

**How do you
talk to your
Raspberry Pi?**



Talking to the Pi

- HDMI cable, monitor, USB keyboard, mouse

Talking to the Pi

- HDMI cable, monitor, USB keyboard, mouse

Talking to the Pi

- HDMI cable, monitor, USB keyboard, mouse
- Serial cable
- Ethernet

Serial vs. ethernet

Serial advantages:

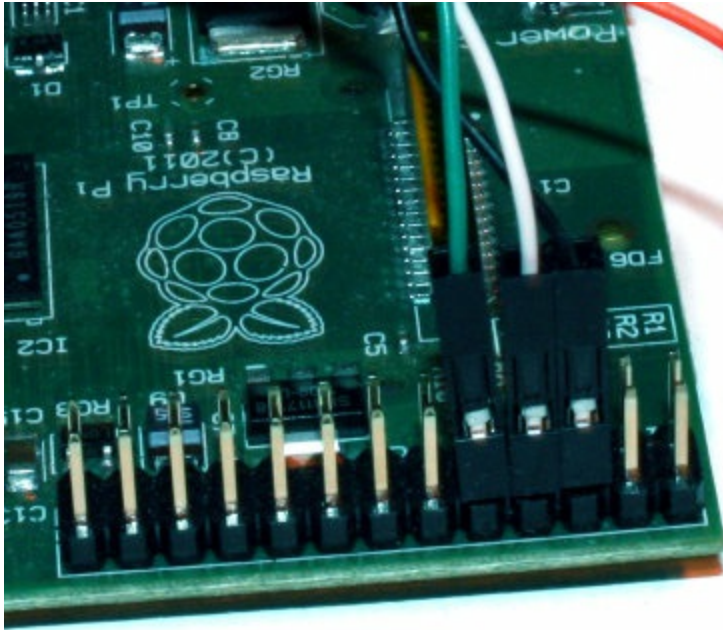
- Simple to set up
- Works even when networking doesn't

Ethernet advantages:

- Some Macs have trouble with serial
- Can copy files, route to internet



Serial setup



Leave red wire
free!

Linux: `screen /dev/ttyUSB0 115200`

Mac: `screen /dev/cu.PLXXX 115200`

Ethernet ...

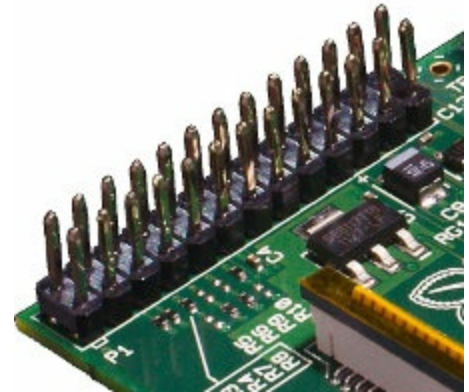


Hardware on the Raspberry Pi



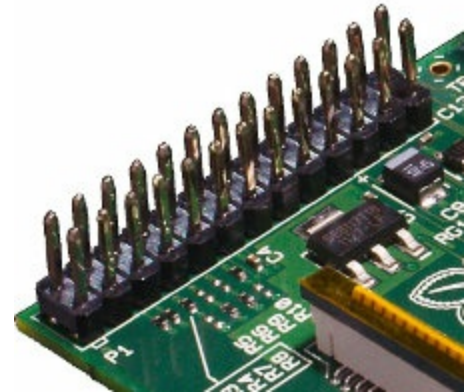
The good:

