Banana Pro&Pi User Manual

V1.0

2015-4-17

Revision History

Revision	Data	Author	Description
1.0	2015-04-17	Tony	Initial version

Table of Contents

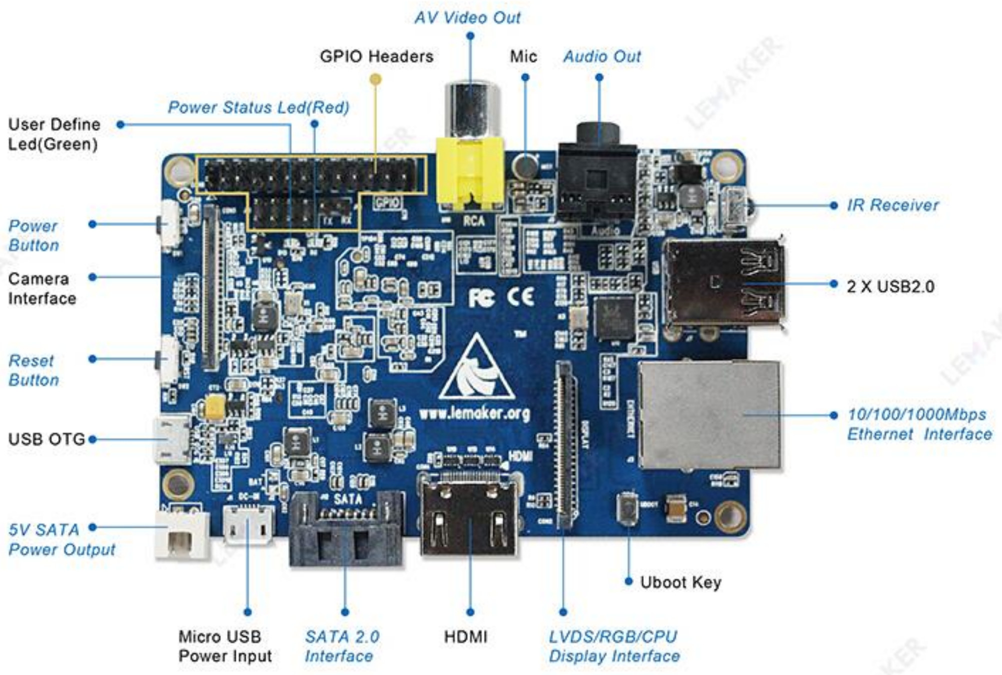
1 Introduction

1.1 What is the Banana Pi™?

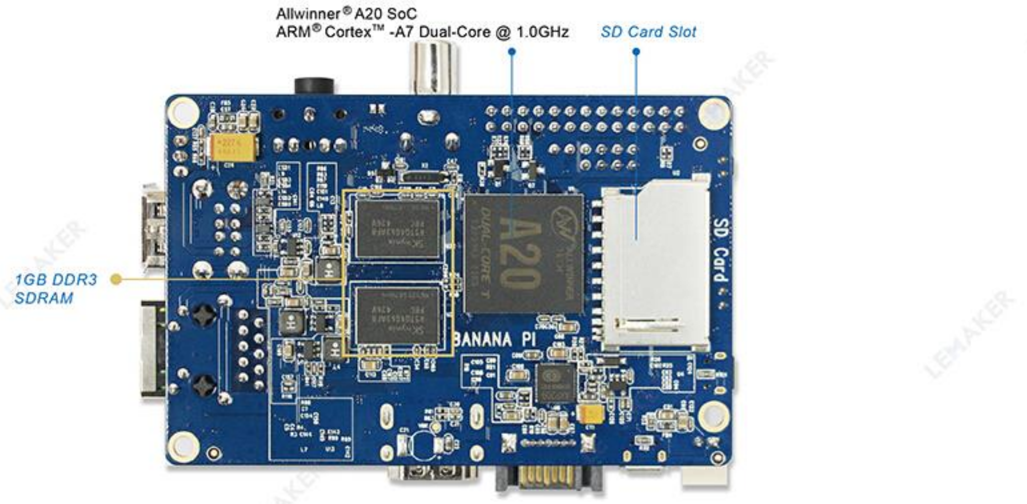
It's an open-source single-board computer (SBC). It can run Android 4.2, Android 4.4*, Ubuntu, Debian, Fedora, Raspbian, ArchLinux, openSUSE, OpenWrt, Bananian, and other Linux OS systems (also known as distros) such as Gentoo and Fedora. It uses the AllWinner A20 SoC, and has 1GB DDR3 SDRAM, with wired Gigabit ethernet (RJ45 socket) and a SATA port.

> *Please note that the Android_for_bananapi_4.4_beta1 image is not a LeMaker product and therefore only available from an external website with which we are not affiliated or connected to in any way. We therefore provide no support for this image. However, discussions about it in our forums are freely encouraged.*

1.1.1Banana Pi Layout



Front side



Back side

1.1.2Hardware Specifications

Hardware specification of Banana Pi™	
Soc	Allwinner® A20(sun 7i)
CPU	ARM® Cortex™-A7 Dual-Core1GHz (ARM v7 instruction set)
GPU	Mali400MP2 Complies with OpenGL ES 2.0/1.1 (hardware acceleration support)
SDRAM	1GB DDR3 (shared with GPU)
Power	5V @ 2A via MicroUSB (DC in Only)
PMU	AXP209
Features	
On board Network	10/100/1000 Ethernet RJ45 (optional USB WIFI Dongle)
On board Storage	SD (Max. 64GB) / MMC card slot UP to 4T on SATA disk drive
Sound Input	Mic
Display	Supports multi-channel HD display:
	HDMI 1.4 (Type A - full)
	LVDS/RGB/CPU display interface (DSI) for raw LCD panels
	Composite video (PAL and NTSC)
	11 HDMI resolutions from 640×480 to 1920×1080 plus various PAL and NTSC standards
Video	HD H.264 2160p video decoding
	Mutil-format FHD video decoding, including Mpeg1/2, Mpeg4, H.263, H.264, etc H.264 high profile 1080p@30fps or 720p@60fps encoding
Camera Input	A CSI input connector（Parallel 8-bit camera interface）allows for the connection of a designed camera module (available now from LeMaker)
USB	2 USB 2.0 host, 1 USB 2.0 OTG (all direct from A20 chip)
Audio Output	3.5 mm Jack and HDMI
Buttons	Reset button: Next to MicroUSB connector Power button: Next to Reset button UBoot button (optional): Behind HDMI connector
GPIO(2X13) pin	GPIO,UART,I2C bus,SPI bus with two chip selects, CAN bus,ADC,PWM,+3.3v,+5v,ground.
LED	Power Status LED (Red) Ethernet Status LED (Blue) User Define LED (Green)
Remote	IR
Interface definition	
Product size	92 mm × 60mm
Weight	48g

1.2 What is the Banana Pro™?

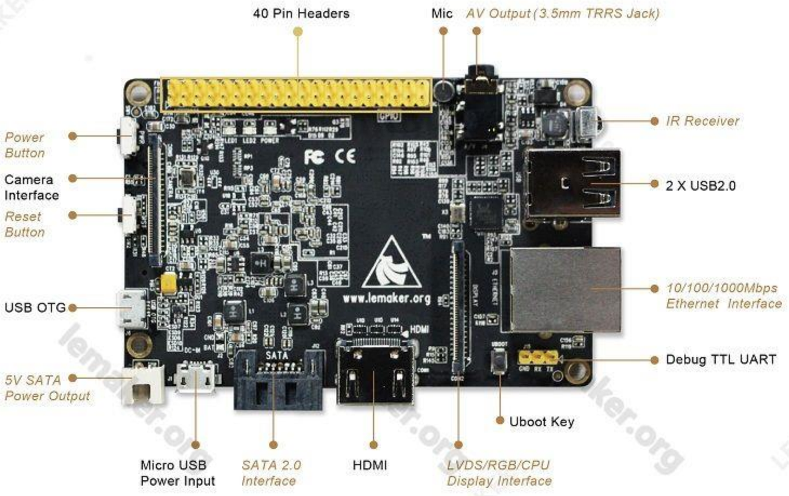
Banana Pro™ is an updated version of Banana Pi™ designed by the LeMaker Team. Try Banana Pro™ today and take advantage of the many enhanced features.

Banana Pro™ is compatible with many Linux-based operating system and has many distributions specially developed for Banana Pi™ Hardware. Some of these distribution include Lubuntu, Android, Debian, Bananian, Berryboot, OpenSuse, Scratch, Fedora,Gentoo,Open MediaVault, OpenWRT. Banana Pro™ also supports the BSD system.

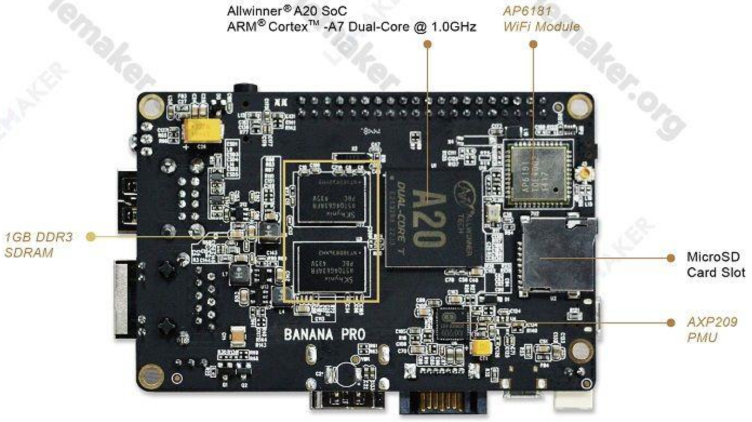
Banana Pro™ has a wide selection of home applications including: Building a low-cost computer, Servers (for Multimedia, Minecraft or other home servers), Video Game Emulators, Home Security Cameras and more.

Banana Pro™ is an excellent educational learning tool that can be used for many projects including: building Multimedia projects,Robots, Arduino applications or Computer Programming with many popular programming languages available including Scratch (a drag and drop programming language for people beginning to learn how to code).

1.2.1Banana Pro Layout



Front side



Back side

1.2.2Hardware Specifications

Hardware Specification of Banana Pro™	
Soc	Allwinner® A20(sun 7i)
CPU	ARM® Cortex™-A7 Dual-Core1GHz (ARM v7 instruction set)
GPU	Mali400MP2 Complies with OpenGL ES 2.0/1.1 (hardware acceleration support)
SDRAM	1GB DDR3 (shared with GPU)
Power	5V @ 2A via MicroUSB (DC in Only)
PMU	AXP209
Features	
Low-level perpherials	40 Pins Header, 28×GPIO, some of which can be used for specific functions including UART, I2C, SPI, PWM, CAN, I2S, SPDIF, LRADC, ADC, LINE-IN,FM-IN,HP-IN.
On board Network	10/100/1000Mbps ethernet (Realtek RTL8211E/D)
Wifi Module	WiFi 802.11 b/g/n
Bluetooth	Optional
On board Storage	MicroSD (TF) card，SATA 2.0
Sound Input	Mic
Display	Supports multi-channel HD display: HDMI 1.4 (Type A - full) LVDS/RGB/CPU display interface (DSI) for raw LCD panels Composite video (PAL and NTSC) (via 3.5 mm TRRS jack shared with audio out) 11 HDMI resolutions from 640×480 to 1920×1080 plus various PAL and NTSC standards
Video	HD H.264 2160p video decoding Mutil-format FHD video decoding, including Mpeg1/2, Mpeg4, H.263, H.264, etc H.264 high profile 1080p@30fps or 720p@60fps encoding
Audio outputs	HDMI, analog audio (via 3.5 mm TRRS jack shared with composite video out),I2S audio (also potentially for audio input)
Camera	Parallel 8-bit camera interface
Audio input	On board micphone
USB	2 USB 2.0 host, 1 USB 2.0 OTG (all direct from A20 chip)
Buttons	Reset button Power button U-boot button
Leds	Power status led (red) User defined led1 (green) User defined led2 (blue)
Other	IR reciever
Interface definition	
Sizes	92 mm × 60mm
Weight	45g

1.3 What can I do with Banana Pro/Pi?

Build…

- A computer
- A wireless server
- Games
- Music and sounds
- HD video
- A speaker
- Android
- Scratch
- Pretty much anything else, because Banana Pi is open source

1.4 OS introduction

Linux is a Unix-like and mostly POSIX-compliant computer operating system assembled under the model of free and open-source software development and distribution. The defining component of Linux is the Linux kernel, an operating system kernel first released on 5 October 1991 by Linus Torvalds. The Free Software Foundation uses the name GNU/Linux to describe the operating system, which has led to some controversy.

Typically, Linux is packaged in a form known as a Linux distribution, for both desktop and server use. Some popular mainstream Linux distributions include Debian, Ubuntu, Linux Mint, Fedora, openSUSE, Arch Linux, and the commercial Red Hat Enterprise Linux and SUSE Linux Enterprise Server. Linux distributions include the Linux kernel, supporting utilities and libraries and usually a large amount of application software to fulfill the distribution's intended use.

1.4.1 Bananian

Bananian Linux is a pre-installed Debian 7 image optimized for Banana Pi/Pro. It uses the official Debian wheezy armhf repositories with a kernel and bootmanager (u-boot), customized for Banana Pi/Pro.

The main focus is to provide a lightweight headless platform for home servers, small webservers, ownCloud hosting, Linux based wifi access points, router, NAS systems, monitoring devices, etc.

For more information please refer to https://www.bananian.org/

1.4.2 Raspbian

A Raspbian image is a file that you can download onto an SD card which in turn can be used to boot your single-board computer. Using a Raspbian image is the easiest way for a new user to get started with Raspbian.

For more information please refer to http://www.raspbian.org/

1.4.3 Lubuntu

Lubuntu is a fast and lightweight operating system. The core of the system is based on Linux and Ubuntu. Lubuntu uses the minimal desktop LXDE, and a selection of light applications. It focus on speed and energy-efficiency. Because of this, Lubuntu has very low hardware requirements.

For more information please refer to http://lubuntu.net/

2 Quick start

By following this short quick start guide, you can use your Banana Pro/Pi in just a few minutes. There are three steps to booting your Banana Pro/Pi.

2.1 Get what you need

To enjoy the use of your Banana Pro/Pi, you will need at the very minimum these accessories in the table below.

No.	Item	Minimu recommended specification & notes
1	SD card for Pi MicroSD card for Pro	● Minimum size 4Gb; class 4 (the class indicates how fast the card is). ● We recommend using branded SD or MicroSD cards as they are more reliable.
2a	HDMI (Full sized – Type A) to HDMI / DVI(VGA) cable	● HDMI (Type A) to HDMI lead (for HD TVs and monitors with HDMI input). OR HDMI (Type A) to DVI adapter cable (for monitors with only a DVI input). Type A HDMI is 13.9 mm wide (check Wikipedia or Google for more info or look at the photos ***Attention**: Some HDMI-DVI adapters will only work on the Linux images (as adapted for B-Pro/B-Pi and in our Downloads section). For “Android 4.2.2 for B-Pi v2.0” you can ONLY use an HDMI-HDMI cable (in other words, your monitor or TV must be HD-ready)
2b	AV video lead for Pi Composite AV cable for Pro	● A standard AV video lead or Composite AV cable to connect to your analogue display (eg a TV) if you

		are not using the HDMI output.(Pro via 3.5 mm TRRS jack shared with composite video out)
3	Keyboard and mouse	● Any standard USB keyboard and mouse should work. ● However, keyboards or mice that take a lot of power from the USB ports may need a powered USB hub. This may include some wireless devices.
4	Ethernet cable USB WiFi for Pi WiFi antenna for Pro (Optional)	● Networking is optional, although it makes updating and getting new software for your Banana Pro/Pi much easier. On Banana Pro, it has onboard WiFi module. On Banana Pi, you can connect an USB WiFi adapter.
5	Micro USB power adapter	● A good quality, micro USB power supply that can provide at least 2A at 5V is essential. ● However, most mobile phone chargers are **NOT** suitable — check the label on the plug. It's possible they can deliver 2 amps and 5 volts, but maybe not at the same time!
6	Audio lead (Optional)	● You can use a 3.5mm jack audio cable to connect the audio port to external speakers to get stereo audio. (Pro’s 3.5 mm jack shared with composite video out)
7	Mobile hard disk (optional)	● You can choose to connect a mobile hard disk to the SATA port to store more files. Special cables are required for this – look on Amazon – but they are not expensive, under 10 dollars/Euros/pounds.
8	A case for your B-Pro/B-Pi (optional but highly recommended)	● A suitable acrylic or similar case, which should cost less than 10 dollars/Euros/pounds and will protect your B-Pro/B-Pi from dust, moisture and most

	importantly short circuits and static. ● Please be aware that ALL of the the Raspberry Pi cases are NOT compatible (the board dimensions and also the layout of the B-Pi's inputs/outputs are different).

HDMI to HDMI lead

HDMI to DVI lead

AV video lead for pi

SD card for pi

MicroSD card for pro

Micro USB power adapter

Banana Pro Video Plug cable 2 in 1

2.2 Prepare your MicriSD or SD card for the Banana Pro/Pi

In order to enjoy your Banana Pro/Pi, you will need to install an Operating System (OS) onto an MicroSD/SD card. ***You need to pay attention to that the Android image cannot use the dd command in linux or the Win32Diskimage in Windows ,so you need to use the PhoenixCard tool to burn the image to the MicroSD/SD card (you can refer to the 2.2.2 section).*** The instructions below will teach you how to write an OS image to your MicroSD/SD card either in Windows or Linux.

2.2.1 Installing the general Linux OS image

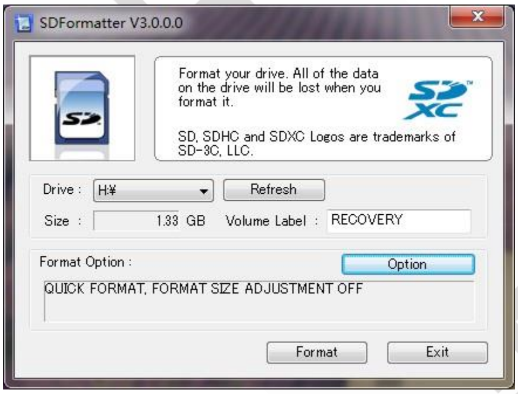
1. Insert your MicroSD/SD card into your computer or card reader. The size of the MicroSD/SD should be larger than the OS image size, generally 4GB or greater.
2. Format the MicroSD/SD card.

In Windows:

i. Download an MicroSD/SD card format tool such as **SD Formatter** from https://www.sdcard.org/downloads/formatter_4/eula_windows/

ii. Unzip the download file and run the setup.exe (Run as Administrator) to install the tool on your machine.

iii. After installation, start the tool (again, Run as Administrator). In the "Options" menu, set "FORMAT TYPE" option to QUICK, "FORMAT SIZE ADJUSTMENT" option to "ON".



SDFormatter V3.0.0.0

Format your drive. All of the data on the drive will be lost when you format it.

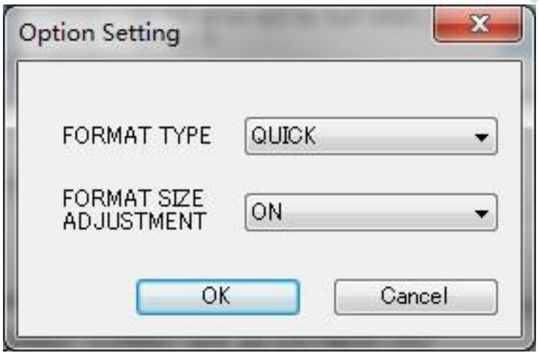
SD, SDHC and SDXC Logos are trademarks of SD-3C, LLC.

Drive : H:¥

Size : 1.33 GB Volume Label : RECOVERY

Format Option :

QUICK FORMAT, FORMAT SIZE ADJUSTMENT OFF



Option Setting

FORMAT TYPE QUICK

FORMAT SIZE ADJUSTMENT ON

iv. Check that the drive letter of the MicroSD/SD card you inserted matches the one selected by the software. Otherwise it will format and delete all data on another drive or card. To be safe, only have your main hard drive connected and only the MicroSD/SD card that you want to use in your B-Pi. LeMaker is not responsible for any loss of data.

v. Click the “Format” button.

In Linux:

i.In a terminal, run the

```
sudo fdisk -l
```

command to check the MicroSD/SD card node.

ii.Run the

```
umount /dev/sdxx
```

to unmount all the partitions of the MicroSD/SD card.

iii.Run the

```
sudo fdisk /dev/sdx
```

command. Use the ***o*** command to delete all partition of MicroSD/SD card and use the ***n*** command to add one new partition. Use the ***w*** command to save change.

iv.Run the

```
sudo mkfs.vfat /dev/sdx1
```

command to format the new created partition of MicroSD/SD card as FAT32.

(***x*** should be replaced according to your MicroSD/SD card node as discovered in point vi above)

You can also jump this step under Linux, because write image command ***dd*** under Linux will format the MicroSD/SD card automatically.

3. Download the OS image from the Downloads webpage.
4. Unzip the download file to get the OS image (should have the extension .img). To do this -

In Windows: Right click on the file and choose “Extract all”.

In Linux: Run the

```
unzip [path]/[downloaded filename]
```

command. If the filename extension is .tgz, run the

```
tar zvxf [path]/[downloaded filename]
```

command.

Ensure that neither the file name of the image you're using or the path contain any spaces (or other odd characters, for that matter).

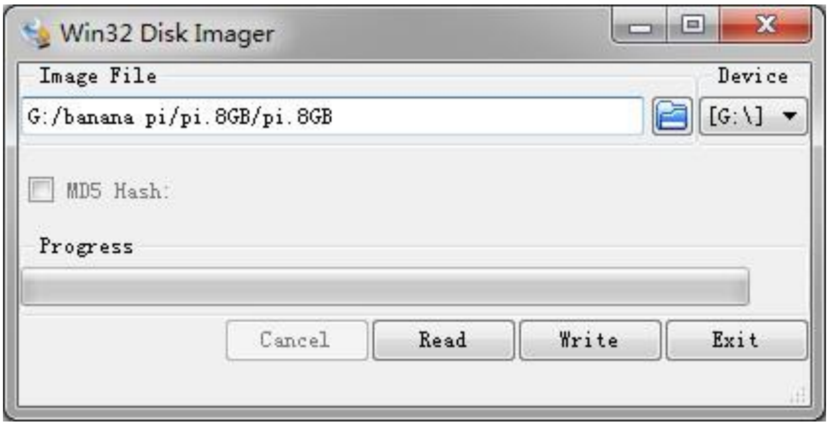
5. Write the image file to the MicroSD/SD card.

In Windows:

i. Download a tool that can write images to MicroSD/SD card, such as **Win32 Diskimager** from: http://sourceforge.net/projects/win32diskimager/files/Archive/

ii. Open the unzipped image file.

iii. Click the Write button. Wait patiently to successfully complete the writing. Do not disturb or disconnect/remove the card or shut down the computer during this process. When it has finished, soft-eject the card using the 'Safely Remove Hardware' icon in the System Tray/Notification area (bottom right of your screen), then physically remove the card from the card reader.



In Linux:

i. Run the

```
sudo fdisk -l
```

command to check the MicroSD/SD card node.

ii. Verify if the hash key of the zip file is the same as shown on the downloads page (optional).

```
shalsum [path]/[imagename]
```

This will print out a long hex number which should match the "SHA-1" line for the MicroSD/SD image you have downloaded.

iii. Run the

```
sync && sudo umount /dev/sdxx
```

to unmount all the partitions of the MicroSD/SD card.

iv. Run the

```
sudo dd bs=4M if=[path]/[imagename] of=/dev/sdx
```

command to write image file to MicroSD/SD card. Wait patiently to successfully complete writing, it’s a very long time. Please note that block size set to 4M will work most of the time, if not, please try 1M, although 1M will take considerably longer. You can use the

```
sudo pkill –USR1 –n –x dd
```

command to check progress.

2.2.2 Installing the Android OS image

The Android images (4.2 v2.0 & 4.4 beta 1) cannot unfortunately use the dd command in Linux or the Win32Diskimager in Windows, so you need to use the PhoenixCard tool to write the image the MicroSD/SD card.

(Note : If your laptop's card slot cannot burn the MicroSD/SD card, you should use an external USB MicroSD/SD card reader instead.)

Download the Android image and PhoenixCard.

The Android 4.2 image (a LeMaker product) from our Downloads page:

http://www.lemaker.org/resources/9-38/image_files.html

The Android 4.4 image (not a LeMaker product) from the external website.

