The Control Subsystem enables a human operator to maneuver the robot. Commands are issued through joysticks and buttons on the Transmitter, and sent via radio signal to the Receiver on the robot. In this way, the robot can be controlled through a combination of manual and autonomous methods.
control

table of contents:

the purpose of the RF Receiver Module 6.2

squarebot RF Receiver Module 6.3
parts & assembly

concepts to understand 6.7

subsystems interfaces 6.23

control subsystem inventory 6.24
squarebot control subsystem parts & assembly

The control subsystem provides the link between the robot and the human operator. Commands are entered through the joysticks and buttons on the RF Transmitter, and sent through the air via FM radio waves to the RF Receiver module mounted on the robot.

1. Collect and identify the parts from the list of materials below:

<table>
<thead>
<tr>
<th>materials</th>
<th>qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>radio transmitter</td>
<td>1</td>
</tr>
<tr>
<td>transmitter antenna</td>
<td>1</td>
</tr>
<tr>
<td>RF receiver</td>
<td>1</td>
</tr>
<tr>
<td>receiver crystal (75MHz)</td>
<td>1</td>
</tr>
<tr>
<td>8-32 hex screw, 3/8&quot;</td>
<td>5</td>
</tr>
<tr>
<td>keps nut</td>
<td>5</td>
</tr>
<tr>
<td>receiver antenna sleeve</td>
<td>1</td>
</tr>
<tr>
<td>receiver antenna sleeve holder</td>
<td>1</td>
</tr>
</tbody>
</table>
squarebot control subsystem parts & assembly, continued

- Transmitter x 1
- RF receiver module x 1
- 8-32 hex screw, 3/8” x 5
- Keps nut x 5
- Receiver antenna sleeve holder x 1
- Receiver antenna sleeve x 1
2 Attach the RF Receiver Module to the robot:
Position the RF receiver module on top of the Squarebot deck, and secure it with four \(\frac{3}{8}\)" screws and keeps nuts.
3 Attach the Antenna Holder to the robot:

3/8"
3. Attach the Antenna Holder to the robot:
control subsystem

Basic Transmitter Operation
The Transmitter joysticks can be configured to work in two basic configurations. To check or switch between configurations, follow these instructions:

1. **Turn on the Transmitter** by pushing the power switch to the ON position.

2. **Enter the menu** on the transmitter by holding down both the Mode and Select buttons next to the LCD until the menu opens.

3. **Enter the Driving Mode Adjustment menu** by pressing the Mode button until DRIVE is displayed on the left side (it's the last menu).

4. **The current driving mode is displayed.** This will be either “23” or “12”. Push up or down toward either the + or – on the data input button on the right side of the LCD to switch between these two modes. The two modes are explained on the following pages.
Control Subsystem, continued

Configuration 1:
Tank-style control (“23” mode – default)

Note: Make sure there are no jumper clips on Analog/Digital Ports 13, 14, 15, or 16 on the Micro Controller, otherwise your robot’s controls will behave differently from what is listed here in this section. For details on how to use these jumpers to configure advanced control features, visit the Logic Subsystem chapter.

This control configuration uses the vertical axes of both sticks to control the two motors independently. The name “23 mode” comes from the fact that the vertical axis of the right stick is “Control Channel 2”, and the vertical axis of the left stick is “Control Channel 3”, hence axes 2 and 3 (“23”) are being used to drive.

In this configuration, the left stick controls the motor attached to Motor Port 3, and the right stick controls the motor attached to Motor Port 2.

Warning: Always make sure the transmitter is turned on and functioning before turning on the robot! If the transmitter is not on when the receiver is activated, the receiver may accidentally interpret other radio waves in the air as commands and cause the robot to move unexpectedly!
Control Subsystem, continued

Configuration 2: Arcade-style control ("12" mode)

Note: Make sure there are no jumper clips on Analog/Digital Ports 13, 14, 15, or 16 on the Micro Controller, otherwise your robot’s controls will behave differently from what is listed here in this section. For details on how to use these jumpers to configure advanced control features, visit the Logic Subsystem chapter.

