

welcome!

This Inventor's Guide is provided as part of the Vex Starter Kit as a tool to help you get started using your robot. Depending on how much experience you have had with robotics in the past, you will find different parts of this manual to be most useful.

Using this Guide

The Vex Robotics Design System supports open exploration by users of any skill level. Three "tracks" are described below that will help you to get started with the kit, based on the amount of experience you already have in the field of robotics.

All Users Track

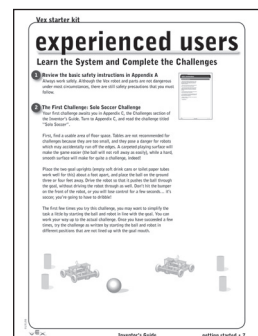
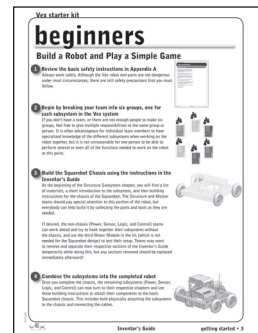
Users old and new should start with the ALL USERS section, which covers material that both new and veteran users will need to get started.

Beginner Track

The BEGINNERS section is for users with a minimal amount of knowledge in the field of robotics to get up and running quickly, and to learn by doing, rather than being overwhelmed with technical information from the start. Exploration is encouraged if you would like to learn more about a particular area, but not required in order to complete the tasks.

Experienced Users Track

The EXPERIENCED USER section is for those who have worked with robots or in related fields in the past, especially those who have participated in FIRST competitions. The approach in this track is centered around tackling a simple challenge, and learning the particulars of the Vex system as you go, then moving on to more difficult challenges.



all users

How to use the Vex Starter Kit the first time

1 Unwrap the Inventor's Guide chapters and insert them into the binder.

Start with the packet containing the Subsystem Dividers (with the colored tabs), then add the chapter packets in behind the appropriate dividers. If your subsystems get out of order, the supplied table of contents can help you set them straight.

Your Inventor's Guide Binder is the central repository for information about the Vex Robotics Design System and all its components and accessories.

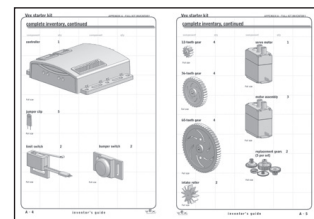
The Starter Kit includes the first set of chapters, but as your designs evolve, you will add new parts and accessories that will expand your robotic repertoire. Whenever you decide to expand your robot's horizons, your binder will expand with them. Every accessory and part in the Vex line comes with all the information you need on a page that drops right into your binder so you don't need to worry about losing it—or getting lost yourself.

Your kit also includes a product registration card packed on top of the documentation, which you should fill out and send in before you forget.



2 Take an inventory of all the parts in the kit to make sure you have everything.

Turn to Appendix D at the back of your newly constructed binder, and use the parts listing there to make sure you have all the pieces in the kit. If you have parts storage bins or an organizer case, this would be a great time to unpack the parts from the box and move them to their new homes.



3 Start charging your batteries

Standard AA alkaline batteries can be used to power the Radio Transmitter for your first few uses if needed, but the Vex Micro Controller cannot be run on alkaline AAs. You will need a set of non-alkaline (preferably NiCd) rechargeable batteries. See the Power Subsystem section of the Inventor's Guide for more information.

Since batteries typically take between 4 and 14 hours to charge (depending on your charger) and are typically shipped empty or with only a partial charge, you should plug them in now so they will be ready as soon as possible. In order to ensure a healthy battery charging cycle, don't use the batteries until they have finished charging.