PhoenixCard:

International download address:

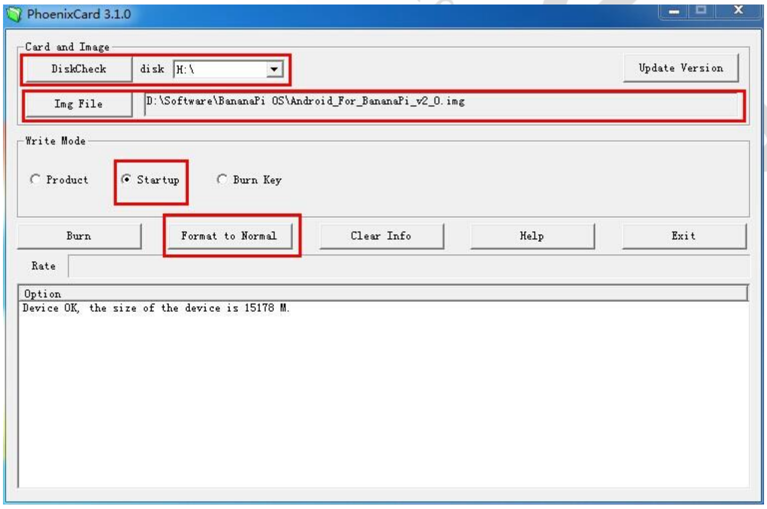
https://drive.google.com/file/d/0B_VynIqhAcB7NTg2UkRDdHRWX2s/edit?usp=sharing

China domestic download address:

http://pan.baidu.com/s/1qW9dFLq?qq-pf-to=pcqq.c2c

Install the Phoenixcard software (Run as Administrator), then start the program from its icon (also using Run as Administrator).

First, check the disk letter is EXACTLY the same as your MicroSD/SD card with the button 'Disk Check'. (Better safe than sorry – disconnect all other USB devices and secondary hard drives before continuing. See this forum link for help if you do this.) Then load the disk file by clicking on the button 'Img File'. Next step – click the radio button 'Startup' in the Write Mode box, then press the 'Format to Normal' button.



PhoenixCard 3.1.0

Card and Image

disk H:\

D:\Software\BananaPi OS\Android_For_BananaPi_v2_0.img

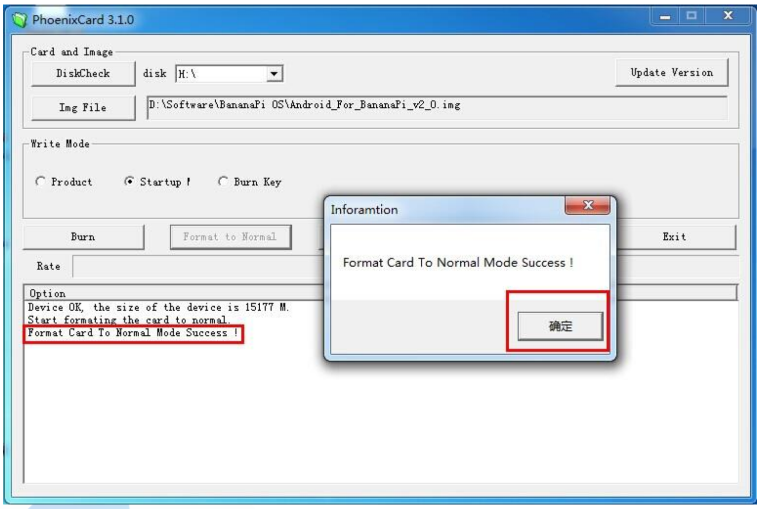
Write Mode

○ Product ● Startup ○ Burn Key

Option

Device OK, the size of the device is 15178 M.

Please note: although the text in the window of the above screenshot says "Device OK, the size of the device is XXXXX M", depending on your system and if it is an internal/external or single/multi-card reader, you may instead get only a message such as "Find 4 device, Please select correct the one"



disk: H:\

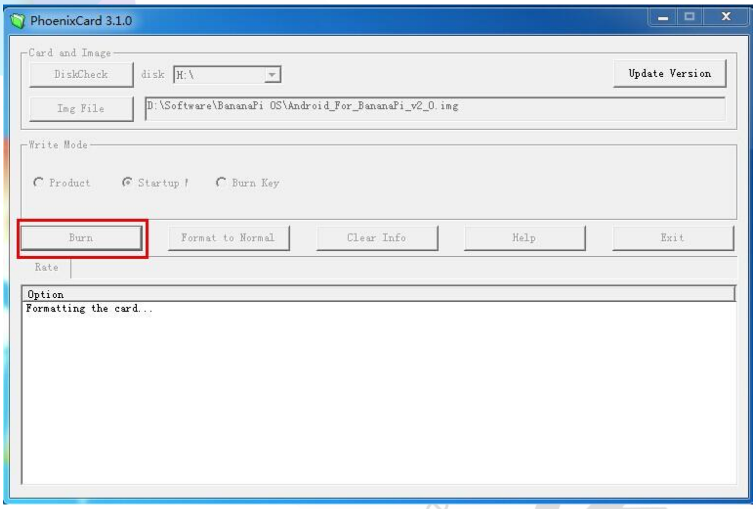
Img File: D:\Software\BananaPi OS\Android_For_BananaPi_v2_0.img

Write Mode: ○ Product ● Startup ! ○ Burn Key

```
Device OK, the size of the device is 15177 M.
Start formating the card to normal.
Format Card To Normal Mode Success !
```

Inforamtion: Format Card To Normal Mode Success !

Burn the Android image to the MicroSD/SD card (by pressing 'Burn' of course).



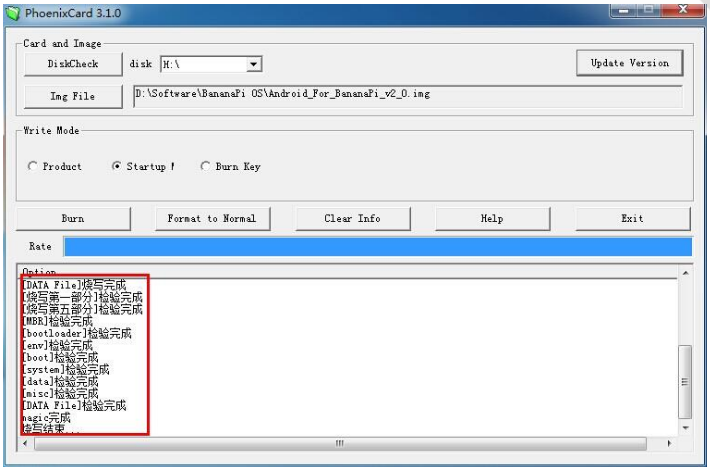
disk: H:\

Img File: D:\Software\BananaPi OS\Android_For_BananaPi_v2_0.img

Write Mode: ○ Product ● Startup ! ○ Burn Key

```
Formatting the card...
```

This can take quite a while so be patient. As mentioned previously, do not disturb the MicroSD/SD card or remove it or turn off the computer during this process. Serious damage to the card and/or computer hardware can occur.



disk: H:\

Img File: D:\Software\BananaPi OS\Android_For_BananaPi_v2_0.img

Write Mode: ○ Product ● Startup ! ○ Burn Key

```
[DATA File]烧写完成
[烧写第一部分]检验完成
[烧写第五部分]检验完成
[MBR]检验完成
[bootloader]检验完成
[env]检验完成
[boot]检验完成
[system]检验完成
[data]检验完成
[misc]检验完成
[DATA File]检验完成
magic完成
烧写结束...
```

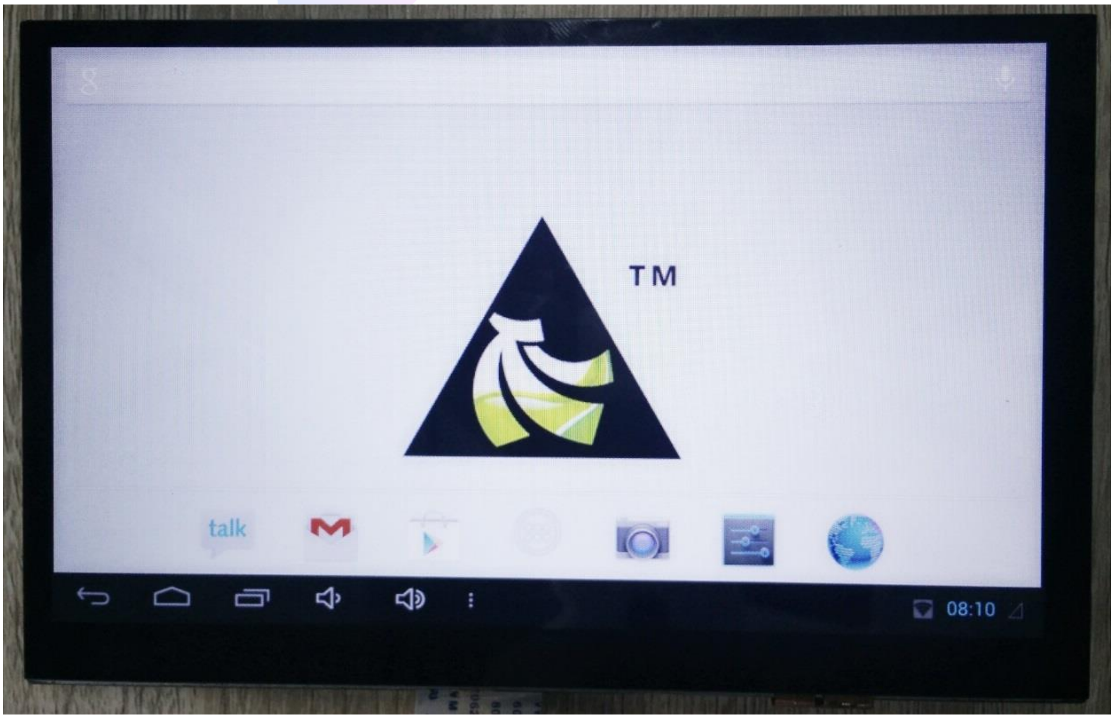
When the final 'Success' message appears, soft-eject the card using the 'Safely Remove Hardware' function in the Notification Area/System Tray (bottom right hand corner of the Windows screen). Now you can physically remove it and then insert it into the Banana Pro/Pi, plug in the mouse (a physical keyboard is optional as you can use Android's in-built on-screen version instead), the display and finally the power supply to experience the Android system on your Banana Pro/Pi.

The Android system start-up GUI.

(GUI = Graphical User Interface)

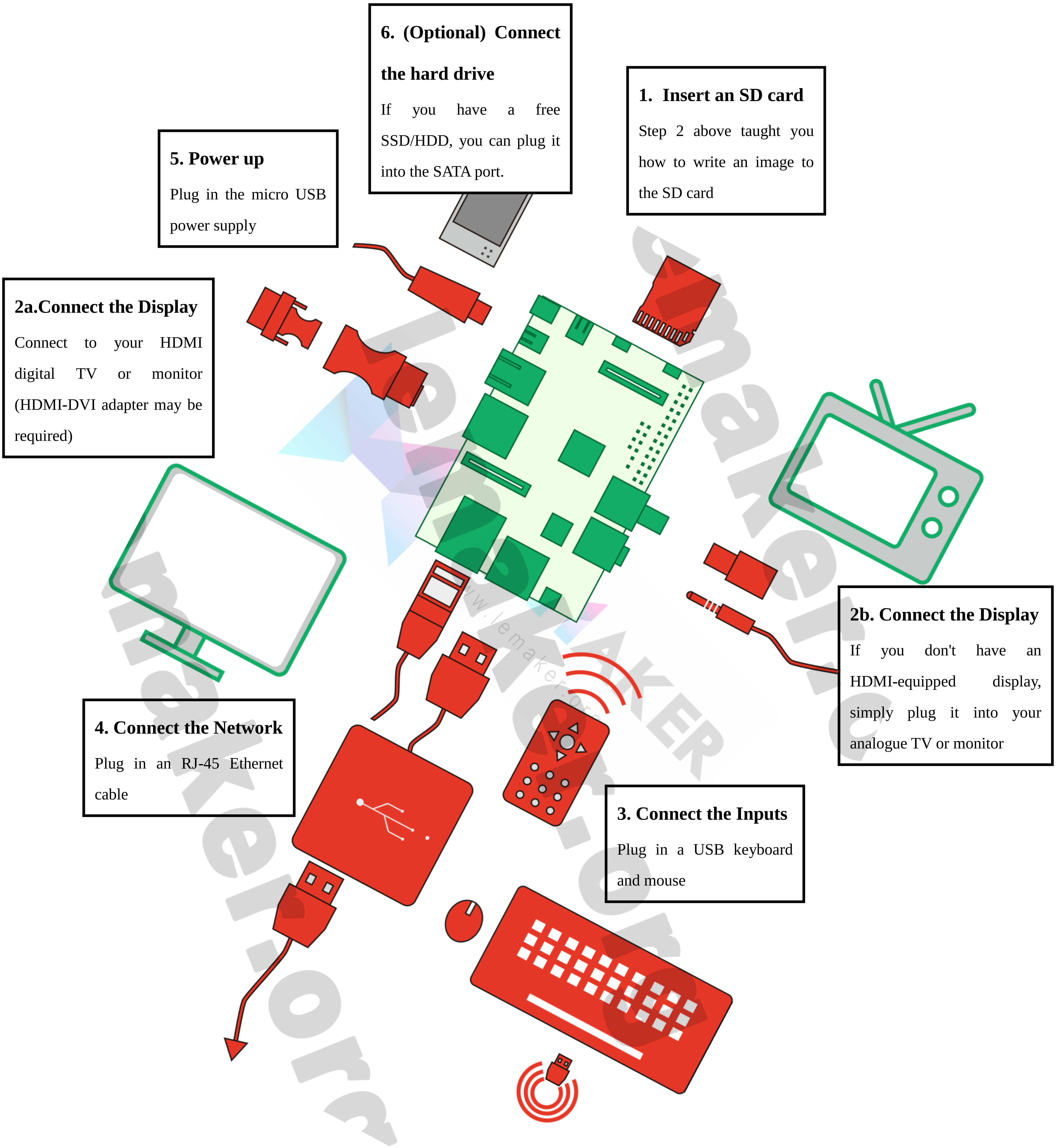
NB. The first time the system starts will take a long time, so please be patient - subsequent boots will be quicker.

The picture below shows the start screen of the 'Android For Banana Pro v1503' image.



2.3 Set up your Banana Pro/Pi

According to the set up diagram below, you can easily set up your Banana Pro/Pi.



1. Insert an SD card

Step 2 above taught you how to write an image to the SD card

2a.Connect the Display

Connect to your HDMI digital TV or monitor (HDMI-DVI adapter may be required)

2b. Connect the Display

If you don't have an HDMI-equipped display, simply plug it into your analogue TV or monitor

3. Connect the Inputs

Plug in a USB keyboard and mouse

4. Connect the Network

Plug in an RJ-45 Ethernet cable

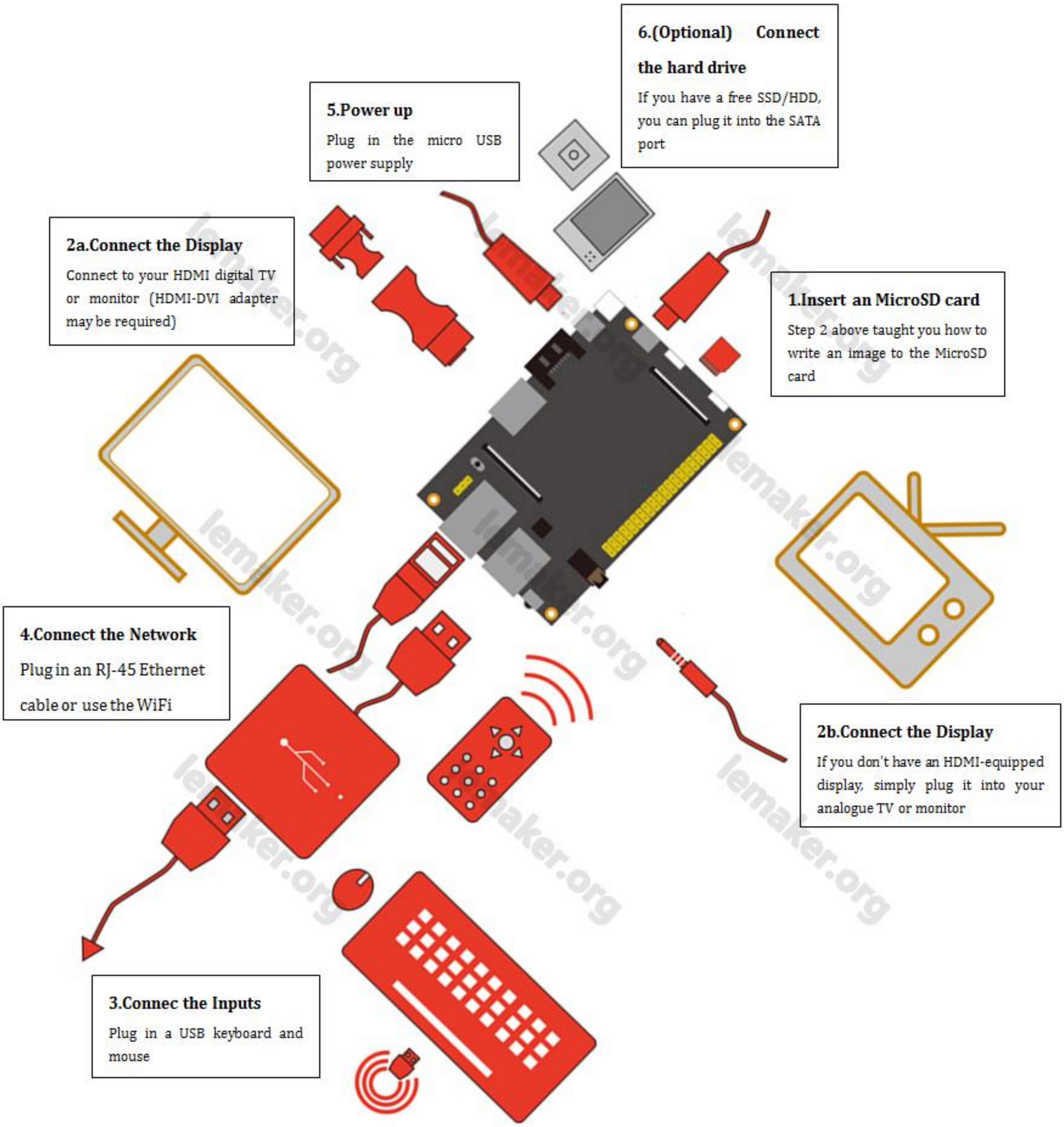
5. Power up

Plug in the micro USB power supply

6. (Optional) Connect the hard drive

If you have a free SSD/HDD, you can plug it into the SATA port.

Banana Pi


6.(Optional) Connect the hard drive
If you have a free SSD/HDD, you can plug it into the SATA port
5.Power up
Plug in the micro USB power supply
2a.Connect the Display
Connect to your HDMI digital TV or monitor (HDMI-DVI adapter may be required)
1.Insert an MicroSD card
Step 2 above taught you how to write an image to the MicroSD card
4.Connect the Network
Plug in an RJ-45 Ethernet cable or use the WiFi
2b.Connect the Display
If you don't have an HDMI-equipped display, simply plug it into your analogue TV or monitor
3.Connec the Inputs
Plug in a USB keyboard and mouse

Banana Pro

1. Insert the newly written MicroSD/SD card into the MicroSD/SD card socket on the left side edge of the underside of the board.
2. On the bottom edge in the middle of the board is the HDMI Type A (full sized – 13.9mm wide) port, just to the right of the SATA port. Just connect any HDMI Type A cable from the B-Pi or B-Pro to your TV or HDMI Monitor.

   If you don't have a TV/Monitor with a HDMI or DVI-D port:

   On the B-Pi you can use the yellow AV jack located in the middle of the top edge and the 3.5 mm stereo headphone jack to the right of it.

   On the B-Pro you can use the AV jack located in the top edge.
3. Plug a USB keyboard and mouse into the USB slots located on the right hand edge.
4. Just under the USB ports on the right hand edge is the Ethernet connector if you want to plug the Banana Pro/Pi into a wired network.
5. Finally, at the very left of the bottom edge is the micro-USB power connector. Plug in a regulated power supply that is rated at 5V ±5% and at least 2A. Any value bigger than 2A (like 2.5A) will also work. Avoid using the smaller chargers used for small GSM phones, as these are often unregulated - even if they claim "5V 2A", they may do "5V" and may do "2A", but not at the simultaneously!

   Make sure you have the correct USB plug. In the photo below, the mini-USB (on the left) is the wrong one. It’s thicker and looks like a trapezoid with its sides pinched in. The micro-USB (on the right) is the correct one. It is thinner and also looks like a trapezoid except its sides are rounded outward.

6. (This step is optional))If you have a free SATA 2.5 inch or 3.5 inch hard drive (SSD or HDD), you can use it on the Banana Pro/Pi. Connect the SATA cable to the SATA port just between the micro-USB and HDMI ports. Remember to put the power cable with the 2 male 2.54mm headers into the SATA power. Then you can plug your hard drive into the other side of the SATA cable. Be careful with the connection of the different color cables.

If all goes well, the Banana Pro/Pi will boot in a few minutes. The screen will display the OS's GUI (Graphical User Interface). The first boot of a new OS can sometimes take a long time. Be patient! Subsequent boots are usually much quicker.

2.4 Shut down your Banana Pro/Pi

You can use the GUI to shut down the Banana Pro/Pi safely.

Also you can run the command in the terminal:

```
sudo halt
```

or

```
sudo shutdown –h now
```

This will shut down the Pro/Pi safely, (just use the power key to turn off might damage the MicroSD/SD-cards file system).

3 Basic Usages

3.1 Log in to Banana Pro/Pi

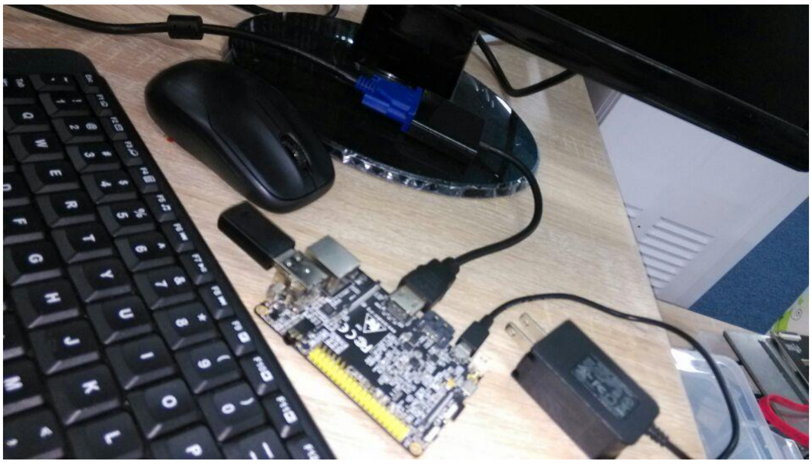
There are five methods for you to log in to Banana Pro or Banana Pi OS.

3.1.1 Using the HDMI

(1). First, get the basic things you need: a Banana Pro/Pi with a prepared MicroSD/SD card containing an OS, an HDMI cable with Type A plug (13.9mm wide) for the B-Pi or B-Pro end, an HD-ready monitor, a micro USB power adapter, a keyboard and a mouse.

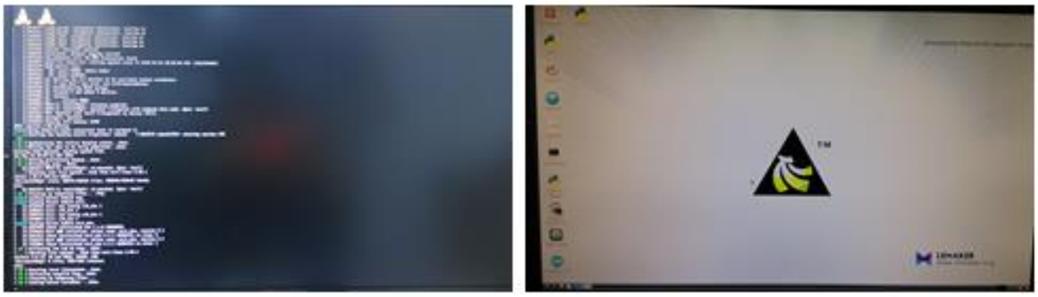
We'll be using the HDMI to VGA lead in the photo below.

(2). Connect the Banana Pro/Pi as shown here:



.

(3) Power on the Banana Pro/Pi by plugging in the mains adapter. You will then see the boot screen and eventually get to the desktop of the Banana Pro/Pi. (Remember, the first boot with a new OS on a card takes longer than usual - subsequent boots are quicker.) The photos below show first the Linux code scrolling up as it boots, and then the next screenshot shows the final main screen of the Raspbian OS (a variant of Debian 7 'Wheezy') for the Raspberry Pi which has been adapted for the Banana Pro/Pi.