This control configuration uses only the right joystick to control both forward/back motion and turning motion. The name “12 mode” comes from the fact that the horizontal axis of the right stick is “Control Channel 1”, and the vertical axis is “Control Channel 2”, hence axes 1 and 2 ("12") are being used to drive.

In this configuration, the right stick controls both throttle and turning.
Because the sticks on the transmitter are analog electromechanical devices that operate directly on circuit voltage, there is the distinct possibility that the sticks will become miscalibrated. This happens when the sticks start delivering different voltages than what the controller expects for a given position.

In order to counteract this problem, there are manual adjustment buttons on the transmitter that allow you to recalibrate or “recenter” the transmitter. These can be adjusted so that the voltages match up correctly again on the stick.

Note that each stick’s position actually breaks down into two separate measurements. One of them indicates how far left and right the stick is (the horizontal, or “X”, axis), and the other measures where it is with respect to the vertical, or “Y”, axis. These four axes (two axes times two sticks) can become miscalibrated separately, so you may need to adjust each of them independently.

Conveniently, each axis is assigned a number (which corresponds with the “control channel” that it works on), so there should be no confusion between which axis or stick is which.
To calibrate the sticks:

1. Release both control sticks so they return to their neutral positions.

2. Hold the robot (or just the motors, if they are not mounted) up in the air so you can see whether the motors are turning or not, and whether the servomotors are in the centered positions or not.

3. If you see a motor turning or a servomotor not centered, follow the wire back to the Micro Controller to see which port it is plugged into.

4. Consult the Joystick Mappings section to see which transmitter axis controls that particular port (this will depend on the Driving mode you are in).

5. Push either direction on the Trim Button for that axis to try and correct the problem.

6. Check if the motors slowed down or got closer to center. If they did, then keep pushing the button in that direction until they are stopped/centered; if they get faster or farther from center, push the other way on the trim button instead.

7. If you cannot get the motors to stop because the “stop” position seems to be in between two trim settings, finer adjustments are available. Go into the menu (hold both the Select and Mode buttons for one second), and adjust the appropriate channel from the TRIM menu (push Mode until TRIM is displayed, then Select until the channel you want is displayed, then use the Data Input lever on the right to make adjustments).
Transmitter Battery Voltage

In normal operation, the transmitter displays two numbers on the LCD screen: the configuration number (see Appendix G), and the battery voltage on the transmitter. Note that this screen only displays the battery power left on the transmitter, and not the robot! There is no way to monitor the robot’s battery voltage using this display, so you will need to watch separately for problems arising from low robot battery power.

The transmitter’s power begins to decrease at approximately 9.4V on the display. If you are at 9.4V or less, consider stopping and recharging the transmitter batteries. If the voltage reaches 8.9V, you have about 10 minutes left before you hit low voltage, so you should stop if possible. The transmitter hits low voltage at 8.5V on the display. At this point, you will hear a beeping sound, a low battery indicator will appear, and performance will begin to degrade significantly. You should stop and recharge the batteries at this point.

See the Power Subsystem Background Information for details.

<table>
<thead>
<tr>
<th>Voltage</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>9.4V</td>
<td>Batteries somewhat low. You will need to stop soon.</td>
</tr>
<tr>
<td>8.9V</td>
<td>Batteries very low (10 minutes or less remaining), stop unless absolutely necessary.</td>
</tr>
<tr>
<td>8.5V</td>
<td>Batteries depleted. Stop now. (Low battery indicator comes on, controller sounds warning beep)</td>
</tr>
</tbody>
</table>
Stick Mode
Stick Mode configuration is accessed differently from the other menus. To access this mode, you must hold down Mode and Select while turning the transmitter on, rather than pressing them once it is already on.

