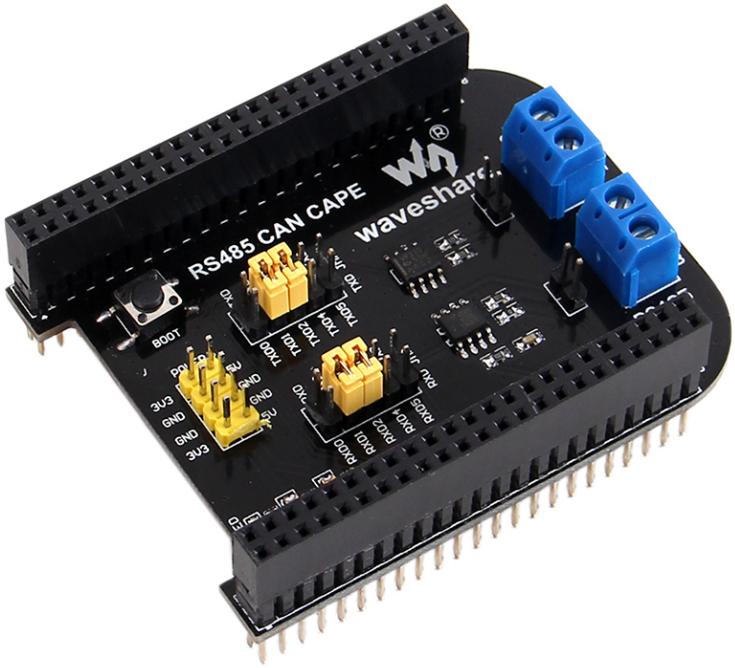
BEAGLEBONE RS485 CAN CAPE EXPANSION BOARD

User Manual



Getting Ready

Writing the TF Card System Image

Follow the steps below to write the Angstrom into TF card:

1) Extract the system image

Extract the system image file .img.7z by using archiver software like 7z920.exe.

Note: please download the image file from:

LCD CPAE(4.3inch) image for testing

- Angstrom-Cloud9-IDE-GNOME-eglibc-ipk-v2012.12-beaglebone-2013.05.24-LCD-cape-LCD4.3-v1.1.img.7z

LCD CPAE(7inch) image for testing

- Angstrom-Cloud9-IDE-GNOME-eglibc-ipk-v2012.12-beaglebone-2013.05.24-LCD-cape-LCD7-v1.1.img.7z

MISC CAPE and RS485/CAN CAPE image for testing

- Angstrom-Cloud9-IDE-GNOME-eglibc-ipk-v2012.12-beaglebone-2013.05.24-MISC-cape-HDMI-v1.1.img.7z

2) Format the TF card

Use HPUSBDisk.exe to format the TF card.

Choose the Device as your TF card, File system as FAT32. Then click Start.

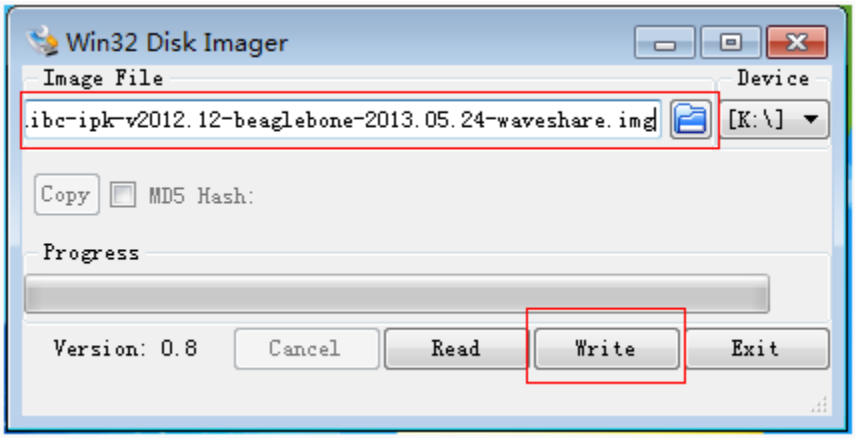
Note: the TF card capacity should be 4GB or above!

Use HPUSBDisk.exe to format the TF card

3) Writing the system image

Launch Win32DiskImager.exe, select the extracted system image. Then click write.

Use Win32DiskImager.exe to write the system image



Install USB to UART driver

1) Connect the LCD CAPE with USB TO UART interface to the PC through a USB cable.

Note: You need to install the corresponding driver. Please refer to the respective manuals of your USB TO UART module.

