

Burglar Alarm

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Intro

Did you ever go to school, with a very, very, very delicious cheesecake in your lunchbox and found it missing at lunch? You want to find the thief, but you don't know when the thief is stealing your delicious food out of your lunch. Well, if you set up this foolproof alarm, the culprit would be found in one day! **NOTE: THIS BURGLAR ALARM IS VERY HARD TO MAKE.**

Materials Needed

First, get a Ultrasonic Distance Sensor (Raspberry Pi GPIO Compatible), Raspberry Pi 4 Model B (RAM 4GB), a LCD (16x2, alphabet & numbers compatible, with 4 ports (SDA, SCL, 5V Power Input (VCC), and Ground (GND)), 4x4 matrix keypad, a MicroSD card that has a minimum memory of 16 GB (I recommend 64GB), a Raspberry Pi GPIO Expansion, a NPM Transistor, a PiCamera V2, about 20 male-male jumper wires, about 10 female-male jumper wires, and a buzzer (active). See how the components look like at [Images](#) so you buy the right components.

Downloading Raspberry Pi OS

Now you have all the materials needed to make the Alarm, go to [Download Raspberry Pi Imager](#) and go to the heading that says "Install Raspberry Pi OS using Raspberry Pi Imager". Download the right imager for your OS; there are imagers for Raspberry Pi OS, Windows, Macs, and Ubuntu for x86. It's hard to get the RPi OS directly from the Pi, so download the Raspberry Pi Imager for your OS. (computer) Insert the MicroSD card, launch Raspberry Pi Imager, and select "CHOOSE STORAGE". Click the right MicroSD card, and then click "OK". Click "CHOOSE OS", and click the one that says "Recommended". Click "OK". Now, click "WRITE". After it says "Done", go to Finder (Mac), Files (Windows), or any app that allows you to manage your files, click "Eject". Insert the MicroSD card into the MicroSD slot in the Raspberry Pi. (on the bottom side of the Pi)

Raspberry Pi Setup


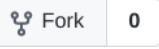


Connect a Micro-HDMI cable into the Micro HDMI port highlighted in yellow; if you put it in the port HDMI2 (labeled "2" in black), it will think you never plugged in the cable. Next, plug a USB-C cable into the Power port (highlighted in red), and connect a mouse and keyboard to the USB-2 ports (x2), which is highlighted in green. Connect the PiCamera's cable to the port labeled CSI (in the real Pi) or the port right to the HDMI 2 Port. (Follow the instructions from [Getting Started with the PiCamera V2](#), only do the Connect the Camera Module part)

Now, supply power to the Pi and the monitor. (you might see some code for a short amount of time while the Pi's booting up) Follow the instructions on the screen to set up your Pi after the boot of the Pi; it will take about a few minutes. Time needed to set up is different on every Raspberry Pi, and it might take longer than usual.

*On the actual Pi, the ports are not highlighted. The image above is edited.