3.1.2 Using the RCA interface

The AV cable is usually yellow and of the RCA connector/phono type – it normally comes bundled with similar red and white versions. Plug the yellow* one into the AV port (also yellow) of the Banana Pi, and the other end into the corresponding socket on your TV. **But** Pro via 3.5 mm TRRS jack shared with composite video out so it need a Composite AV cable   to connect device.

Power on the Banana Pro/Pi. If there is no display in the monitor, you may need check the script.bin file.

script.bin is a binary configuration file used by Allwinner SOC core driver or LiveSuit. And it contains the information that how to set the peripherals, port, and I/O pins of A10/A20 target board.

Because we can’t compile the script.bin file directly, we have to modify the corresponding text file whose format is FEX, so we must change script.bin file into script.fex file. We can use the sunxi-tools to change binary file into text file or change it back. Please refer to the steps in the 5.1 section.

AV driver has been included in the kernel, just Configure the script.fex directly:

```
[disp_init]
disp_init_enable = 1
disp_mode = 0
screen0_output_type = 2
screen0_output_mode = 11
screen1_output_type = 0
screen1_output_mode = 4
fb0_width = 1024
fb0_height = 768
fb0_framebuffer_num = 2
fb0_format = 10
fb0_pixel_sequence = 0
fb0_scaler_mode_enable = 0
fb1_width = 1024
fb1_height = 768
fb1_framebuffer_num = 2
fb1_format = 10
fb1_pixel_sequence = 0
```

```
fb1_scaler_mode_enable = 0
lcd0_backlight = 197
lcd1_backlight = 197
lcd0_bright = 50
lcd0_contrast = 50
lcd0_saturation = 57
lcd0_hue = 50
lcd1_bright = 50
lcd1_contrast = 50
lcd1_saturation = 57
lcd1_hue = 50
[tvout_para]
tvout_used=1
tvout_channel_num=1
```

Then convert it into script.bin format by using fex2bin, and replace the earlier script.bin on the board.

Reboot the system, now the AV port can be used for displaying.

[* For pi only use the cable with the yellow plugs as it has a 75 ohm resistor built in – the white and red ones don't. Please, someone correct or update this if it is inaccurate.]

3.1.3 Using SSH

Using SSH to log in to the Banana Pro/Pi for remote operation is very convenient, safe and highly efficient. In addition, it is not necessary to even use a monitor linked to the Banana Pro/Pi via HDMI cable in some situations, for example, if the Banana Pro/Pi is acting as a home server. The SSH server is installed by default and starts during boot up on the 'Raspbian for Banana Pro/Pi' and 'Lubuntu for Banana Pro/Pi' operating systems. So in general, you don't need to install SSH on your Banana Pro/Pi.

(1). If the SSH is not installed, you can install it using this command

```
sudo apt-get install openssh-server
```

(2). Check whether the SSH has started.

```
ps -e | grep ssh
```

If sshd is in the output, the SSH sever has started. If not, you should start it with your own command:

```
sudo /etc/init.d/ssh start
```

To stop the SSH server:

```
sudo /etc/init.d/ssh stop
```

Restart the SSH server:

```
sudo /etc/init.d/ssh restart
```

(3). Configure the rc.local file so that you can set the SSH server to start during boot:

```
sudo nano /etc/rc.local
```

Add

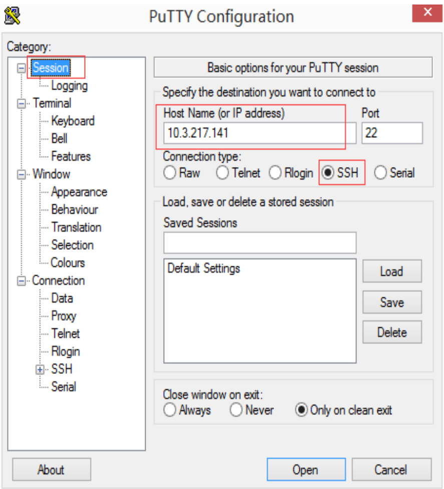
```
/etc/init.d ssh start
```

before exit 0.

Now you need to make sure your Banana Pro/Pi and your computer are connected to the same local internet.

(4) Log in to your Banana Pro/Pi.

In Windows, download a free SSH client such as PuTTY for remote login to the Banana Pro/Pi. Start PuTTY on your computer and then enter the IP address of your Banana Pro/Pi. Then click Open to connect to your Banana Pro/Pi. Finally, enter the user name and password to complete verification.



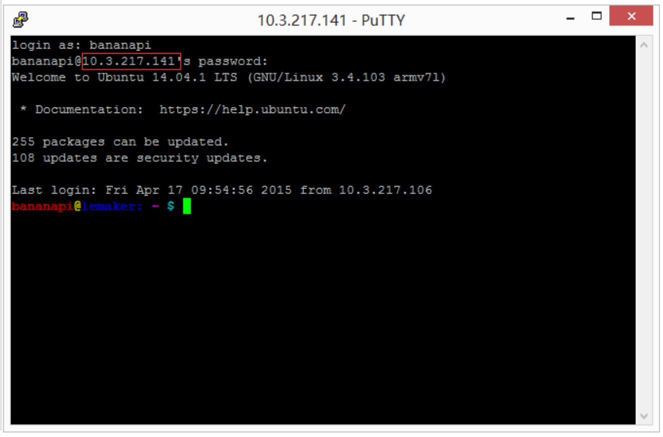
Specify the destination you want to connect to

Host Name (or IP address): 10.3.217.141

Port: 22

Connection type: ○ Raw ○ Telnet ○ Rlogin ● SSH ○ Serial

Close window on exit: ○ Always ○ Never ● Only on clean exit



```
login as: bananapi
bananapi@10.3.217.141's password:
Welcome to Ubuntu 14.04.1 LTS (GNU/Linux 3.4.103 armv7l)

 * Documentation:  https://help.ubuntu.com/

255 packages can be updated.
108 updates are security updates.

Last login: Fri Apr 17 09:54:56 2015 from 10.3.217.106
bananapi@lemaker: ~ $
```

In Ubuntu, it is easier to log in to your Banana Pro/Pi using the ssh command only：

```
ssh remote_username@remote_host
```

The remote username is the same user name that you use to log in to the Banana Pro/Pi such as pi. The remote_host is the Banana Pro/Pi's IP address.

3.1.4 Using VNC

In the previous section, we saw how SSH can be used to control remotely your Banana Pro/Pi without an HDMI display, as well as being safe, convenient and efficient. Another way you can try this is by using VNC to display the Banana Pro/Pi's desktop on your PC through its IP address.

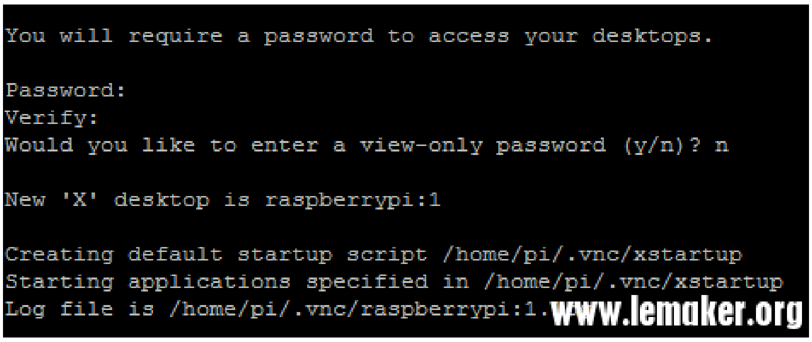
When the VNC service is on, a .vnc file will be generated. This file contains the information about the VNC service. The location and path of .vnc is generally to be found at either [/home/username] or [/root] according to the user's permissions. The following steps will guide you in configuring VNC if you are the root user.

(1). Install the VNC Server

```
sudo apt-get install tightvncserver
```

(2). Start the VNC Server and set the password

```
vncserver
```



```
You will require a password to access your desktops.

Password:
Verify:
Would you like to enter a view-only password (y/n)? n

New 'X' desktop is raspberrypi:1

Creating default startup script /home/pi/.vnc/xstartup
Starting applications specified in /home/pi/.vnc/xstartup
Log file is /home/pi/.vnc/raspberrypi:1.
```

This will require you to enter a VNC password (at least 6 characters) for the first time, and then it asks you if you would like to enter a view-only password (y/n), enter n to skip this step. You can check whether the VNC service is set up successfully.

The default port is **5901**.

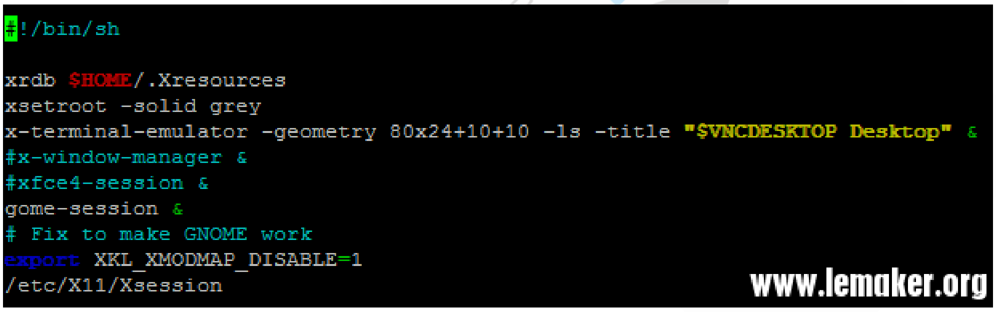
(3). Configure the **.vnc/xstartup** script

You should configure the xstartup script to display the desk in VNC client. You can choose which desktop system session to use.

Edit the xstartup script to enable different desktop sessions

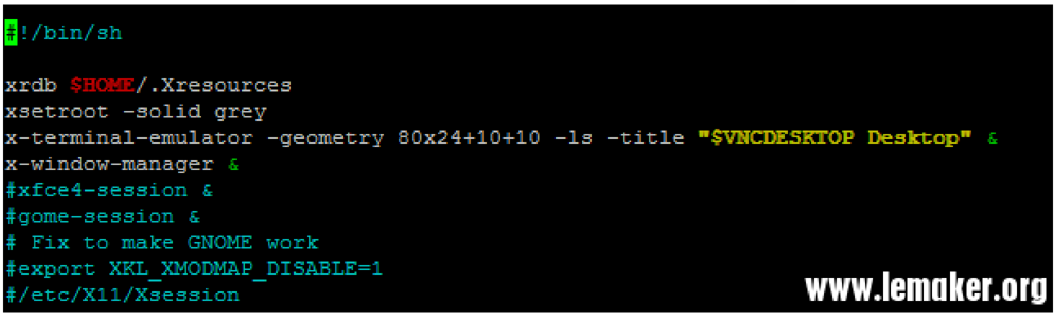
```
sudo nano /root/.vnc/xstartup
```

Gnome. The most powerful desktop session.



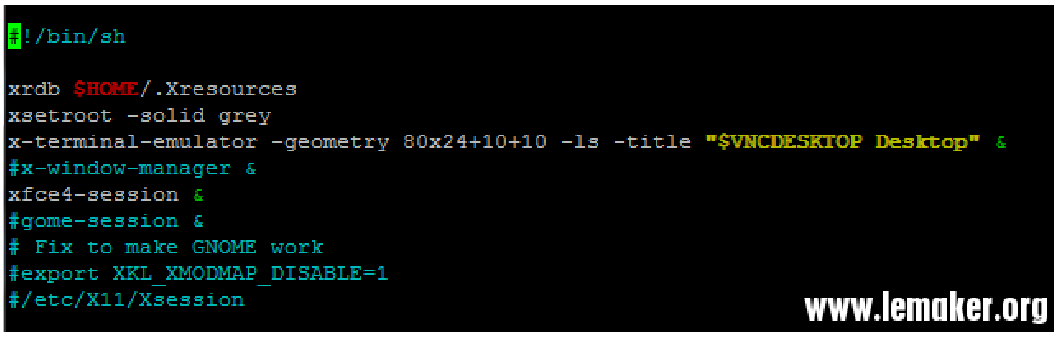
```
#!/bin/sh

xrdb $HOME/.Xresources
xsetroot -solid grey
x-terminal-emulator -geometry 80x24+10+10 -ls -title "$VNCDESKTOP Desktop" &
#x-window-manager &
#xfce4-session &
gome-session &
# Fix to make GNOME work
export XKL_XMODMAP_DISABLE=1
/etc/X11/Xsession
```

X-Window. The simplest desktop session.



```
#!/bin/sh

xrdb $HOME/.Xresources
xsetroot -solid grey
x-terminal-emulator -geometry 80x24+10+10 -ls -title "$VNCDESKTOP Desktop" &
x-window-manager &
#xfce4-session &
#gome-session &
# Fix to make GNOME work
#export XKL_XMODMAP_DISABLE=1
#/etc/X11/Xsession
```

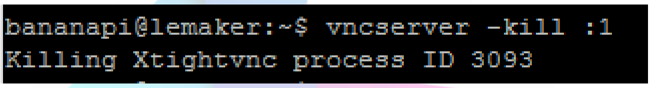
Xfce 4. Linux like desktop session.



```
#!/bin/sh

xrdb $HOME/.Xresources
xsetroot -solid grey
x-terminal-emulator -geometry 80x24+10+10 -ls -title "$VNCDESKTOP Desktop" &
#x-window-manager &
xfce4-session &
#gome-session &
# Fix to make GNOME work
#export XKL_XMODMAP_DISABLE=1
#/etc/X11/Xsession
```

After modifying the xstartup script you should restart the VNC service to make the modification work. First kill the current VNC service.

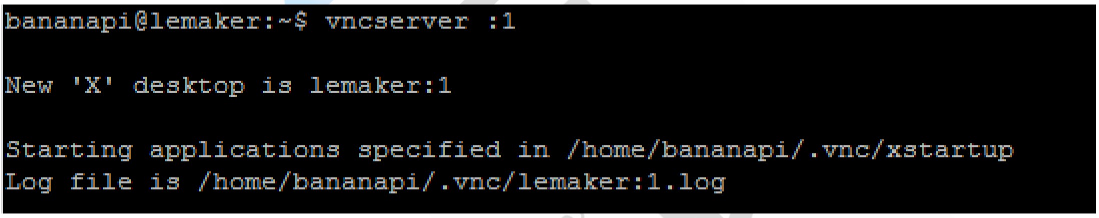
```
vncserver -kill
```



```
bananapi@lemaker:~$ vncserver -kill :1
Killing Xtightvnc process ID 3093
```

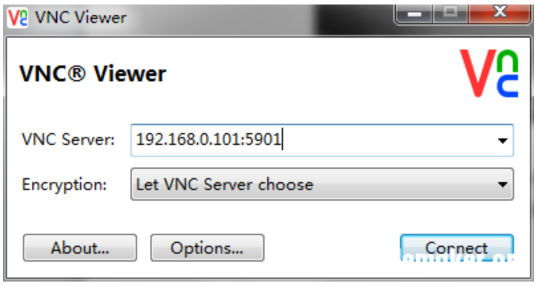
And restart the modified vnc service.

```
vncserver :1
```



```
bananapi@lemaker:~$ vncserver :1

New 'X' desktop is lemaker:1

Starting applications specified in /home/bananapi/.vnc/xstartup
Log file is /home/bananapi/.vnc/lemaker:1.log
```

(4). Use VNC-View on your computer to log in to your Banana Pro/Pi. Enter the Banana Pro/Pi's IP and port. The port of desktop 1 is 5901, desk 2 is 5902 and so on. You can use ifconfig command to get the IP address.

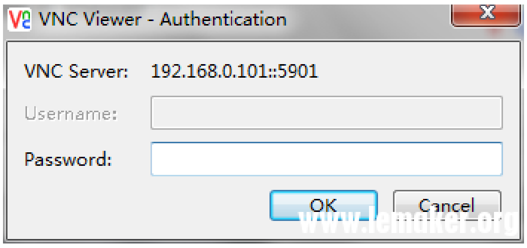


VNC Viewer

VNC® Viewer

VNC Server: 192.168.0.101:5901

Encryption: Let VNC Server choose



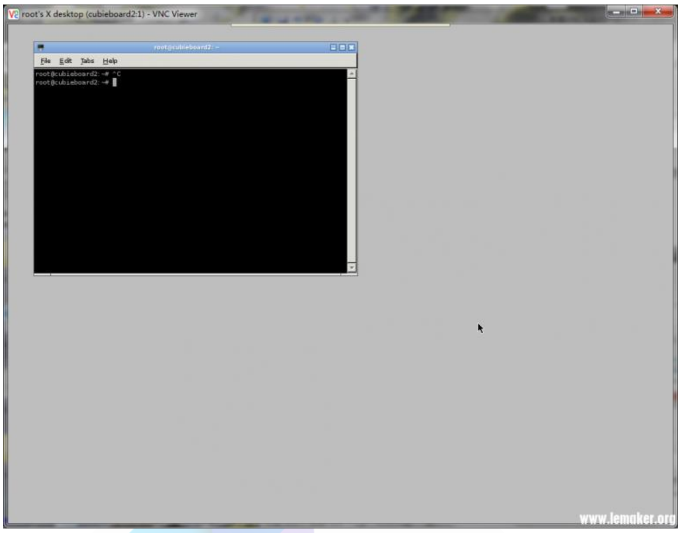
VNC Viewer - Authentication

VNC Server: 192.168.0.101::5901

Username:

Password:

This is an X-Window display.



```
root@cubieboard2:~# ^C
root@cubieboard2:~#
```

On X-Window, if using the Chromium web browser, you should start the VNC service under a normal user and then use VNC-View to log in to the Banana Pro/Pi. Don't use the root user to start the VNC service.

Summary of Commands

The commands to start the VNC service:

```
vncserver

vncserver :1

tightvncserver
```

The commands to stop the VNC service:

```
Vncserver -kill

tightvncserver -kill
```

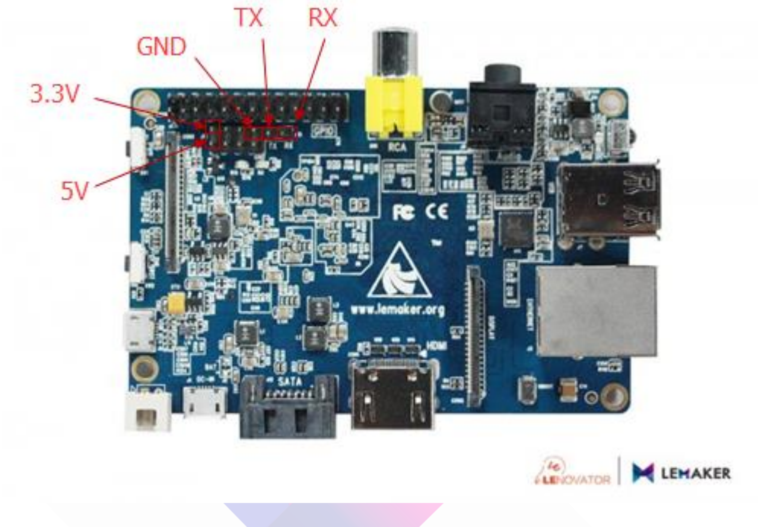
The command to change the password:

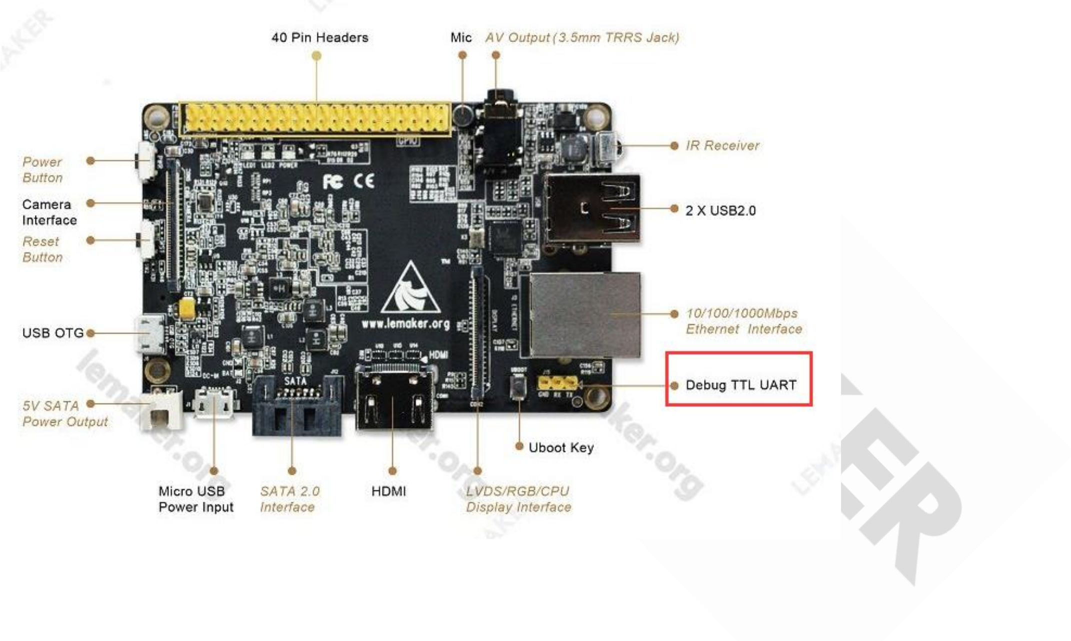
```
ps -axjf | grep vnc
```

3.1.5 Using the TTL serial port

This section will introduce you to using the TTL serial port to log in to the Banana Pro/Pi.

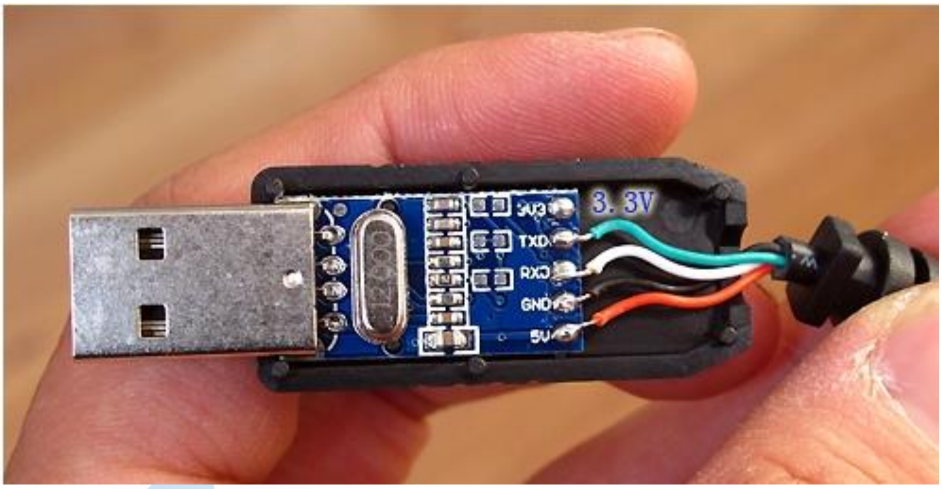
(1). Familiarise yourself with the pin assignments of the UART interface on the Banana Pro/Pi.





(2). Use the PL2303 to connect the Banana Pro/Pi and the computer.

The PL2303 operates as a bridge between a USB port and a standard RS232 serial port. There are pins for 3.3V, TXD, RXD, GND and 5V on the PL2303 as shown here.



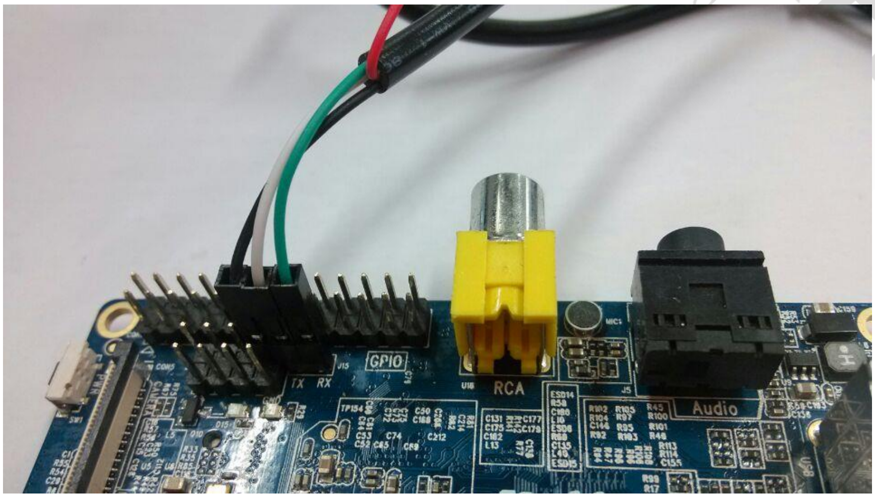
The table below shows the connections between the Banana Pro/Pi and the PL2303.