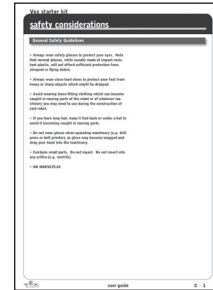


4 You are now ready to build a robot!

beginners

Build a Robot and Play a Simple Game

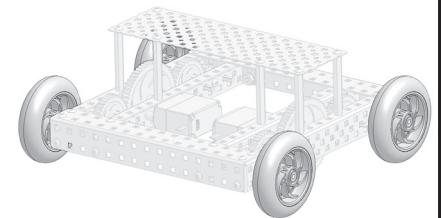
1 Review the basic safety instructions in Appendix A
Always work safely. Although the Vex robot and parts are not dangerous under most circumstances, there are still safety precautions that you must follow.



2 Begin by breaking your team into six groups, one for each subsystem in the Vex system
If you don't have a team, or there are not enough people to make six groups, feel free to give multiple responsibilities to the same group or person. It is often advantageous for individual team members to have specialized knowledge of the different subsystems when working on the robot together, but it is not unreasonable for one person to be able to perform several or even all of the functions needed to work on the robot at this point.

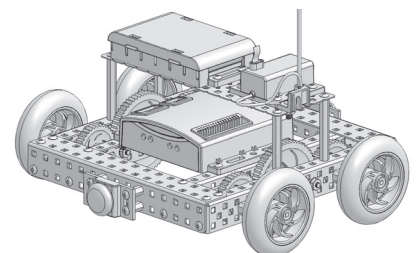


3 Build the Squarebot Chassis using the instructions in the Inventor's Guide
At the beginning of the Structure Subsystem chapter, you will find a list of materials, a short introduction to the subsystem, and then building instructions for the chassis of the Squarebot. The Structure and Motion teams should pay special attention to this portion of the robot, but everybody can help build it by collecting the parts and tools as they are needed.



If desired, the non-chassis (Power, Sensor, Logic, and Control) teams can work ahead and try to hook together their subsystems without the chassis, and use the third Motor Module in the kit (which is not needed for the Squarebot design) to test their setup. Teams may want to remove and separate their respective sections of the Inventor's Guide temporarily while doing this, but any sections removed should be replaced immediately afterward!

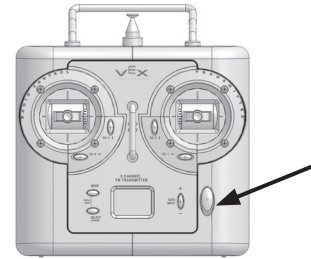
4 Combine the subsystems into the completed robot
Once you complete the chassis, the remaining subsystems (Power, Sensor, Logic, and Control) can now turn to their respective chapters and use those building instructions to attach their components to the basic Squarebot chassis. This includes both physically attaching the subsystems to the chassis and connecting the cables.



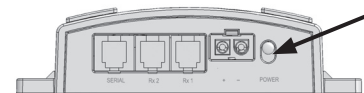
beginners, continued

5 Test the robot

Once you have completed the robot, extend the antenna on the Radio Control Transmitter and turn it on by flipping the power switch on the front of the transmitter.

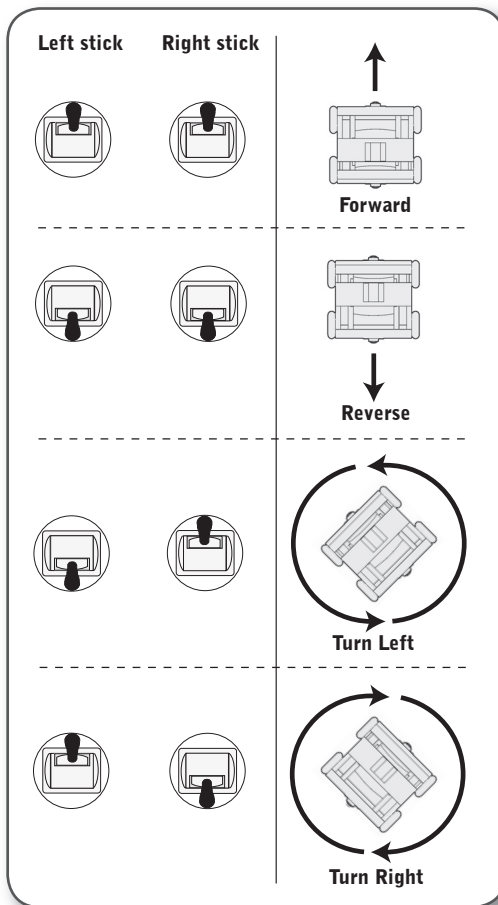


Once the Transmitter is on, you can turn on the Vex Micro Controller module on the robot by flipping its power switch (located next to the battery port).