Downloading burglar-alarm Using GitHub

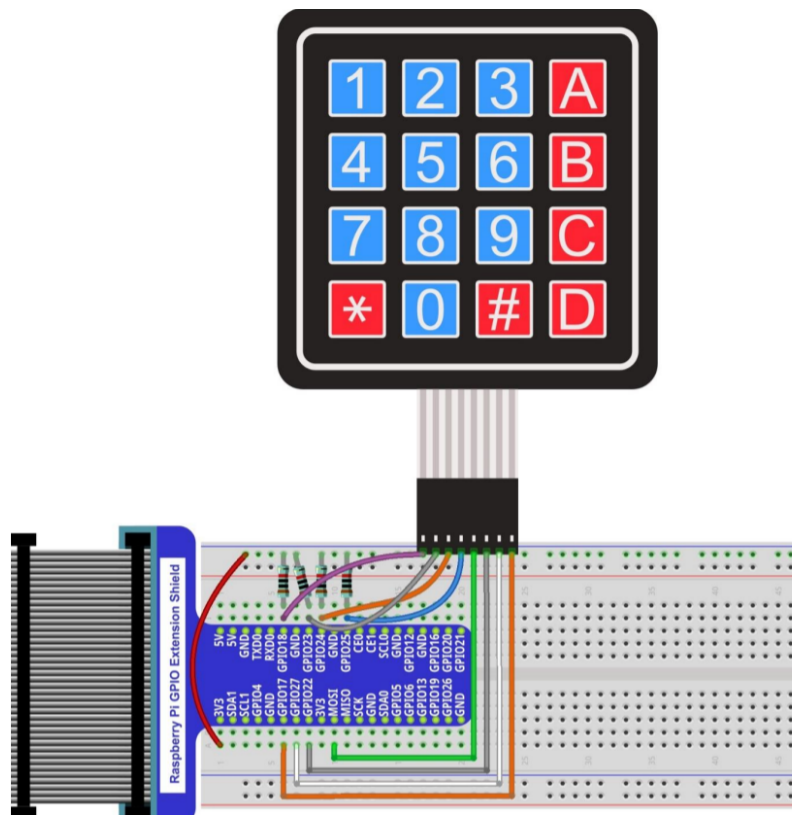
After the Pi's set up, click terminal (), on the top-left corner of the screen (represented by an icon that says ">_") or press CTRL + ALT + T. Type cd to go to the home directory. DO NOT DELETE THE TAB OF THE TERMINAL. You'll need to make a GitHub Account [here](#). After that, go to [Adding a new SSH Key to your GitHub account](#) and follow the instructions provided in the website to generate a new SSH key for your Pi (name the SSH key rpi4-burglar-alarm and it's your choice to add a SSH key password). After you're done, go to [Burglar Alarm GitHub Repo](#) and click "fork" () at the top-right corner of the screen. When it's done forking it, go to the repo (link will be something like <https://github.com/your-github-username/burglar-alarm> **This link is invalid, if you go there GitHub will give you a 404 error**) and then click "Code" (button that's green) on the top-right corner. Click SSH, and then copy the SSH link. Go back to the terminal (check if the starting of the new line in the terminal is pi@raspberrypi ~/Projects/ \$) and type git clone [your-ssh-code](#). Paste your SSH code by using the keyboard shortcut CTRL + SHIFT + V. (In the Terminal you have to press SHIFT to copy & paste) It will take a few seconds, and enter the Project Directory by the command cd Projects. **STILL, DO NOT DELETE THE TERMINAL TAB.** Next, you'll set up the hardware.

*The commands that you need to type are in a code font.