The only option you can change is the Stick Mode, between “2” and “1”. 2 is the default, and you should leave it this way unless you have a specific reason for changing it. Setting the Stick Mode to 1 will swap axes 2 and 3, so the vertical axis of the left stick becomes channel 2, and the vertical axis of the right stick becomes channel 3. Unless you have a good reason to change this, you should leave the Stick Mode on 2.

Tether Port
Sometimes for diagnostic purposes, it may be useful to plug the transmitter directly into the micro controller, and bypass the need for the RF Receiver. This would help you determine, for instance, whether radio interference is at fault for your robot behaving strangely, or if some other factor is to blame.

In order to use the tether feature, you will need to purchase a cable. Any telephone handset extension cable should work (the cable that goes from the handset to the base of a corded phone, not the cable that goes from the phone to the wall).
control subsystem, continued

Tether Port, continued
To use the tether feature:
1. **Hook up one end of the cable** to the back of your Radio Transmitter, in the port marked “Tether Port”.

2. **Plug the other end directly into the Rx1 port** of your Micro Controller.

3. **Turn the Transmitter on** by pushing the power switch on the Transmitter to the ON position.

4. **Turn the Micro Controller on** by flipping the power switch on the Micro Controller to the ON position.

5. **Test your robot**. The controls should operate exactly as they would remotely over radio, but without the possibility of radio interference or other similar issues.
control

control subsystem, continued

Tips
Always turn the Transmitter on before powering up the robot. If the transmitter is not on when the receiver is activated, the receiver may accidentally interpret other radio waves in the air as commands and cause the robot to move unexpectedly!

Radio waves radiate out from the sides of the transmitter antenna, not from the tip. For this reason, you will get the best range and performance from your transmitter if you don’t point it directly at your robot.
control subsystem, continued

Tips, continued
If you accidentally change a setting on your controller that you didn’t want to change, you can reset the controls through the CONFIG menu.

1. Turn the transmitter on by pushing the power switch into the ON position.

2. Hold down the Mode and Select buttons for two seconds until the menu appears. CONFIG should be selected by default.

3. If you wish to reset the data for a different robot configuration, press the + button on the Data Input button until the configuration number you want is displayed. If you are not using multiple configurations (see Appendix G), then ignore this step.

4. Press the Select button. The letters CL (for “clear”) should appear.

5. Push up or down toward the + or – on the Data Input button and hold for 2 seconds to reset the controls for the selected config number. The Transmitter will beep when the configuration is reset.
control subsystem, continued

Tips, continued

Remember that the transmitter does not monitor robot battery voltage, only its own transmitter battery. Watch the robot to see if it seems to be low on power.

If more than one robot is operating in the same area, be sure that the robots are operating on different frequencies or their commands will interfere with each other (see Frequency Crystals in Background Information in this chapter).

If you own more than one set of frequency crystals, be sure that the frequency module in your transmitter matches the crystal in your RF receiver module (see Frequency Crystals in Background Information in this chapter).

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.
When electrons accelerate, they radiate an electromagnetic signal that moves at the speed of light. By accelerating and decelerating electrons in a controlled pattern, a wave pattern can be generated in the radiated electromagnetic field. These are called electromagnetic waves. Electromagnetic waves move at the speed of light, and are therefore very good at carrying information quickly from one place to another.
The Vex Radio Transmitter uses an electromagnetic wave with a certain frequency to transmit data to the RF receiver module. Frequency modulation (FM) is a way of encoding information in wave patterns such as these.

Waves have several basic properties, including amplitude and frequency. In frequency modulation, the frequency of the basic wave, known as a carrier wave, is modified by combining it with another signal known as the modulating wave, which produces a final wave that looks irregular, but is really carrying the data from the signal wave on top of the carrier wave.

FM is less susceptible to interference than other radio transmission methods, such as amplitude modulation (AM) or direct transmission of the signal wave.
Radio Frequencies

Since every FM signal has a set carrier wave frequency, different carrier waves can be used to carry different signals at the same time without causing interference. The air around you is filled with a multitude of different FM wave frequencies being sent from many sources, and they don’t interfere with each other, because their carrier waves all have different frequencies.

