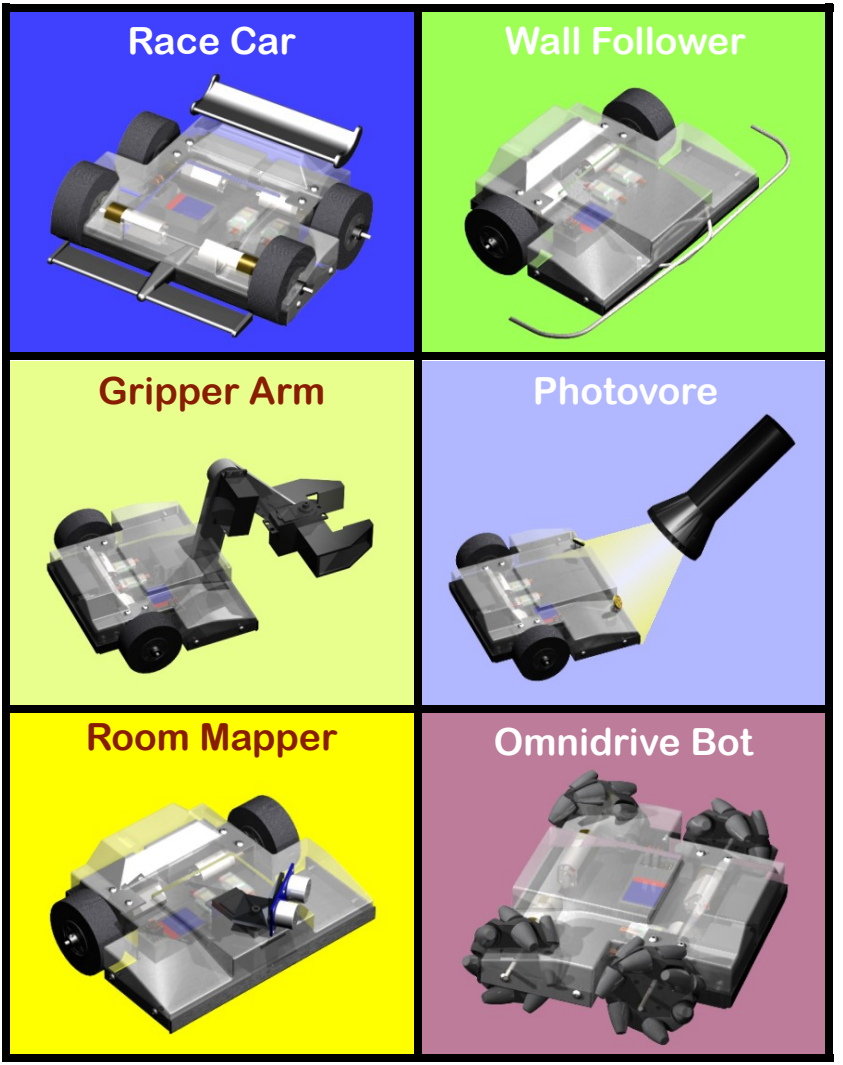
Trossen Community
http://forums.trossenrobotics.com

Parallax Forums
http://forums.parallax.com/forums

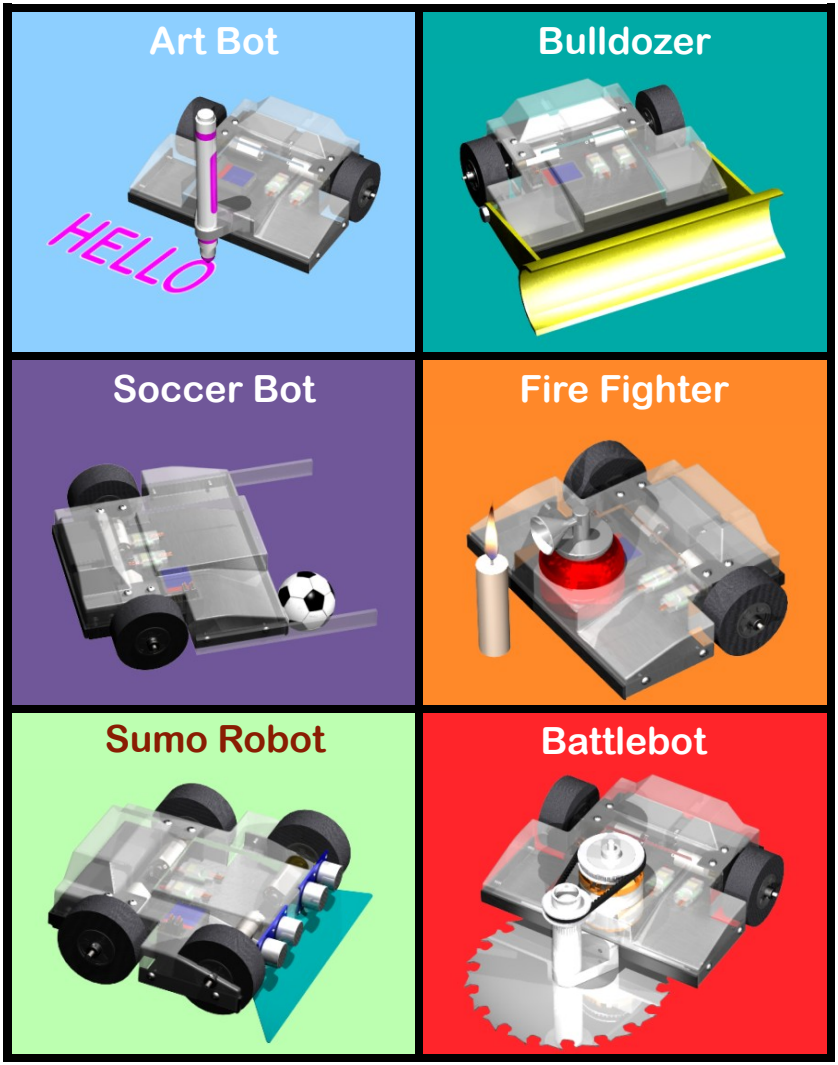
Robots.net
http://robots.net

Servo Magazine Forum
http://forum.servomagazine.com

More Ideas


Race Car
Wall Follower
Gripper Arm
Photovore
Room Mapper
Omnidrive Bot

More Ideas


Art Bot
HELLO
Bulldozer
Soccer Bot
Fire Fighter
Sumo Robot
Battlebot

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

Robot Kits

FingerTechRobotics.com

Questions or comments regarding our products or your purchase can be directed to sales@fingertechrobotics.com