

Raspberry Pi+PHP + MySQL + HC-SR04

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Installing Operation System Image

1. Download the image :

Official images for recommended operating systems are available to download from the Raspberry Pi website <http://www.raspberrypi.org/downloads/>
Index of images: <http://downloads.raspberrypi.org/>

2. Write an image to the SD card:

You need to use an image writing tool to install it on your SD card.

Installing Operation System Image

Image writing tools :

1.Linux:

<https://www.raspberrypi.org/documentation/installation/installing-images/linux.md>

2.Mac OS:

<https://www.raspberrypi.org/documentation/installation/installing-images/mac.md>

3.Windows:

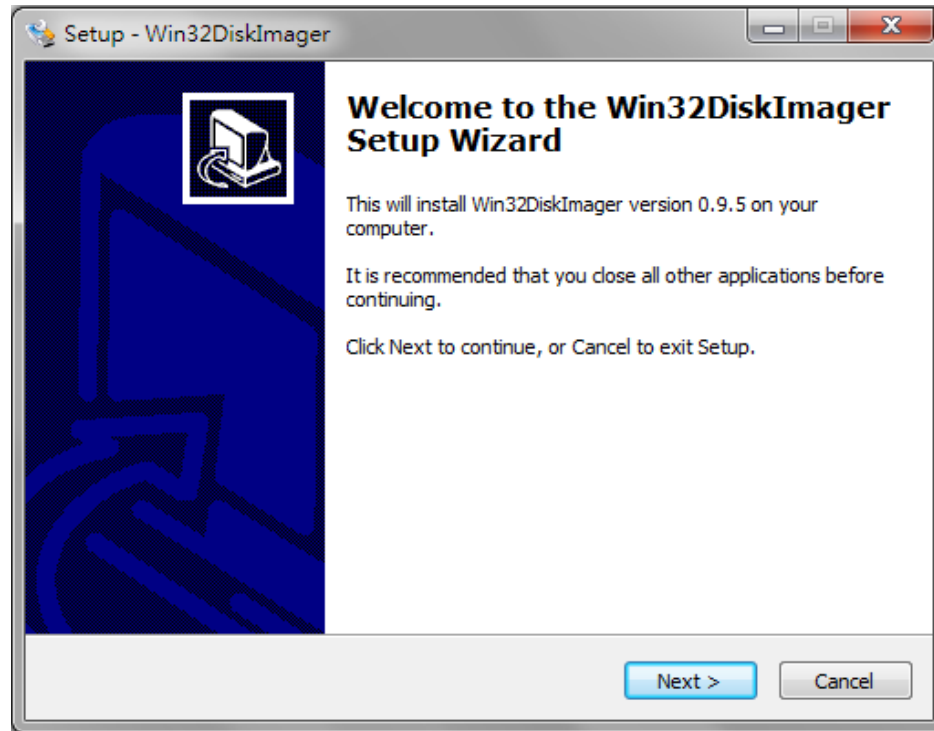
<https://www.raspberrypi.org/documentation/installation/installing-images/windows.md>



Installing Operation System Image

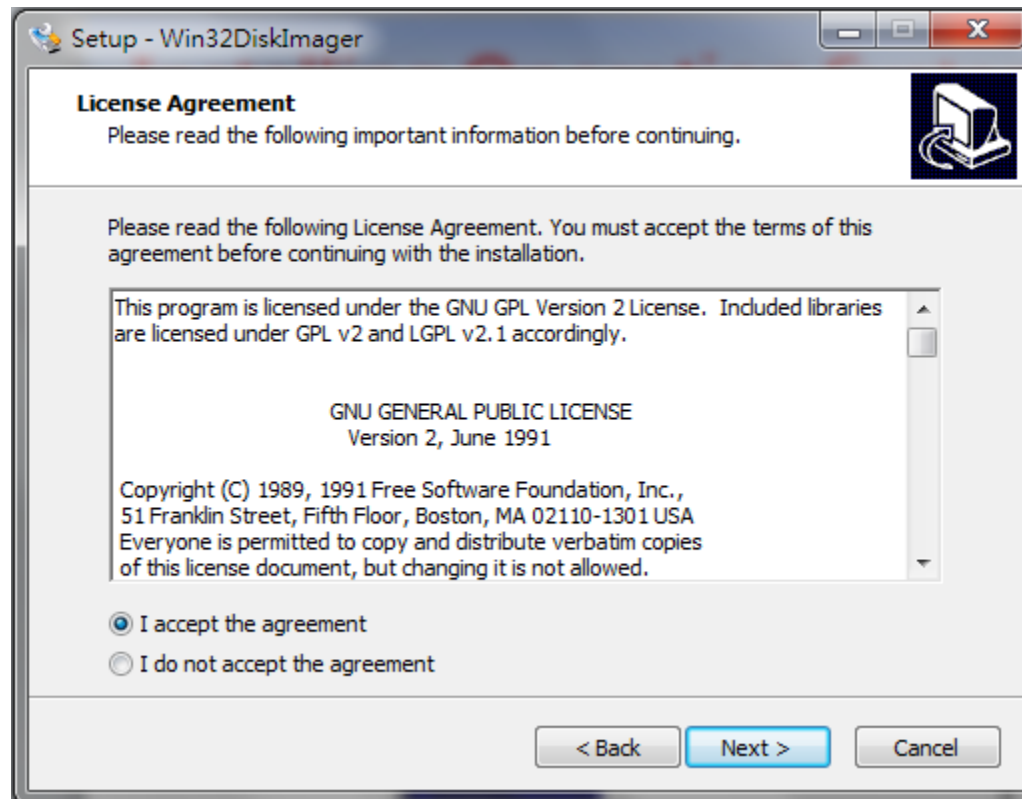
Using Windows:

- Download and install the Win32DiskImager utility
<https://sourceforge.net/projects/win32diskimager/>