To prevent chaos, there are a limited number of frequencies that can be used for radio control. In the US, the Federal Communications Commission (FCC) is responsible for distributing these frequencies among the various industries that want to use RC. Ground vehicles operating by FM radio control have been assigned the 75MHz band and must transmit their control information using a carrier frequency that is between 75MHz and 76MHz.

Radio Channels

Exact frequencies (which have names like 75.410MHz) are often hard to remember, or inconvenient to talk about. The frequencies that are used to transmit data in the 75MHz band are therefore also assigned channel numbers. A channel is like a nickname for a certain frequency. The carrier frequency 75.410MHz, for instance, can also be called Channel 61 for convenience.

Be careful with the term channel, however, because the term is also used to refer to “control channels,” which are used to number the inputs on the transmitter (each joystick has two control channels, for instance: one for the x-axis and one for the y-axis). You will need to infer from usage context whether “channel” is being used to refer to a “radio frequency channel” (frequency) or a “control channel” (axis).
When more than one Transmitter is running in the same area (e.g. during a competition), there is potential for trouble. How can the robot determine which transmitter is sending which signal?

If all Vex Radio Transmitters and RF Receivers were to operate on the same frequency, then there would be no way for the robot to discriminate between signals. However, the Vex Radio Transmitter and Receivers are designed to be able to use a number of different FM carrier frequencies (see Radio Frequencies above). As long as each transmitter-receiver pair uses a different frequency, the robots won’t get confused.

The Radio Transmitter and RF Receiver are set frequencies according to a special radio frequency crystal that is installed in them. A transmitter frequency module and RF receiver crystal set comes pre-installed in both the Transmitter and Receiver, but they are modular, and can be removed and replaced only with a Vex approved transmitter frequency module and matching RF reciever crystal. All Starter Kits transmit and receive on the same frequency, so in order to compete in an environment with multiple robots or to use multiple transmitters, you will need to replace at least one transmitter frequency module and RF receiver crystal.
Remember, crystals come in pairs! The crystal in the transmitter frequency module determines what frequency it will use to send commands, and the RF receiver crystal tells it what frequency to listen on. If the crystals in the transmitter and the receiver don’t match, they will not be able to communicate. Always use crystals of the same frequency on both the transmitter and receiver for a given robot.

### Frequency Crystals, continued

<table>
<thead>
<tr>
<th>Crystals available for use with the Vex Robotics Design System</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Starter kit</strong> = Ch. 61 (75.410MHz)</td>
</tr>
<tr>
<td><strong>TX/RX Upgrade</strong> = Ch. 89 (75.970MHz)</td>
</tr>
<tr>
<td><strong>Additional Crystal Kit #1</strong> = Ch. 65, 69, 81, 85 (75.490, 75.570, 75.810, 75.890MHz)</td>
</tr>
<tr>
<td><strong>Additional Crystal Kit #2 (Web Only)</strong> = Ch. 63, 67, 83, 87 (75.450, 75.530, 75.850, 75.930MHz)</td>
</tr>
</tbody>
</table>

Inventors should only use Vex authorized RF receiver crystals and transmitter frequency modules.

### Joystick Mechanism

The joysticks on the radio control transmitter are actually part of a variable resistor component in the transmitter circuit. Pushing the sticks in one direction or another changes the electrical resistance of a potentiometer inside the transmitter, which in turn causes a change in voltage. The transmitter will then send a different signal to the receiver based on this voltage. For instance, the transmitter may expect the sticks to provide a resistance that produces a voltage of 4.8V when centered.

Miscalibration occurs when the joystick circuit does not generate the expected voltage for a given position of the sticks. For any number of reasons, from manufacturing tolerances to battery voltage drop, the sticks may start providing a different number while centered, say 3.7V.