Interface definition:

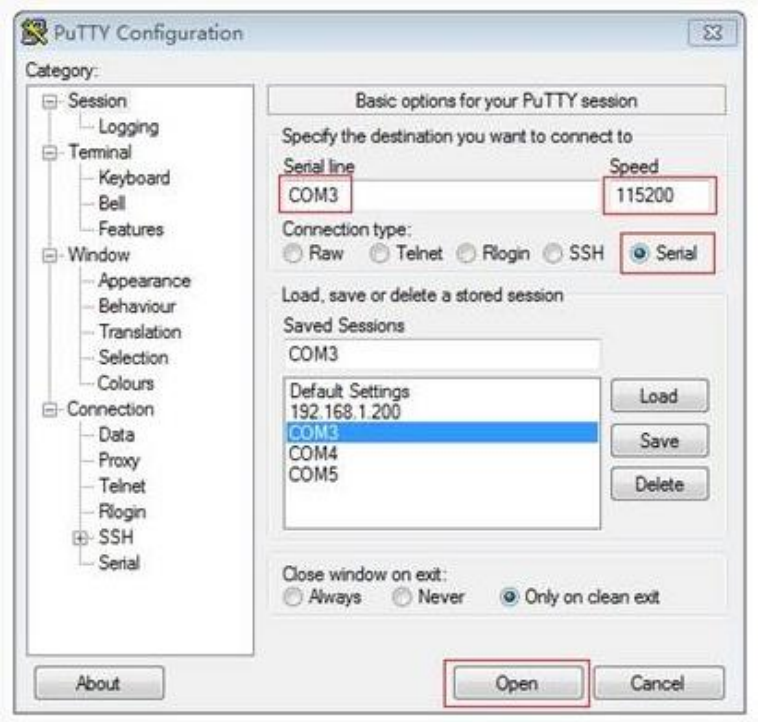
- Red: VCC
- Black: GND
- Green: TXD(connect to RXD)
- White: RXD(connect to TXD)

USB to UART Cable

2) Open PL2303_Prolific_DriverInstaller_v1.8.0.exe and install the driver.

3) Launch putty.exe, configure as follows, then click Open.

PuTTY Settings



Note:

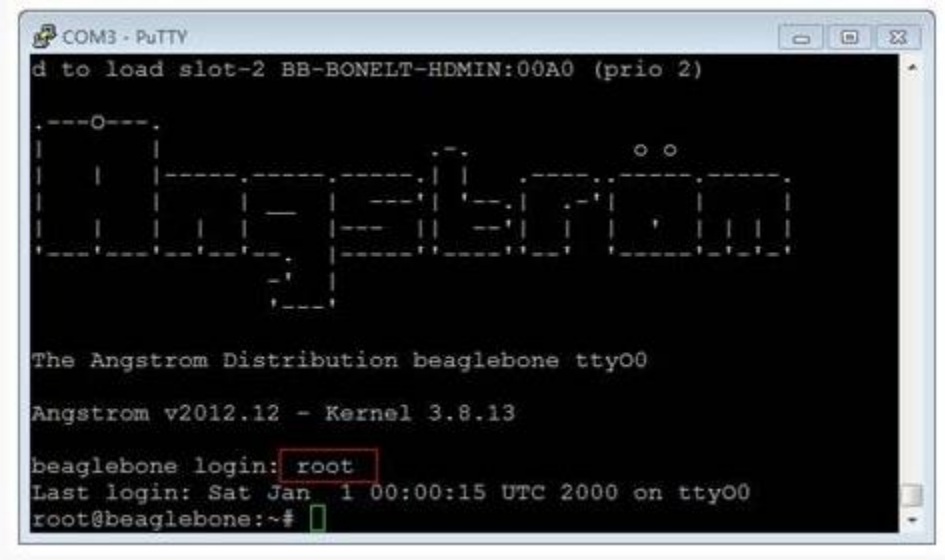
- Serial line: check the PC "Device Manager" to confirm which COM port should be selected.
- Speed: 115200。
- Connection type: Serial。

Enter Bash Shell

1) Insert the TF card into the BeagleBone Black onboard slot, keep pressing down the BOOT button, power up the board, then release the BOOT button.

2) When the system startups, input "root" to enter Bash Shell environment, now the shell commands are available to use. All the commands follows are executed here.

Enter Bash Shell



Note: please make sure that you are using the TF card image that we provide, and the system should boot from TF card (keep pressing down BOOT button, then power up), otherwise, the testing will fail.

API Source Code

The API source code can be found on /home/xuser/waveshare_demo/API.