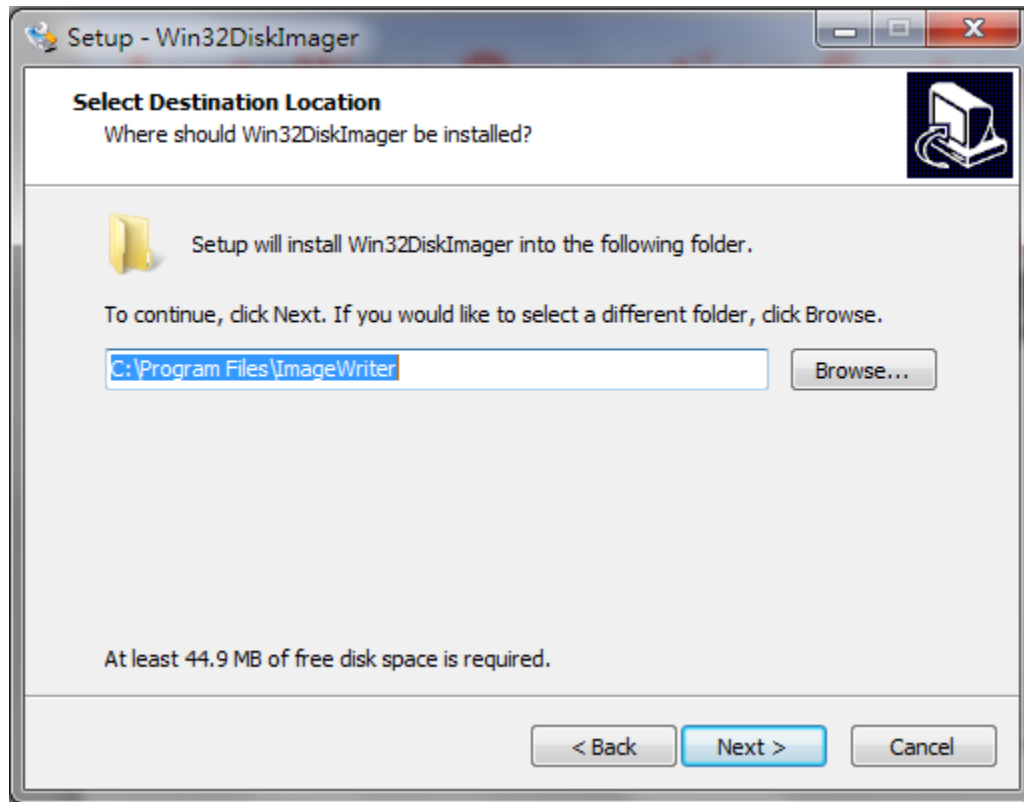
Installing Operation System Image

Install Win32DiskImager



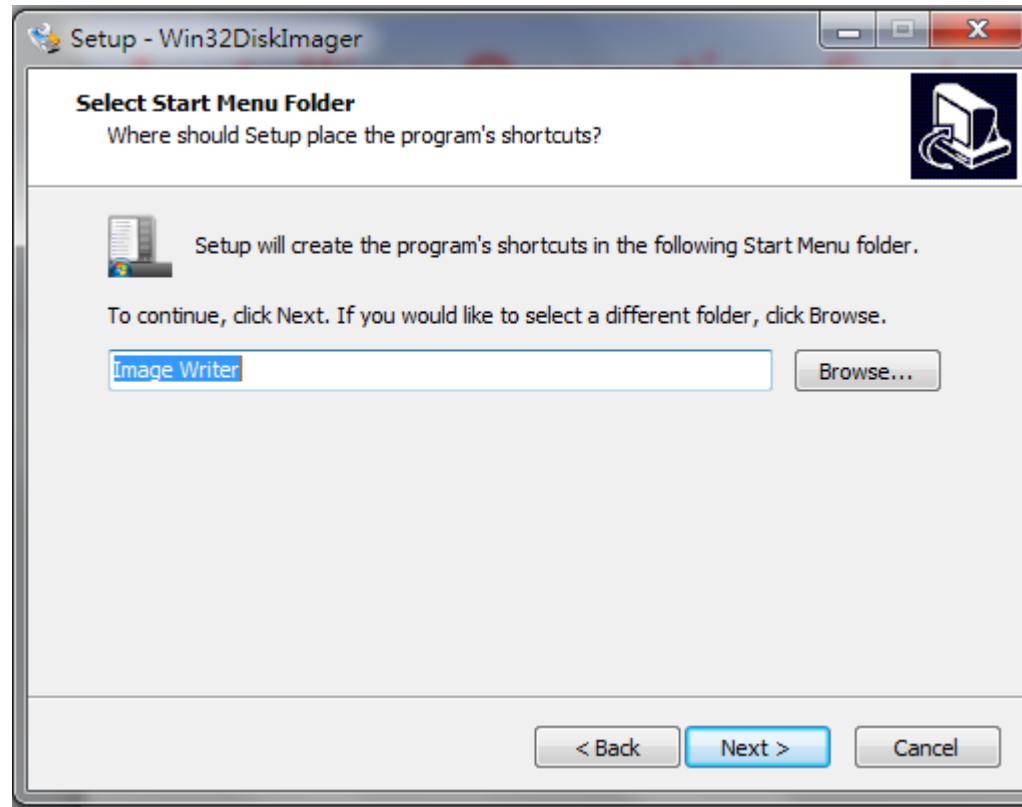
Installing Operation System Image

Install Win32DiskImager



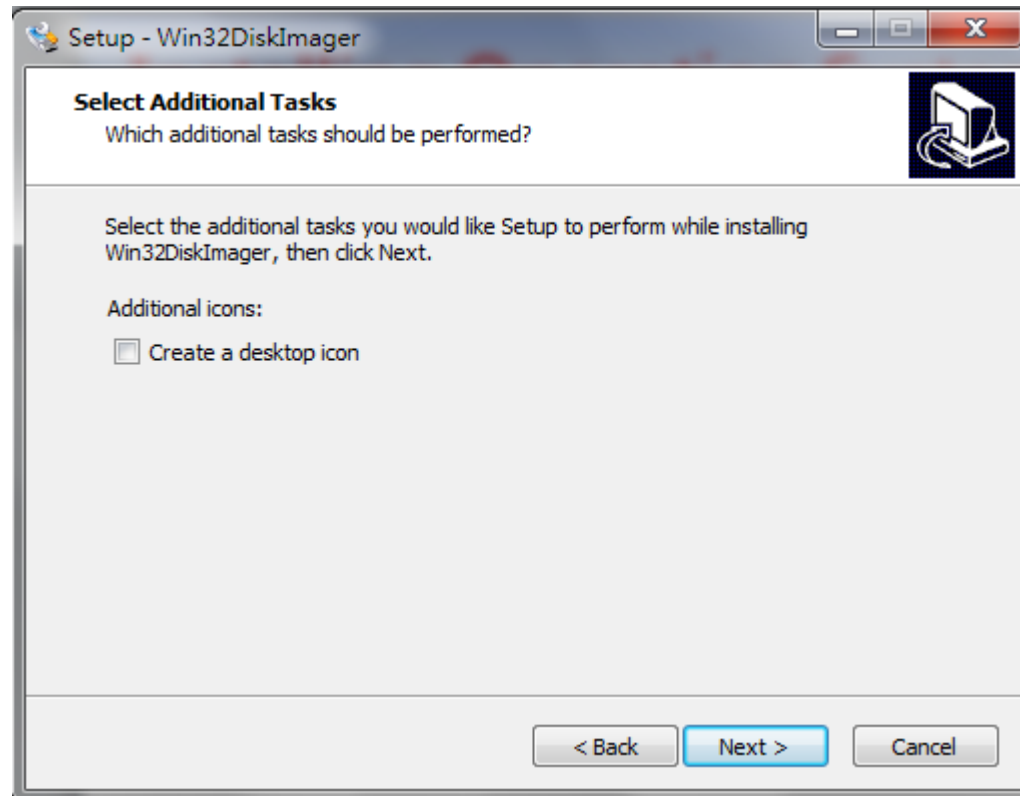
Installing Operation System Image

Installing Win32DiskImager



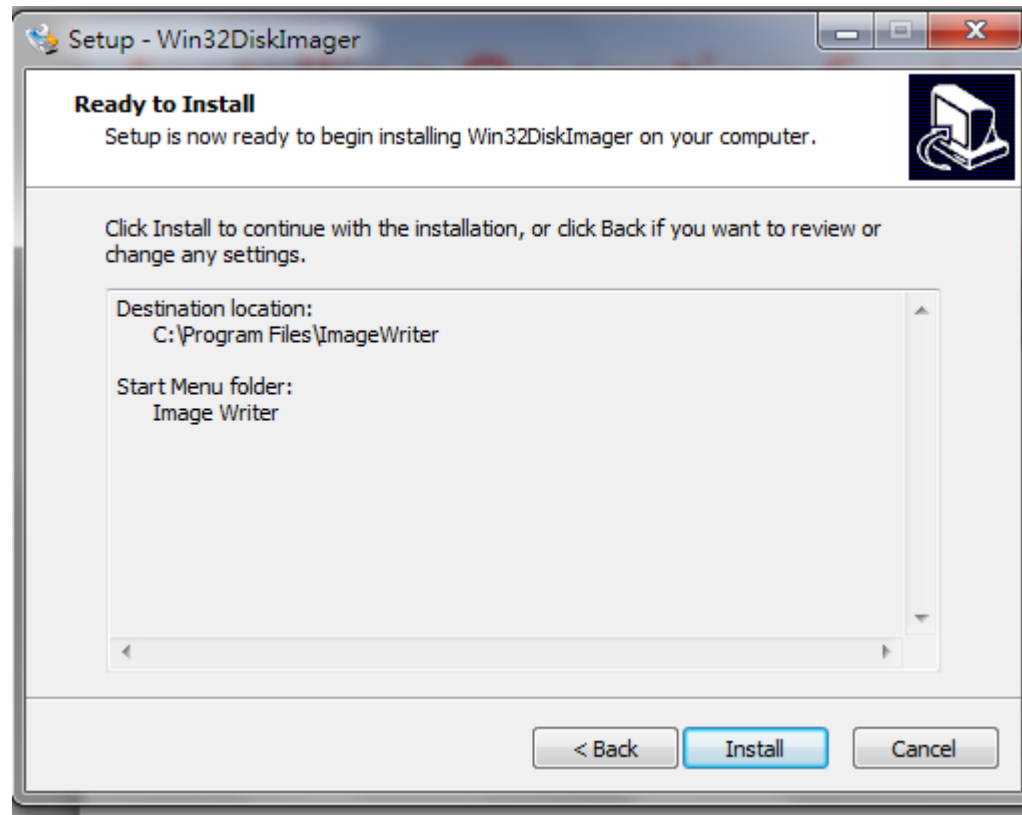
Installing Operation System Image

Installing Win32DiskImager



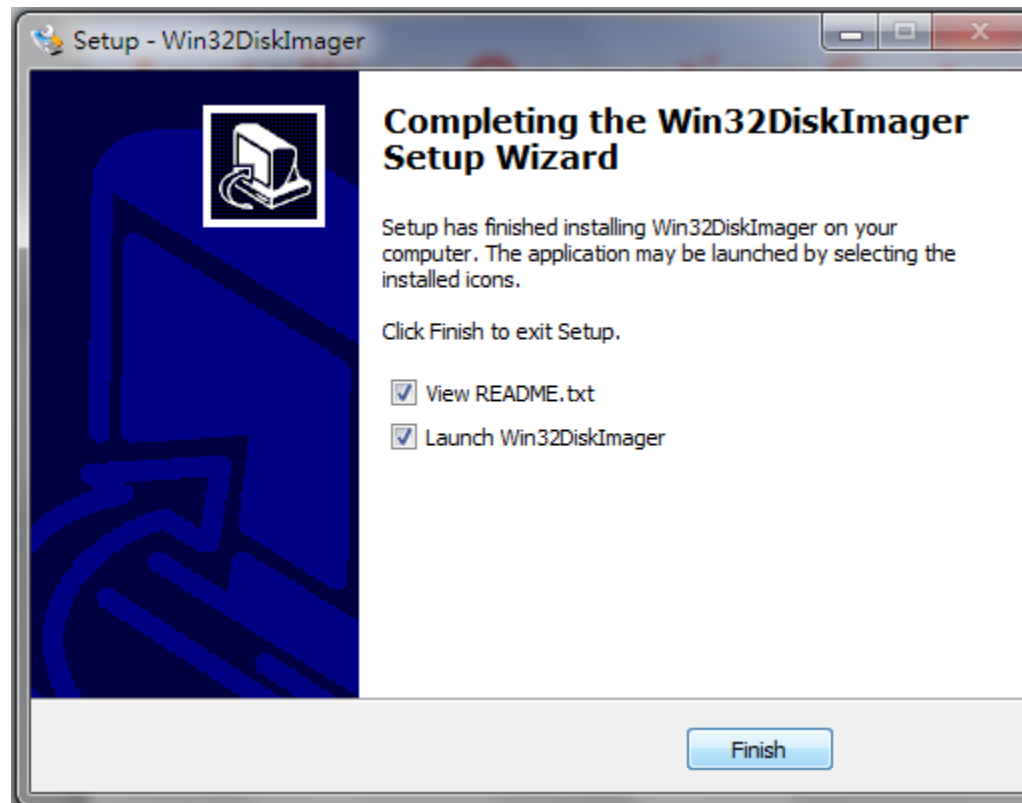
Installing Operation System Image

Install Win32DiskImager



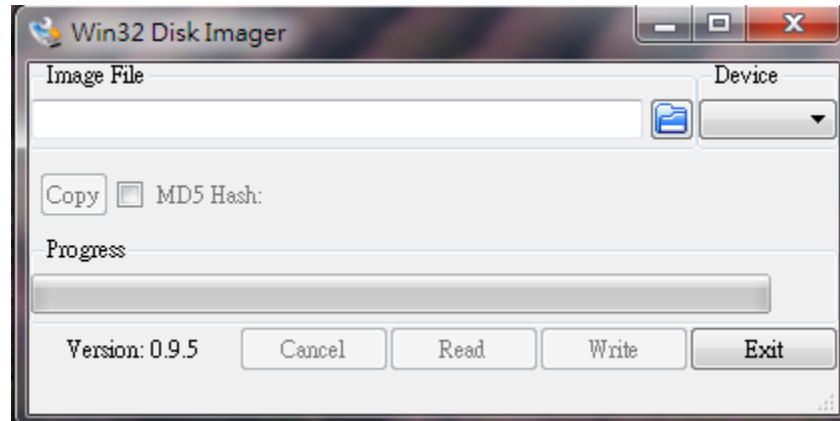
Installing Operation System Image

Install Win32DiskImager



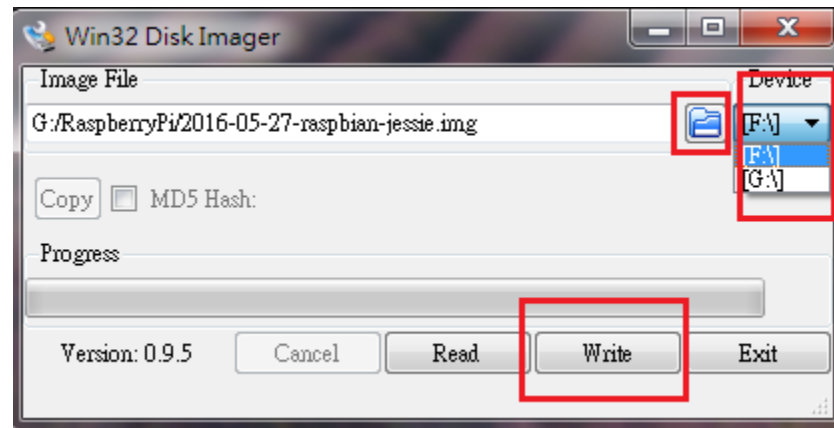
Installing Operation System Image

Launch Win32DiskImager



Installing Operation System Image

Select the Image ; **Select the Device** ; press [Write]