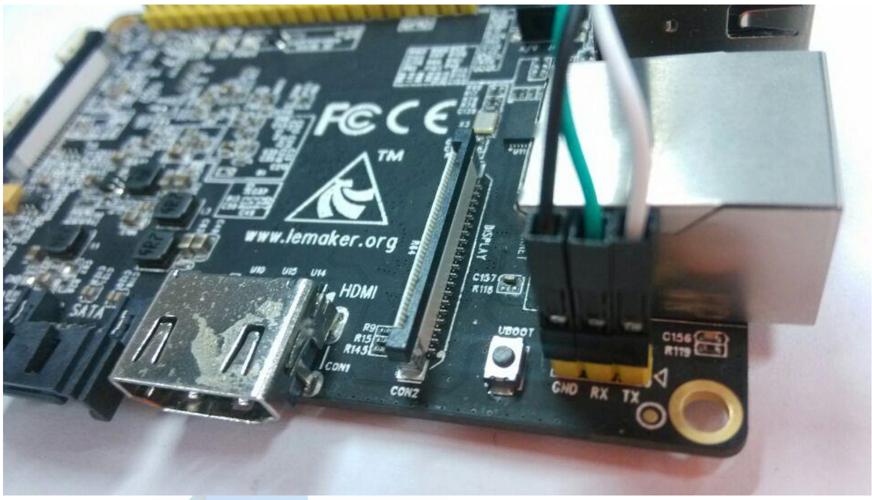
The connection between Banana Pro/Pi and PL2303	
Pin on Banana Pro/Pi	Pin on PL2303
GND port	GND
TX port	RXD
RX port	TXD

Attention:

A.TX on one device is connected to RX on the other and vice versa.

B. The power line(red one, 5V) is NOT connected. The connection between Banana Pro/Pi and PL2303 is shown below.





(3). Software on the computer

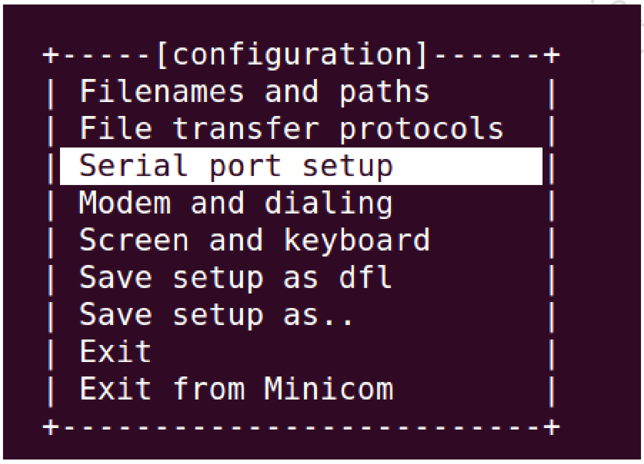
A. In Linux, the driver for PL2303 is already in the system.

Install the minicom software.

```
sudo apt-get install minicom
```

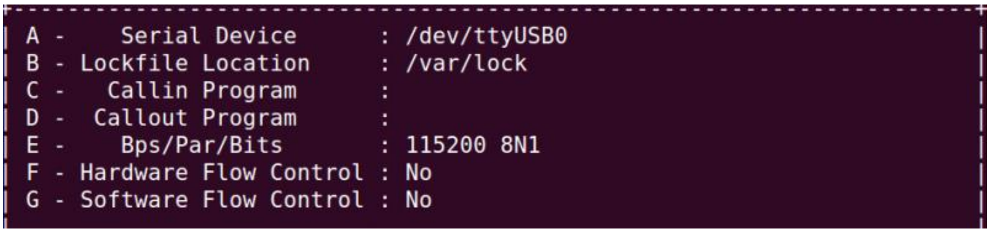
When the installation has finished, setup the minicom:

```
sudo minicom -s
```



```
+-----[configuration]------+
| Filenames and paths      |
| File transfer protocols  |
| Serial port setup        |
| Modem and dialing        |
| Screen and keyboard      |
| Save setup as dfl        |
| Save setup as..          |
| Exit                     |
| Exit from Minicom        |
+--------------------------+
```

Select the "Serial port setup" option



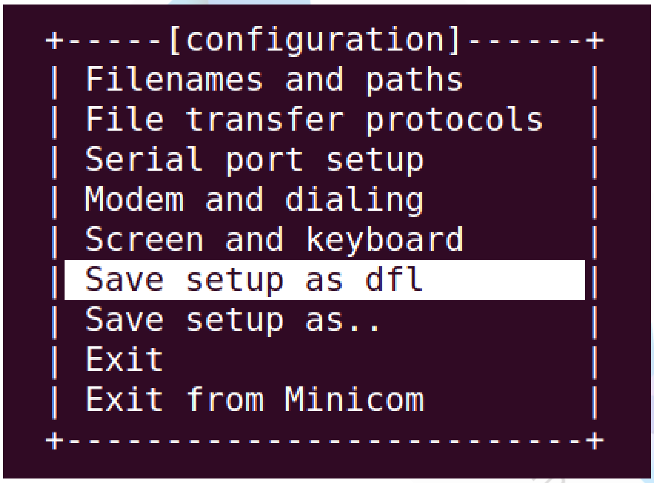
```
+-----------------------------------------------------------------------+
| A -    Serial Device      : /dev/ttyUSB0                              |
| B - Lockfile Location     : /var/lock                                 |
| C -   Callin Program      :                                           |
| D -  Callout Program      :                                           |
| E -    Bps/Par/Bits       : 115200 8N1                                |
| F - Hardware Flow Control : No                                        |
| G - Software Flow Control : No                                        |
```

Modify the parameters :

A - Serial Device: /dev/ttyUSB0

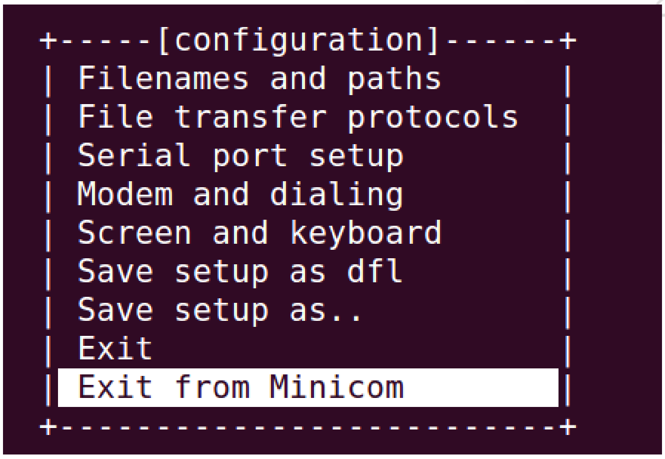
F - Hardware Flow Control: No

And save and then select the "save setup as dfl" option



```
+-----[configuration]------+
| Filenames and paths      |
| File transfer protocols  |
| Serial port setup        |
| Modem and dialing        |
| Screen and keyboard      |
| Save setup as dfl        |
| Save setup as..          |
| Exit                     |
| Exit from Minicom        |
+--------------------------+
```

Save the setting and select "Exit from Minicom" to exit



```
+-----[configuration]------+
| Filenames and paths      |
| File transfer protocols  |
| Serial port setup        |
| Modem and dialing        |
| Screen and keyboard      |
| Save setup as dfl        |
| Save setup as..          |
| Exit                     |
| Exit from Minicom        |
+--------------------------+
```

B. In Windows, the driver may already have been automatically installed. If not, you can install it yourself. You can try TeraTerm or Putty to use the TTL serial port.

(With thanks to native speaker “roses” for checking and upgrading this document)

3.2 Connect hard drive to SATA interface

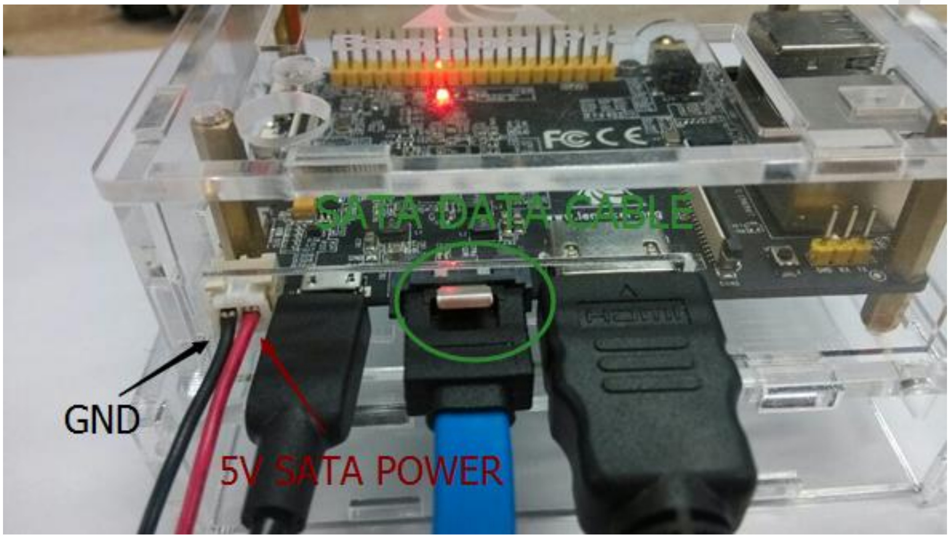
The SATA port on the Banana Pro/Pi can be used with any SATA hard drive (in terms of data transfer).

However, in terms of supplying power to your drive, the Pro/Pi can ONLY supply 5 Volts to a 2.5 inch SSD.

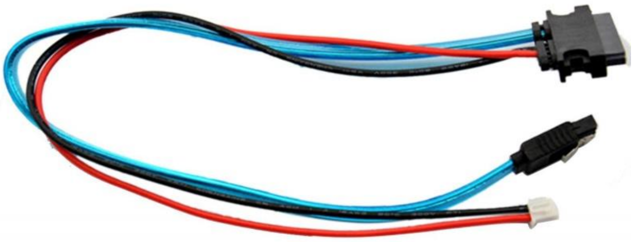
In certain cases, connecting a 2.5 inch HDD is also possible, but some brands and models require too much current, especially during spin up, and this can damage the power rails of your SBC. Furthermore, it also depends on what rating PSU you are using, which and how many USB devices you have plugged in, whether your USB hub is powered or passive, and possibly a few other factors as well. If in doubt, power any kind of HDD externally.

Powering a 3.5 inch HDD MUST be done via an external power supply because it needs both +5V and +12V via a Molex connector. (An old PSU from a desktop computer is possible, but you need to physically connect two specific pins in the ATX connector block to simulate the Power button being pressed. Again, if you don't know what you're doing, buy a dedicated PSU - they're not expensive and are more efficient and therefore 'greener' anyway.)

The two pin SATA power output of the Pro/Pi is situated between the micro-USB DC In and the corner of the board. The 5V pin is nearest the DC In (on the right as you look at it from the side) and the other is ground (GND).



For the connecting cables, you can get these easily and cheaply. Look on Amazon for "dedicated SATA cable HDD connectors with power supply". In the UK, they are currently 3.70 GBP, in Europe 5.96 EUR (and you get 2 pieces!!) with postage also being very low. Delivery times are not quick however. Try and obtain them locally if possible (if the price is right) and 'try before you buy'.



Beware: it's been reported external link that some of these cables have the polarity of +5V & GND the wrong way round!! (Unfortunately, the plug and its socket are 'keyed' and can only meet each other in one orientation, so it's not just a simple case of turning it upside down - pity!!!)

If you look closely at the photo in this blog, you can see insulating tape where he's chopped both cables and rejoined red to black and vice versa. (If you have the correct tool(s), it is maybe possible to push out the internal metal contacts of the plug like in a Molex connector and then swap them around but it's VERY fiddly. Personally, rather than doing such a 'bodge job' as that blogger did, I would use some insulated bullet connectors.)

3.3 OTG

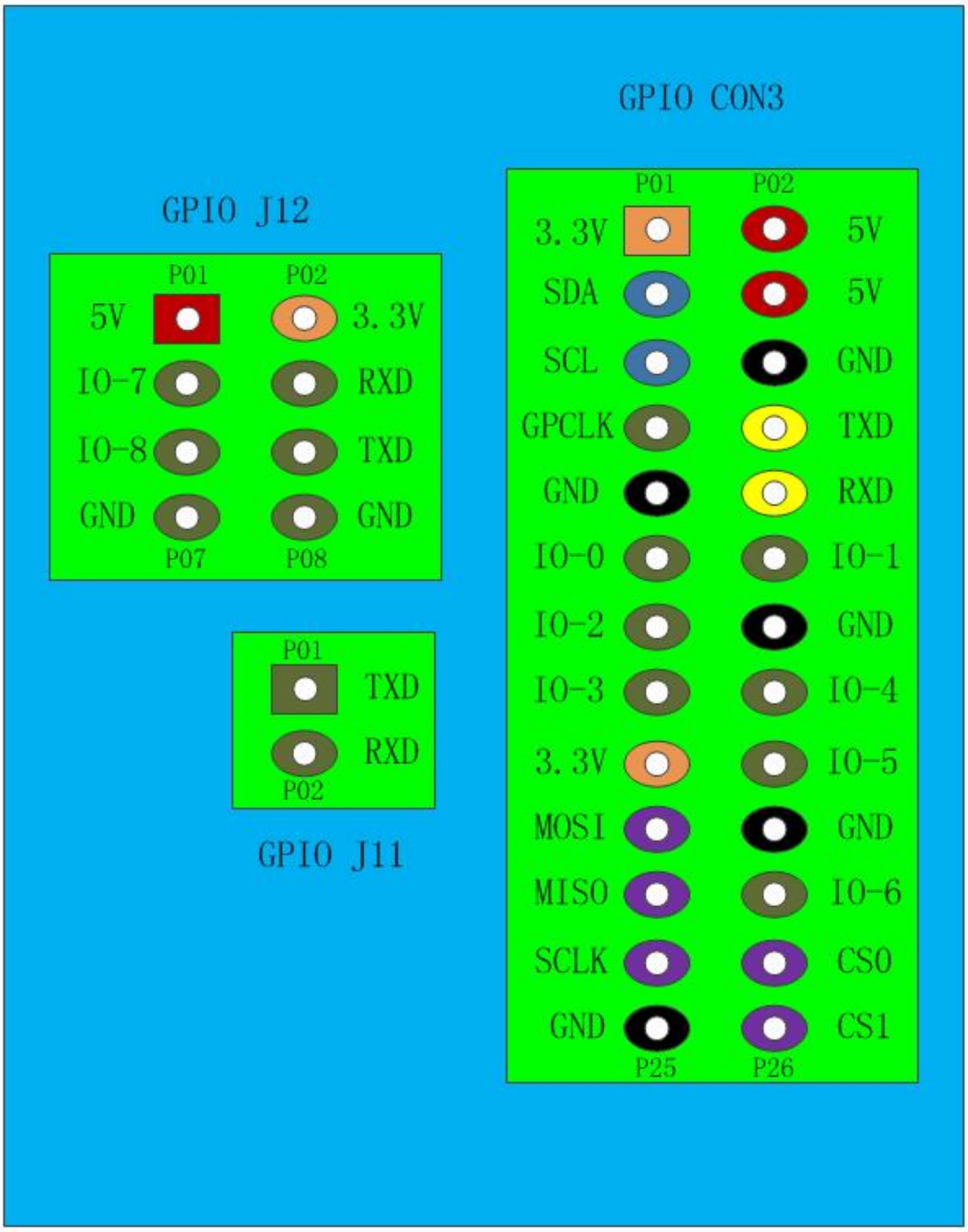
The OTG port (OTG = On the Go) allows you to connect any USB device using a special (but usually inexpensive) micro-USB to female Type A connector cable. This therefore gives you a total of 3 USB ports - more if you have a passive or powered USB hub.

The socket for this port is located on the edge of the board where the SD card slot is, just to the right of the Reset switch and around the corner from the SATA power supply socket. (Confusingly, it's in the same place as where the Raspberry Pi's Power In socket would be - that SBC doesn't have an OTG socket of course - so if you are a regular R-Pi user just coming over to the B-Pi side of things, have your wits about you when connecting your PSU. Personally, I have my PSU plugged into a switched wall socket or switched extension cable with the micro-USB permanently connected to the Pi. This reduces wear and tear on the socket's metal housing and also the solder joints and anchor points around it on the PCB.)

In certain cases, the OTG port can also be used for supplying extra power to the SBC by plugging into it what will become for the Pi a second Power Supply, for example when first booting the Android 4.4 image. However, it is NOT recommended to plug in any power source into the OTG for Linux and/or Android 4.2 images at ANY time, and certainly NEVER on its own if there is nothing plugged into the DC In socket.

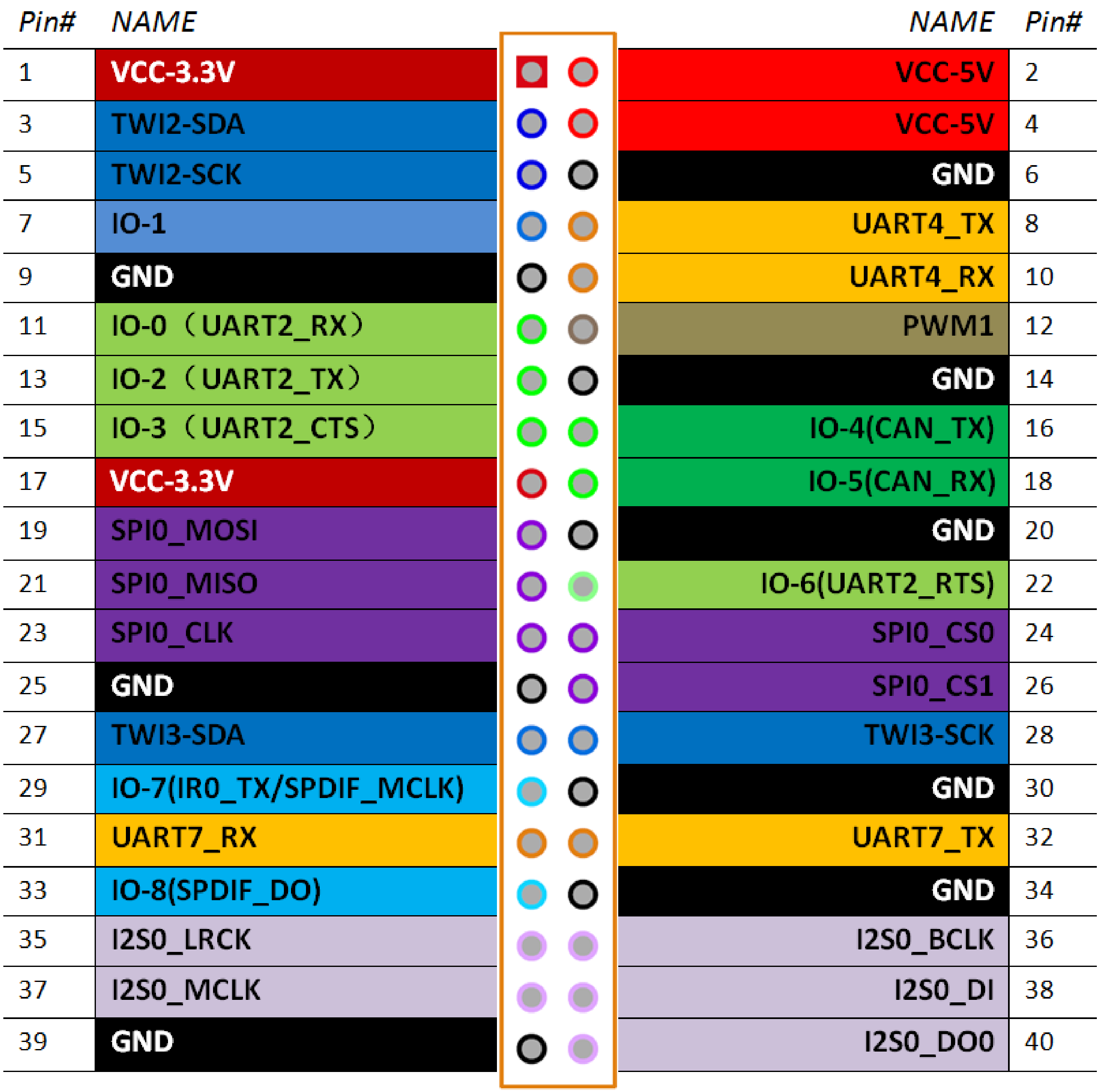
4 Advance Usages

4.1 Pin definition



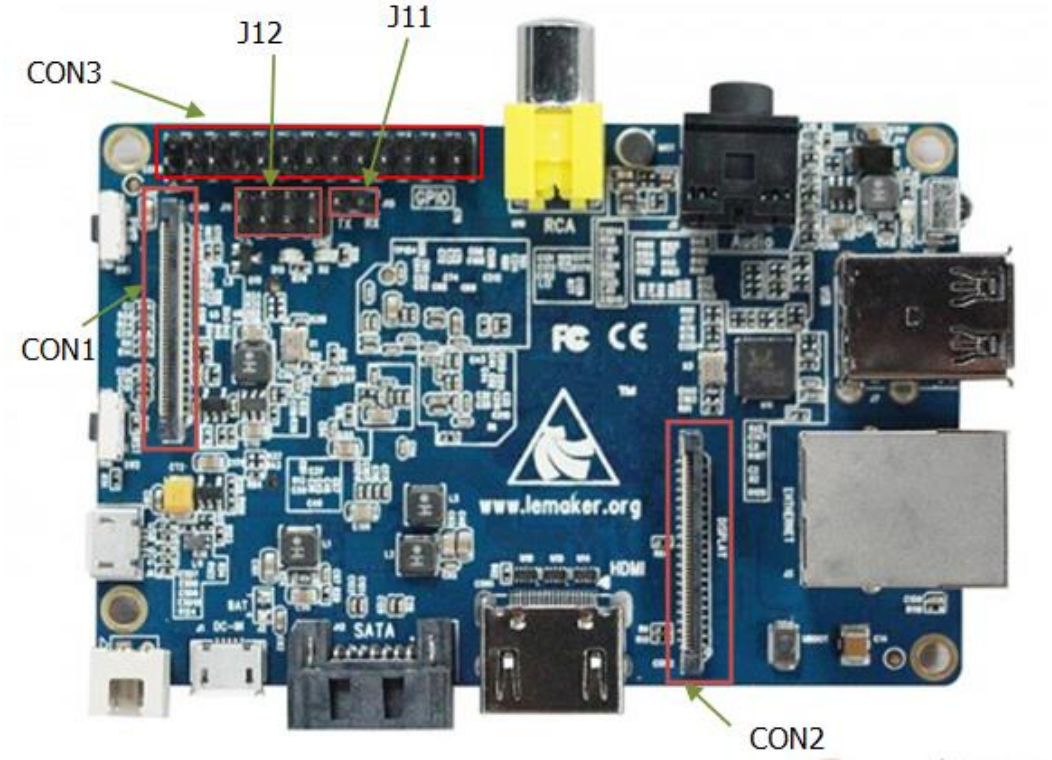
The Banana Pi's CON3, J11 & J12 connectors

Banana Pro CON6

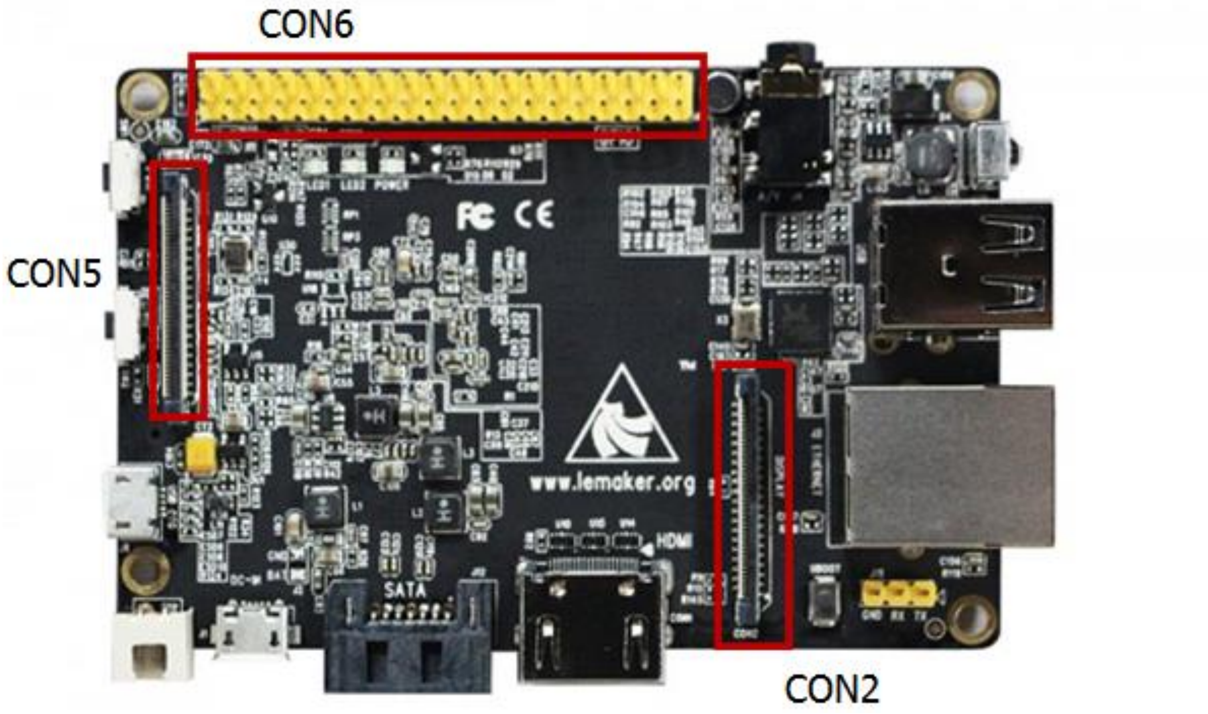


Pin#	NAME	NAME	Pin#
1	VCC-3.3V	VCC-5V	2
3	TWI2-SDA	VCC-5V	4
5	TWI2-SCK	GND	6
7	IO-1	UART4_TX	8
9	GND	UART4_RX	10
11	IO-0（UART2_RX）	PWM1	12
13	IO-2（UART2_TX）	GND	14
15	IO-3（UART2_CTS）	IO-4(CAN_TX)	16
17	VCC-3.3V	IO-5(CAN_RX)	18
19	SPI0_MOSI	GND	20
21	SPI0_MISO	IO-6(UART2_RTS)	22
23	SPI0_CLK	SPI0_CS0	24
25	GND	SPI0_CS1	26
27	TWI3-SDA	TWI3-SCK	28
29	IO-7(IR0_TX/SPDIF_MCLK)	GND	30
31	UART7_RX	UART7_TX	32
33	IO-8(SPDIF_DO)	GND	34
35	I2S0_LRCK	I2S0_BCLK	36
37	I2S0_MCLK	I2S0_DI	38
39	GND	I2S0_DO0	40

The Banana Pro's CON6 connector



Banana Pi Layout



Banana Pro Layout

The detailed pin definition please refer to the appendix.