You should see green lights for the Power Status and Rx1, and the large light blinking occasionally.

If you built and connected everything according to the instructions, you should now be able to drive the robot around using the sticks on your Radio Control Transmitter. The controls are as follows:



In addition, the bumper switch sensors on the front and rear of your robot are configured to act as "tag points." When they are hit by another robot or obstacle, your robot will be temporarily disabled.

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beginners, continued

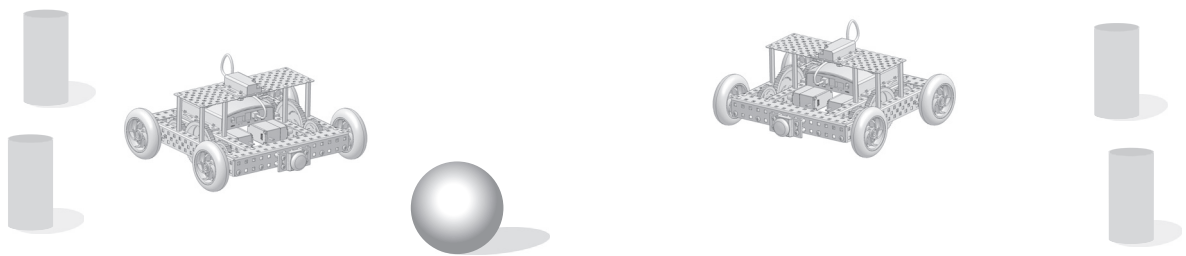
6 Solo Soccer Challenge

Your first challenge awaits you in Appendix C, the Challenges section of the Inventor's Guide. Turn to Appendix C, and read the challenge titled "Solo Soccer".

First, find a usable area of floor space. Tables are not recommended for challenges because they are too small, and they pose a danger for robots which may accidentally run off the edges. A carpeted playing surface will make the game easier (the ball will not roll away as easily), while a hard, smooth surface will make for quite a challenge, indeed!

Place the two goal uprights (empty soft drink cans or toilet paper tubes work well for this) about a foot apart, and place the ball on the ground three or four feet away. Drive the robot so that it pushes the ball through the goal, without driving the robot through as well. Don't hit the bumper on the front of the robot, or you will lose control for a few seconds... it's soccer, you're going to have to dribble!

The first few times you try this challenge, you may want to simplify the task a little by starting the ball and robot in line with the goal. You can work your way up to the actual challenge. Once you have succeeded a few times, try the challenge as written by starting the ball and robot in different positions that are not lined up with the goal mouth.



beginners, continued

7 Improve your Design

Just like with stock car racing, the generic all-purpose design of the Squarebot is a good starting point, but you can do much, much better! Think about how you might want to customize or “soup-up” your design to solve a problem. For example: Did you notice how difficult it was to get the ball to turn with the robot once it was moving? Can you think of any ways you might be able to fix that problem? Implement your solution and play the game again!

8 Challenges

When you’re ready to move on to new, more challenging scenarios, turn to the challenges in Appendix C. Pick one of the other challenges there, and go for it! Formulate a strategy to accomplish the goals in the game, and implement your robotic solutions. As you plan and build your robot, consult the Inventor’s Guide for background information about the components you have available, and refer to the Squarebot subsystems you built for ideas. Good luck!

9 Venture Forth

The Vex Robotics website provides a wealth of support and challenge ideas beyond the starter set supplied in this kit.

If you need a hand with your robot, or you want to learn about new accessories and challenges, visit <http://www.vexrobotics.com>.