Pi 3 serial port error

*Need to disable Bluetooth

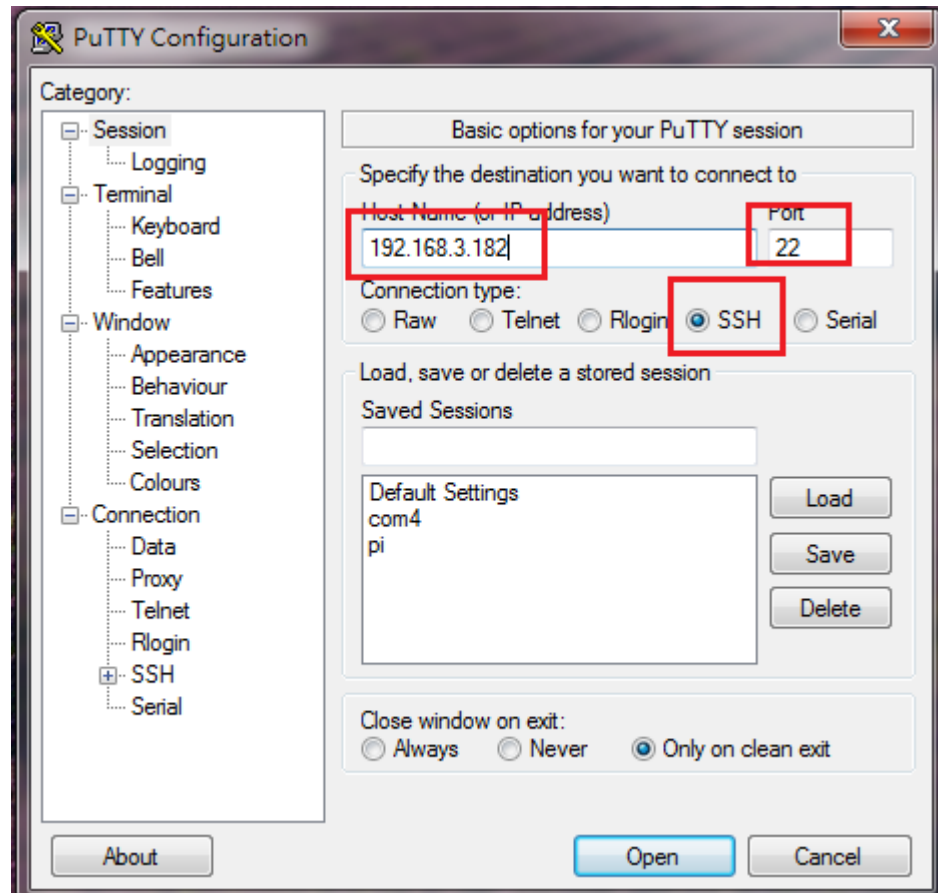


The image shows a PuTTY terminal window titled "/dev/ttyUSB0 - PuTTY". The terminal output is a line of garbled text: "L2i|âr² nî² pò2LlnòÂnbÂn² lî ``ÂnòNbnâîlâr² nbbl". A green cursor is positioned at the end of this line. The terminal window has a black background and a standard PuTTY interface with a title bar, window controls, and a scrollbar on the right.

Booting

Config and Connect to Pi

1. Check the ip
2. Connect to Pi by Putty
3. `$ sudo raspi-config`



Config

Expand Filesystem

Raspberry Pi Software Configuration Tool (raspi-config)

1 Expand Filesystem	Ensures that all of the SD card storage is a
2 Change User Password	Change password for the default user (pi)
3 Boot Options	Choose whether to boot into a desktop enviro
4 Wait for Network at Boot	Choose whether to wait for network connectio
5 Internationalisation Options	Set up language and regional settings to mat
6 Enable Camera	Enable this Pi to work with the Raspberry Pi
7 Add to Rastrack	Add this Pi to the online Raspberry Pi Map (
8 Overclock	Configure overclocking for your Pi
9 Advanced Options	Configure advanced settings
0 About raspi-config	Information about this configuration tool

<Select>

<Finish>

Config

Change User Password

Raspberry Pi Software Configuration Tool (raspi-config)

1 Expand Filesystem	Ensures that all of the SD card storage is a
2 Change User Password	Change password for the default user (pi)
3 Boot Options	Choose whether to boot into a desktop enviro
4 Wait for Network at Boot	Choose whether to wait for network connectio
5 Internationalisation Options	Set up language and regional settings to mat
6 Enable Camera	Enable this Pi to work with the Raspberry Pi
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8 Overclock	Configure overclocking for your Pi
9 Advanced Options	Configure advanced settings
0 About raspi-config	Information about this configuration tool

<Select>

<Finish>

Config

Internationalisation Options

Raspberry Pi Software Configuration Tool (raspi-config)

1 Expand Filesystem	Ensures that all of the SD card storage is a
2 Change User Password	Change password for the default user (pi)
3 Boot Options	Choose whether to boot into a desktop enviro
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8 Overclock	Configure overclocking for your Pi
9 Advanced Options	Configure advanced settings
0 About raspi-config	Information about this configuration tool

<Select>

<Finish>

Config

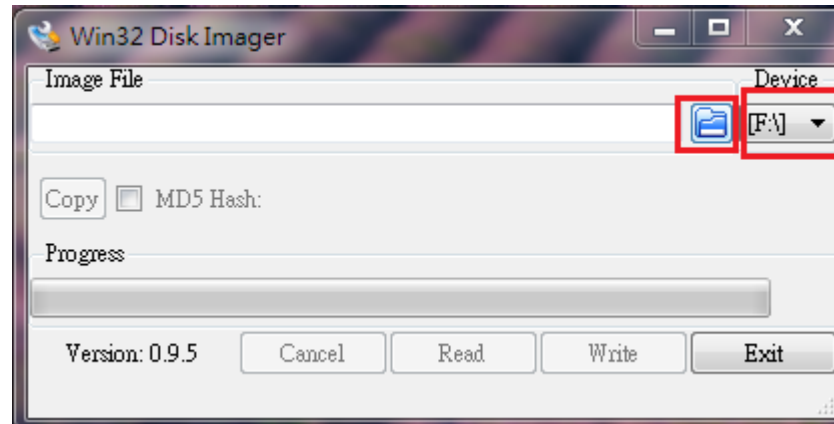
Keyboard layout

Raspberry Pi Software Configuration Tool (raspi-config)

- | | | |
|----|------------------------|--|
| I1 | Change Locale | Set up language and regional settings to match your location |
| I2 | Change Timezone | Set up timezone to match your location |
| I3 | Change Keyboard Layout | Set the keyboard layout to match your keyboard |
| I4 | Change Wi-fi Country | Set the legal channels used in your country |

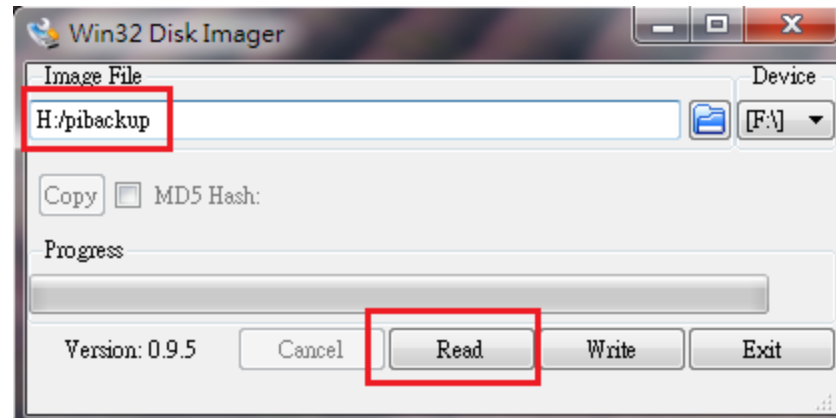
BackUp Operation System

Select the Device ; Give the location and a filename



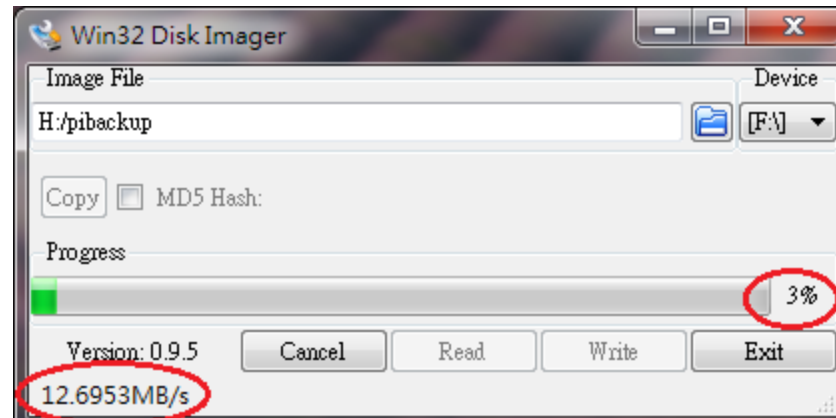
BackUp Operation System

Press [Read]



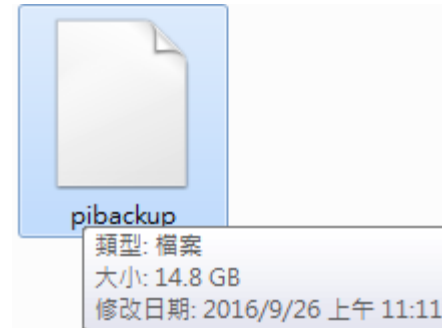
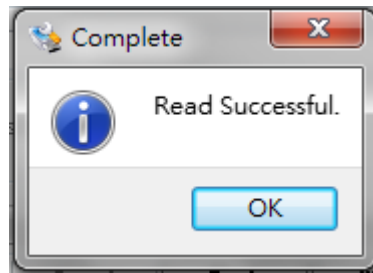
BackUp Operation System

Reading...



BackUp Operation System

Done



LAMP Server

LAMP : Linux + Apache + MySQL + PHP

1. Install Apache+PHP

```
$ sudo apt-get update
```

```
$ sudo apt-get upgrade
```

```
$ sudo apt-get install apache2 php5 libapache2-mod-php5
```

2. Install vim

```
$ sudo apt-get install vim
```

3. Modify DocumentRoot

```
$ sudo vim /etc/apache2/sites-enabled/000-default.conf
```

```
[DocumentRoot /var/www/html] -> [DocumentRoot /var/www]
```

then remove the # symbol of this line :

```
[#Include conf-enabled/serve-cgi-bin.conf]
```

LAMP Server

4. Modify serve-cgi-bin.conf to enable cgi

```
$ sudo vim /etc/apache2/conf-available/serve-cgi-bin.conf
```

```
<Directory "/usr/lib/cgi-bin" >  
    AllowOverride None
```

```
<Directory "/usr/lib/cgi-bin" >  
    AllowOverride All
```

5. Restart Apache2 server

```
$ sudo service apache2 restart
```

6. Check if apache2 server is working

Open a web browser and try to connect to apache2 default page

<http://192.168.xxx.xxx/html> (ip of raspberry Pi)

Apache2 Debian Default Page



Apache2 Debian Default Page

It works!

This is the default welcome page used to test the correct operation of the Apache2 server after installation on Debian systems. If you can read this page, it means that the Apache HTTP server installed at this site is working properly. You should **replace this file** (located at `/var/www/html/index.html`) before continuing to operate your HTTP server.

If you are a normal user of this web site and don't know what this page is about, this probably means that the site is currently unavailable due to maintenance. If the problem persists, please contact the site's administrator.

Configuration Overview

Debian's Apache2 default configuration is different from the upstream default configuration, and split into several files optimized for interaction with Debian tools. The configuration system is **fully documented in `/usr/share/doc/apache2/README.Debian.gz`**. Refer to this for the full documentation. Documentation for the web server itself can be found by accessing the **manual** if the `apache2-doc` package was installed on this server.