LCD CAPE

LCD Display Overview

1. BB_BLACK connector : for connecting BB Black

2. 4.3inch LCD interface : for connecting 4.3inch resistive touchscreen LCD
3. DEBUG interface : BB Black debug interface, for connecting serial modules
4. BOOT selection button: Boot from TF card

1. BB_BLACK connector : for connecting BB Black
2. 7inch LCD interface : for connecting 7inch resistive touchscreen LCD
3. DEBUG interface : BB Black debug interface, for connecting serial modules
4. BOOT selection button : Boot from TF card

LCD Display

1) Connect to a LCD

Note: There are two models of LCD CAPE, LCD CAPE (4.3inch) and LCD CAPE (7inch), each one corresponds our 4.3inch or 7inch resistive touch screen respectively. Some batches of LCD CAPE provide both interfaces. If the CAPE connected to the LCD by a wrong interface, it may damage the LCD and the main board.

- When using 4.3inch LCD

Download LCD CPAE(4.3inch) image for testing.

Connect BB Black to the 4.3inch LCD.

Connect to the 4.3inch LCD

- When using 7inch LCD

Download LCD CPAE(7inch) image for testing.

Connect BB Black to the 7inch LCD.

Connect to the 7inch LCD

2) The touchscreen should be calibrated when the display mode has been changed:

```
root@beaglebone:~# rm -rf /etc/pointercal*
root@beaglebone:~# ts_calibrate
root@beaglebone:~# sync
```

Reboot the system. **Note: if the calibration failed, reboot and retry again.**

MISC CAPE

MISC CAPE Overview

1. BB_BLACK connector : for connecting BB Black
2. DEBUG interface : BB Black debug interface, for connecting serial modules
3. ONE-WIRE interface: easily connects to ONE-WIRE devices (TO-92 package), such as temperature sensor (DS18B20), electronic registration number (DS2401), etc.
4. BOOT selection button : Boot from TF card
5. User button : 4 buttons

6. Buzzer
7. Power indicator
8. User LED：4 LEDs
9. Potentiometer：AD adjustable potentiometer
10. 32.768KHz crystal：for RTC
11. PCF8563：RTC
12. RTC battery holder：for 3.3V battery
13. RTC power selection jumper
14. RTC I2C selection jumper: select I2C1 OR I2C2

LED

Short the LED jumper, enter:

```
root@beaglebone:~# test_led
```

The 4 LEDs will light up one by one, press Ctrl+C to exit.

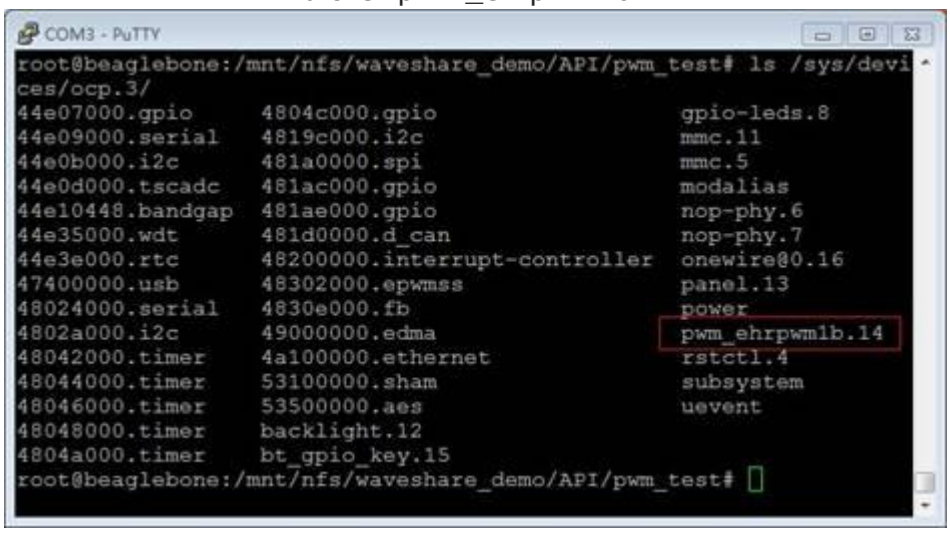
Buzzer

1) Short the buzzer jumper, enter:

```
root@beaglebone:~# ls /sys/devices/ocp.3/
```

You'll find the "pwm_ehrpwm1b.14" as shown:

Find the "pwm_ehrpwm1b.14"



2) Because the pwm_ehrpwm1b.14's extension is .14. It is needed to add parameter 14 when buzzer tested.

```
root@beaglebone:~# test_pwm 14
```

The buzzer will make sounds in different frequency.