4.2 Extension Interface

4.2.1 LVDS/RGB/CPU display interface

LeMaker has designed three different size LCD modules, include 3.5 inch, 5.0 inch and 7.0 inch.

3.5 inch LCD module is RGB interface with 320*240 resolution.

5.0 inch LCD module is RGB interface with 800*480 resolution.

7.0 inch LCD module is LVDS interface with 1024*600 resolution.

Replace the configuration file

In order to use the LCD module, you need modify the script.bin file in your OS. You can donwload the modified file for each size LCD module from LeMaker github: https://github.com/LeMaker/fex_configuration

```
git clone http://github.com/LeMaker/fex_configuration
```

Enter into the fex_configuration:

```
cd fex_configuration
```

You will find two directories, bin and fex. In the bin directories there are compiled bin files that you can use it directly.

Enter the bin directory:

```
cd bin
```

You will see 6 bin files, 3 for Banana Pro and 3 for Banana Pi. On Banana Pro, you need use the files named banana_pro_Xlcd.bin. On Banana Pi, you need use the files named banana_pi_Xlcd.bin.(X should be 35, 5 or 7, choose the right file according to what size LCD you use) Rename the corresponded bin file that you use to script.bin, and replace the new script.bin file with the old on in your OS.

The script.bin file is located at the first partition of your memory card with OS.

Examples are as follows:

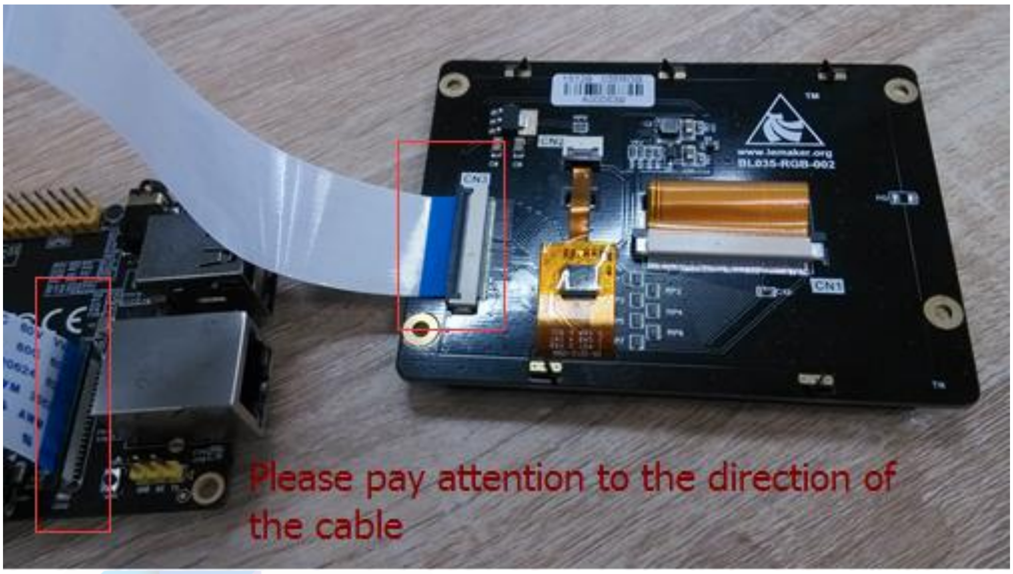
3.5 inch RGB LCD FOR Banana Pro/Pi

Picture below is the 3.5" display with 320x240 24-bit color pixels，and the module connect the the Banana Pro via the Parallerl RGB interface，Provide distinct display effect with lightweight and portable，we can use the 3.5" display as a console, X window port, displaying images or video etc.

3.5 inch LCD specifications shown in the following table

LCD size	3.5 inch(Diagonal)
Interface	Parallel RGB
Resolution	320 x 3(RGB) x 240
Driver element	a-Si TFT active matrix
Dot pitch	73(W) ×219(H) um
Connections to Banana Pi	40 Pin FPC to the Display Sensor Interface (DSI)
Surface treatment	Glare
Color arrangement	RGB-stripe
View direction	6 O’Clock
Power	5V/250mA
Active area	70.08(W) ×52.56(H) mm
Dimension	76.9(W) ×63.9(H) ×3.26(D) mm
Weight	TBD

This module consists of two parts: 3.5 inch LCD display and 40 pin FPC. The LCD connect to Banana Pro board by use the 40pin FPC as shown in the picture below:



To use the 3.5 inch lcd module, you need change the script.bin file in the MicroSD card. Power on the Banana Pro, and mount the first partition of the MicroSD card:

```
mount /dev/mmcblk0p1 /mnt
```

Then replace the script.bin file with the one for 3.5 inch lcd:

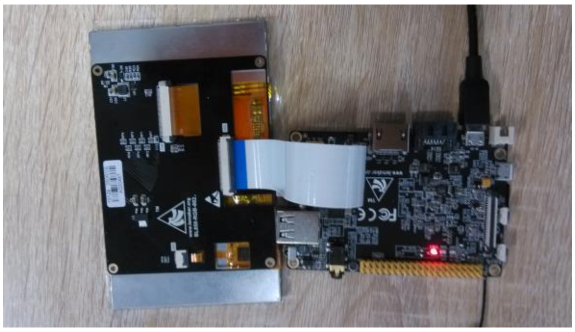
```
git clone http://github.com/LeMaker/fex_configuration

cd fex_configuration/bin

sudo cp banana_pro_35lcd.bin    /mnt/script.bin

sync

sudo umount /mnt
```

(For Raspbian: sudo cp banana_pro_35lcd.bin /mnt/bananapi/script.bin)

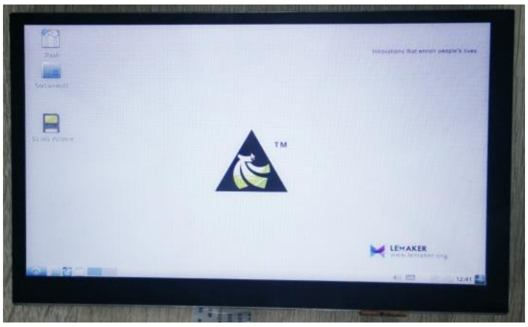
Edit the /etc/modules with your favorite editor (with sudo, ie sudo vim /etc/modules), uncomment ‘lcd’ (remove the ‘#’ in front of it).

Reboot the system, and you will see the display on the 3.5 inch LCD module.

5 inch LCD FOR Banana Pro/Pi



7 inch LCD FOR Banana Pro/Pi

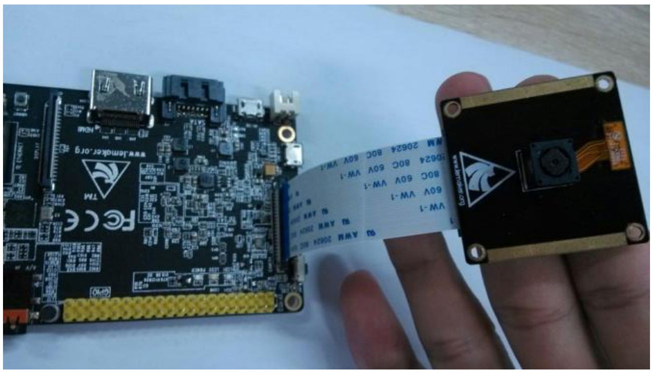


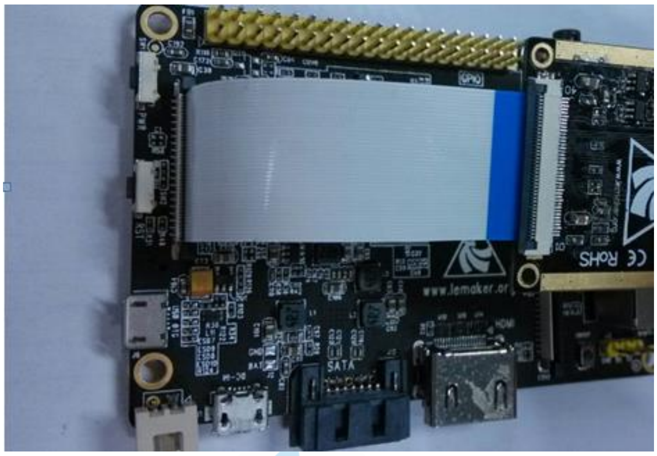
4.2.2 Camera Module

The Banana Pro/Pi camera module is available right now and is a high definition camera module for the Banana Pro/Pi using an Omnivision 5640 CMOS image sensor in an auto-focus module and with an integral IR filter. The camera module connects to the Banana Pro/Pi board via the CSI connector designed specifically for interfacing to cameras. Providing high sensitivity, low crosstalk and low noise image capture in a small and lightweight design.

Banana Pro/Pi Camera

(1) Connecting the camera module





(2)Setting up the B-Pro/B-Pi and running the camera

In the graphical interface, open the command line terminal LXterminal.

First you have to load the necessary drivers needed by the camera module:

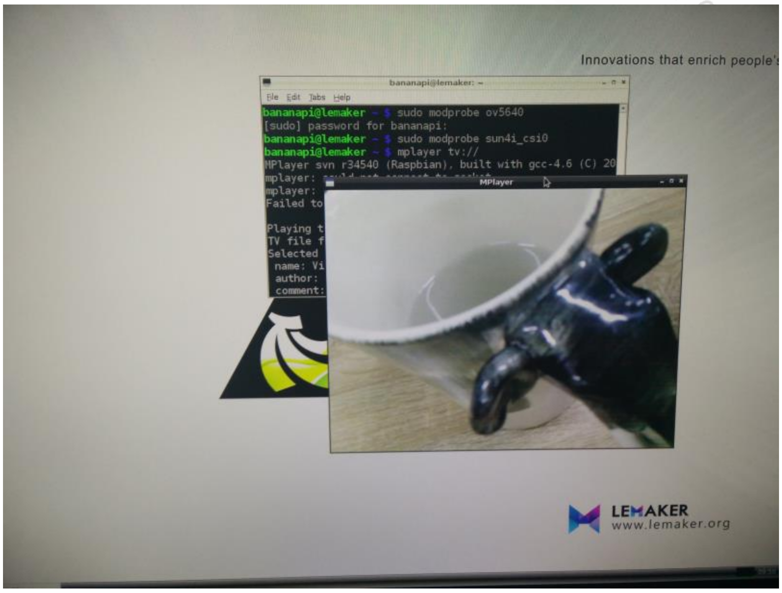
```
sudo modprobe ov5640

sudo modprobe sun4i_csi
```

If modprobe sun4i_csi does not work try:

```
sudo modprobe sun4i_csi0
```

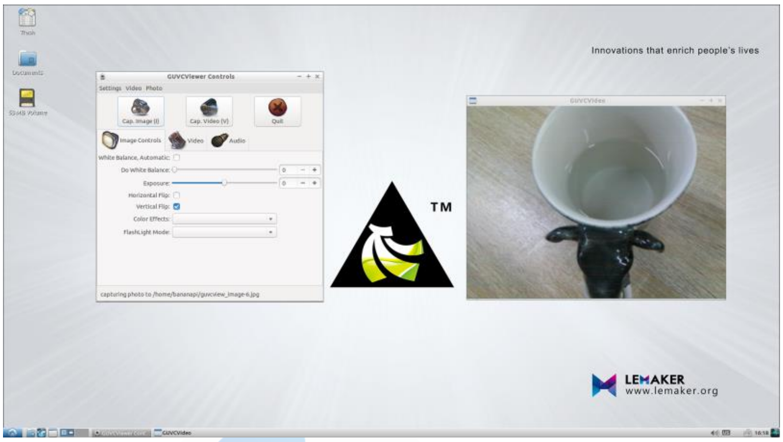
Then you can use MPlayer to test the camera:

```
mplayer tv://
```



```
bananapi@lemaker ~ $ sudo modprobe ov5640
[sudo] password for bananapi:
bananapi@lemaker ~ $ sudo modprobe sun4i_csi0
bananapi@lemaker ~ $ mplayer tv://
MPlayer svn r34540 (Raspbian), built with gcc-4.6 (C) 20
mplayer:
mplayer:
Failed to

Playing t
TV file f
Selected
  name: Vi
  author:
  comment:
```

In lubuntu, you also can use the application GUVCvideo.



White Balance, Automatic: □
Do White Balance: 0
Exposure: 0
Horizontal Flip: □
Vertical Flip: ☑
Color Effects:
FlashLight Mode:

capturing photo to /home/bananapi/guvcview_image-6.jpg

4.2.3 Uart port

Enable UART

On Banana Pi, there are UART0, UART2, UART3, UART7 available. On Banana Pro, there are UART0, UART2, UART4, UART7 available. You can enable them or disable them in script.bin file. For example, if you want to enable UART3 on Banana Pi, so you need first use bin2fex tool to transform script.bin to script.fex, and then you can edit the [uart3_para] in script.fex. Please refer to the steps in the 5.1 section. Set the uart_used value to 1 to enable it:

```
uart_used = 1
```

Then transform script.fex back to script.bin using fex2bin tool.

Identify UART

When we enable uart3，we need to know uart3 is known as ttySX (X should be 0，1，2，3….).

```
ls sys/bus/platform/devices/sunxi-uart.3/tty
```

this displays ttySX.

Test UART

By default, the serial baud rate is 9600, so we need set the serial debug tool baud rate to 115200 on PC. Connect the serial cable between Banana Pro/Pi and PC:

```
echo hello > /dev/ttyS2
```

If the UART3 is well, you will see hello on your PC. After that you can use the UART in your program.

4.2.4 IR

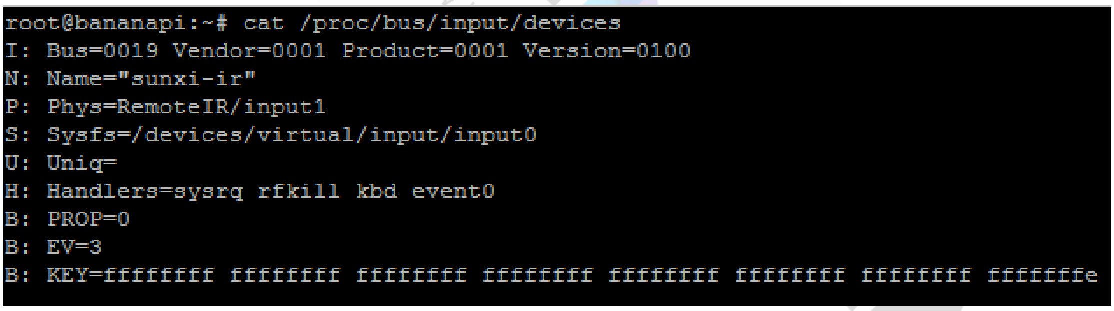
(1) Load IR kernel module:

```
modprobe sunxi-ir
```

(Now, sunxi_ir was built into kernel, you needn't to do this step anymore. If you are not sure whether sunxi-ir is in kernel, please follow this step, you can add it in /etc/modules.)

Check if you have the correct device (should be dev/input/event0)

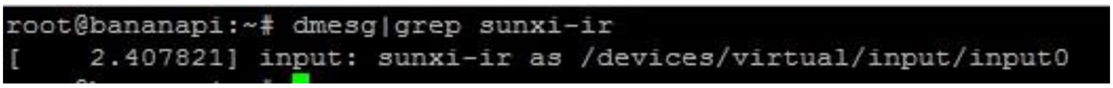
```
cat /proc/bus/input/devices
```



```
root@bananapi:~# cat /proc/bus/input/devices
I: Bus=0019 Vendor=0001 Product=0001 Version=0100
N: Name="sunxi-ir"
P: Phys=RemoteIR/input1
S: Sysfs=/devices/virtual/input/input0
U: Uniq=
H: Handlers=sysrq rfkill kbd event0
B: PROP=0
B: EV=3
B: KEY=ffffffff ffffffff ffffffff ffffffff ffffffff ffffffff ffffffff fffffffe
```

and/or check with dmesg (but no evidence about event*)

```
dmesg|grep sunxi-ir
```



```
root@bananapi:~# dmesg|grep sunxi-ir
[    2.407821] input: sunxi-ir as /devices/virtual/input/input0
```

So, Device is /dev/input/event0

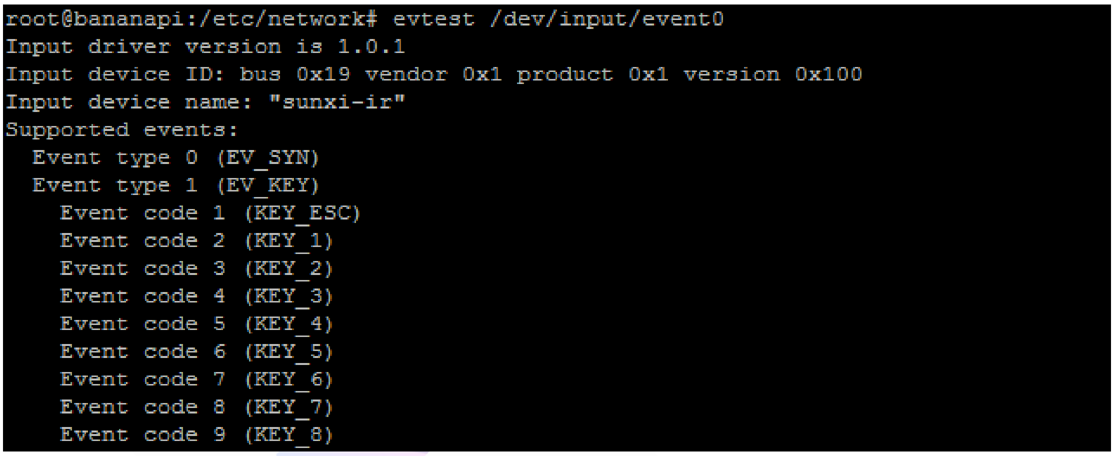
(2) Find a working remote

```
apt-get install evtest
```

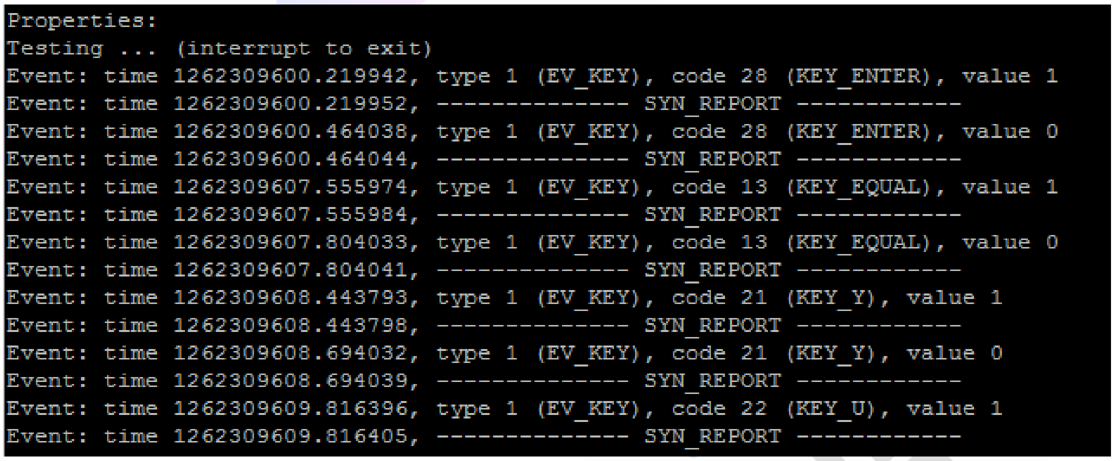
Run **evtest** and press button on your remote facing the IR receiver and if you see some output ... bingo! You have found a working remote!

Remember: only few remotes work.

```
evtest /dev/input/event0
```



```
root@bananapi:/etc/network# evtest /dev/input/event0
Input driver version is 1.0.1
Input device ID: bus 0x19 vendor 0x1 product 0x1 version 0x100
Input device name: "sunxi-ir"
Supported events:
  Event type 0 (EV_SYN)
  Event type 1 (EV_KEY)
    Event code 1 (KEY_ESC)
    Event code 2 (KEY_1)
    Event code 3 (KEY_2)
    Event code 4 (KEY_3)
    Event code 5 (KEY_4)
    Event code 6 (KEY_5)
    Event code 7 (KEY_6)
    Event code 8 (KEY_7)
    Event code 9 (KEY_8)
```



```
Properties:
Testing ... (interrupt to exit)
Event: time 1262309600.219942, type 1 (EV_KEY), code 28 (KEY_ENTER), value 1
Event: time 1262309600.219952, -------------- SYN_REPORT ------------
Event: time 1262309600.464038, type 1 (EV_KEY), code 28 (KEY_ENTER), value 0
Event: time 1262309600.464044, -------------- SYN_REPORT ------------
Event: time 1262309607.555974, type 1 (EV_KEY), code 13 (KEY_EQUAL), value 1
Event: time 1262309607.555984, -------------- SYN_REPORT ------------
Event: time 1262309607.804033, type 1 (EV_KEY), code 13 (KEY_EQUAL), value 0
Event: time 1262309607.804041, -------------- SYN_REPORT ------------
Event: time 1262309608.443793, type 1 (EV_KEY), code 21 (KEY_Y), value 1
Event: time 1262309608.443798, -------------- SYN_REPORT ------------
Event: time 1262309608.694032, type 1 (EV_KEY), code 21 (KEY_Y), value 0
Event: time 1262309608.694039, -------------- SYN_REPORT ------------
Event: time 1262309609.816396, type 1 (EV_KEY), code 22 (KEY_U), value 1
Event: time 1262309609.816405, -------------- SYN_REPORT ------------
```

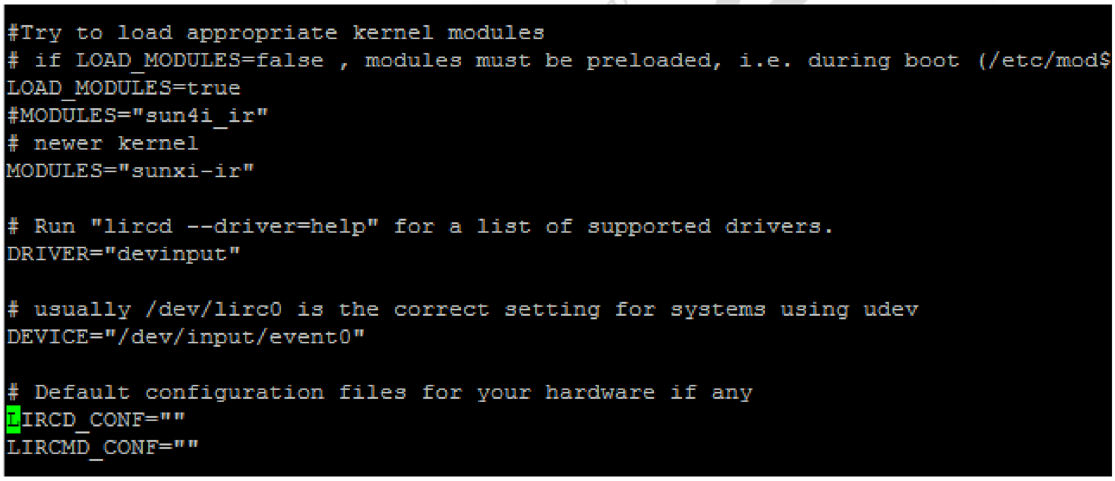
(3) Now install and configure LIRC

```
apt-get install lirc
```

edit **/etc/lirc/hardware.conf** as below:

```
# /etc/lirc/hardware.conf

#

# Arguments which will be used when launching lircd

   LIRCD_ARGS=""

#Don't start lircmd even if there seems to be a good config file
```

```
   START_LIRCMD=false
#Don't start irexec, even if a good config file seems to exist.
   START_IREXEC=false
#Try to load appropriate kernel modules
# if LOAD_MODULES=false , modules must be preloaded, i.e. during boot (/etc/modules)
   LOAD_MODULES=true
#MODULES="sun4i_ir"
# newer kernel
MODULES="sunxi-ir"
# Run "lircd --driver=help" for a list of supported drivers.
   REMOTE_DRIVER="devinput"
# usually /dev/lirc0 is the correct setting for systems using udev
   REMOTE_DEVICE="/dev/input/event0"
   START_LIRCD="true"
# Default configuration files for your hardware if any
   LIRCD_CONF=""
   LIRCMD_CONF=""
```

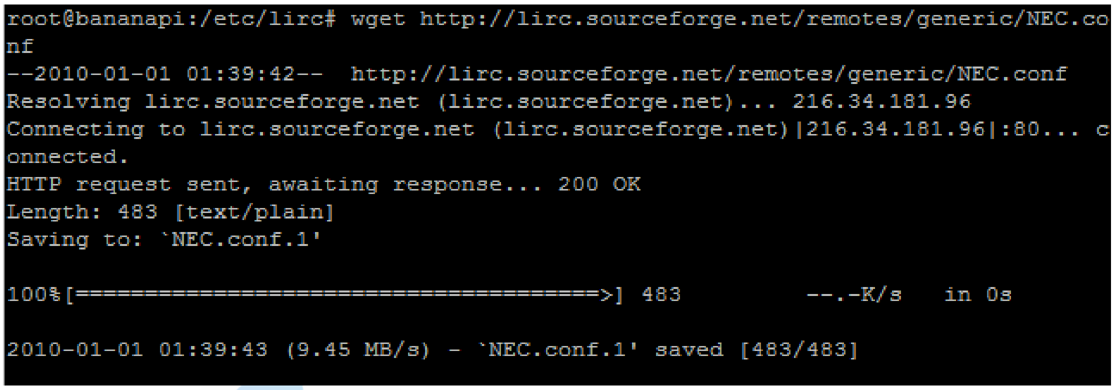


```
#Try to load appropriate kernel modules
# if LOAD_MODULES=false , modules must be preloaded, i.e. during boot (/etc/mod$
LOAD_MODULES=true
#MODULES="sun4i_ir"
# newer kernel
MODULES="sunxi-ir"

# Run "lircd --driver=help" for a list of supported drivers.
DRIVER="devinput"

# usually /dev/lirc0 is the correct setting for systems using udev
DEVICE="/dev/input/event0"

# Default configuration files for your hardware if any
LIRCD_CONF=""
LIRCMD_CONF=""
```

Now you must configure LIRC with your remote.