The configuration layout for an Apache2 web server installation on Debian systems is as follows:

```
/etc/apache2/  
|-- apache2.conf  
|   |-- ports.conf  
|-- mods-enabled
```

Hello, PHP

1. A simple PHP program

```
$ sudo vim /var/www/hello.php
```

```
<h1>Hello NUK</h1>
```

```
<?php
```

```
    phpinfo();
```

```
?>
```

2. Check the hello.php

Open a web browser and connect to

<http://192.168.xxx.xxx/hello.php>

Hello.php

Hello NUK

PHP Version 5.6.24-0+deb8u1



System	Linux raspberrypi 4.4.13-v7+ #894 SMP Mon Jun 13 13:13:27 BST 2016 armv7l
Build Date	Jul 26 2016 23:12:41
Server API	Apache 2.0 Handler
Virtual Directory Support	disabled
Configuration File (php.ini) Path	/etc/php5/apache2
Loaded Configuration File	/etc/php5/apache2/php.ini
Scan this dir for additional .ini files	/etc/php5/apache2/conf.d
Additional .ini files parsed	/etc/php5/apache2/conf.d/05-opcache.ini, /etc/php5/apache2/conf.d/10-pdo.ini, /etc/php5/apache2/conf.d/20-gd.ini, /etc/php5/apache2/conf.d/20-json.ini, /etc/php5/apache2/conf.d/20-mcrypt.ini, /etc/php5/apache2/conf.d/20-mysql.ini, /etc/php5/apache2/conf.d/20-mysqli.ini, /etc/php5/apache2/conf.d/20-pdo_mysql.ini, /etc/php5/apache2/conf.d/20-readline.ini
PHP API	20131106
PHP Extension	20131226
Zend Extension	220131226
Zend Extension Build	API20131226,NTS
PHP Extension Build	API20131226,NTS
Debug Build	no
Thread Safety	disabled

MySQL + phpmyadmin

1. Install MySQL

```
$ sudo apt-get install mysql-server
```

Give a password for MySQL (twice)

2. Test MySQL

```
$ mysql -u root -p
```

Input [exit] to leave test

3. Install phpmyadmin

```
$ sudo apt-get install phpmyadmin
```

- Input the same password
- Choose the apache2

```
[*] apache2
```

```
[ ] lighttpd
```

MySQL + phpmyadmin

4. Modify apache2.conf

```
$ sudo vim /etc/apache2/apache2.conf
```

Add a line at the end of the file

```
[Include /etc/phpmyadmin/apache.conf]
```

5. Restart Apache2 server

```
$ sudo /etc/init.d/apache2 restart
```

6. Test phpmyadmin

Open a web browser and connect to

<http://192.168.xxx.xxx/phpmyadmin>

phpMyAdmin



歡迎使用 phpMyAdmin

語系 - *Language*

中文 - Chinese traditional ▼

登入 ⓘ

使用者名稱:

密碼:

執行

HC-SR04 Ultrasonic Range Sensor

HC-SR04



HC-SR04 Ultrasonic Range Sensor

HC-SR04

Working Voltage: DC 5 V

Working Current: 15mA

Working Frequency: 40Hz

Max Range: 4m

Min Range: 2cm

MeasuringAngle: 15 degree

Trigger Input Signal: 10uS TTL pulse

Echo Output Signal: Input TTL lever signal and the range in proportion

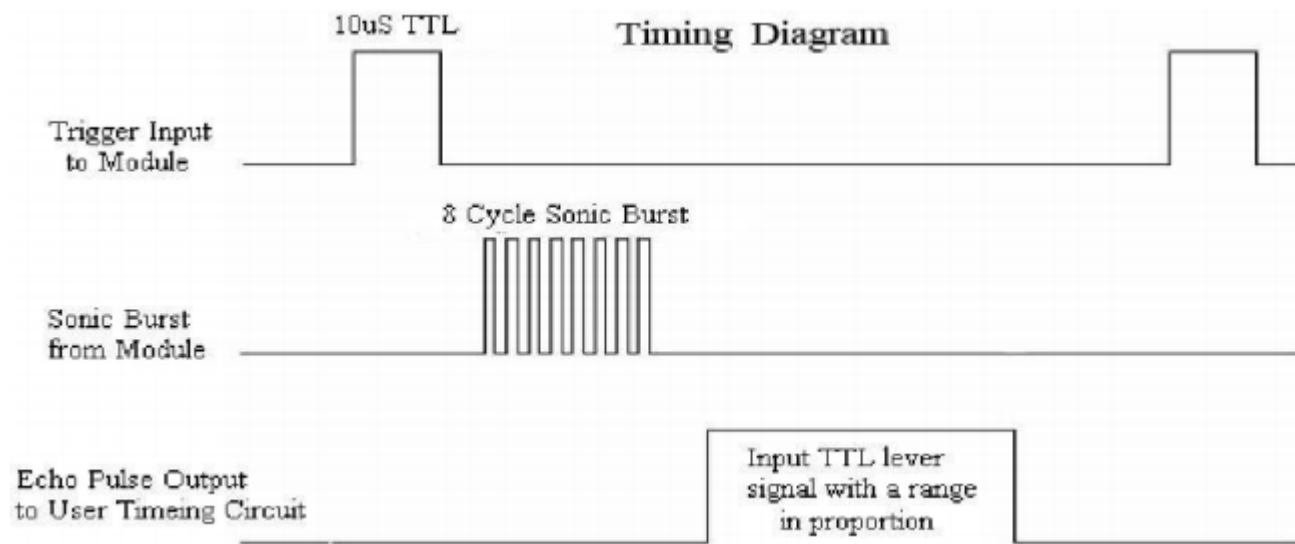
HC-SR04 Ultrasonic Range Sensor

HC-SR04

- Using IO trigger for at least 10us high level signal.
- The Module automatically sends eight 40 kHz and detect whether there is a pulse signal back.
- IF the signal back, through high level , time of high output IO duration is the time from sending ultrasonic to returning.
- Test distance = (high level time \times velocity of sound (340M/S) / 2.
- When tested objects, the range of area is not less than 0.5 square meters and the plane requests as smooth as possible, otherwise ,it will affect the results of measuring.
- Suggest to use over 60ms measurement cycle, in order to prevent trigger signal to the echo signal.

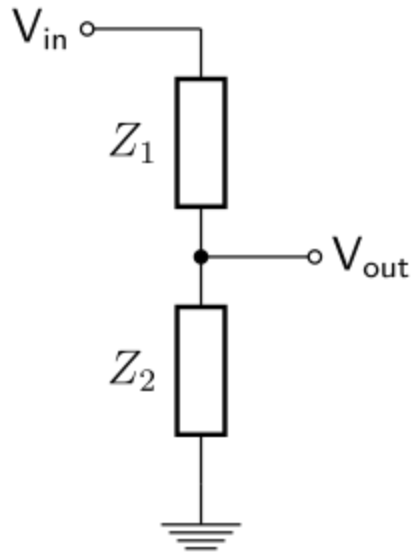
HC-SR04 Ultrasonic Range Sensor

Timing Diagram



Voltage divider

A simple voltage divider



Voltage divider

Equation

$$V_{out} = V_{in} \times \frac{R2}{R1 + R2}$$

$$\frac{V_{out}}{V_{in}} = \frac{R2}{R1 + R2}$$

$$\frac{3.3}{5} = \frac{R2}{1000 + R2}$$

$$0.66 = \frac{R2}{1000 + R2}$$

$$0.66(1000 + R2) = R2$$

$$660 + 0.66R2 = R2$$

$$660 = 0.34R2$$

$$1941 = R2$$

Pi3 GPIO Pin



3.3V PWR	1	2	5V PWR
I2C1 SDA	3	4	5V PWR
I2C1 SCL	5	6	GND
GPIO 4	7	8	Reserved
GND	9	10	Reserved
SPI1 CS0	11	12	GPIO 18
GPIO 27	13	14	GND
GPIO 22	15	16	GPIO 23
3.3V PWR	17	18	GPIO 24
SPI0 MOSI	19	20	GND
SPI0 MISO	21	22	GPIO 25
SPI0 SCLK	23	24	SPI0 CS0
GND	25	26	SPI0 CS1
Reserved	27	28	Reserved
GPIO 5	29	30	GND
GPIO 6	31	32	GPIO 12
GPIO 13	33	34	GND
SPI1 MISO	35	36	GPIO 16
GPIO 26	37	38	SPI1 MOSI
GND	39	40	SPI1 SCLK

Pi3 GPIO Pin

Assemble the Circuit:

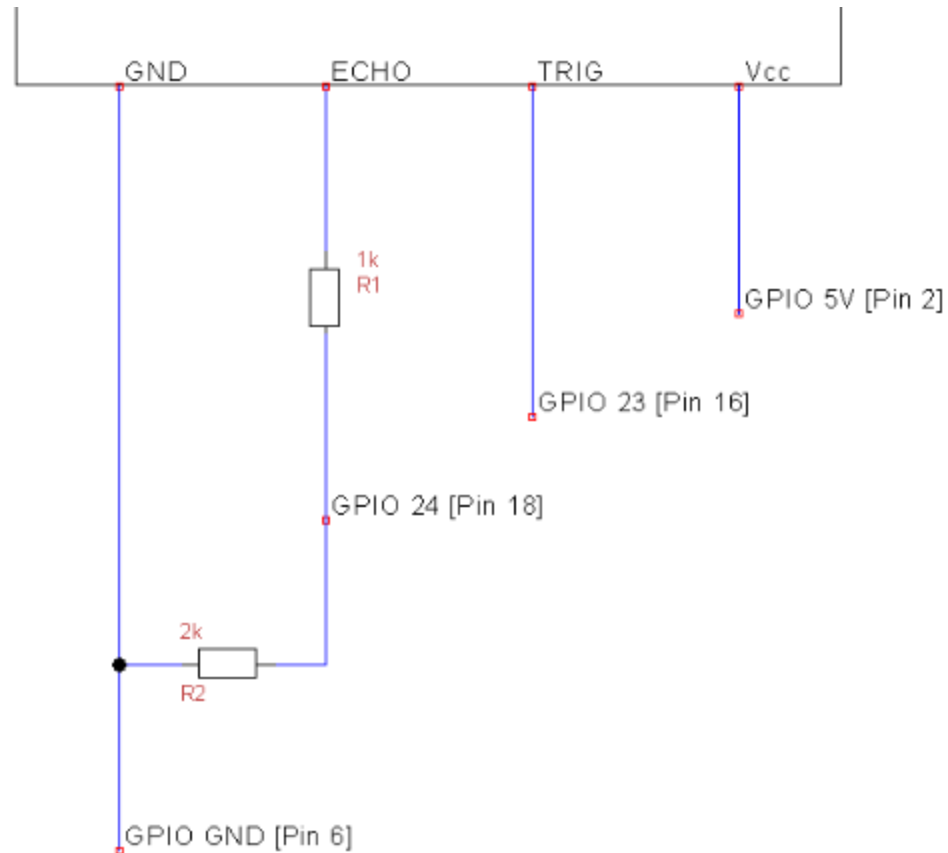
GPIO 5V [Pin 2]; Vcc (5V Power)

GPIO GND [Pin 6]; GND (0V Ground)