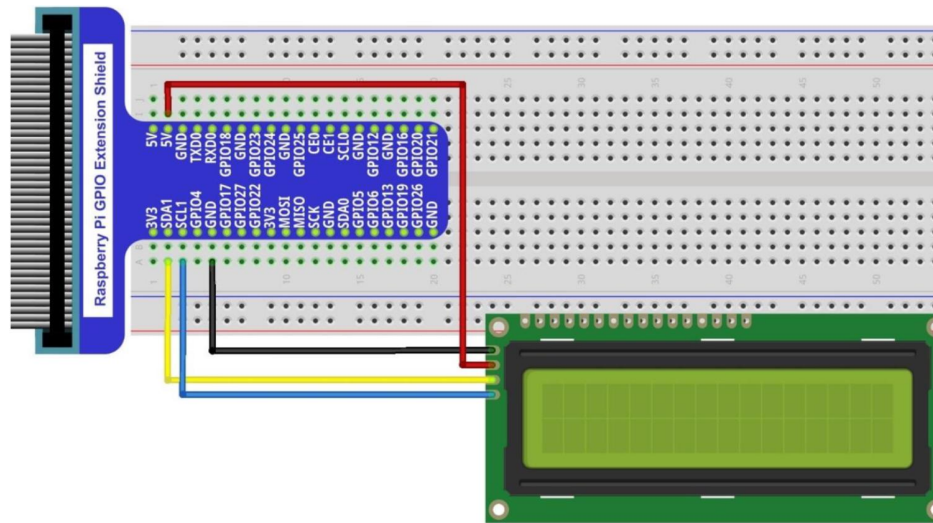
GPIO Setup

DANGER

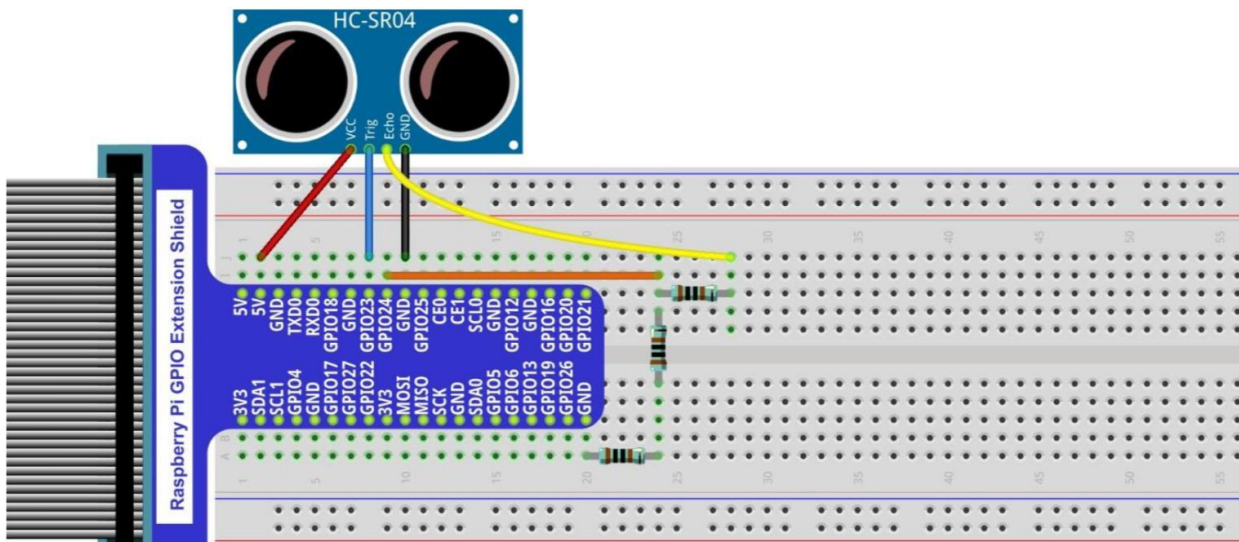
Now comes the hard part. Have a hole at the side of your lunchbox, and get the cables through the hole. Get the breadboard, install the Raspberry Pi GPIO Expansion Board on it and put the wires like this (Keypad):



Then, do this (LCD):

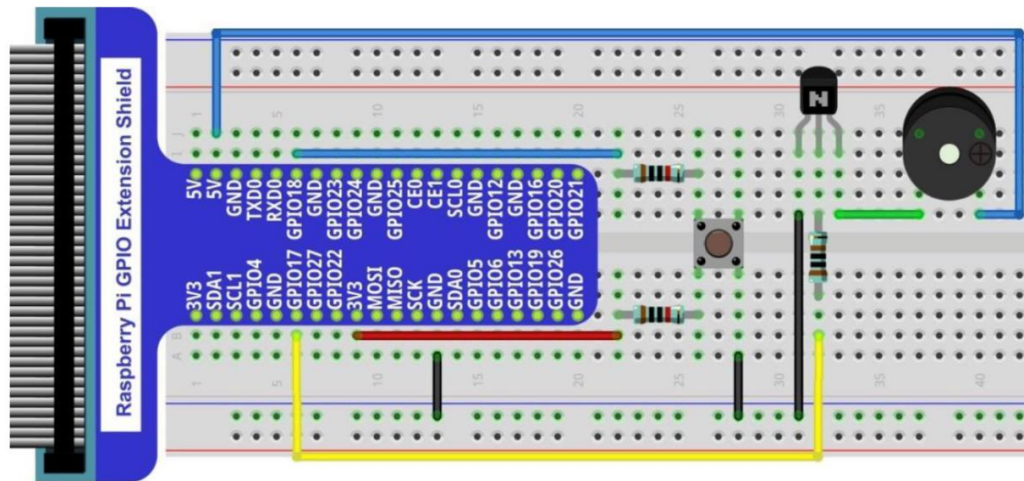


Do this next (Ultrasonic Distance Sensor):



PLUG ECHO (YELLOW WIRE) GPIO 20 AND PLUG TRIG (BLUE WIRE) TO GPIO 21.