DS18B20

1) Insert the DS18B20 into the 1-WIRE socket, short the 1-WIRE jumper, enter:

```
root@beaglebone:~#ls /sys/bus/w1/devices/
```

You will find the "28-00000 57c5948" (the last 7 characters are unique for each DS18B20, it depends)

2) Execute:

```
root@beaglebone:~#test_ds18b20  57c5948
```

The terminal will print the current temperature.

Buttons

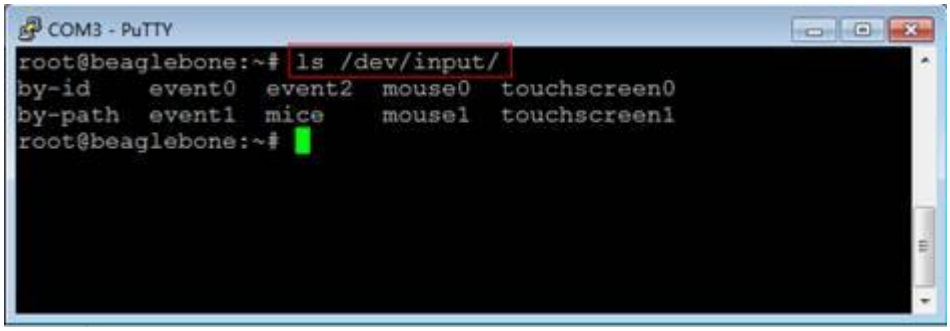
1) Execute

```
root@beaglebone:~# test_key event2
```

Note: Device file "event2" is based on user's device, Not necessarily "event2". You can execute the following command to view:

```
root@beaglebone:~# ls /dev/input
```

Check event device



2) Press any of the onboard buttons, the terminal will show which one has been pressed, press Ctrl+C to exit.

Note: if the LCD screen was connected while testing joystick/buttons, the LCD screen seems that it was touched at the same time, it's normal.

RTC

Confirm that the module is powered by onboard battery.

1) Show system date time:

```
root@beaglebone:~# date
```

2) Set system date time:

```
root@beaglebone:~# date 020809302014.23
```

3) Set the hardware clock of RTC module:

```
root@beaglebone:~# hwclock –w –f /dev/rtc1
```

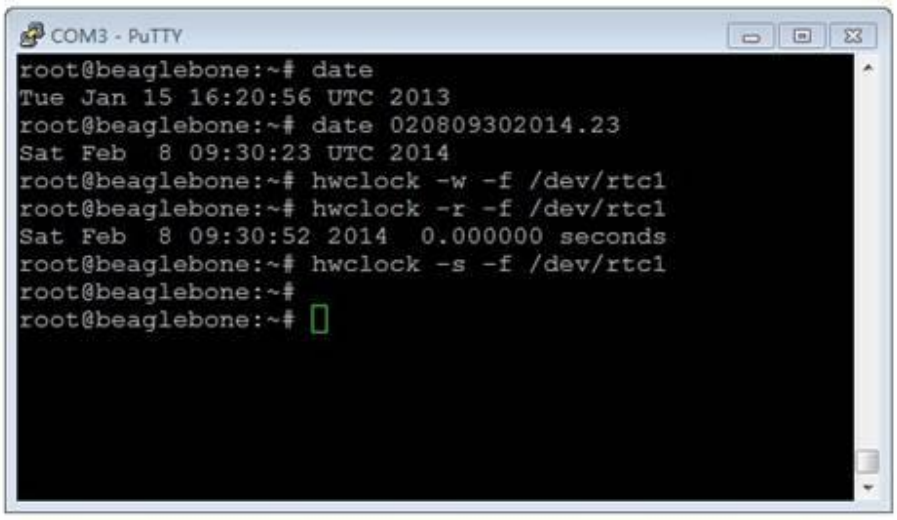
4) Show the hardware clock of RTC module:

```
root@beaglebone:~# hwclock –r –f /dev/rtc1
```

5) Synchronize the hardware clock to system date time:

```
root@beaglebone:~# hwclock –s –f /dev/rtc1
```