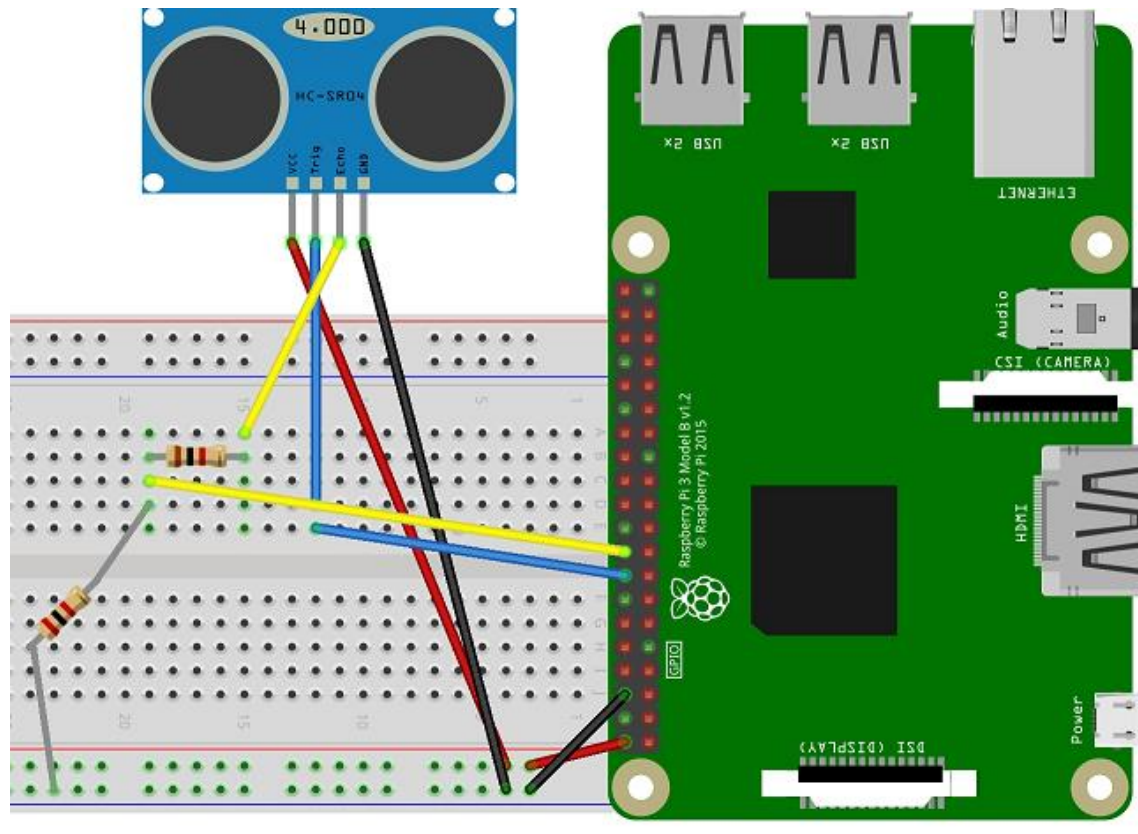
GPIO 23 [Pin 16]; TRIG (GPIO Output)

GPIO 24 [Pin 18]; ECHO (GPIO Input)