The transmitter will have no idea what is causing the 3.7V, so it will assume that it is because the stick is in the position that would normally produce a 3.7V reading. It will send a signal to the receiver indicating that the stick is in the 3.7V position. Clearly, this is not correct, and this miscommunication will cause the robot to behave oddly, because it will be responding to commands that aren’t actually being given on the stick. “Trim Setting Adjustment” instructions (pages 6-12) will correct this condition.
subsystem interactions

How does the Control Subsystem interact with...

...the Structure Subsystem?
- The structure subsystem will generally provide a place to store the RF Receiver module on the robot.
- On Squarebot, the structure subsystem provides an elevated deck for the RF Receiver Module to be mounted for enhanced reception.

...the Motion Subsystem?
- Unlike radio-controlled cars, the Vex robot does not directly tie the Control Subsystem into the Motion Subsystem. The commands generated by the operator using the Transmitter are sent to the radio receiver on the robot, but from there, the commands are given to the Micro Controller, which takes this and other information into account when deciding which command to give to the Motion components.

...the Power Subsystem?
- Broadcasting radio waves takes a significant amount of electrical power. The 8 AA batteries (or 9.6V battery pack) installed in the Vex Transmitter provide the Transmitter with all the power it needs to operate its internal circuitry and send out radio waves carrying commands to the receiver.
- The RF Receiver mounted onboard the robot, on the other hand, draws its power from the Power Subsystem indirectly, through the Micro Controller (which is part of the Logic Subsystem).

...the Sensor Subsystem?
- The Control and Sensor Subsystems complement each other to achieve better control of the robot. The Control Subsystem provides human control over the robot, but the human operator does not always have perfect control, or the perfect point of view to see the robot’s position. The Sensor Subsystem gives the robot the ability to make its own informed decisions, and can be a substantial aid to the human operator.

...the Sensor Subsystem, continued
- On Squarebot, the bumper sensors function as both tag game sensors and as emergency stop triggers. In the event that the operator accidentally drives into a wall or other obstacle, the sensor will stop the robot for a few seconds to prevent motor damage that could occur if the operator attempts to continue running the motors when the robot is stuck.

...the Logic Subsystem?
- The Micro Controller module controls the flow of commands from the human operator to the robot. The Micro Controller ultimately decides whether to pass joystick commands on to the motors, to modify them, or to override them, based on its programmed behavior and other information available to it (from sensors, for instance).
- The RF Receiver module is connected to the Vex Micro Controller through the 9” RJ-10 cable that runs from the back of the Receiver into the front of the Micro Controller. Up to two receivers can be supported simultaneously.
- If desired, the Transmitter can be hooked directly into the Vex Micro Controller using a tether cable, bypassing the RF Receiver (see the Control Subsystem chapter for details).
- The specific way that the robot will respond to joystick movement is determined by a combination of Radio Transmitter and Micro Controller settings. See Appendix F for a full listing of control layouts.
- The Squarebot receives user driving commands through the the RF Receiver, and uses the default control layout.
## Control Subsystem Inventory

<table>
<thead>
<tr>
<th>Component</th>
<th>Qty</th>
</tr>
</thead>
<tbody>
<tr>
<td>RF Receiver module and crystal</td>
<td>1</td>
</tr>
<tr>
<td>Radio transmitter</td>
<td>1</td>
</tr>
<tr>
<td>Receiver antenna sleeve holder</td>
<td>1</td>
</tr>
</tbody>
</table>

---

**Diagram:**
- RF Receiver module and crystal
- Radio transmitter
- Receiver antenna sleeve holder
control accessories

crystal upgrade kit – A

The Vex Robotics Design System is designed to be usable in competition settings with multiple robots on the field together at the same time. In order for a robot to be able to tell which radio commands are intended for it, it needs to listen for commands on a different radio frequency (see Control Subsystem background information).

The transmitter’s frequency module and the matching receiver crystal determine the control frequency for a robot. The receiver will hear only commands sent by transmitters using the same frequency. However, a robot will also hear commands sent by every other transmitter using the same frequency, so you’ll need to make sure that nobody else uses the same frequency as you.

transmitter frequency module x 4 (different frequencies)
receiver crystal x 4 (different frequencies)

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.