Plug the wires like this (buzzer):



CONNECT THE YELLOW WIRE TO GPIO 26 INSTEAD OF GPIO 17.

YOU DO NOT NEED THE BUTTON. (BLUE WIRE (GPIO 18))

YOU DO NOT NEED THE RED WIRE.

*Circuit Diagram by Freenove (source: [Freenove Ultimate Starter Kit: Tutorial.pdf](#))

Face the Ultrasonic Distance Sensor to the cover of the lunchbox so the distance between the lunchbox cover and the sensor changes when you open the cover. Make the eye-looking part of the sensor look at the cover of your lunchbox. Use some tape to stick the sensor.

Configuring I2C and Downloading SMBUS

To configure I2C, get a new terminal window and type `sudo raspi-config` (you need to type `sudo` or it will not let you to open the Raspberry Pi Configuration) and then use the up & down arrow keys to go to Interfacing Options. Press enter. Press yes when it asks you to enable I2C. If it asks you about automatically loading the kernel module. Use the left & right arrow buttons on your keyboard to select <finish> and click enter. Type `sudo reboot` to reboot your Pi so I2C is actually activated. After the Pi restarts, open a new terminal and type:

```
sudo apt-get update
sudo apt-get upgrade
```

```
sudo apt-get install python-smbus
sudo apt-get install python3-smbus
```

Wait until the process is finished, and then type:

```
sudo reboot
```

You're ready to actually run the Alarm!

Running burglar-alarm

To run burglar-alarm, open a new terminal and type:

```
cd Projects/burglar-alarm
```

Next, type `python3 run.py` and it should say:

```
Running run.py...
```

You're all set! In the next chapter, you will learn how to disarm/arm your Alarm and how to stop it from ringing!

How to use the Burglar Alarm

Try opening your lunchbox on startup, without pressing any buttons on the keypad. It won't ring because your Alarm is unarmed. If you take a look at the LCD, it will say:

UNARMED
TIME : 12:34:56

**Time is in 24-hour clock*

If you want it to ring when someone opens your lunchbox, press A on the keypad. Press *, and then enter the 4-digit passphrase (only numbers, or the LCD will display Invalid PIN) The last step is, press #. Try opening your lunchbox. The buzzer will ring, and the camera will record a 20-second clip, to find out who the burglar is. To disarm (unlock) your Alarm when the Alarm is armed (locked), press A, then *, your set passphrase, and finally, #. (The same buttons that you pressed to Arm your Alarm) To turn off the buzzer from ringing when the lunchbox is open (when armed), press B, your passphrase (4-digit, numbers-only), and then #.

How your Burglar Alarm works

In this chapter, I will show you **how** your Burglar Alarm works. I won't go over the whole process. First, when you enter `python3 run.py` when you are in the directory `~/home/pi/Projects/`, bash (the terminal) executes the python3 file, named `run.py`. The Ultrasonic Distance Sensor detects the distance between the sensor and the cover of the lunchbox. If the distance between the cover and the sensor gets farther than when the cover is closed, the buzzer buzzes. Also, your Pi will take a photo of the robber with the PiCamera (V2) and save the picture to the directory `~/home/pi/Projects/burglar-alarm/images`.

Conclusion

I hope you found this burglar alarm useful. I hope you found the burglar in a day!

Images

Matrix Keypad (4x4) looks like:



NPN Transistor looks like:



Active Buzzer looks like:



Copyright

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The GitHub repository [burglar-alarm](#) is licensed under the MIT license.