Take a look at http://lirc.sourceforge.net/remotes/generic/ and download a generic configuration file, i.e. NEC.conf. Run following command at /etc/lirc/.

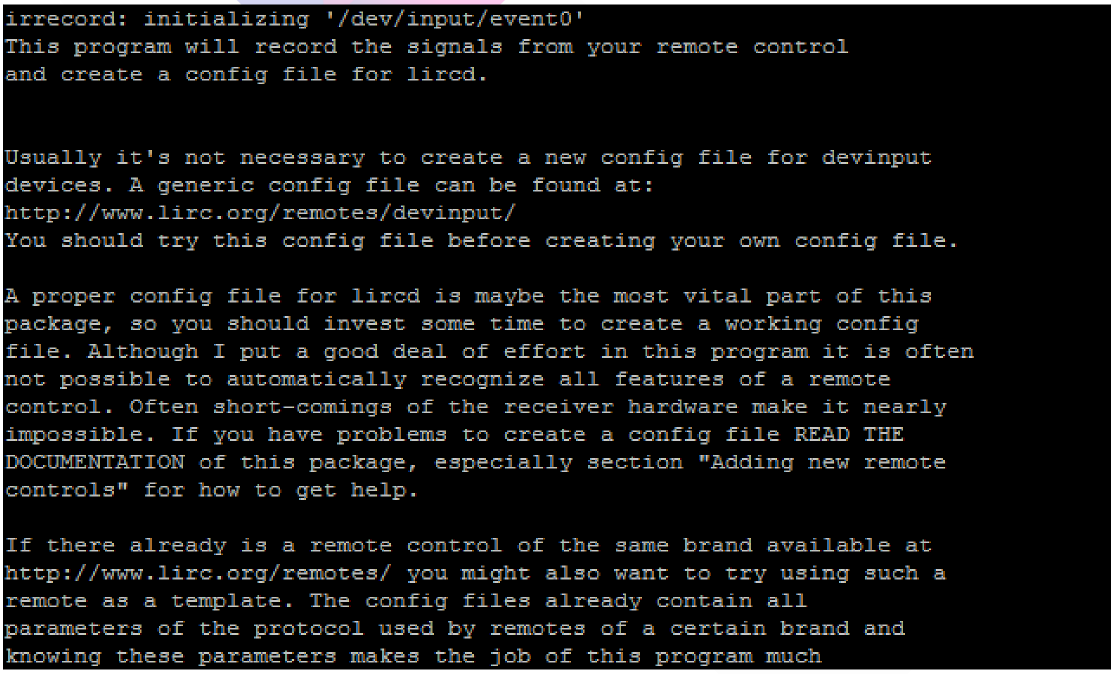
```
wget http://lirc.sourceforge.net/remotes/generic/NEC.conf
```



```
root@bananapi:/etc/lirc# wget http://lirc.sourceforge.net/remotes/generic/NEC.co
nf
--2010-01-01 01:39:42--  http://lirc.sourceforge.net/remotes/generic/NEC.conf
Resolving lirc.sourceforge.net (lirc.sourceforge.net)... 216.34.181.96
Connecting to lirc.sourceforge.net (lirc.sourceforge.net)|216.34.181.96|:80... c
onnected.
HTTP request sent, awaiting response... 200 OK
Length: 483 [text/plain]
Saving to: `NEC.conf.1'

100%[======================================>] 483         --.-K/s   in 0s

2010-01-01 01:39:43 (9.45 MB/s) - `NEC.conf.1' saved [483/483]
```

Run irrecord to record the code of your remote.

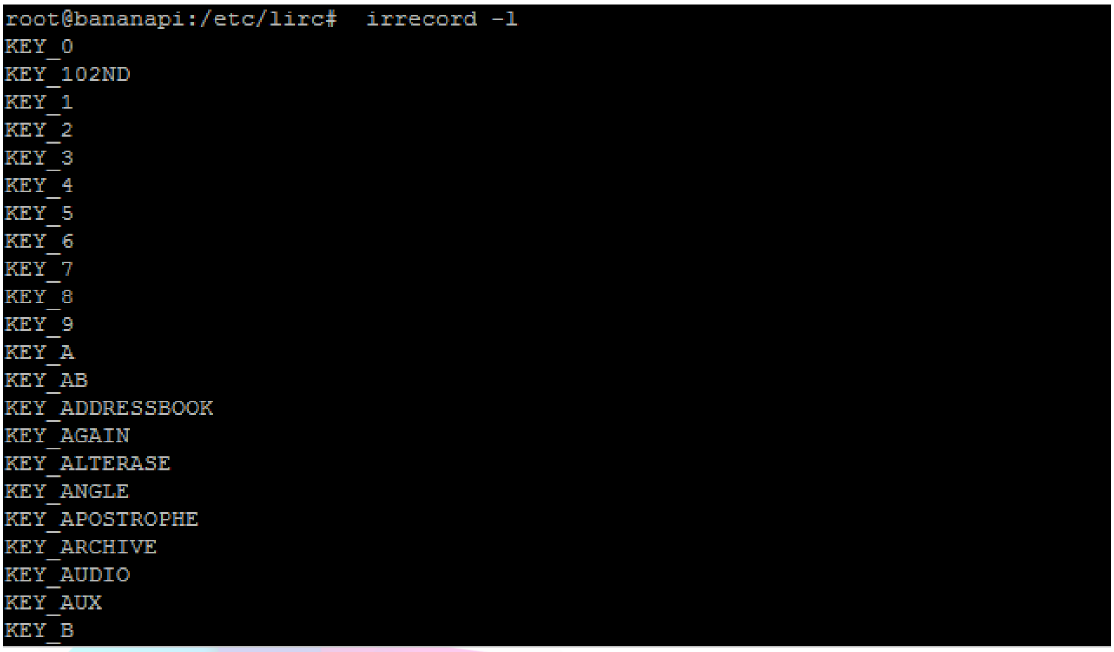
```
irrecord -H devinput -d /dev/input/event0 NEC.conf
```



```
irrecord: initializing '/dev/input/event0'
This program will record the signals from your remote control
and create a config file for lircd.


Usually it's not necessary to create a new config file for devinput
devices. A generic config file can be found at:
http://www.lirc.org/remotes/devinput/
You should try this config file before creating your own config file.

A proper config file for lircd is maybe the most vital part of this
package, so you should invest some time to create a working config
file. Although I put a good deal of effort in this program it is often
not possible to automatically recognize all features of a remote
control. Often short-comings of the receiver hardware make it nearly
impossible. If you have problems to create a config file READ THE
DOCUMENTATION of this package, especially section "Adding new remote
controls" for how to get help.

If there already is a remote control of the same brand available at
http://www.lirc.org/remotes/ you might also want to try using such a
remote as a template. The config files already contain all
parameters of the protocol used by remotes of a certain brand and
knowing these parameters makes the job of this program much
```

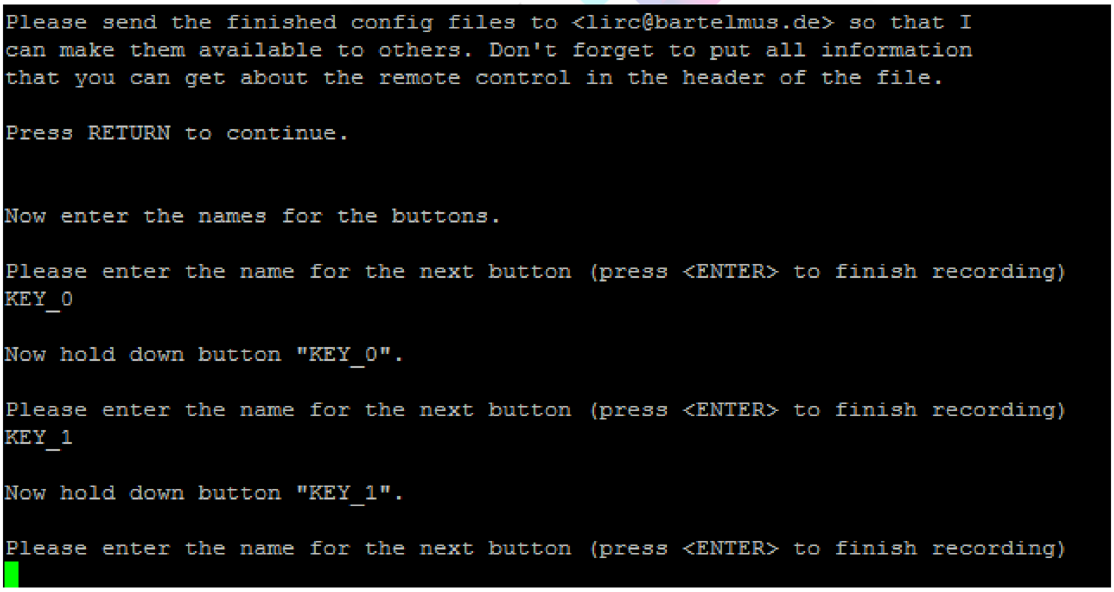
Now, press the “Enter” key to start record your remote key code. First, you need to input a name for a key, you can’t define the key name by yourself, just run command like these to look at the legal key names.

```
irrecord -l
```



```
root@bananapi:/etc/lirc#  irrecord -l
KEY_0
KEY_102ND
KEY_1
KEY_2
KEY_3
KEY_4
KEY_5
KEY_6
KEY_7
KEY_8
KEY_9
KEY_A
KEY_AB
KEY_ADDRESSBOOK
KEY_AGAIN
KEY_ALTERASE
KEY_ANGLE
KEY_APOSTROPHE
KEY_ARCHIVE
KEY_AUDIO
KEY_AUX
KEY_B
```

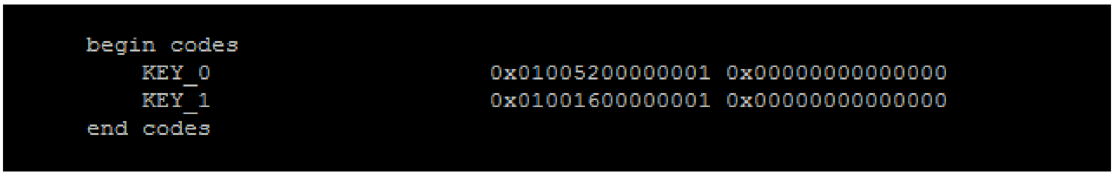
For example, input ”KEY_0” after ENTER, there is a reminder tell you to press the corresponding remote key. It will begin the next record after record a key successfully, then repeat the process until all of your keys are recorded. ENTER to exit and save the records.



```
Please send the finished config files to <lirc@bartelmus.de> so that I
can make them available to others. Don't forget to put all information
that you can get about the remote control in the header of the file.

Press RETURN to continue.


Now enter the names for the buttons.

Please enter the name for the next button (press <ENTER> to finish recording)
KEY_0

Now hold down button "KEY_0".

Please enter the name for the next button (press <ENTER> to finish recording)
KEY_1

Now hold down button "KEY_1".

Please enter the name for the next button (press <ENTER> to finish recording)
```

New record file will be saved as *NEC.conf.conf* with new hardware parameters and key codes.

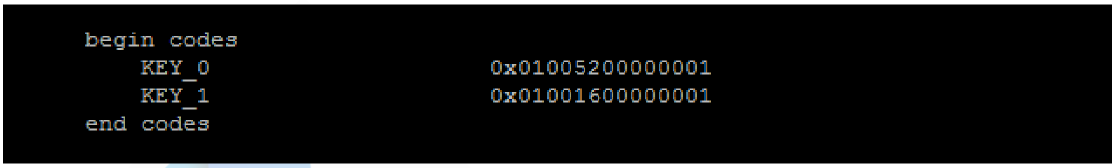
If your key codes are doubled like



```
    begin codes
        KEY_0                    0x01005200000001 0x00000000000000
        KEY_1                    0x01001600000001 0x00000000000000
    end codes
```

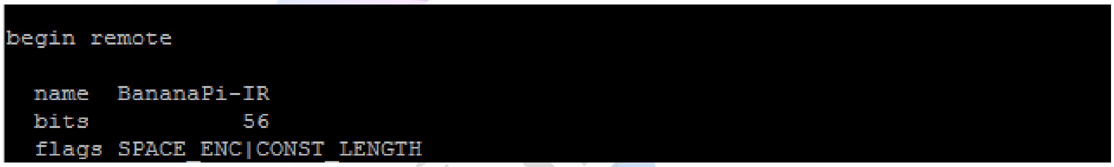
Edit *NEC.conf.conf* and manually remove the second code 0x00000000000000

Result



```
    begin codes
        KEY_0                    0x01005200000001
        KEY_1                    0x01001600000001
    end codes
```

Edit *NEC.conf.conf* and change the 'name' from NEC.conf.conf to something better, i.e. BananaPi-IR .



```
begin remote

  name  BananaPi-IR
  bits           56
  flags SPACE_ENC|CONST_LENGTH
```

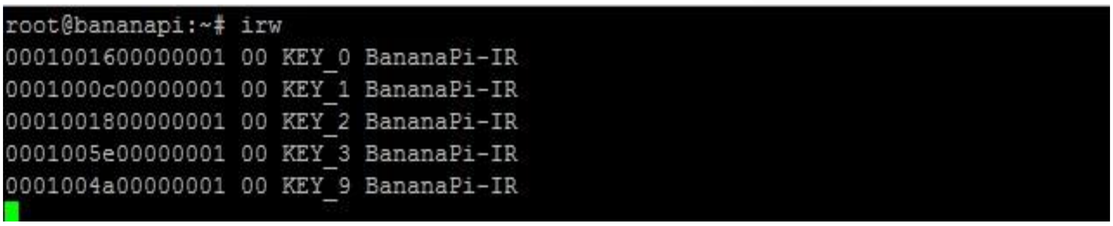
Finally copy *NEC.conf.conf* to /etc/lirc/lircd.conf

Now test lircd. Start (or restart) it with

```
/etc/init.d/lirc start
```

and run **irw** and press some keys on your remote:

```
irw
```



```
root@bananapi:~# irw
0001001600000001 00 KEY_0 BananaPi-IR
0001000c00000001 00 KEY_1 BananaPi-IR
0001001800000001 00 KEY_2 BananaPi-IR
0001005e00000001 00 KEY_3 BananaPi-IR
0001004a00000001 00 KEY_9 BananaPi-IR
```

SUCCESS : LIRC is working fine !

Provided as example, this is my full **/etc/lirc/lircd.conf** working with a remote used for **LeMedia**.

```
# Please make this file available to others

# by sending it to <lirc@bartelmus.de>

#

# this config file was automatically generated

# using lirc-0.9.0-pre1(devinput) on Thu Sep 25 09:45:21 2014

#

# contributed by

#

# brand:                         NEC.conf.conf

# model no. of remote control:

# devices being controlled by this remote:

#

begin remote

  name   BananaPi-IR

  bits              56

  flags SPACE_ENC|CONST_LENGTH

  eps               30

  aeps             100


  header          9000   4500

  one              563   1687

  zero             563    562

  ptrail          563

  pre_data_bits    8

  pre_data         0x0

  gap             108000

  toggle_bit_mask 0x0

  frequency       38000

  duty_cycle      33
```

```
        begin codes
            KEY_0                      0x01001600000001
            KEY_1                      0x01000C00000001
            KEY_2                      0x01001800000001
            KEY_3                      0x01005E00000001
            KEY_4                      0x01000800000001
            KEY_5                      0x01001C00000001
            KEY_6                      0x01005A00000001
            KEY_7                      0x01004200000001
            KEY_8                      0x01005200000001
            KEY_9                      0x01004A00000001
            KEY_PLAYPAUSE                0x01004300000001
            KEY_VOLUMEUP                 0x01001500000001
            KEY_VOLUMEDOWN                0x01000700000001
            KEY_BACK                    0x01004400000001
            KEY_ENTER                   0x01000900000001
            KEY_FORWARD                  0x01004000000001
            KEY_KP0                    0x01004500000001
            KEY_KP1                    0x01004600000001
            KEY_KP2                    0x01004700000001
            KEY_KP3                    0x01001900000001
            KEY_KP4                    0x01000D00000001
        end codes
end remote
```

4.3 Resize SD card

Sometimes the image file is just 4GB or smaller. But the SD card is 8GB or 16GB. Then we want to use the left space of SD card. So we can resize the SD card.

4.3.1 Raspbian

In Raspbian, you can use bpi-config command to easy resize sd card.

```
sudo bpi-config
```

Then select expand_rootfs to resize your SD card.

4.3.2 Other linux OS

From the command line or a terminal window enter the following:

```
sudo fdisk /dev/mmcblk0
```

Then **type p** to list the partition table

you should see two partitions. if you look in the last column labeled System you should have:

Linux

make a note of the start number for partiton 2, you will need this later. though it will likely still be on the screen (just in case).

Next **type d** to delete a partition.

You will then be prompted for the number of the partition you want to delete. In the case above you want to delete both the Linux and Linux swap partitions.

So **type 2**

Now you can resize the main partition.

type n to create a new partition.

This new partition needs to be a primary partition so **type p**.

Next **enter 2** when prompted for a partition number.

You will now be prompted for the first sector for the new partition. **Enter the start number from the earlier step (the Linux partition)**

Next you will be prompted for the last sector you can **just hit enter** to accept the default which will utilize the remaining disk space.

Type w to save the changes you have made.

Next reboot the system with the following command:

```
sudo reboot
```

once the system has reboot and you are **back at the commandline** enter the following command:

```
sudo resize2fs /dev/mmcblk0p2
```

5 Configure your Banana Pro/Pi

5.1 How to Modify the script.bin file

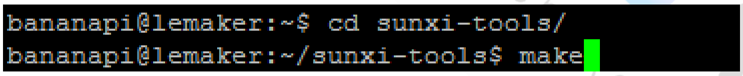
script.bin is a binary configuration file (lubuntu) used by Allwinner SOC core driver or LiveSuit. And it contains the information that how to set the peripherals, port, and I/O pins of A10/A20 target board. Because we cannot compile the script.bin file directly, we have to modify the corresponding text file whose format is FEX. We can use the sunxi-tools to change binary file into text file or change it back. You can refer to more information as below:

http://linux-sunxi.org/Fex_Guide

5.1.1 Download sunxi-tools tool:

git clone git://github.com/linux-sunxi/sunxi-tools.git

Then go into sunxi-tools menu, and generate fex2bin and bin2fex file through "make" command.



```
bananapi@lemaker:~$ cd sunxi-tools/
bananapi@lemaker:~/sunxi-tools$ make
```

There may be make failure in the course, so we enter the following command

```
sudo apt-get update

sudo apt-get install gcc

sudo apt-get install pkg-config libusb-1.0
```

Then we enter the "make" command again.

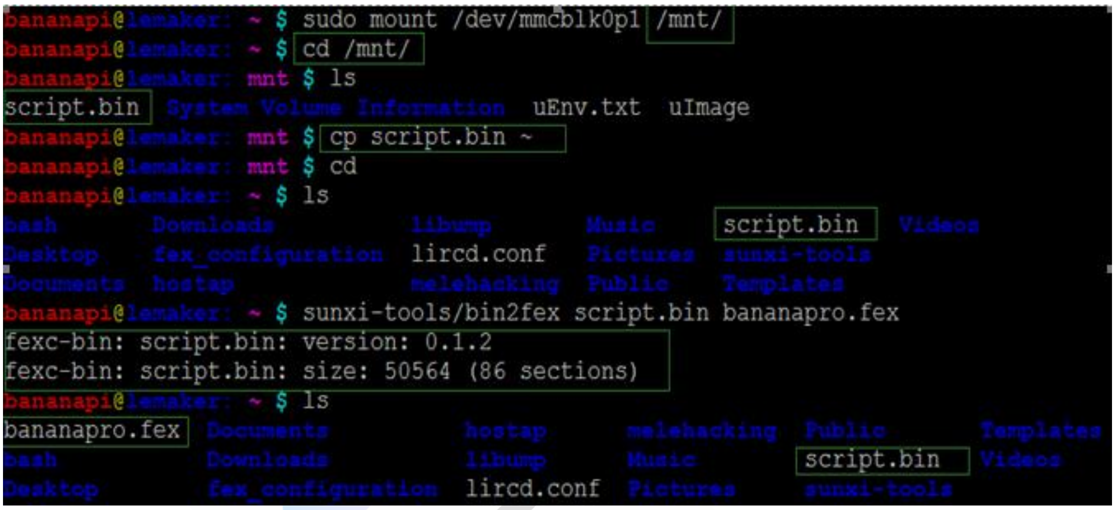
5.1.2 How to get FEX file.

A. Get from AllWinner

Over there, it contains FEX file for different kinds of chipset such as A10 and A20, but currently banana Pi does not put their own FEX file in the Allwinner git, so the FEX file from Allwinner is just for study. So the FEX file from Allwinner cannot be used at this stage.