- Cheap, low power
- That big GPIO connector!
- RPi.GPIO Python module



The bad :(

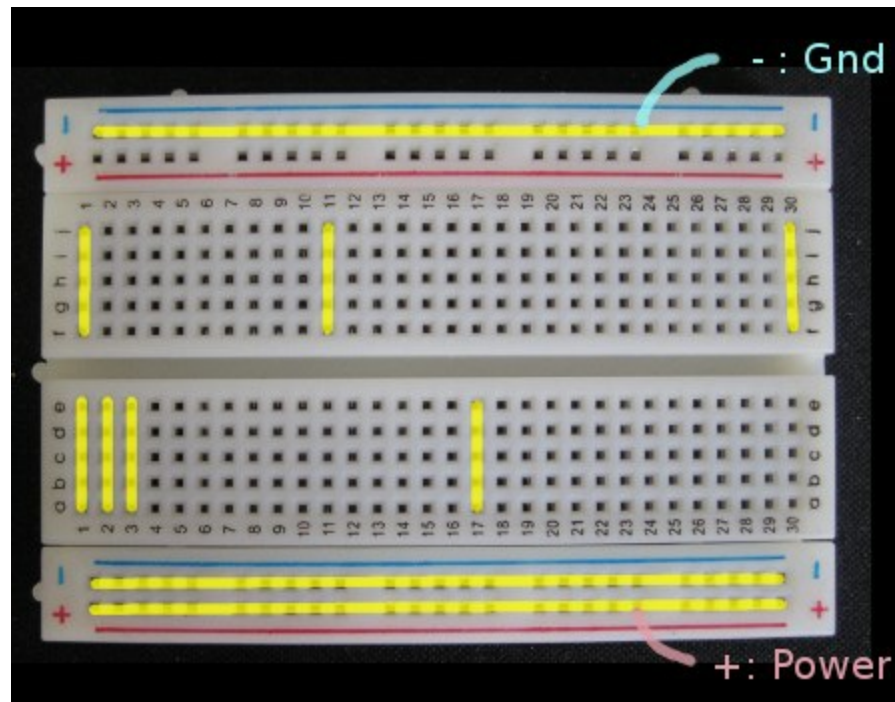
- Chaotic pin numbering
- No analog
- Poor PWM support
- 3 volts, not 5