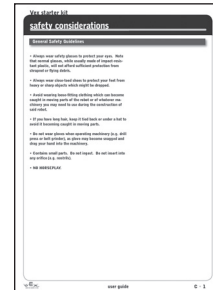
Inventor’s Guide Resources visited in this track:

- Safety in Appendix A
- Glossary in Appendix B
- Challenges from Appendix C
- Squarebot Parts & Assembly in each subsystem chapter
- The System Map poster included in the Starter Kit
- The Registration Card included in the Starter Kit

experienced users

Learn the System and Complete the Challenges

1 Review the basic safety instructions in Appendix A
Always work safely. Although the Vex robot and parts are not dangerous under most circumstances, there are still safety precautions that you must follow.

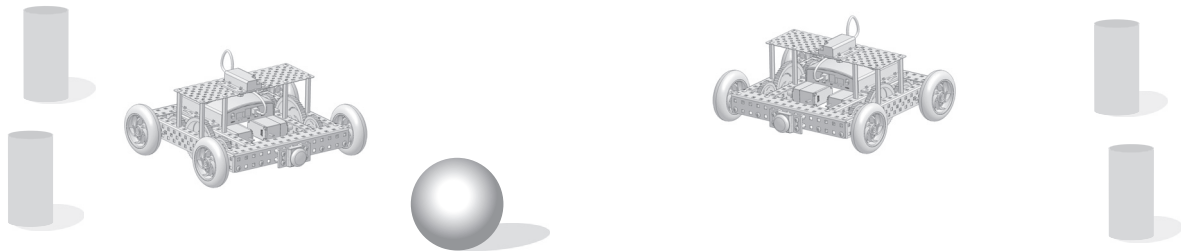


2 The First Challenge: Solo Soccer Challenge
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First, find a usable area of floor space. Tables are not recommended for challenges because they are too small, and they pose a danger for robots which may accidentally run off the edges. A carpeted playing surface will make the game easier (the ball will not roll away as easily), while a hard, smooth surface will make for quite a challenge, indeed!

Place the two goal uprights (empty soft drink cans or toilet paper tubes work well for this) about a foot apart, and place the ball on the ground three or four feet away. Drive the robot so that it pushes the ball through the goal, without driving the robot through as well. Don't hit the bumper on the front of the robot, or you will lose control for a few seconds... it's soccer, you're going to have to dribble!

The first few times you try this challenge, you may want to simplify the task a little by starting the ball and robot in line with the goal. You can work your way up to the actual challenge. Once you have succeeded a few times, try the challenge as written by starting the ball and robot in different positions that are not lined up with the goal mouth.



experienced users, continued

3 Design and Build a Robot to Play the Game

Your team must come up with a strategy and build a robot to play Solo Soccer. You may use any methods you like to organize your team efforts to plan and complete the robot, but a suggested method would be to break the team up into groups and assign responsibility for a few of the major robot subsystems to each group.

If you need ideas or assistance in the construction of any of the subsystems (Structure, Motion, Power, Sensors, Logic, or Control), flip to the appropriate section in the Inventor's Guide. You will find a variety of information there, from background information about the workings of the components, to building instructions for a sample implementation of each subsystem on a robot called Squarebot. The examples are probably the most useful, as they illustrate both the construction and connecting that you will need in order to get your subsystems working together. The System Map (the large stand-alone poster sheet included with the Starter Kit) identifies the accessories that will allow you to easily expand your Vex Robotics Design System.

If you prefer to start with a basic robot and modify from there, then all you need to do is build all the subsystem examples. The six sample subsystems that are provided are all pieces of the Squarebot, and when attached according to the instructions in the chapters, you will have a simple, but working, robot that you can use as a starting point for your own designs.