Synchronize the hardware clock to system date time



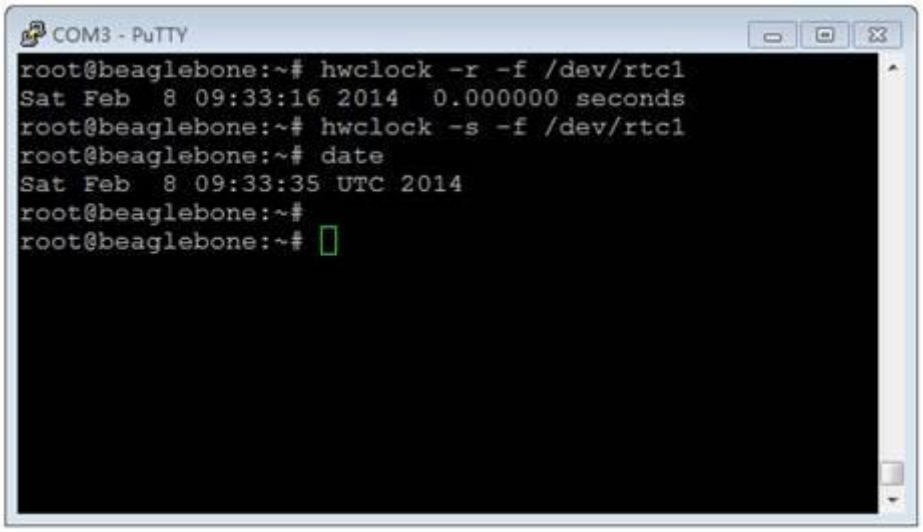
6) Power off and reboot, read the hardware clock of RTC module and synchronize to system date time:

```
root@beaglebone:~# hwclock –r –f /dev/rtc1
```

```
root@beaglebone:~# hwclock -s -f /dev/rtc1
```

```
root@beaglebone:~# date
```

Synchronize to system date time



Now the date time of software and hardware are synchronous.

RS485 CAN CAPE

CAN

Two BeagleBone Black and two RS485/CAN CAPEs are required for this testing. Set jumper to enable UART1(RXD1, TXD1). Connect two CAN Board to CAN1 interface separately, connect the CANH, CANL of one module to the CANH, CANL of another module via jumper wires.

1) Configure the baud rate:

```
root@beaglebone:~#canconfig can0 bitrate 115200 ctrlmode triple-sampling on
```

2) Enable the CAN device:

```
root@beaglebone:~# canconfig can0 start
```

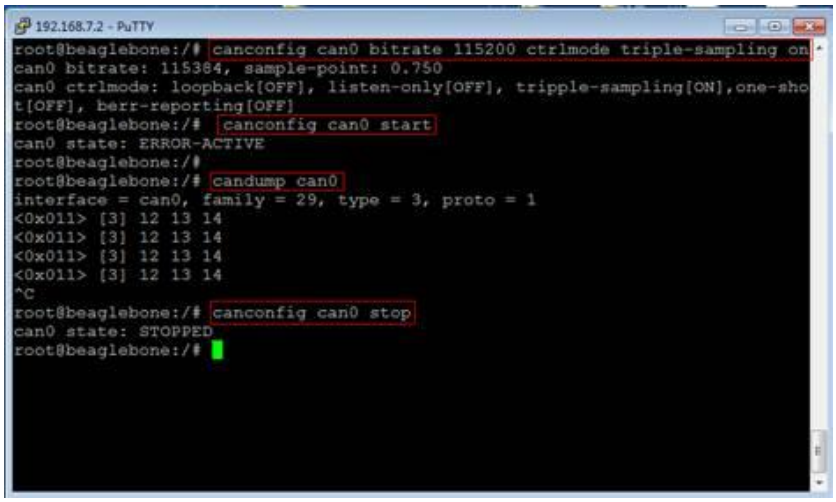
The two CAN devices act as receiver and sender separately. The receiver gets ready to receive data first, and then the sender starts sending data.

3) Receiver:

```
root@beaglebone:~# candump can0
```

As shown in the picture:

CAN receiver status



5) Stop the devices:

```
root@beaglebone:~# canconfig can0 stop
```

RS485

Two BeagleBone Black and two RS485/CAN CAPEs are required for this testing. Set jumper to enable UART2(RXD2, TXD2). Connect two RS485 Boards to UART2 interface separately. Connect the A, B of one module to the A, B of another module via jumper wires.

The two RS485 devices act as receiver and sender separately.

1) The receiver gets ready to receive data first, and then the sender starts sending data. Execute:

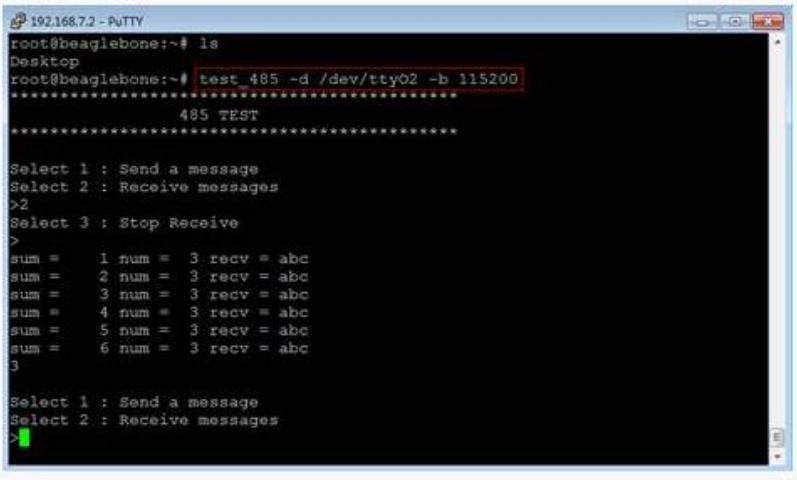
```
root@beaglebone:~# test_485 –d /dev/ttyO2 –b 115200
```

2) Receiver:

Select "2", it will keep receiving data until you select "3".

As shown in the picture:

RS485 receiver status

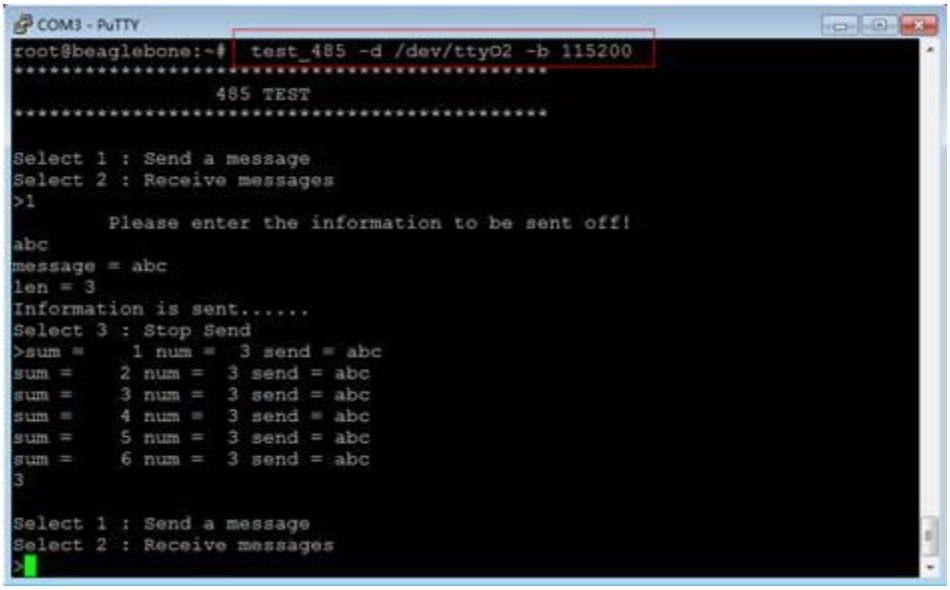


3) Sender:

Select "1", and then enter the message, say, "abc", it loops sending the message until you select "3".

As shown in the picture:

RS485 sender status



4) Press Ctrl+C to exit.

Other Expansion Module

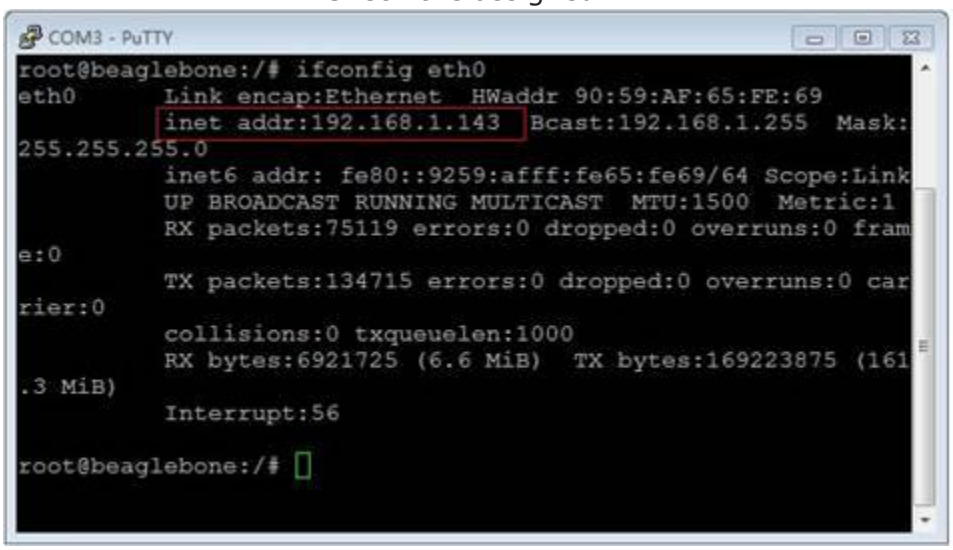
USB Camera

1) Connect the USB Camera to the BeagleBone Black USB Host connector.