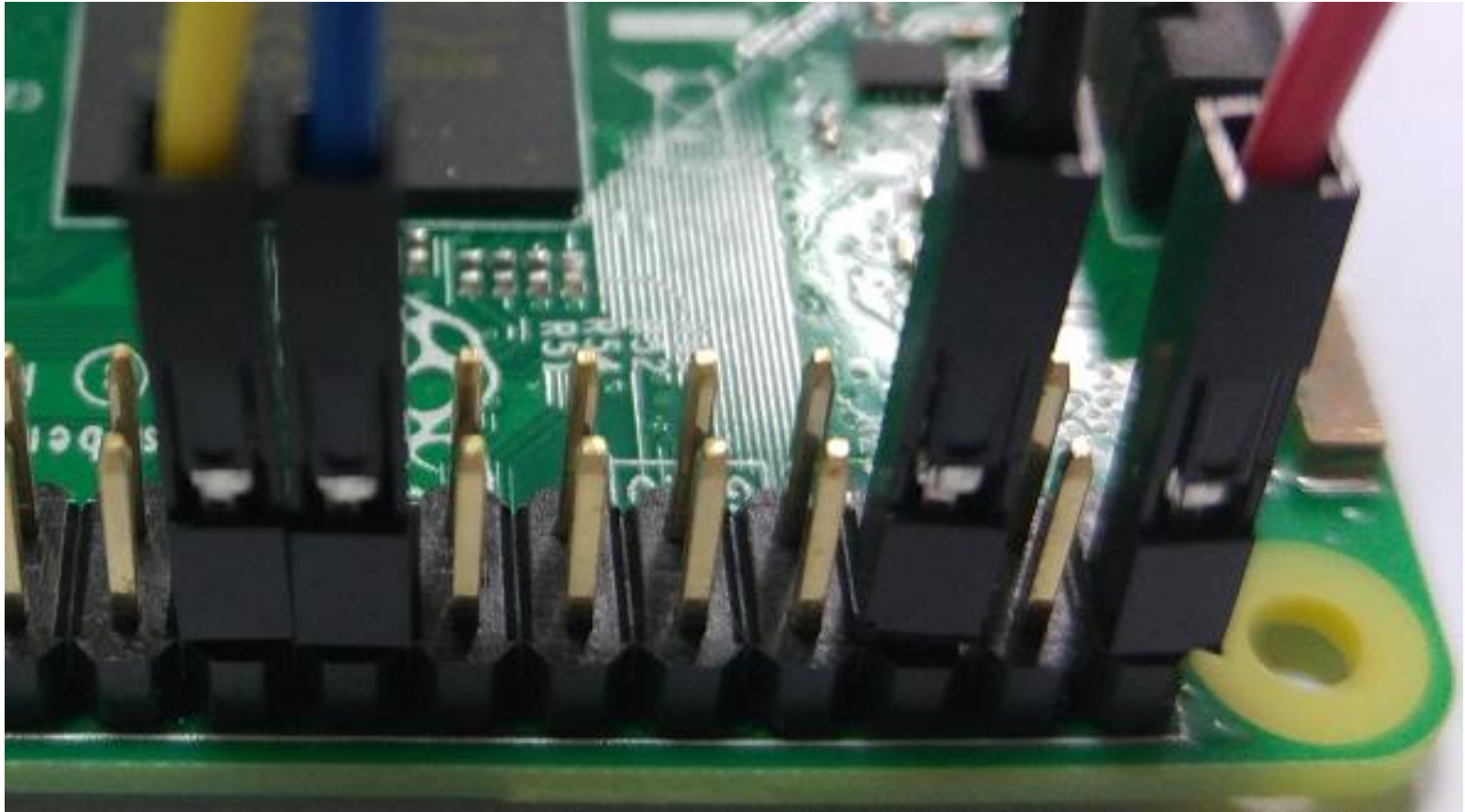
HC-SR04 to Pi3



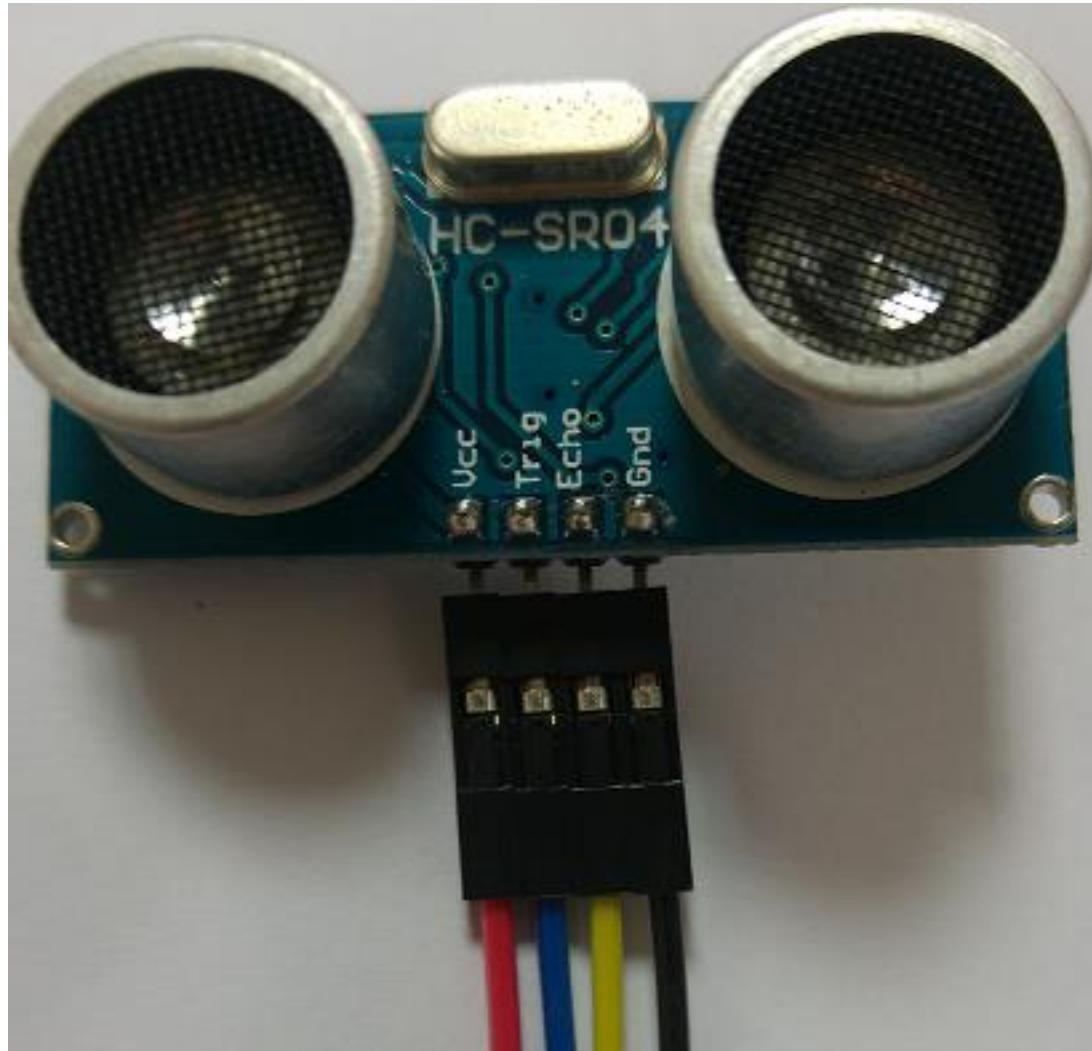
Fritzing



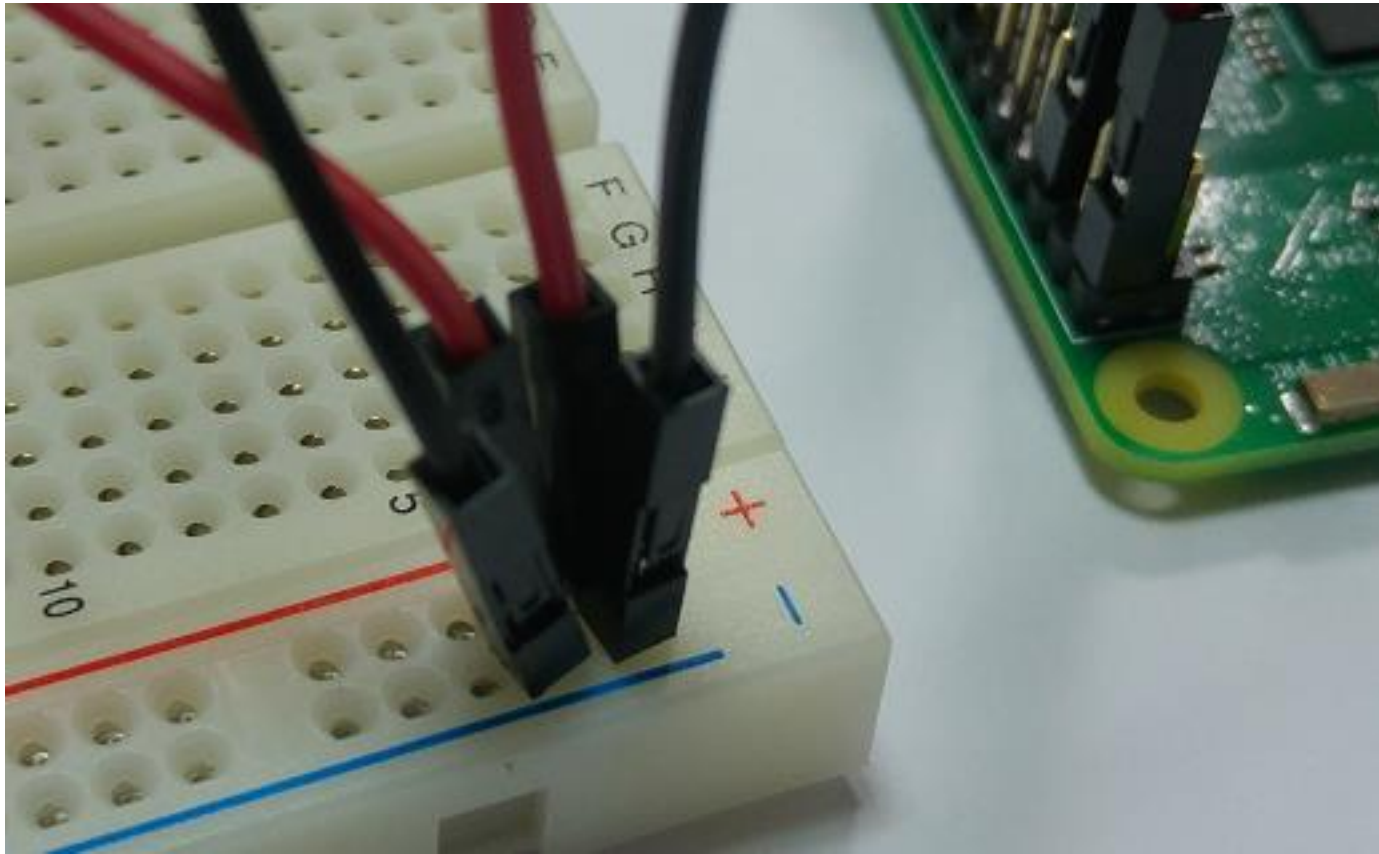
Connection



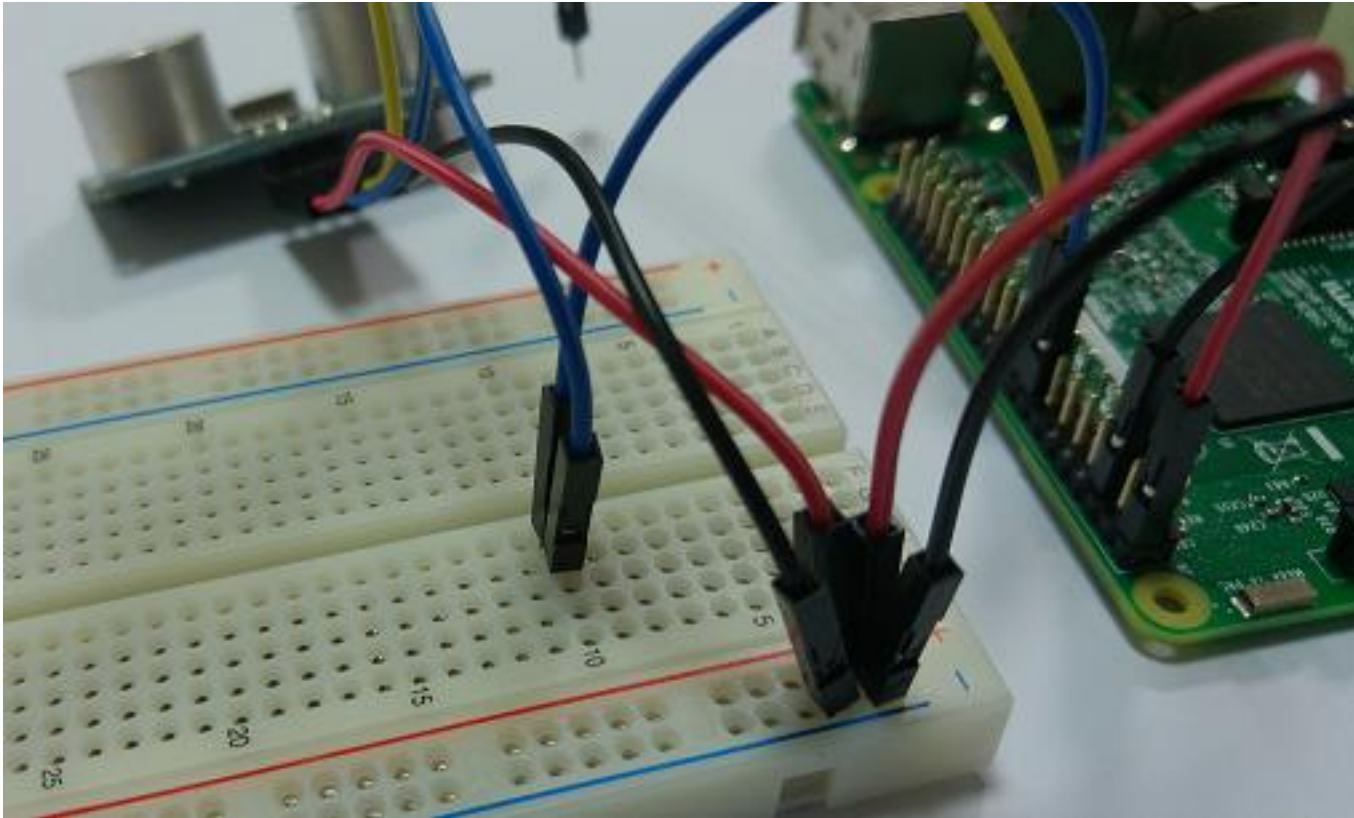
Connection



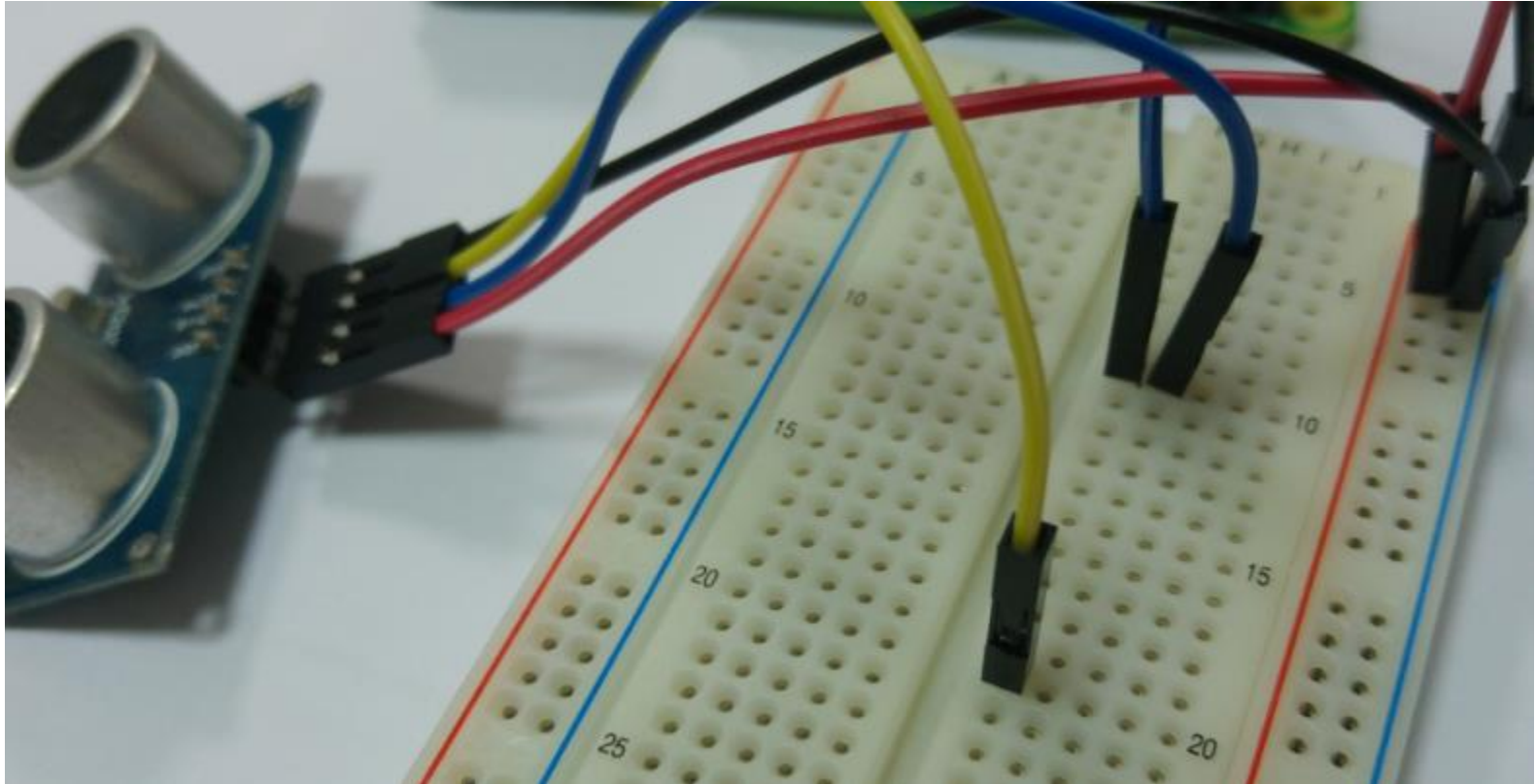
Connection



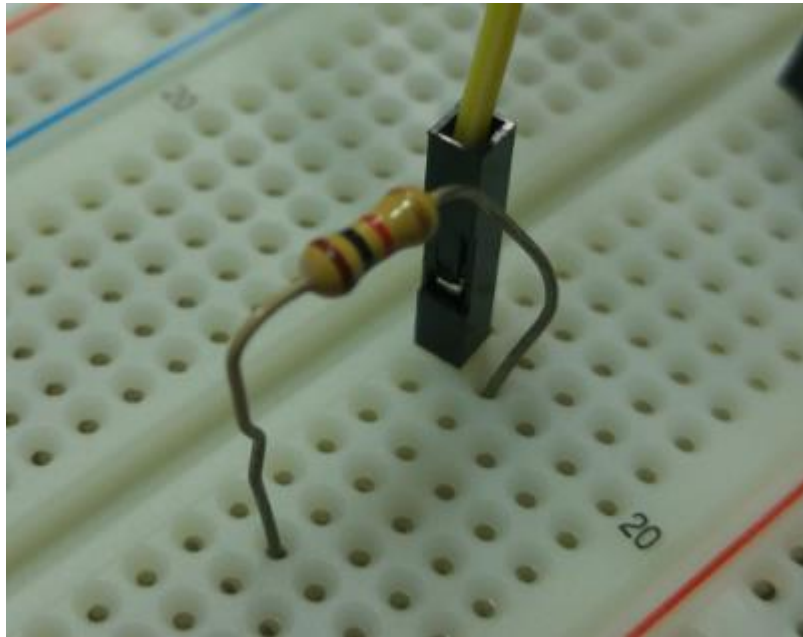
Connection



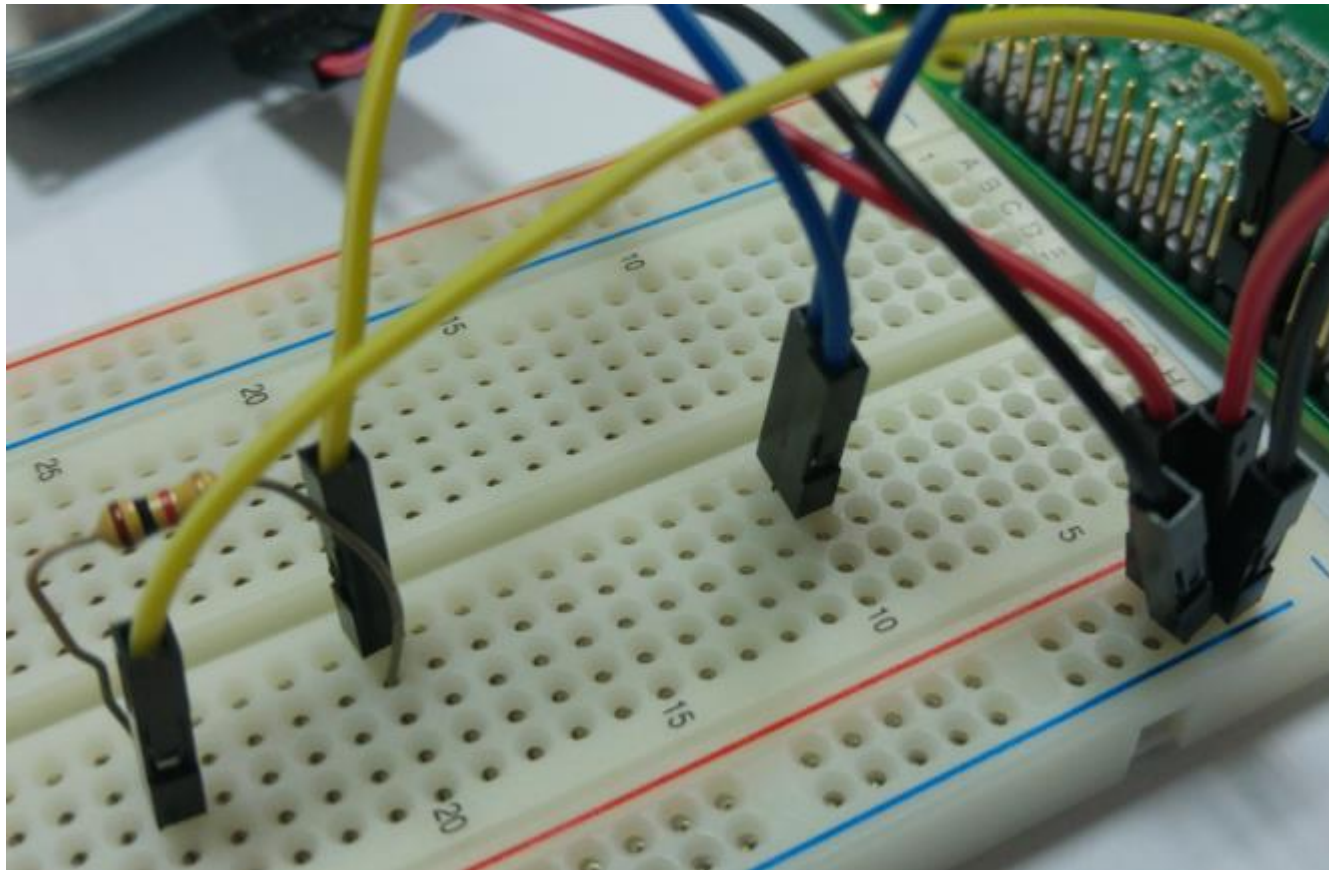
Connection



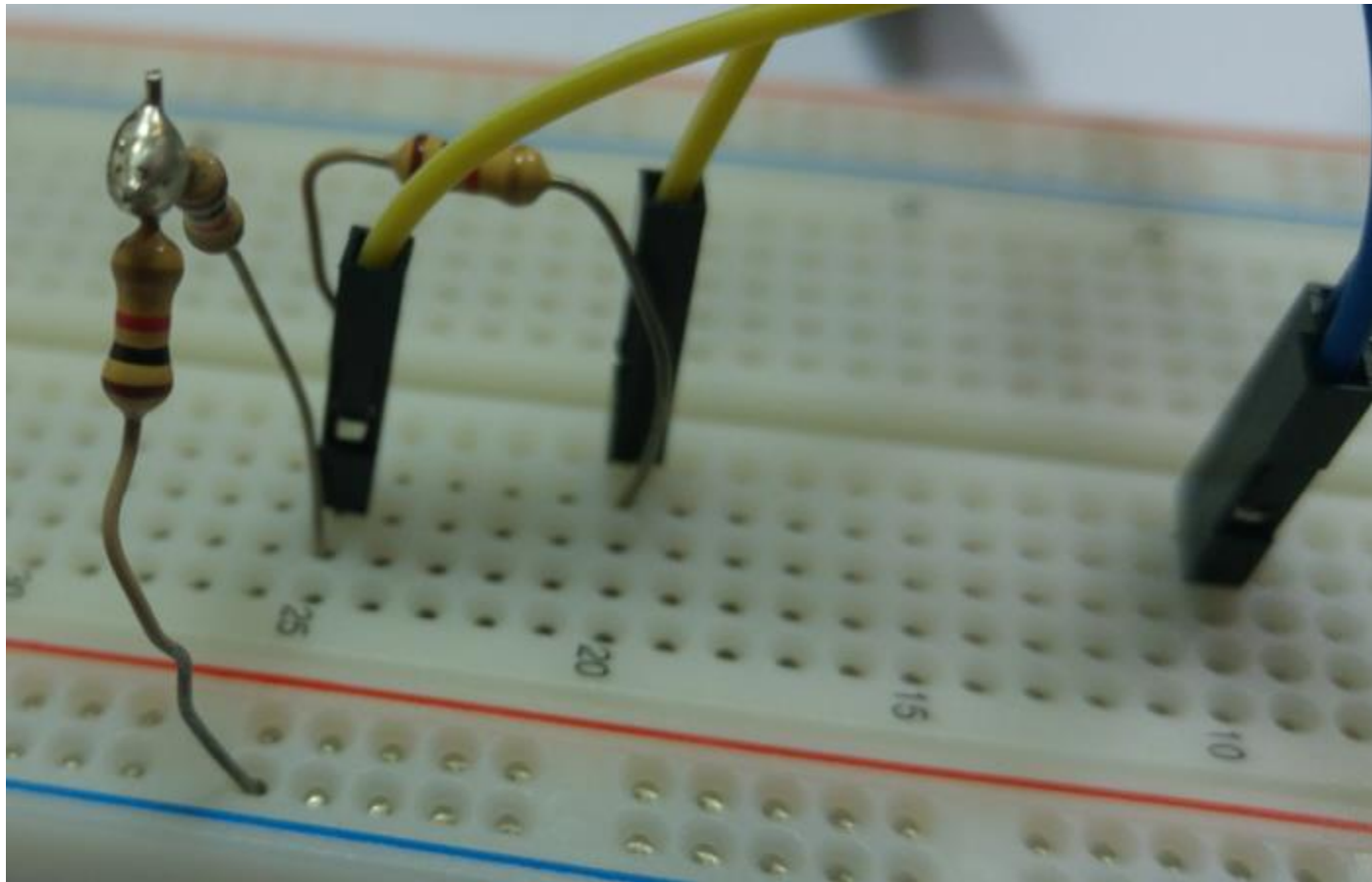
Connection



Connection



Connection



Speed formula

$$\text{Speed} = \frac{\text{Distance}}{\text{Time}}$$

$$34300 = \frac{\text{Distance}}{\text{Time}/2}$$

$$17150 = \frac{\text{Distance}}{\text{Time}}$$

$$17150 \times \text{Time} = \text{Distance}$$

Python Script for HC-SR04

1. Add a python script which is named : hc-sr04.py

`$ sudo vim hc-sr04.py`

2. Run the python program

`$ sudo python hc-sr04.py`

```
pi@raspberrypi:~ $ sudo python hc-sr04.py
Distance Measurement In Progress