B. Get from image file.

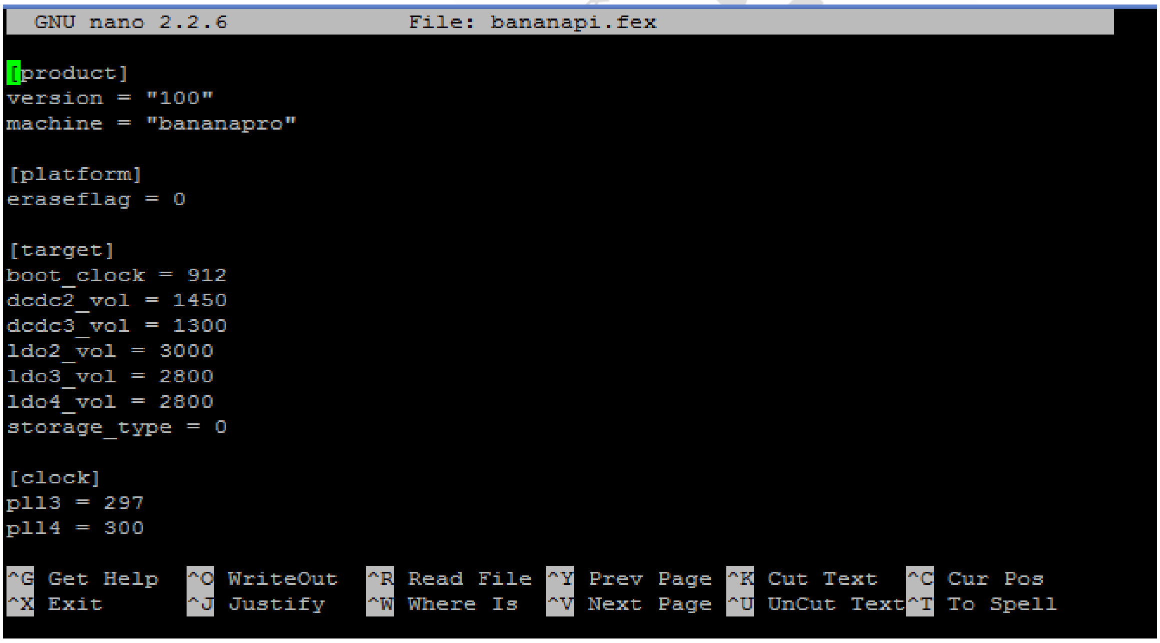
Take the Raspbian_For_BananaPro_v1412 image file as an example. When we burn the image into MicroSD card, we can get the script.bin file from the /dev/mmcblk0p1 directory after the system booting, then we can use bin2fex tool to change it into compiled fex file.



```
bananapi@lemaker: ~ $ sudo mount /dev/mmcblk0p1 /mnt/
bananapi@lemaker: ~ $ cd /mnt/
bananapi@lemaker: mnt $ ls
script.bin  System Volume Information  uEnv.txt  uImage
bananapi@lemaker: mnt $ cp script.bin ~
bananapi@lemaker: mnt $ cd
bananapi@lemaker: ~ $ ls
bash       Downloads          libump       Music     script.bin   Videos
Desktop    fex_configuration  lircd.conf   Pictures  sunxi-tools
Documents  hostap             melehacking  Public    Templates
bananapi@lemaker: ~ $ sunxi-tools/bin2fex script.bin bananapro.fex
fexc-bin: script.bin: version: 0.1.2
fexc-bin: script.bin: size: 50564 (86 sections)
bananapi@lemaker: ~ $ ls
bananapro.fex  Documents          hostap      melehacking  Public       Templates
bash           Downloads          libump      Music        script.bin   Videos
Desktop        fex_configuration  lircd.conf  Pictures     sunxi-tools
```

5.1.3 Compile FEX file.

As shown above, we have used bin2fex tool to get the fex file. We can open this fex file with text tool(such as nano). And then we can edit the fex file.

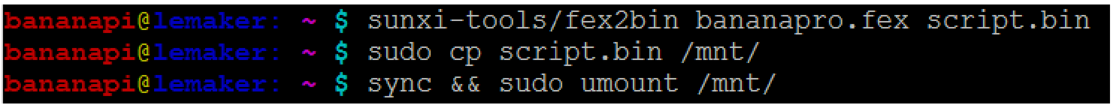


```
  GNU nano 2.2.6              File: bananapi.fex

[product]
version = "100"
machine = "bananapro"

[platform]
eraseflag = 0

[target]
boot_clock = 912
dcdc2_vol = 1450
dcdc3_vol = 1300
ldo2_vol = 3000
ldo3_vol = 2800
ldo4_vol = 2800
storage_type = 0

[clock]
pll3 = 297
pll4 = 300

^G Get Help   ^O WriteOut   ^R Read File  ^Y Prev Page  ^K Cut Text   ^C Cur Pos
^X Exit       ^J Justify    ^W Where Is   ^V Next Page  ^U UnCut Text ^T To Spell
```

Save the file, then exit.

5.1.4 Generate scrip.bin file.

Use fex2bin tool to re-compile the modified fex file into script.bin file, then copy the new scripy.bin file to the first folder.



```
bananapi@lemaker: ~ $ sunxi-tools/fex2bin bananapro.fex script.bin
bananapi@lemaker: ~ $ sudo cp script.bin /mnt/
bananapi@lemaker: ~ $ sync && sudo umount /mnt/
```

So far, we can insert the MicroSD card to Banana Pro, and reboot.

5.2 Auto Log in to system

In Lubuntu

Modify the ***20-lubuntu.conf*** file.

```
sudo vim /etc/lightdm/lightdm.conf.d/20-lubuntu.conf
```

Insert the below lines after [SeatDefaults]:

```
autologin-user=yourloginname

autologin-user-timeout=0
```

5.3 Network Configuration

On Banana Pro, it has onboard WiFi adapter. On Banana Pi, you can connect a usb wifi adapter. Sometimes we hope connect wifi on boot, it is simple to achieve this by modifying network interface file.

5.3.1 Use WiFi as the station mode

Most people will use the on board WiFi to connect the router, so it is station mode.

(1)Load the WiFi driver

On Banana Pro, you need load the WiFi driver. Although we use AP6181, but the wifi driver is the same of the AP6210, so the driver name is called AP6210. You can use the command below to enable the WiFi:

```
sudo modprobe ap6210
```

You can see if the driver has been loaded by:

```
lsmod
```

If you want to auto load the WiFi driver when you boot the system. You can add "ap6210" into the /etc/modules file:

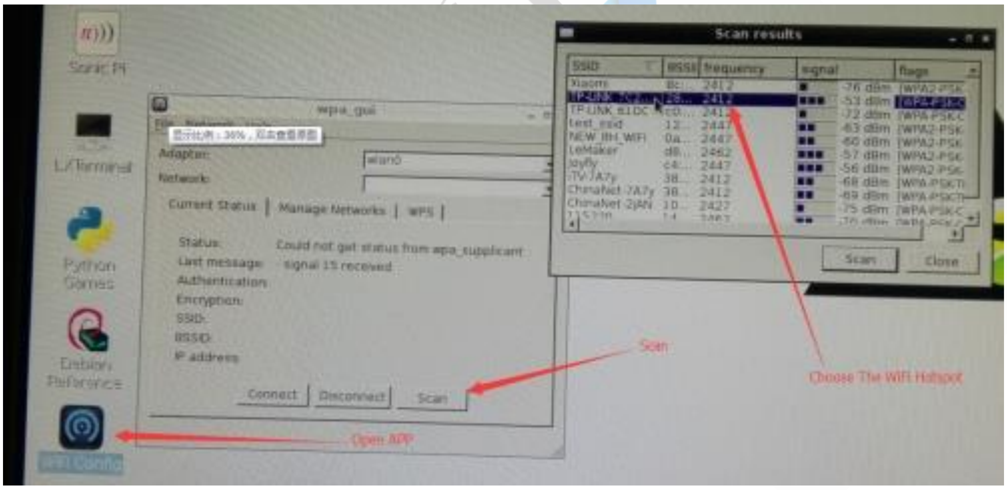
```
sudo nano /etc/modules
```

And then add the "ap6210" below the file, save and exit.

(2)Use the WiFi

Raspbian

On the Raspbian system, you can connect to the WiFi hot spot by using the WiFi Config application, as follows:



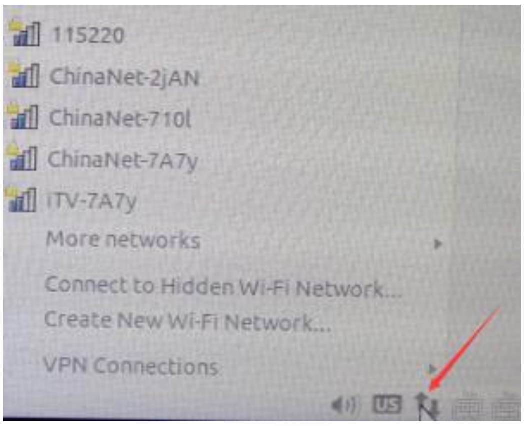
Adapter: wlan0
Network:

Status: Could not get status from wpa_supplicant
Last message: signal 15 received
Authentication:
Encryption:
SSID:
BSSID:
IP address:

SSID	BSSID	frequency	signal	flags
Xiaomi	8c:...	2412	-76 dBm	[WPA2-PSK
TP-LINK_7C2...	28...	2412	-53 dBm	[WPA-PSK-C
TP-LINK_61DC	c0...	2412	-72 dBm	[WPA-PSK-C
test_essid	12...	2447	-63 dBm	[WPA2-PSK
NEW_BH_WIFI	0a...	2447	-60 dBm	[WPA2-PSK
LeMaker	d8...	2462	-57 dBm	[WPA2-PSK
Joyfly	c4...	2447	-56 dBm	[WPA2-PSK
TV-7A7y	38...	2412	-68 dBm	[WPA-PSK-TI
ChinaNet-7A7y	38...	2412	-69 dBm	[WPA-PSK-TI
ChinaNet-2JAN	10...	2427	-75 dBm	[WPA-PSK-C

Lubuntu

On the Lubuntu system, you can connect to the WiFi hot spot by clicking the button which is at the right bottom corner of the desktop, as follows:



Linux without Desktop

If you use the Linux-like system without desktop, and recommend you to use wpa_supplicant tool to connect the WiFi hot spot, An example of the Debian as follows. Install wpa_supplicant

```
sudo apt-get install wpasupplicant
```

Edit the wpa_supplicant.conf

```
vim /etc/wpa_supplicant/wpa_supplicant.conf
```

Add the content below into the wpa_supplicant.conf:

```
ap_scan=1    # use the wpa_supplicant to scan and choose the AP
network={
        ssid=" your_wifi_name "
        psk=" your_wifi_password "
}
```

If the wpa_supplicant.conf is not exist, you need create one. ssid: the WiFi hot spot id name, psk: the password of the WiFi hot spot. Edit the /etc/network/interfaces

```
vim /etc/network/interfaces
```

Edit the wlan part of the interfaces file:

```
auto wlanx
```

```
iface wlanx inet dhcp

pre-up wpa_supplicant -B -i wlanx -c/etc/wpa_supplicant

/wpa_supplicant.conf

pre-down killall -q wpa_supplicant
```

Note: wlan**x** represent wlan0,wlan1 ...you can enter the command ***ifconfig*** to see what the x should be.

5.3.2 WiFi AP mode

If you want to use the AP mode of the AP6181 WiFi module on the Banana Pro, you can refer to the instructions below.

(1)Edit the /etc/modules

Edit the /etc/modules file, and add the content below into the file:

```
ap6210 op_mode=2
```

(2)Download and compile the hostapd

```
git clone git://w1.fi/srv/git/hostap.git

sudo apt-get install libnl-dev

sudo apt-get install openssl

sudo apt-get install libssl-dev

cd hostap/hostapd

cp defconfig .config

make

cp hostapd /usr/local/bin
```

(3)Create and edit the hostapd.conf

```
mkdir -p /etc/hostapd

vim /etc/hostapd/hostapd.conf
```

For example add the content below into the hostapd.conf file:

```
interface=wlanx
```

```
driver=nl80211
ssid=ap6210_ap_test
channel=6
hw_mode=g
macaddr_acl=0
auth_algs=1
ignore_broadcast_ssid=0
wpa=2
wpa_passphrase=12345678
wpa_key_mgmt=WPA-PSK
wpa_pairwise=TKIP
rsn_pairwise=CCMP
```

You can change the ssid and wpa_passphrase.

(4)Edit the network interfaces

```
vim /etc/network/interfaces
```

For example replace the content below:

```
auto lo
iface lo inet loopback
iface eth0 inet dhcp
allow-hotplug wlanx
iface wlanx inet static
address 192.168.100.1
netmask 255.255.255.0
```

(5)Enable the DHCP server

1）Install the DHCP server

```
sudo apt-get install udhcpd
```

2）Edit the udhcpd.conf

```
vim /etc/udhcpd.conf
```

For example add the content below into the file:

```
#The start and end of the IP lease block
start 192.168.100.101    #default: 192.168.0.20
end 192.168.100.254      #default: 192.168.0.254
#The interface that udhcpd will use
interface wlanx          #default: eth0
#Examles
option subnet 255.255.255.0
opt router 192.168.100.1
opt wins 192.168.100.1
option dns 192.168.100.1
option domain local
ption lease 864000
```

3）Reboot and restart the server

Run the DHCP server:

```
udhcpd /etc/udhcpd.conf
```

Run the hostapd:

```
hostapd -B /etc/hostapd/hostapd.conf
```

And then you can check the result:

```
iwconfig
```

(6)Bridge

1).Install bridge-utils

```
sudo apt-get install bridge-utils
```

2).Add a new bridge

```
sudo brctl addbr br0
```

3).Close STP (not necessary)

```
sudo brctl stp br0 off
```

4).Set an IP address for br0, for example 192.168.1.100

```
sudo ifconfig br0 192.168.1.100
```

5).Add eth0&wlanx to br0

```
sudo brctl addif br0 eth0

sudo brctl addif br0 wlanx
```

6).Start br0

```
sudo ifconfig br0 up
```

When you Setup completed you can use the pro as the wireless switch to connect the internet.

5.4 Turn off the screen saver

Edit the file /etc/lightdm/lightdm.conf, in the **SeatDefaults** section, make it looks like below:

```
[SeatDefaults]

xserver-command=X -s 0 -dpms
```

5.5 Auto mount storage device

Edit /etc/udev/rules.d/10-usbstorage.rules:

```
[SeatDefaults]

xserver-command=X -s 0 –dpms

KERNEL!="sd*", GOTO="media_by_label_auto_mount_end"

SUBSYSTEM!="block",GOTO="media_by_label_auto_mount_end"

IMPORT{program}="/sbin/blkid -o udev -p %N"

ENV{ID_FS_TYPE}=="", GOTO="media_by_label_auto_mount_end"

ENV{ID_FS_LABEL}!="", ENV{dir_name}="%E{ID_FS_LABEL}"
```

```
ENV{ID_FS_LABEL}=="", ENV{dir_name}="Untitled-%k"

ACTION=="add", ENV{mount_options}="relatime,sync"

ACTION=="add", ENV{ID_FS_TYPE}=="vfat", ENV{mount_options}="iocharset=utf8,umask=000"

ACTION=="add", ENV{ID_FS_TYPE}=="ntfs", ENV{mount_options}="iocharset=utf8,umask=000"

ACTION=="add", RUN+="/bin/mkdir -p /media/%E{dir_name}", RUN+="/bin/mount -o

$env{mount_options} /dev/%k /media/%E{dir_name}"


ACTION=="remove", ENV{dir_name}!="", RUN+="/bin/umount -l /media/%E{dir_name}",

RUN+="/bin/rmdir /media/%E{dir_name}"

LABEL="media_by_label_auto_mount_end"
```

5.6 Add desktop shortcut

Raspbian

Add a shortcut in desktop, for example add Arduino-1.5.4 application.

Create a file called arduino.desktop:

```
[Desktop Entry]

Type=Application

Encoding=UTF-8

Name=Arduino-1.5.4

Comment=Programming system and content development tools

Terminal=false

Categories=Programming

Exec=/opt/arduino-1.5.4/run.sh

Icon=/usr/share/pixmaps/arduinio.xpm
```

And then

```
cp arduino.desktop $HOME/Desktop
```

6 Applications

6.1 Using Banana Pro to build NAS home server

I have an old computer not to be used that just have the computer case, hard drive and a power supply. If you don't use those devices they will be wasted. So I use the surplus equipment and Banana Pro (Using Banana Pi can achieve the same effect) set up my NAS home server.

6.1.1 The main function of the NAS home server

(1) File server: Use samba to realize the file sharing.

(2) Download machine: Use aria2c to realize the automatic download.

(3) Streaming media server: DLNA realize the use of computer or mobile phone playing the media files that were placed in the sharing directory.

The steps are as follows.

6.1.2 Preparation work

(1)Write the OS image file Raspbian for BananaPro to MicroSD card

(2) The preparation of hardware

1) Use the power supply to supply power for the hard drive

2) Connect the hard drive to the SATA port on the B-Pro

3) Plug in an RJ-45 Ethernet

4) Plugging in the mains adapter power on the Banana Pro.

(3)Format the hard drive to create a new partition and mount the root directory to the hard drive

1)Format the hard drive to create a new partition

Run the ***sudo fdisk /dev/sda*** command. Use the ***o*** command to delete all partition of hard drive and use the ***n*** command to add one new partition. Use the ***w*** command to save change.

Run the ***sudo mkfs.ext4 /dev/sda1*** command to format the new created partition of hard drive as ext4.

2) Mount the root directory to your hard drive

When we mount the root directory to the hard drive, the file system will start in the hard drive. This setting is a good way to protect our MicroSD card, when we need a long time to use the system .Specific methods are as follows.

Create a temporary directory in the root directory

```
mkdir temp
sudo fdisk –l
```

Mount the /dev/mmcblk0p2 to the temp directory

```
sudo mount /dev/mmcblk0p2    /temp
```

Copy the file system to the hard drive partition

```
sudo mount /dev/sda1 /mnt
cp –aP    /temp    /mnt
```

Edit the /boot/uEnv.txt,

```
sudo nano uEnv.txt
```

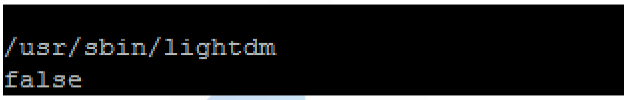
Change the content ***root=/dev/mmcblk0p2*** as follow

```
root=/dev/sda1
```

(4)Close the GUI

```
sudo nano /etc/X11/default-display-manager
```

Add ***false*** in the file



```
/usr/sbin/lightdm
false
```

Reboot the system then graphical interface is no longer present. Automatically run in the CUI mode when the system reboot. The machine does not need to use the GUI. The graphical interface for the B-Pro was closed to save computational resources.

6.1.3 Create a file server

Use the file server can achieve LAN file sharing. Through this function we can upload files to the shared directory or download files from the shared directory. Here we use the samba software to realize our LAN sharing.

(1) Set up static IP

Edit ***/etc/network/interfaces***

```
sudo nano /etc/network/interfaces
```

Change the ***iface eth0 inet dhcp*** as follow

```
iface eth0 inet static
```

Add the content as follow

```
address 192.168.1.15

netmask 255.255.255.0

gateway 192.168.1.1
```

And then delete ***iface default inet dhcp***

Here the static IP is set to 192.168.1.15. Restart the network or reboot the system to finish it.

```
sudo    /etc/init.d/networking    restart
```

(2) Installation of samba services

```
sudo apt-get update
sudo apt-get install samba
sudo apt-get install samba-common-bin
```

(3) Add user and create the download directory

```
sudo useradd maker
```

To set a password for the new user, this is set to 123

```
sudo passwd maker
sudo mkdir /aria2download/download
sudo chown –R maker /aria2download/download
```

(4) Edit the samba configuration file

```
sudo nano /etc/samba/smb.conf
```

To find out the ***security* = *user*** and delete the symbol # in front of the sentence.

Add the content at the end of the file.

```
[aria2share]
comment=my family’s share
path=/aria2download/download
valid users=maker
public=no
writable=yes
browseable=yes
create mask=0777
directory mask=0777
```

Aria2share is the sharing file’s name that we can see on the computer

(5) Add Samba user

Here we set Samba password is 321

```
sudo smbpasswd   -a maker

sudo service samba restart
```

So far we have established the file server based on samba. Type the Winkey+R and input our IP address of the server. Then we will see our sharing file on the computer. On the mobile phone use software ES file explorer to view the sharing file. In ***my network page*** of the ES file explorer click the ***new*** option and input the path of our sharing file like ***IP/sharing filename*** then input user name with password. Here I input 192.168.1.15/aria2share. User name is maker and password is 321. We can manage our shared file in our phone now.

6.1.4 Download machine

(1) Set up aria2

1) Install aria2

```
sudo apt-get install aria2
```

Create a new directory and file

```
sudo mkdir   /etc/aria2

sudo touch   /etc/aria2/aria2.session
```

2) To configure the aria2

```
sudo nano   /etc/aria2/aria2.conf
```

Edit /etc/aria2/aria2.conf. The meaning of the content you can refer the aria2 manual from *http://aria2.sourceforge.net/manual/en/html/aria2c.html*

#Basic Options

```
dir=/aria2download/download
input-file=/etc/aria2/aria2.session
max-concurrent-downloads=20
continue=true
lowest-speed-limit=0
max-connection-per-server=5
min-split-size=10M
split=5
```

#Bt Options

```
bt-enable-lpd=true
bt-max-open-files=100
bt-max-peers=55
bt-min-crypto-level=plain
bt-require-crypto=true
follow-torrent=true
listen-port=6881-6999
max-overall-upload-limit=0
max-upload-limit=0
seed-ratio=1
seed-time=120
```

#RPC Options

```
enable-rpc=true
rpc-allow-origin-all=true
rpc-listen-all=true
```

# Advanced Options

```
disable-ipv6=true
file-allocation=falloc
```

```
max-overall-download-limit=0

max-download-limit=0

save-session=/etc/aria2/aria2.session

save-session-interval=300
```

Save configuration and test the function

```
aria2c --conf-path=/etc/aria2/aria2.conf    -D
```

To see whether aria2 is running

```
ps –ef|grep aria2
```

3) Enable aria2 boot as the system start

Edit /etc/rc.lcal , and insert the following contents before ***exit0.***

```
sudo aria2c --conf-path=/etc/aria2/aria2.conf –D
```

The next time you start Pro, aria2 will automatically run

(2)To build web server

1) Install nginx

```
sudo apt-get install nginx
```

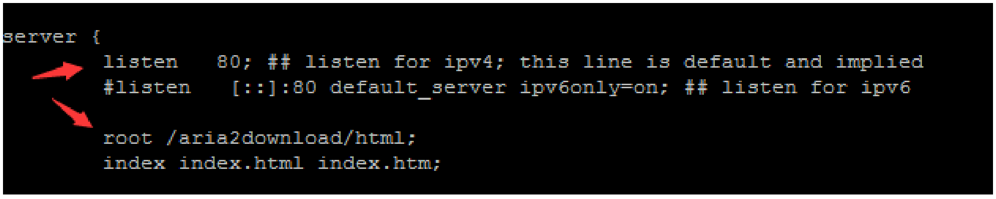
Create a new directory

```
sudo mkdir /aria2download/html

sudo chmod    777    /aria2download/html
```

2) To configure the nginx

```
sudo nano /etc/nginx/sites-available/default
```

find out sentence ***#listen 80;*** and delete the symbol #. Underneath change the sentence ***root /usr/share/nginx/html*** to ***root /aria2download/html***



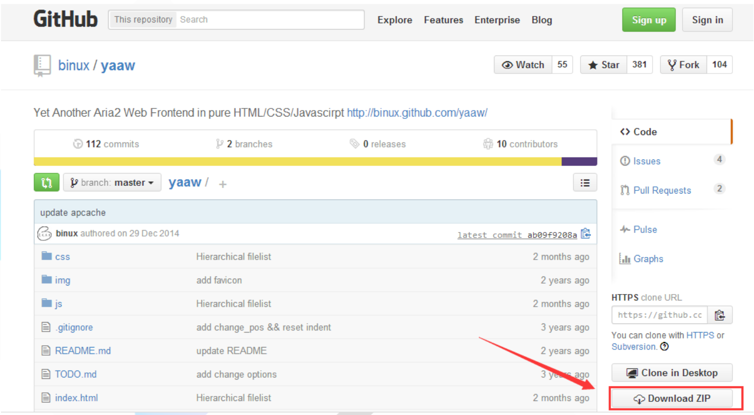
```
server {
        listen   80; ## listen for ipv4; this line is default and implied
        #listen   [::]:80 default_server ipv6only=on; ## listen for ipv6

        root /aria2download/html;
        index index.html index.htm;
```

3) Reload and restart the nginx

```
sudo /etc/init.d/nginx reload

sudo /etc/init.d/nginx restart
```

4) Install yaaw

Download the yaaw from https://github.com/binux/yaaw



Yet Another Aria2 Web Frontend in pure HTML/CSS/Javascript http://binux.github.com/yaaw/

112 commits 2 branches 0 releases 10 contributors

branch: master yaaw / +

update apcache

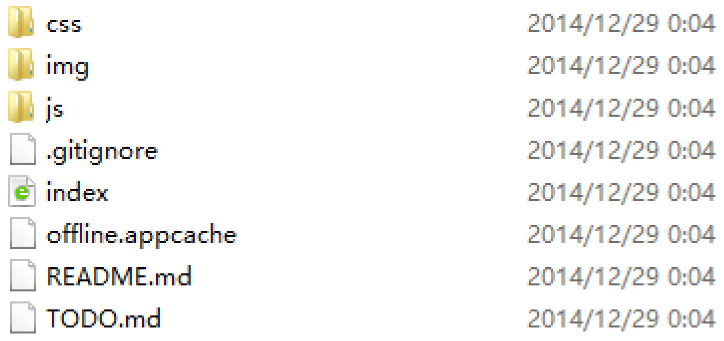
binux authored on 29 Dec 2014 latest commit ab09f9208a

css	Hierarchical filelist	2 months ago
img	add favicon	2 years ago
js	Hierarchical filelist	2 months ago
.gitignore	add change_pos && reset indent	3 years ago
README.md	update README	2 years ago
TODO.md	add change options	3 years ago
index.html	Hierarchical filelist	2 months ago

HTTPS clone URL https://github.cc

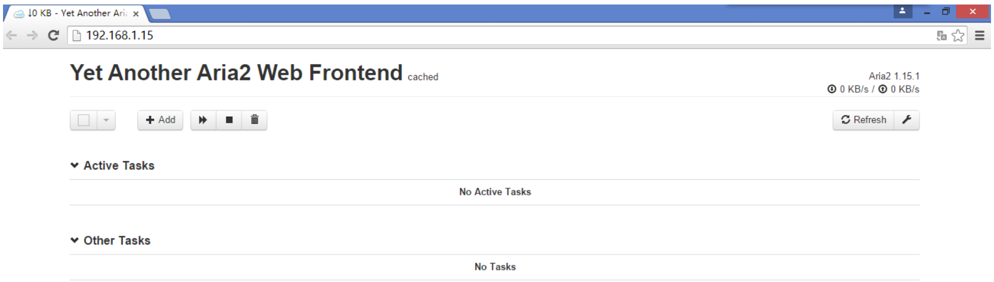
You can clone with HTTPS or Subversion.

