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# RAD Team - User Manual

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# Contents

<b>1</b>	<b>Version History</b>	<b>3</b>
<b>2</b>	<b>Setting Up the System</b>	<b>4</b>
2.1	Drum Set . . . . .	4
2.2	Raspberry Pi and Master Wizzimote . . . . .	4
2.3	Webserver and Website . . . . .	5
2.4	Virtual Reality program . . . . .	5
<b>3</b>	<b>Using the System</b>	<b>5</b>
3.1	Playing via the WebPage . . . . .	5
3.2	Playing via VR . . . . .	6
<b>4</b>	<b>Long-Term Maintenance</b>	<b>7</b>
4.1	Servers . . . . .	7
4.2	Raspberry PI . . . . .	8
<b>5</b>	<b>Troubleshooting</b>	<b>8</b>

## List of Figures

1	The connections from the Raspberry Pi to the Master Wizzimote. . . . .	4
2	The website has a button for each drum and pattern that the system can play. . . . .	6
3	The VR program in its classic theme. . . . .	7

# 1 Version History

Version	Notes
1.0	Initial Release of Manual

## 2 Setting Up the System

There are four main modules in the system: the drum set, the Raspberry Pi and Master Wizzimote, the webserver and website, and the VR program.

### 2.1 Drum Set

The drum set includes the following drums: bass drum, floor tom, low tom, high tom, snare, hi-hat, and cymbal. Each drum is accompanied by a wizzimote that controls the drumsticks using motors. Each drum has two drumsticks, except for the bass drum, cymbal, and hi-hat, which each have only one drum stick.

To set up the drum set, follow these steps:

1. Connect the wires between the wizzimotes, voltage stepper chips, and motor control boards.
2. Flash the slave code to each wizzimote, remembering to change the ID in the config.h file to the appropriate drum for each wizzimote. Remember to reset the wizzimote once the upload is complete by pressing the reset button on the wizzimote board.
3. Power all the wizzimotes and motors. The motors plug into standard power outlets, and the wizzimotes should be powered with the battery packs.
4. Verify that the green LED on each wizzimote is flashing about once a second. This is a heartbeat indicator. If the green LED is not flashing, try resetting the wizzimote by pressing the reset button. If the green LED still does not flash, try replacing the batteries.

### 2.2 Raspberry Pi and Master Wizzimote

The Raspberry Pi connects to the UNL-AIR internet in order to receive commands from the webserver, which it then passes on to the Master Wizzimote via a UART connection. The Master Wizzimote can then distribute the commands to the other wizzimotes over radio. To set up the Raspberry Pi and Master Wizzimote, follow these steps:

1. Connect the Master Wizzimote to the Raspberry Pi: Pi 3.3 V to Wizzimote VDD, Pi GND to Wizzimote GND, Pi RX to Wizzimote TX, Pi TX to Wizzimote RX.

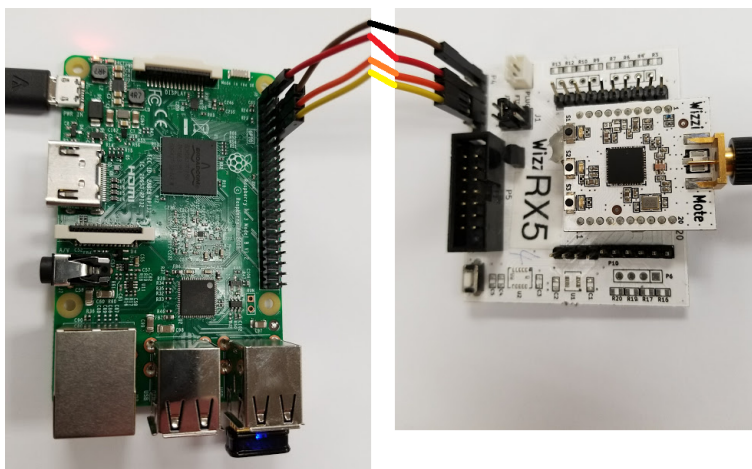


Figure 1: The connections from the Raspberry Pi to the Master Wizzimote.

2. Make sure the Raspberry Pi is in a location where it can connect to the UNL-AIR wifi network. Make sure the Master Wizzimote is within radio range of the drum set wizzimotes; within the same room is recommended.

3. Power on the Raspberry Pi. It will automatically run the script that opens connections to the webserver and the master wizzimote.

## 2.3 Webserver and Website

The webserver and website are constantly running. Long-term maintenance information for the webserver and website is provided later in this document.