Waiting For Sensor To Settle
Distance: 27.56 cm
pi@raspberrypi:~ $ sudo python hc-sr04.py
Distance Measurement In Progress
Waiting For Sensor To Settle
Distance: 230.0 cm
```

Python Script

```
import RPi.GPIO as GPIO
import time
GPIO.setmode(GPIO.BCM)
```

```
TRIG = 23
ECHO = 24
```

```
print "Distance Measurement In Progress"
```

```
GPIO.setup(TRIG,GPIO.OUT)
GPIO.setup(ECHO,GPIO.IN)
```

```
GPIO.output(TRIG, False)
print "Waiting For Sensor To Settle"
time.sleep(2)
```

Python Script

```
GPIO.output(TRIG, True)
time.sleep(0.00001)
GPIO.output(TRIG, False)

while GPIO.input(ECHO) == 0:
    pulse_start = time.time()

while GPIO.input(ECHO) == 1:
    pulse_end = time.time()

pulse_duration = pulse_end - pulse_start

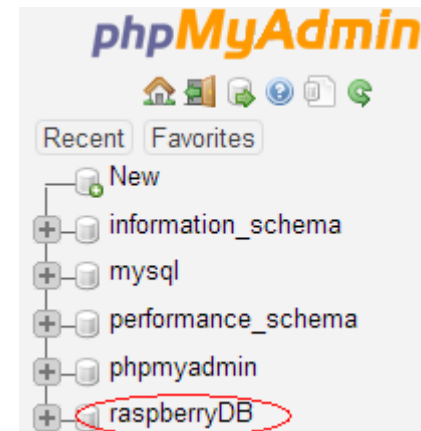
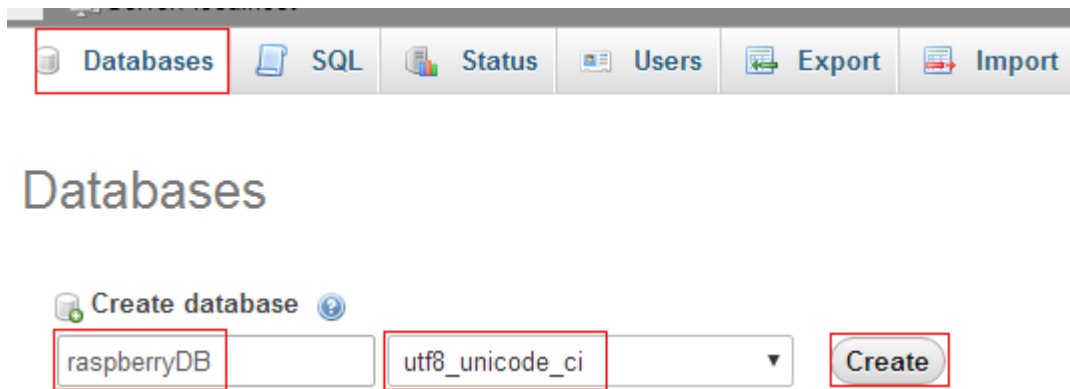
distance = pulse_duration * 17150

distance = round(distance, 2)

print "Distance:", distance, "cm"
```