After download, extract the compressed file and copy all of the contents under the directory yaaw-master to the directory /aria2download/html.



css	2014/12/29 0:04
img	2014/12/29 0:04
js	2014/12/29 0:04
.gitignore	2014/12/29 0:04
index	2014/12/29 0:04
offline.appcache	2014/12/29 0:04
README.md	2014/12/29 0:04
TODO.md	2014/12/29 0:04

Now we use Google Chrome or Firefox browse to open the webpage address 192.168.1.15 on our computer then you can see the page as follow.



Yet Another Aria2 Web Frontend cached

Aria2 1.15.1
0 KB/s / 0 KB/s

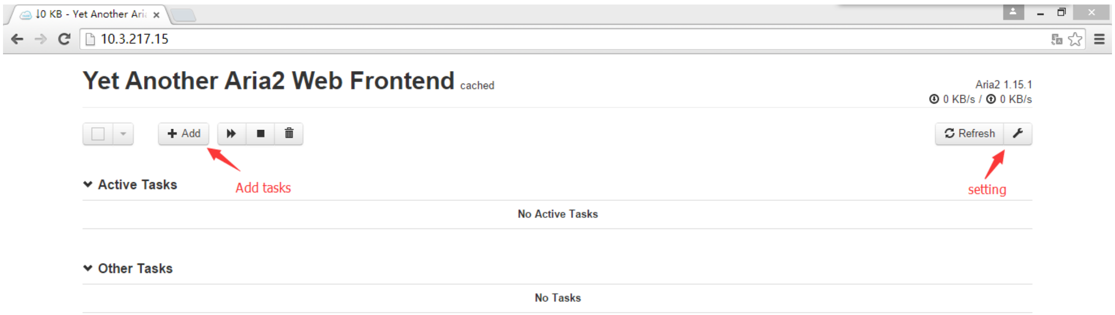
Active Tasks

No Active Tasks

Other Tasks

No Tasks

Yes, we did it. Let’s try it right now.


10 KB - Yet Another Ari

10.3.217.15

Yet Another Aria2 Web Frontend cached

Aria2 1.15.1
0 KB/s / 0 KB/s

+ Add

Add tasks

Refresh

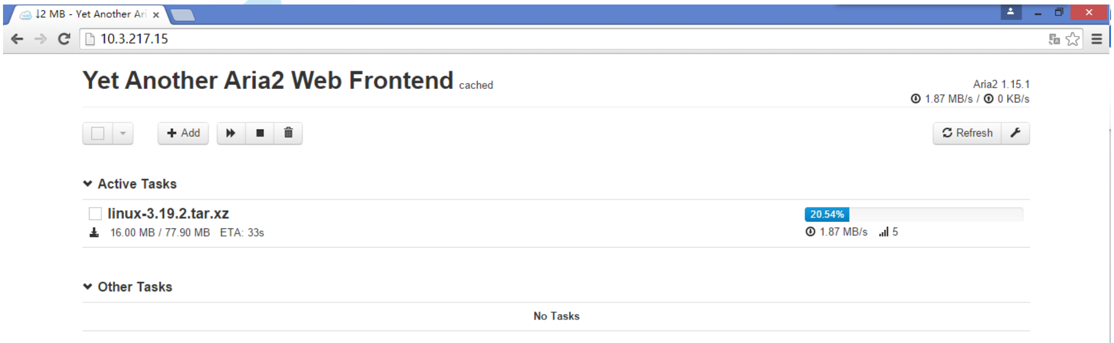
setting

Active Tasks

No Active Tasks

Other Tasks

No Tasks


12 MB - Yet Another Ari

10.3.217.15

Yet Another Aria2 Web Frontend cached

Aria2 1.15.1
1.87 MB/s / 0 KB/s

+ Add

Refresh

Active Tasks

linux-3.19.2.tar.xz
16.00 MB / 77.90 MB ETA: 33s
20.54%
1.87 MB/s 5

Other Tasks

No Tasks

6.1.5 Install the DLNA steaming media server

DLNA is mainly oriented to media resources (such as video, music) to realize the network sharing. The setting steps as follows:

(1) Install minidlna

```
sudo apt-get install minidlna
```

(2) Configure the minidlna

Create the directory

```
sudo mkdir /aria2download/minidlna

sudo mkdir /aria2download/minidlna/dd

sudo mkdir /aria2download/minidlna/log

sudo chmod –r 777 /aria2download/minidlna
```

Edit /etc/minidlna.conf

```
sudo nano /etc/minidlna.conf
```

Find out ***media_dir=/var/lib/minidlna*** and replace it

```
media_dir=/aria2download/download
```

Find out ***#db_dir=/var/lib/minidlna*** and replace it

```
db_dir=/aria2download/minidlna/db
```

Find out ***#log_dir=/var/log*** and replace it

```
log_dir=/aria2download/minidlna/log
```

Last find out the default minidlna database and log files then delete it to avoid confusion

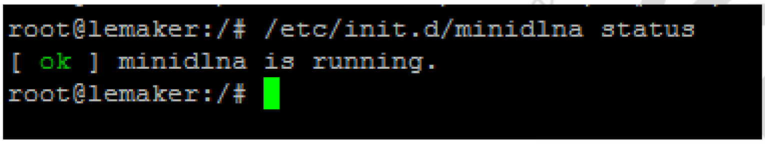
```
rm –r /var/lib/minidlna

rm –r /var/log
```

(3)Restart minidna

```
sudo /etc/init.d/minidlna restart
```

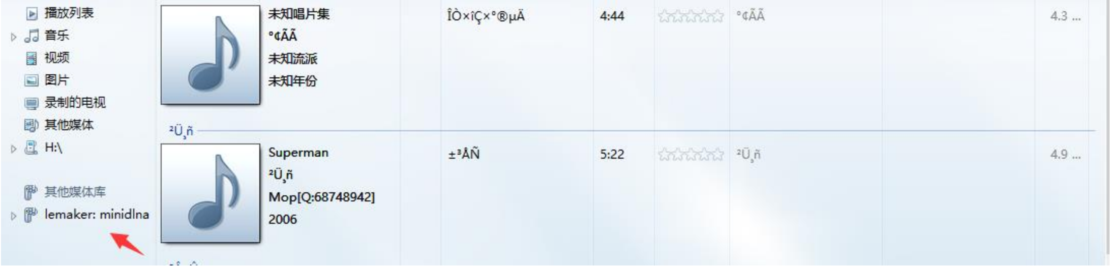
To see whether aria2 is running

```
/etc/init.d/minidlna status
```



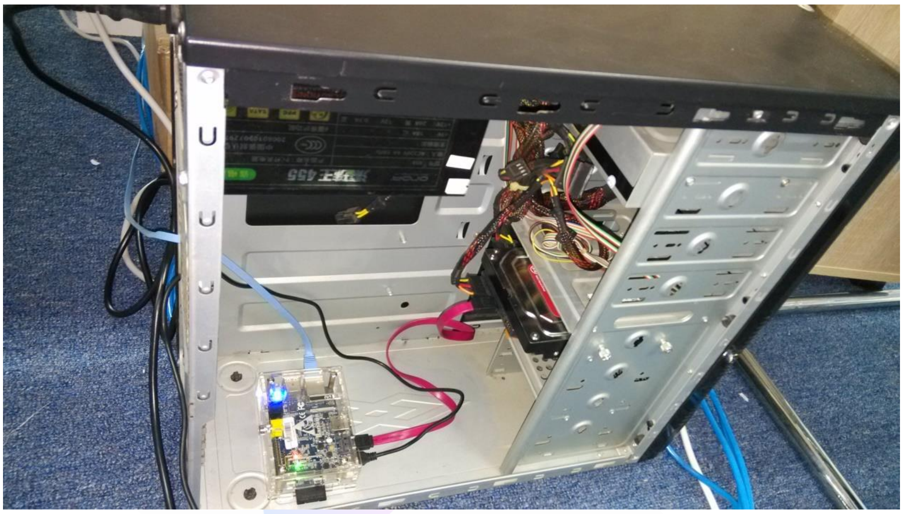
```
root@lemaker:/# /etc/init.d/minidlna status
[ ok ] minidlna is running.
root@lemaker:/#
```

We have successfully established a streaming media server. But we need to turn off the firewall or allow the Windows Media Player through the firewall before we use it. Now we can see the sharing streaming media files by the Windows Media Player in the LAN.



We also can see it on our mobile phone via the streaming media player software. Here I use moliplayer.

NAS home server finally completed! We can put the server on a corner of home working for us, now.



6.2 XBMC

Note that the 4&5 step can be used to support the hardware acceleration for Mplayer to compared the playback with XBMC,so it is not necessary to compile the XBMC and you can skip.

To install the XBMC, you should use 8G or larger SD card and resize SD card, please reference 4.3section first.

6.2.1 Modprobe needed modules:

```
modprobe sunxi_cedar_mod
modprobe   mali_drm
modprobe   drm
modprobe   mali
modprobe   ump
```

6.2.2 Install UMP library

http://linux-sunxi.org/Mali_binary_driver

The main steps are follows：

（1）Prequisites

```
sudo apt-get install git build-essential autoconf libtool
```

（2）Clone the repository

```
git clone https://github.com/linux-sunxi/libump.git
cd libump
```

（3）Manual Build

```
sudo apt-get update
sudo apt-get install debhelper dh-autoreconf pkg-config
autoreconf -i
```

```
./configure
make
make install
```

6.2.3Install Xorg()

http://linux-sunxi.org/Xorg#fbturbo_driver

The main steps are follows：

(1)Prerequisites

```
sudo apt-get install xorg-dev xutils-dev x11proto-dri2-dev xorg libdrm-dev libltdl-dev automake
```

(2)Clone the repositorygit

```
git clone -b 0.4.0 https://github.com/ssvb/xf86-video-fbturbo.git
cd xf86-video-fbturbo
```

(3)Build

```
autoreconf -vi
./configure --prefix=/usr
make
```

(4)Installation

```
make install
```

(5)Configuration

```
sudo rm /usr/share/X11/xorg.conf.d/99-sunxifb.conf
cp xorg.conf /etc/X11/xorg.conf
```

6.2.4 Install libvdpau

```
sudo apt-get install libvdpau-dev vdpauinfo
git clone https://github.com/linux-sunxi/libvdpau-sunxi
cd libvdpau-sunxi
```

```
make && make install
```

6.2.5 Check the hardware acceleration

```
export DISPLAY=:0

export VDPAU_DRIVER=sunxi

vdpauinfo
```

(1)Make sure you have /dev/disp /dev/g2d /dev/mali /dev/fb*

```
sudo apt-get install mplayer
```

(2)Edit configvfile （~/.mplayer/config）

```
vo=vdpau

vc=ffmpeg12vdpau,ffh264vdpau

fullscreen=yes

quiet=yes

ao=pulse

framedrop=yes

cache=8192

lavdopts=threads=2

ass=no

ass-font-scale=1.4

ass-color=FFFFFF00

ass-border-color=00000000

ass-use-margins=yes

ass-bottom-margin=50

spualign=2

subalign=2

subfont=/usr/share/fonts/truetype/ttf-dejavu/DejaVuSans.ttf

subcp=cp1250
```

6.2.6 Building XBMC for A10 and A20 SoC series

(1)Install the dependencies for XBMC (needs update!

```
sudo apt-get build-dep xbmc
sudo apt-get update
sudo apt-get install swig default-jre libgtk2.0-bin libssh-4 libssh-dev libxslt-dev libxml2-dev
```

(2)ensure you use hardware acceleration: (to set it permanently)

```
echo -e "\nA10HWR=1" >> /etc/environment
```

(3)Prerequisites for native compile

Create a swap-file, because otherwise the compiler runs out of memory during compiling and aborts

```
dd if=/dev/zero of=/swap bs=1M count=384
mkswap –c /swap
swapon /swap
```

(4)Create your workspace directory:

```
sudo mkdir melehacking
cd melehacking
```

(5)Checkout the source code

```
git clone https://github .com/warped-rudi/xbmc.git
cd xbmc
git checkout origin/Gotham-A10
```

(6)Build(network is needed!)

Build dependencies

```
cd tools/a10/depends
sudo mkdir –p /opt/a10hacking/xbmctmp/tarballs
make #(here will be download 5 library: taglib, cedarx, libmad, mali, mali-dev)
```

Build xbmc itself

```
make –C xbmc
cd ../../../
make install
```

6.2.7 Start XBMC

```
export A10HWR=1 (ensure to have this set if not rebooting!)
cd /allwinner/xbmc-pvr-bin/lib/xbmc
./xbmc.bin
```

Dear reader, it may still exist many imperfect places, readers can tell us, thank you for your support. We are doing all we can.

7 Appendix

Appendix A : Banana Pro pin definition

PIN	PIN define	GPIO
CON5-P01	LINEINL	
CON5-P02	LINEINR	
CON5-P37	HPL	
CON5-P36	HPR	
CON5-P07	FMINL	
CON5-P09	FMINR	
CON5-P04	ADC_X1	
CON5-P06	ADC_X2	
CON5-P08	ADC_Y1	
CON5-P10	ADC_Y2	
CON5-P13	LRADC0	
CON5-P15	LRADC1	
CON5-P33	RESET#	
CON5-P17	CSI-D0	PE4
CON5-P19	CSI-D1	PE5
CON5-P21	CSI-D2	PE6
CON5-P23	CSI-D3	PE7
CON5-P25	CSI-D4	PE8
CON5-P27	CSI-D5	PE9
CON5-P29	CSI-D6	PE10
CON5-P31	CSI-D7	PE11
CON5-P20	CSI-PCLK	PE0
CON5-P24	CSI-MCLK	PE1

CON5-P28	CSI-VSYNC	PE3
CON5-P30	CSI-HSYNC	PE2
CON5-P18	CSI0-STBY-EN	PH19
CON5-P26	CSI0-RESET#	PH14
CON5-P32	CSI1-STBY-EN	PH18
CON5-P34	CSI1-RESET#	PH13
CON5-P14	TWI1-SDA	PB19
CON5-P16	TWI1-SCK	PB18
CON5-P12	CSI-FLASH	PH17
CON5-P22	CSI0-PWR-EN	PH16
CON5-P35	CSI-IO0	PH11
CON5-P38	IPSOUT	
CON5-P40	IPSOUT	
CON5-P05	GND	
CON5-P11	GND	
CON5-P39	GND	
CON5-P03	VCC-CSI	
CON2-P09	LCD0-D00	PD0
CON2-P11	LCD0-D01	PD1
CON2-P13	LCD0-D02	PD2
CON2-P15	LCD0-D03	PD3
CON2-P17	LCD0-D04	PD4
CON2-P19	LCD0-D05	PD5
CON2-P21	LCD0-D06	PD6
CON2-P23	LCD0-D07	PD7
CON2-P25	LCD0-D08	PD8
CON2-P27	LCD0-D09	PD9
CON2-P29	LCD0-D10	PD10

CON2-P31	LCD0-D11	PD11
CON2-P33	LCD0-D12	PD12
CON2-P35	LCD0-D13	PD13
CON2-P37	LCD0-D14	PD14
CON2-P39	LCD0-D15	PD15
CON2-P40	LCD0-D16	PD16
CON2-P38	LCD0-D17	PD17
CON2-P36	LCD0-D18	PD18
CON2-P34	LCD0-D19	PD19
CON2-P32	LCD0-D20	PD20
CON2-P30	LCD0-D21	PD21
CON2-P28	LCD0-D22	PD22
CON2-P26	LCD0-D23	PD23
CON2-P22	LCD0-CLK	PD24
CON2-P20	LCD0-CS	PH6
CON2-P18	LCD0-HSYNC	PD26
CON2-P16	LCD0-VSYNC	PD27
CON2-P14	LCD0-DE	PD25
CON2-P12	LCD0-IO2	PH9
CON2-P10	PWM0	PB2
CON2-P08	LCD0-IO1	PH8
CON2-P06	LCD0-IO0	PH7
CON2-P04	TWI3-SCK	PI0
CON2-P02	TWI3-SDA	PI1
CON2-P07	LCDIO-03	PH12
CON2-P01	IPSOUT	
CON2-P03	IPSOUT	
CON2-P05	GND	

CON2-P24	GND	
CON6-P18	IO-5(CAN_RX)	PH21
CON6-P16	IO-4(CAN_TX)	PH20
CON6-P23	SPI0_CLK	PI11
CON6-P21	SPI0_MISO	PI13
CON6-P19	SPI0_MOSI	PI12
CON6-P24	SPI0_CS0	PI10
CON6-P26	SPI0_CS1	PI14
CON6-P05	TWI2-SCK	PB20
CON6-P03	TWI2-SDA	PB21
CON6-P28	TWI3-SCK	PI0
CON6-P27	TWI3-SDA	PI1
CON6-P15	IO-3(UART2_CTS)	PI17
CON6-P22	IO-6(UART2_RTS)	PI16
CON6-P11	IO-0(UART2_RX)	PI19
CON6-P13	IO-2(UART2_TX)	PI18
CON6-P10	UART4_RX	PH5
CON6-P08	UART4_TX	PH4
CON6-P31	UART7_RX	PI21
CON6-P32	UART7_TX	PI20
CON6-P07	IO-1	PH2
CON6-P29	IO-7(IR0_TX/SPDIF_MCLK)	PB3
CON6-P33	IO-8(SPDIF_DO)	PB13
CON6-P12	PWM1	PI3
CON6-P35	I2S0_LRCK	PB07
CON6-P36	I2S0_BCLK	PB06
CON6-P37	I2S0_MCLK	PB05
CON6-P38	I2S0_DI	PB12

CON6-P40	I2S0_DO0	PB08
CON6-P01	VCC-3V3	
CON6-P17	VCC-3V3	
CON6-P02	VCC-5V	
CON6-P04	VCC-5V	
CON6-P09	GND	
CON6-P25	GND	
CON6-P06	GND	
CON6-P14	GND	
CON6-P20	GND	
CON6-P30	GND	
CON6-P34	GND	
CON6-P39	GND	
LED1	GREEN LED	PH24
LED2	BLUE LED	PG2

Appendix B : Banana Pi pin definition

PIN	PIN define	GPIO
CON1-P01	LINEINL	
CON1-P02	LINEINR	
CON1-P37	HPL	
CON1-P36	HPR	
CON1-P07	FMINL	
CON1-P09	FMINR	
CON1-P04	ADC_X1	
CON1-P06	ADC_X2	
CON1-P08	ADC_Y1	
CON1-P10	ADC_Y2	
CON1-P13	LRADC0	
CON1-P15	LRADC1	
CON1-P33	RESET#	
CON1-P17	CSI-D0	PE4
CON1-P19	CSI-D1	PE5
CON1-P21	CSI-D2	PE6
CON1-P23	CSI-D3	PE7
CON1-P25	CSI-D4	PE8
CON1-P27	CSI-D5	PE9
CON1-P29	CSI-D6	PE10
CON1-P31	CSI-D7	PE11
CON1-P20	CSI-PCLK	PE0
CON1-P24	CSI-MCLK	PE1
CON1-P28	CSI-VSYNC	PE3
CON1-P30	CSI-HSYNC	PE2

CON1-P18	CSI0-STBY-EN	PH19
CON1-P26	CSI0-RESET#	PH14
CON1-P32	CSI1-STBY-EN	PH18
CON1-P34	CSI1-RESET#	PH13
CON1-P14	TWI1-SDA	PB19
CON1-P16	TWI1-SCK	PB18
CON1-P12	CSI-FLASH	PH17
CON1-P22	CSI0-PWR-EN	PH16
CON1-P35	CSI-IO0	PH11
CON1-P38	IPSOUT	
CON1-P40	IPSOUT	
CON1-P05	GND	
CON1-P11	GND	
CON1-P39	GND	
CON1-P03	VCC-CSI	
CON2-P09	LCD0-D00	PD0
CON2-P11	LCD0-D01	PD1
CON2-P13	LCD0-D02	PD2
CON2-P15	LCD0-D03	PD3
CON2-P17	LCD0-D04	PD4
CON2-P19	LCD0-D05	PD5
CON2-P21	LCD0-D06	PD6
CON2-P23	LCD0-D07	PD7
CON2-P25	LCD0-D08	PD8
CON2-P27	LCD0-D09	PD9
CON2-P29	LCD0-D10	PD10
CON2-P31	LCD0-D11	PD11
CON2-P33	LCD0-D12	PD12

CON2-P35	LCD0-D13	PD13
CON2-P37	LCD0-D14	PD14
CON2-P39	LCD0-D15	PD15
CON2-P40	LCD0-D16	PD16
CON2-P38	LCD0-D17	PD17
CON2-P36	LCD0-D18	PD18
CON2-P34	LCD0-D19	PD19
CON2-P32	LCD0-D20	PD20
CON2-P30	LCD0-D21	PD21
CON2-P28	LCD0-D22	PD22
CON2-P26	LCD0-D23	PD23
CON2-P22	LCD0-CLK	PD24
CON2-P20	LCD0-CS	PH6
CON2-P18	LCD0-HSYNC	PD26
CON2-P16	LCD0-VSYNC	PD27
CON2-P14	LCD0-DE	PD25
CON2-P12	LCD0-IO2	PH9
CON2-P10	PWM0	PB2
CON2-P08	LCD0-IO1	PH8
CON2-P06	LCD0-IO0	PH7
CON2-P04	TWI3-SCK	PI0
CON2-P02	TWI3-SDA	PI1
CON2-P07	LCDIO-03	PH12
CON2-P01	IPSOUT	
CON2-P03	IPSOUT	
CON2-P05	GND	
CON2-P24	GND	
CON3-P18	IO-5(CAN_RX)	PH21

CON3-P16	IO-4(CAN_TX)	PH20
CON3-P23	SPI0_CLK	PI11
CON3-P21	SPI0_MISO	PI13
CON3-P19	SPI0_MOSI	PI12
CON3-P24	SPI0_CS0	PI10
CON3-P26	SPI0_CS1	PI14
CON3-P05	TWI2-SCK	PB20
CON3-P03	TWI2-SDA	PB21
CON3-P15	IO-3(UART2_CTS)	PI17
CON3-P22	IO-6(UART2_RTS)	PI16
CON3-P11	IO-0(UART2_RX)	PI19
CON3-P13	IO-2(UART2_TX	PI18
CON3-P10	UART3_RX	PH1
CON3-P08	UART3_TX	PH0
CON3-P12	IO-1	PH2
CON3-P07	GPCLK	PI3
CON3-P01	VCC-3V3	
CON3-P17	VCC-3V3	
CON3-P02	VCC-5V	
CON3-P04	VCC-5V	
CON3-P09	GND	
CON3-P25	GND	
CON3-P06	GND	
CON3-P14	GND	
CON3-P20	GND	

J12-P03	IO-7	PH5
J12-P05	IO-8	PH3

J12-P04	UART7_RX	PI21
J12-P06	UART7_TX	PI20
J12-P01	VCC-5V	
J12-P02	VCC-3V3	
J12-P07	GND	
J12-P08	GND	

J11-P01	UART0-TX	PB22
J11-P02	UART0-RX	PB23