2) Check the assigned IP:

```
root@beaglebone:~# ifconfig eth0
```

Check the assigned IP



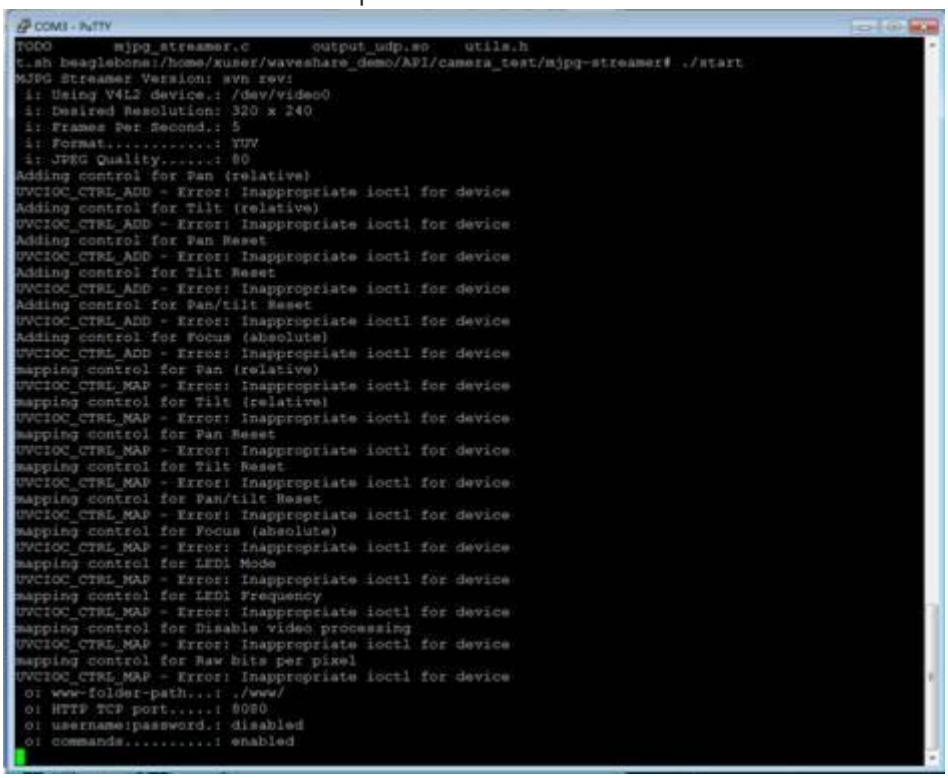
As shown in the picture, the IP is 192.168.1.143. Note this IP(it depends).

3) Start up the video stream server:

```
root@beaglebone:~# cd/home/xuser/waveshare_demo/API/camera_test/mjpg-streamer
```

```
root@beaglebone:~# ./ start.sh
```

Start up the video stream server

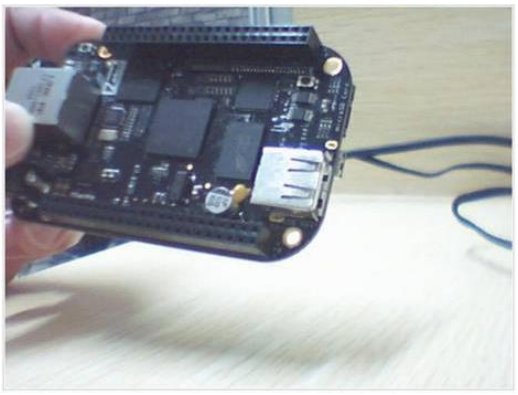


4) Open browser on the PC in the same local network, visit the following address to view the video (default port number is 8080):

http://192.168.1.143:8080/javascript.html

(It depends on the IP you have noted)

Visit video stream server



5) Press Ctrl+C to exit.