Regarding ports and joystick controls, Appendix E has a full listing of control layouts that are available to you. The default controls are the simplest to deal with initially (because every channel controls the same-numbered motor port), but you may want to try switching to arcade-style controls to see if you like them better.

experienced users, continued

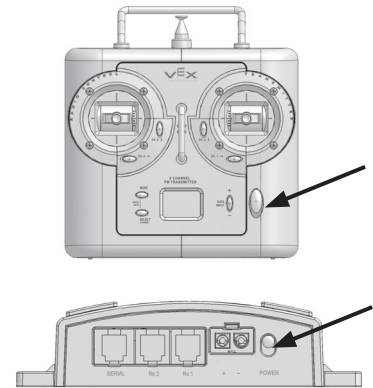
4 Test the robot

Once you have completed the robot (or even just a portion of it that you want to test), extend the antenna on the Transmitter and turn it on by flipping the power switch on the front.

Once the Transmitter is on, you can turn on the Vex Micro Controller module on the robot by flipping its power switch (located next to the battery port).

You should see green lights for the Power Status and Rx1, and the large light blinking occasionally.

You now have control over your robot. Remember that each axis of the stick or pair of buttons controls one of the output ports, so see if you can get your robot to move. You may want to try lifting it up if it looks stuck. Some motors may be trying to turn, but may be encountering unexpected resistance from other parts. Again, consult the Squarebot sample subsystems if you need help.



experienced users, continued

5 Soccer Time

Play the game! Challenge other teams for the best time, or see how many times in a row you can succeed by yourself.

6 Improve your Design

Nobody gets everything perfect the first time. Maybe your robot had trouble handling the ball in a turn, or maybe you think an entirely different strategy would work better. Go back and try it!

7 Challenges

When you're ready to move on to new, more challenging scenarios, turn to the Challenges chapter in the back of the Inventor's Guide. Pick one of the challenges there, and organize a tournament. Formulate a strategy to accomplish the goals in the game, and implement your robotic solutions. As you plan and build your robot, consult the Inventor's Guide for background information about the components you have available, and refer to the example subsystems for ideas.

8 Venture Forth

The Vex Robotics website provides a wealth of support and challenge ideas beyond the starter set supplied in this kit.

Visit <http://www.vexrobotics.com> and get ready to join the worldwide community of Vex inventors. Good luck!

Inventor's Guide Resources visited in this track:

- Safety in Appendix A
- Glossary in Appendix B
- Challenges from Appendix C
- Squarebot Parts & Assembly in each subsystem chapter
- The System Map poster included in the Starter Kit
- The Registration Card included in the Starter Kit

Vex Inventor's Guide

table of contents:

Structure Subsystem	2.1
Motion Subsystem	3.1
Power Subsystem	4.1
Sensor Subsystem	5.1
Control Subsystem	6.1
Logic Subsystem	7.1
Programming Subsystem	8.1
Reference	

Vex starter kit

The FCC Wants You to Know

This equipment has been tested and found to comply with the limits for radio controlled devices, pursuant to Part 15 and Part 95 of the *FCC Rules*. These limits are designed to provide reasonable protection against harmful interference. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Consult your local electronics store or an experienced radio/TV technician for help.
- If you cannot eliminate the interference, the FCC requires that you stop using your R/C transmitter.

Warning: Changes or modifications not expressly approved by Innovation One may cause interference and void the user's authority to operate the equipment. Only use authorized crystals designed for use with the Vex Robotics Design System RF Receiver.



Important: The EPA certified RBRC® Battery Recycling Seal on the nickel-cadmium (Ni-Cd) battery indicates Innovation One voluntarily participates in an industry program that collects and recycles NiCd batteries at the end of their useful life, when taken out of service in the United States or Canada. The RBRC program provides a convenient alternative to placing used Ni-Cd batteries into the trash or the municipal waste stream, which may be illegal in your area. Please call 1-800-8-battery for information on Ni-Cd battery recycling and disposal bans/restrictions in your area. Innovation One's involvement in this program is part of the company's commitment to preserving our environment and conserving our natural resources.

Limited 90-day Warranty

This product is warranted by Innovation One against manufacturing defects in material and workmanship under normal use for ninety (90) days from the date of purchase from authorized Innovation One dealers. For complete warranty details and exclusions, check with your dealer.

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Fort Worth, TX 76102

11/04

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The actual product may vary from images depicted in this Inventor's Guide.