## 2.4 Virtual Reality program

The Virtual Reality program was only tested with the HTC Vive available in Schorr Center, but it should work with any VR system (such as HTC Vive or Oculus Rift) and any internet-connected computer. To set up the virtual reality program for the first time, follow these steps:

1. Follow the setup instructions for the VR system of your choice.
2. Download Steam <http://store.steampowered.com/about/> and SteamVR <https://steamcommunity.com/steamvr>.
3. Download the "RAD Team Drumset" program from our website.

To setup the virtual reality program each time, follow these steps:

1. Make sure your computer is connected to the internet, as the program needs an internet connection to connect to the webserver.
2. Start up Steam and SteamVR. Make sure your VR headset and controllers are tracking correctly.
3. Run the "RAD Team Drumset" program.
4. The lamp in the drumset scene should turn green when a connection to the webserver has been established. If the lamp is red, try tapping the lamp with the drumstick to attempt to connect to the webserver. If the lamp still does not turn green, exit the program and verify that your computer is connected to the internet.

## 3 Using the System

Once the system is up and running, the drums can be played from the website or from the VR program.

### 3.1 Playing via the WebPage

The website can be accessed from any internet-connected device by navigating to the following address: [www.rad-team.co.za](http://www.rad-team.co.za)

The website has a variety of buttons for playing the drums, as shown below. Clicking a button causes the corresponding drum to be played in real-time. Clicking the "Annoy Grad Students" button causes all the drums to be played, thereby annoying any grad students working in the lab where the drum set is kept. Clicking "Simple Beat," "Complex Attack," or "Full Song" causes the appropriate pattern to be played. Clicking the "Stop" button will stop the currently playing pattern. Note that when a VR system is connected, commands from the website are ignored.



Figure 2: The website has a button for each drum and pattern that the system can play.

The webpage also displays information about the system in the box at the top of the screen, such as if a VR system is connected and the total number of times a drum has been struck since the system started up. Additional information about the drum set project, including the code, team member information, and the download link for the VR program can be found by exploring the tabs at the top of the page.

### 3.2 Playing via VR

Inside the VR program, you will see a drumset, a colored lamp, and two menus.



Figure 3: The VR program in its classic theme.

The drumset can be played by simply hitting the drums with the drumsticks that replace your controllers. The lamp indicates if the program is connected to the webserver; green means connected and red means not connected. If the lamp is red, you can tap it with the drumstick to attempt to reconnect to the webserver. The menu on your left can be used to play and stop the simple beat, complex attack, and full song patterns by tapping the corresponding button with a drumstick. The menu on the right can be used to change the appearance of the drumset scene by tapping the corresponding button. Classic, neon, and nature themes are available.

## 4 Long-Term Maintenance

A few components of the system require some maintenance to keep them running in the long-term.

### 4.1 Servers

The server is currently being hosted on <https://www.hostafrica.co.za/>. This service is not free and costs  $R89.00 \approx \$6.50$  a month. Logging into the server can be done as follows:

- ssh into the server:
  - `$ ssh root@160.119.248.28`
- When you are prompted for the password enter:
  - `$ RAD_Team`

You now have access to the webserver. Starting the HTTP sever or webserver can be done as follows:

- Starting the webserver
  - `$ cd RAD_Server`
  - `$ nodejs server.js`
- Resetting the HTTP server
  - `$ cd RAD_Website`
  - `$ nodejs httpserver.js`

## 4.2 Raspberry PI

# 5 Troubleshooting

- *One of the wizzimotes is not flashing its green LED.* The wizzimote is likely not receiving power. Try replacing the batteries.
- *One of the drum sticks is not moving correctly.* The wizzimote may be incorrectly connected, or it may be running the wrong code. Double check the connections between the wizzimote, voltage stepper, and motor control board. Double check that the proper code is uploaded to the wizzimote. Try resetting the wizzimote by pressing the reset button.
- *One of the drum sticks is not moving at all, despite have the proper connections and code.* This is like due to a broken motor. Try replacing the motor.
- *When I click a button on the website, nothing happens.* If a VR program is connected to the drumset, this is expected behavior; the virtual reality program blocks all commands from the website. Check if the website indicates that a VR system is connected.
- *When I click a button on the website, nothing happens, even though the website doesn't indicate that a VR system is connected.* This could be due to an error anywhere between the website and the drums. Make sure all drums, wizzimotes, and the Raspberry Pi are properly powered. Try resetting the drum's wizzimote by pressing the reset button. Try rebooting the Raspberry Pi.
- *When I hit a drum in VR, nothing happens.* Verify that the lamp in the scene is green; a red lamp indicates that the program is not connected to the webserver. Verify that your computer is connected to the internet, and tap the lamp with a drumstick to connect the program to the webserver.
- *The VR lamp is green, but the drums are still not responding.* This is due to an error somewhere between the VR system and the drum set. Verify that all drum set components are properly powered. Try resetting the drums' wizzimotes by pressing the reset button. Try rebooting the Raspberry Pi.