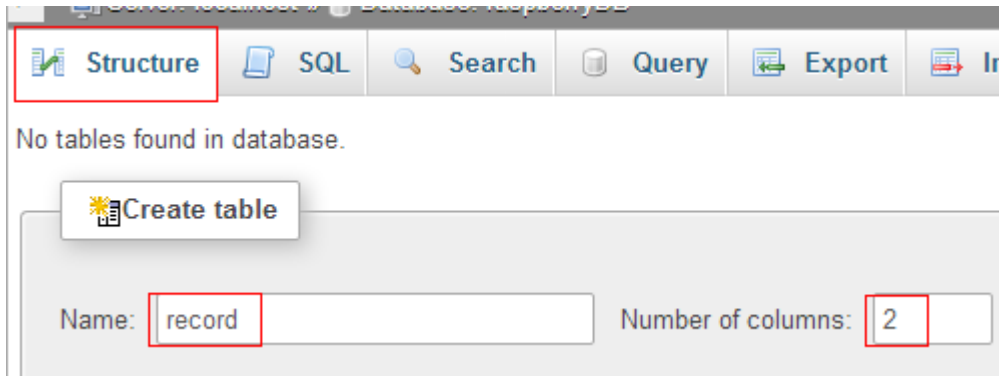
New a Database

1. Click [Databases]
2. Create a new databases named : raspberryDB
3. Select [utf8-unicode_ci] for the collation
4. Press [Create]



New a table

1. Click [raspberryDB]
2. Create a new table named : record
3. Select [2] for the Number of columns
4. Press [Go]



The screenshot shows the raspberryDB web interface. At the top, there is a navigation bar with several tabs: 'Structure' (highlighted with a red box), 'SQL', 'Search', 'Query', 'Export', and 'Import'. Below the navigation bar, a message states 'No tables found in database.' Below this message is a 'Create table' button. Underneath the button, there are two input fields: 'Name:' with the text 'record' entered (the entire field is highlighted with a red box), and 'Number of columns:' with the value '2' entered (the input box is highlighted with a red box).

Add two Columns

1. Column 1 : [Datetime] [DATETIME] [NULL] [utf8_unicode_ci]
2. Column 2 : [Distance] [VARCHAR] [100] [NULL] [utf8_unicode_ci]

	Browse	Structure	SQL	Search	Insert	Exp
#	Name	Type	Collation	Attributes	Null	Default
<input type="checkbox"/> 1	Datetime	datetime			No	0000-00-00 00:00:00
<input type="checkbox"/> 2	Distance	varchar(100)	utf8_unicode_ci		Yes	NULL

Add Primary Key

	Browse	Structure	SQL	Search	Insert	Export	Import	P
#	Name	Type	Collation	Attributes	Null	Default	Extra	Action
<input type="checkbox"/>	1 datetime	datetime			Yes	NULL		Change Drop Primary
<input type="checkbox"/>	2 distance	varchar(100)	utf8_unicode_ci		Yes	NULL		Change Drop Primary

Do you really want to execute "ALTER TABLE `record` ADD PRIMARY KEY(`datetime`);"?

	Import	Privileges	Oper
a	Action		
	Change Drop Primary	Unique	
	Change Drop Primary	Unique	

Python + MySQL

1. Install python-mysqldb

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

2. Modify hc-sr04.py

```
$ sudo vim hc-sr04.py
```

3. Modify :

```
import time, datetime, MySQLdb
```

4. Add :

```
db = MySQLdb.connect("localhost","root","pi","raspberryDB")  
cursor = db.cursor()
```

Python + MySQL

5. Add :

try:

```
    cursor.execute("""INSERT INTO record VALUES (%s,%s)""",(datetime.datetime.now().strftime("%Y-%m-%d %H:%M:%S"),distance))
    db.commit()
    print "Data committed "
```

except:

```
    db.rollback()
```

```
db.close()
```

Python + MySQL

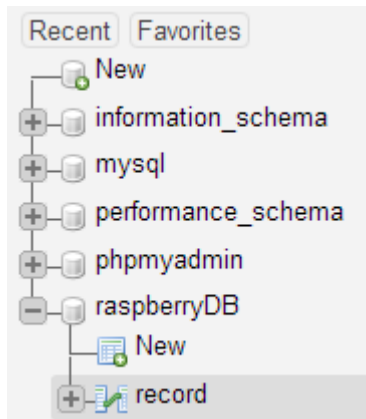
Run the new python program

`$ sudo python hc-sr04.py`

```
pi@raspberrypi:~ $ sudo python hc-sr04.py
Distance Measurement In Progress
Waiting For Sensor To Settle
Distance: 230.09 cm
Data committed
pi@raspberrypi:~ $ sudo python hc-sr04.py
Distance Measurement In Progress
Waiting For Sensor To Settle
Distance: 230.48 cm
Data committed
```

phpMyAdmin

Check record table



+ Options

		Datetime	Distance
<input type="checkbox"/>	Edit Copy Delete	2016-10-05 15:00:14	229.61
<input type="checkbox"/>	Edit Copy Delete	2016-10-05 15:02:10	229.65
<input type="checkbox"/>	Edit Copy Delete	2016-10-05 15:15:14	230.09
<input type="checkbox"/>	Edit Copy Delete	2016-10-05 15:15:17	230.48

PHP table

Add a php program named : showTable.php (under /vaw/www)

```
$ sudo vim showTable.php
```

```
<?php
```

```
$con=mysqli_connect("localhost", "root", "pi", "raspberryDB");
```

```
if (mysqli_connect_errno()) {
```

```
    echo "Fail to connect to MySQL server: " . mysqli_connect_error();
```

```
}
```

```
$result = mysqli_query($con,"SELECT * FROM record");
```

```
echo "<table border='1'>
```

```
<tr>
```

```
<th>Date Time</th>
```

```
<th>Distance</th>
```

```
</tr>";
```

PHP table

```
while($row = mysqli_fetch_array($result))
{
    echo "<tr>";
    echo "<td>" . $row['Datetime'] . "</td>";
    echo "<td>" . $row['Distance'] . "</td>";
    echo "</tr>";
    $Lables=$Lables. "'" . $row[Datetime]. "',";
    $dis=$dis. "'" . $row[Distance]. "',";
}

echo "</table>";
mysqli_close($con);
?>
```

PHP Table

Open a web browser and connect to
<http://192.168.xxx.xxx/showTable.php>

Date Time	Distance
2016-10-05 15:00:14	229.61
2016-10-05 15:02:10	229.65
2016-10-05 15:15:14	230.09
2016-10-05 15:15:17	230.48
2016-10-06 15:49:28	327.77
2016-10-06 15:49:41	13.26

Future work

1. Automatic execution? (shell script + crontab)
2. Chart? (jquery ; highchart.js ; Chart.js)
3. Remote control? (CGI ; Android app ; ConnectBot)

highcharts

HC-SR04 Ultrasonic Range Sensor

資料類型

開始日期(不得為空白)

結束日期(最多一個月)

開始查詢

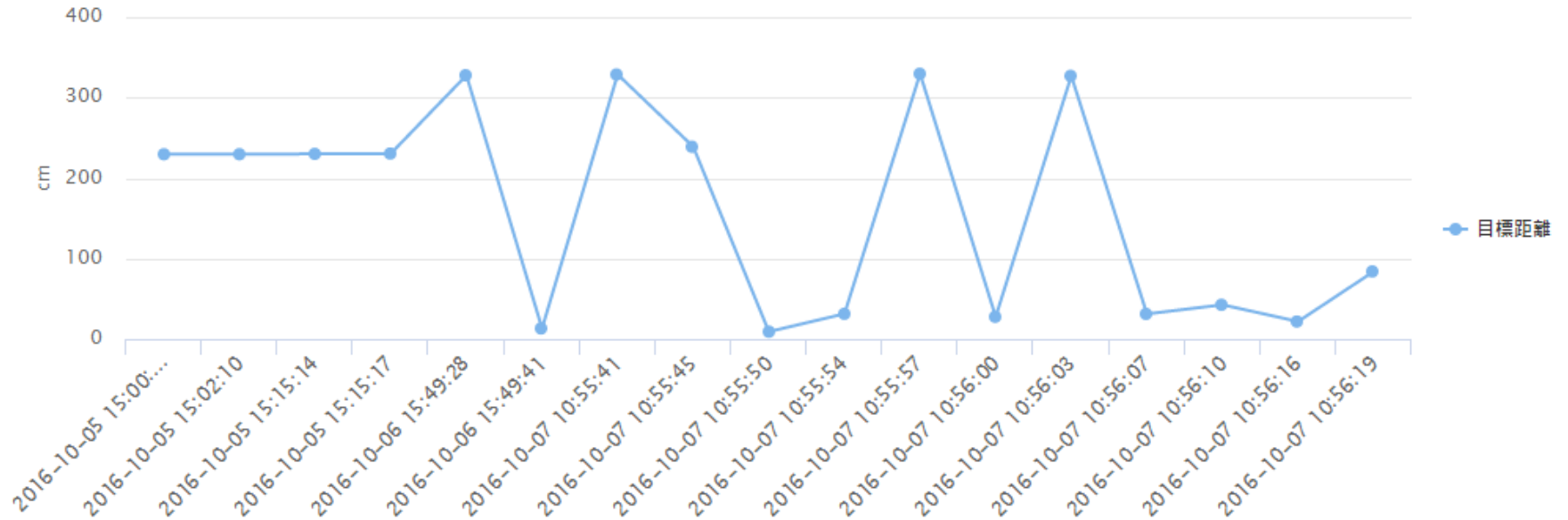
HCSR04 ▼

2016-10-07

2016-10-07

Distance record

LucasChen



Highcharts.com






OpenELEC

OpenELEC : Open Embedded Linux Entertainment Center

1. Download DiskImage for Pi3

<http://openelec.tv/get-openelec>

Most downloaded files

-  [Raspberry Pi 2 and Pi3 \[Model B+ 512MB\] - Diskimage \(Raspberry Pi2 builds\)](#)
-  [x86 Generic \(Intel/AMD/Nvidia\) - Diskimage \(x86 Generic \(Intel/AMD/Nvidia\) builds\)](#)
-  [Raspberry Pi 2 and Pi3 \[Model B+ 512MB\] - Update File \(Raspberry Pi2 builds\)](#)
-  [Raspberry Pi 1 \[Model A/B/B+/CM/Zero 256/512MB\] - Diskimage \(Raspberry Pi builds\)](#)
-  [Raspberry Pi 2 and Pi3 \[Model B+ 512MB\] - Diskimage \(Raspberry Pi2 builds\)](#)

Raspberry Pi 2 and Pi3 [Model B+ 512MB] - Update File

 [OpenELEC-RPi2.arm-6.0.3.tar](#)

Details

Download

Raspberry Pi 2 and Pi3 [Model B+ 512MB] - Diskimage

 [OpenELEC-RPi2.arm-6.0.3.img.gz](#)

Details

Download

Static IP

```
#sudo vim /etc/dhcpd.conf
```

```
interface eth0  
static ip_address=192.168.0.10/24  
static routers=192.168.0.1  
static domain_name_servers=192.168.0.1
```

```
interface wlan0  
static ip_address=192.168.0.200/24  
static routers=192.168.0.1  
static domain_name_servers=192.168.0.1
```

Q&A

Thanks for reading

Reference

<https://www.modmypi.com/blog/hc-sr04-ultrasonic-range-sensor-on-the-raspberry-pi>

<http://elecfreaks.com/store/download/HC-SR04.pdf>

https://en.wikipedia.org/wiki/Voltage_divider