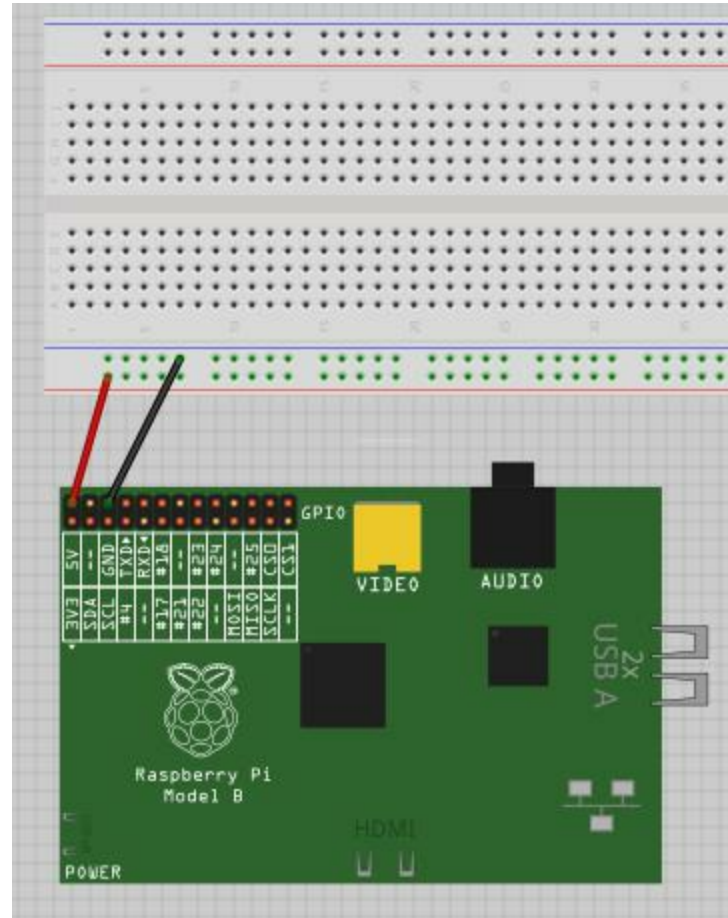
The GPIO connector



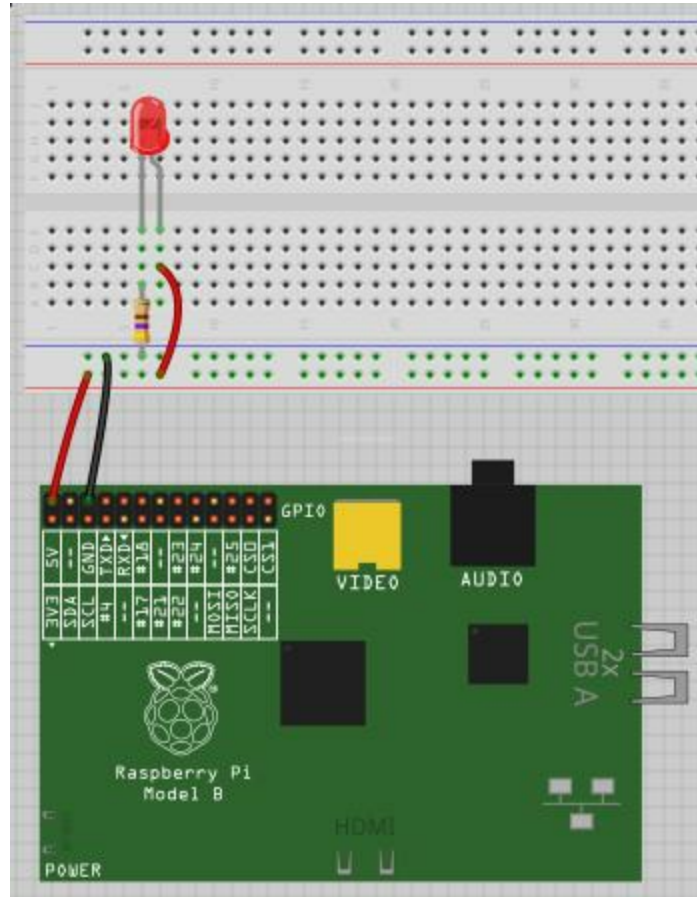
Solderless breadboard



Connect power, ground

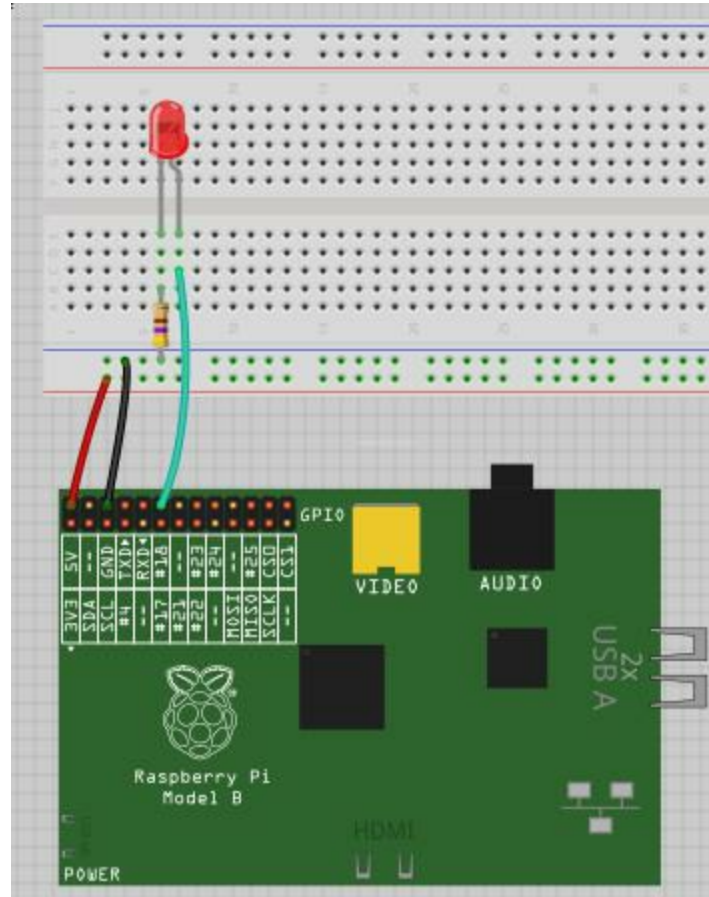


Connect an LED



This LED will stay on (if the RPi is).

Connect the LED to pin 18



Blink an LED on pin 18

```
import RPi.GPIO as GPIO
import time

GPIO.setmode(GPIO.BCM)

pin = 18

GPIO.setup(pin, GPIO.OUT)

while True:
    GPIO.output(pin, 0)
    time.sleep(.5)
    GPIO.output(pin, 1)
    time.sleep(.5)
```

(This is *led.py* in the source.)