Innovation One, Inc.
350 North Henderson Street
Fort Worth, TX 76102
11/04
Printed in China
0105
control accessories

crystal upgrade kit – A, continued

1 Installing the crystals

Remove the existing frequency module in the transmitter and crystal in the receiver, and store them safely for later use. Select another matching RF frequency module and crystal.

Carefully insert the desired frequency module into the transmitter and crystal into the receiver. Do not use force, or you may bend or break the pins.

<table>
<thead>
<tr>
<th>Crystal Upgrade Kit – A</th>
<th>Ch. 61, 69, 81, 85 - 75.490, 75.570, 75.810, 75.890MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crystal Upgrade Kit – B</td>
<td>Ch. 63, 67, 83, 87 - 75.450, 75.530, 75.850, 75.930MHz</td>
</tr>
</tbody>
</table>
control accessories

crystal upgrade kit – B

The Vex Robotics Design System is designed to be usable in competition settings with multiple robots on the field together at the same time. In order for a robot to be able to tell which radio commands are intended for it, it needs to listen for commands on a different radio frequency (see Control Subsystem background information).

The transmitter’s frequency module and the matching receiver crystal determine the control frequency for a robot. The receiver will hear only commands sent by transmitters using the same frequency. However, a robot will also hear commands sent by every other transmitter using the same frequency, so you’ll need to make sure that nobody else uses the same frequency as you.

transmitter frequency module x 4 (different frequencies)
receiver crystal x 4 (different frequencies)
1 Installing the crystals

Remove the existing frequency module in the transmitter and crystal in the receiver, and store them safely for later use. Select another matching RF frequency module and crystal.

Carefully insert the desired frequency module into the transmitter and crystal into the receiver. Do not use force, or you may bend or break the pins.

<table>
<thead>
<tr>
<th>Starter Kit</th>
<th>Ch. 61 - 75.410MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Additional Transmitter and Receiver</td>
<td>Ch. 89 - 75.970MHz</td>
</tr>
<tr>
<td>Crystal Upgrade Kit – A</td>
<td>Ch. 65, 69, 81, 85 - 75.490, 75.570, 75.810, 75.890MHz</td>
</tr>
<tr>
<td>(This kit) Crystal Upgrade Kit – B</td>
<td>Ch. 63, 67, 83, 87 - 75.450, 75.530, 75.850, 75.930MHz</td>
</tr>
</tbody>
</table>
control accessories

transmitter & receiver kit

The Vex Micro Controller can simultaneously support two transmitters and receivers on different frequencies. The addition of a second Transmitter and Receiver can provide added functionality to your design, enabling two human operators to control different aspects of the same robot. The most common use for this is for one person to control the motion of the robot (by driving it), while the other person controls articulation (the operation of a robotic arm or other attachment).

The Transmitter and Receiver included in this accessory kit come with a different crystal set from the original Transmitter and Receiver supplied with your starter kit. This kit uses 75MHz channel 89 (75.970MHz), enabling you to use both sets of Transmitters and Receivers at the same time without causing interference.

The Vex Micro Controller will automatically detect the presence of the second RF Receiver module on the robot once it is plugged in, and will switch over to dual transmitter controls.

This kit can serve as a replacement if the original Vex Transmitter and Receiver are damaged, stolen, or lost.

Turn to the next page to see an illustration of all of the parts in the accessory kit.

For complete instructions about installing and operating your transmitter and receiver, refer to the Control Chapter in your Vex Inventor’s Guide.

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.

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.
control accessories

transmitter & receiver kit, continued

transmitter x 1

receiver antenna sleeve x 1

transmitter frequency module (75MHz) x 1

receiver crystal (75MHz) x 1

receiver antenna sleeve holder x 1

RF receiver module x 1

antenna (comes installed)

keps nut x 5

8-32 3/8” x 5