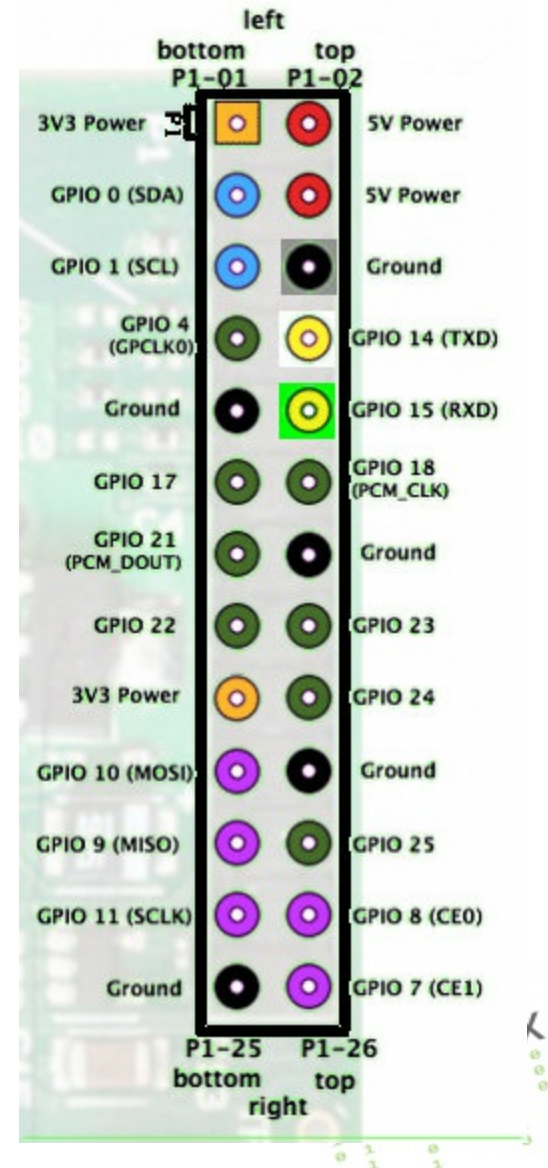


BCM vs BOARD numbering

BCM: functional notation

BOARD: actual pin numbers on the RPi.

BOARD sounds appealing, but doesn't save you from needing GPIO numbers.

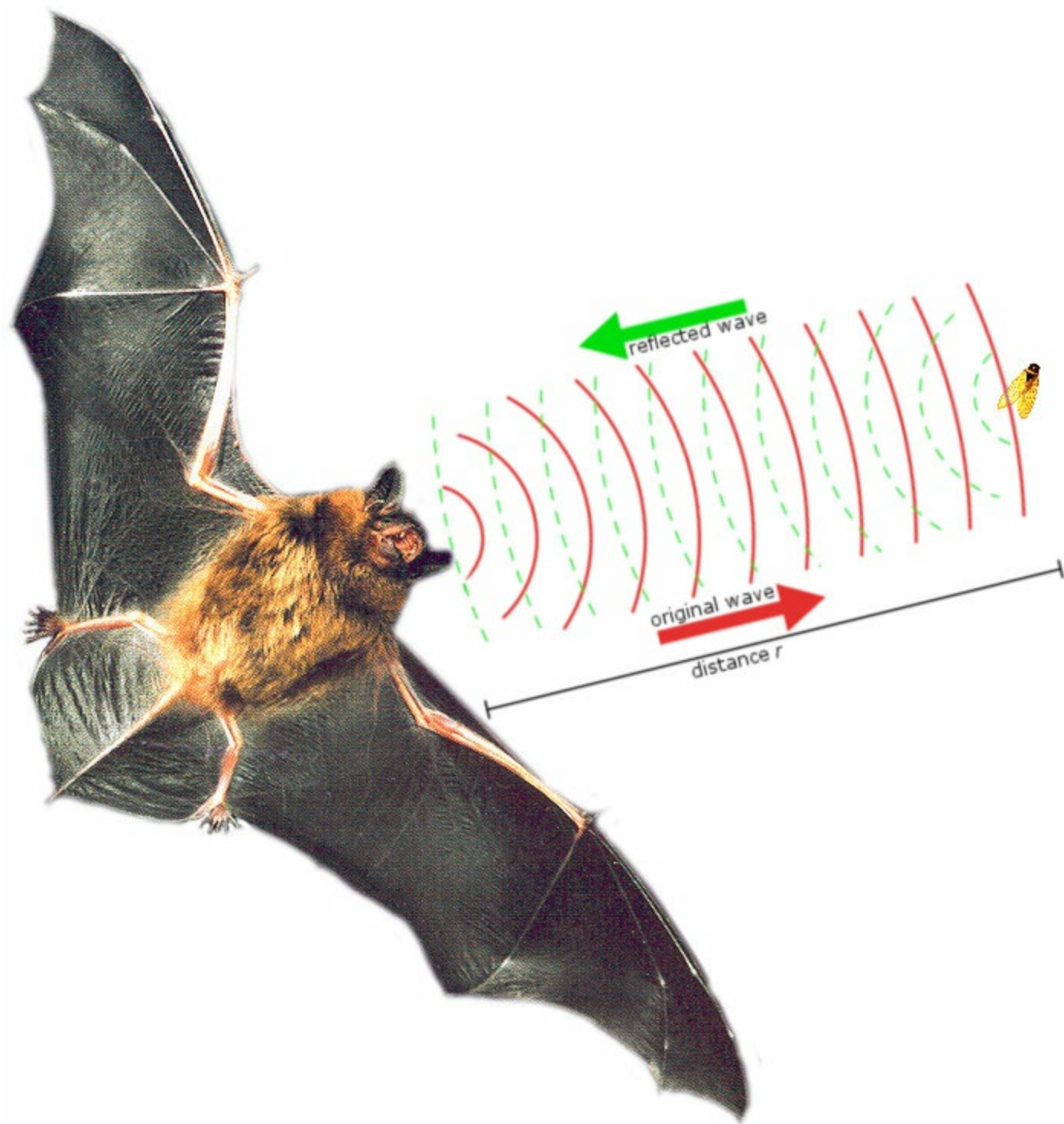


HC-SR04 Sonar Rangefinder

Emits a pulse of sound;
times how long the
sound takes to return.

About \$5 on Amazon.





Using the HC-SR04

Write to the **Trigger**;
read **Echo** to learn
when the sound pulse
returns.



One problem:

The HC-SR04 operates on 5 volts.

The Raspberry Pi's GPIO pins can only handle 3 volts or less.

We'll use a *voltage divider*
(2 resistors) to turn 5V into 3V.

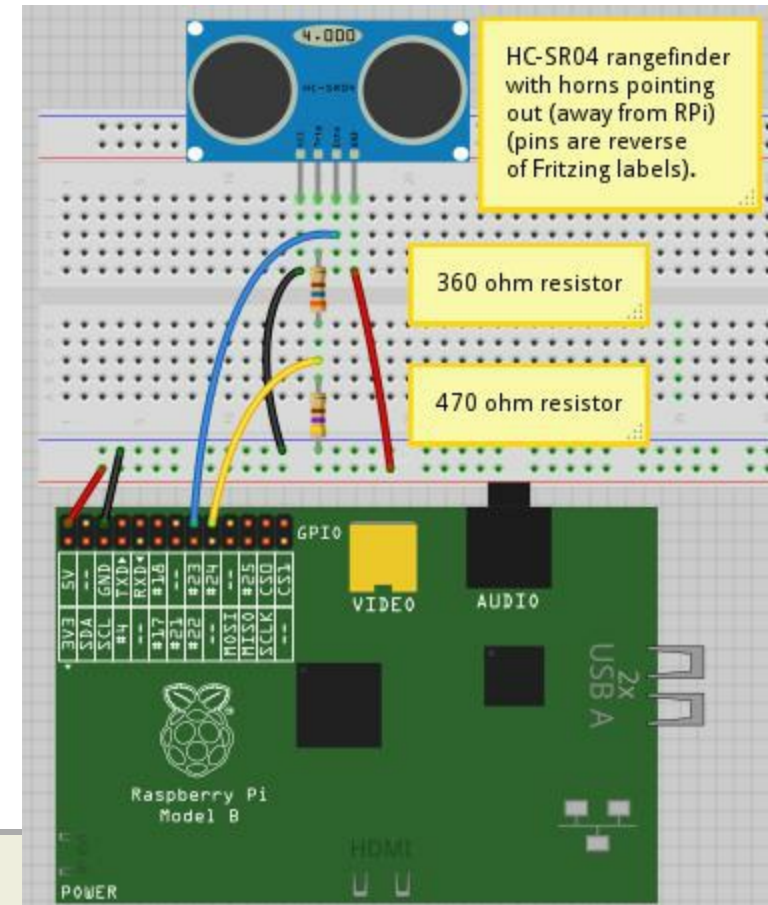


Connecting the HC-SR04

Be careful of which resistor goes where!

When ready, test it by running

```
sudo python HC_SR04.py
```



Running the PiDoorbell app



Local mode

```
$ sudo python pidoorbell-recognizer-gpio.py -i -local
```

```
Distance: 102.0 inches
```

```
102.022406334
```

```
Distance: 150.8 inches
```

```
150.823360135
```

```
Distance: 151.5 inches
```

```
151.532743398
```

```
Distance: 150.9 inches
```

```
150.938192221
```

```
Distance: 11.9 inches
```

```
11.884047763
```

```
** DETECTED AN OBJECT AT -- 11.884047763 -- INCHES **
```

```
Distance: 11.8 inches
```

```
11.7531177204
```


Adding networking ...



Cameras

USB Webcam

Shows up as */dev/video0*

To take a still image: **fswebcam**

To take a video: **ffmpeg** or **avconv**

Packages you'll need:

```
$ sudo apt-get install fswebcam libv4l v4l-utils ffmpeg
```



Raspberry Pi Camera

Shows up as */dev/fb0*

To take a still image: **raspistill**

To take a video: **raspivid**

Or use the *picamera* package:

```
$ sudo apt-get install python-picamera
```

■ ■ ■