USB WIFI

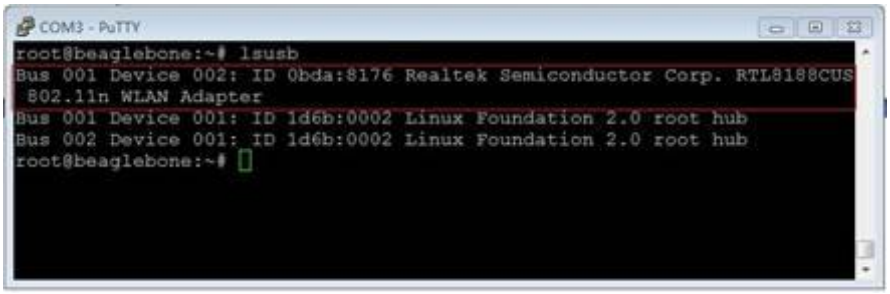
1) Config the wireless network:

a) Power off, connect the USB WIFI module to the BeagleBone Black USB Host connector, power up again.

b) Check the USB status:

```
root@beaglebone:~# lsusb
```

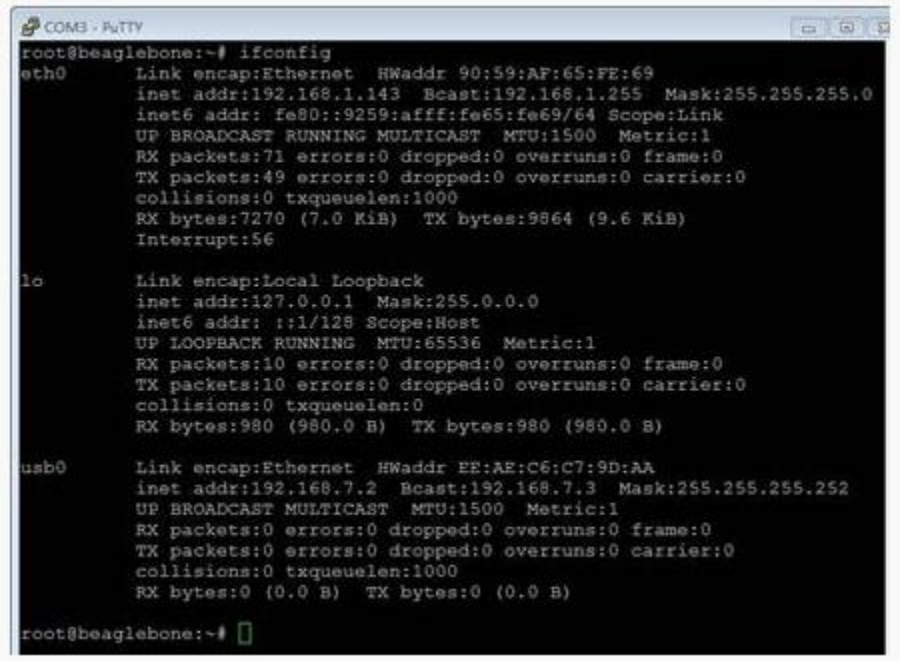
Check the USB status



c) Check the network status:

```
root@beaglebone:~# ifconfig
```

Check the network status



d) Shut down the Ethernet NIC, start up the WIFI NIC:

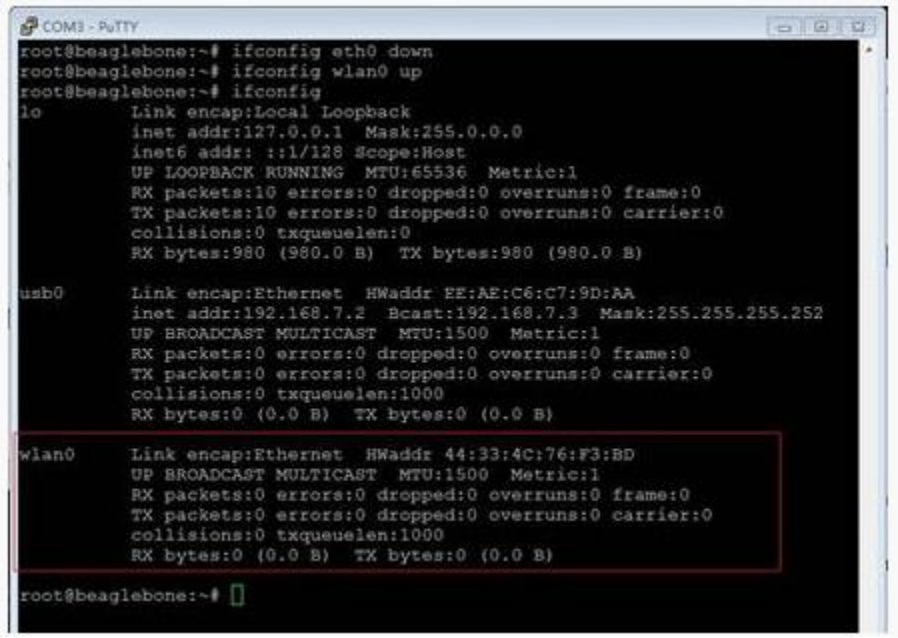
```
root@beaglebone:~# ifconfig eth0 down
```

```
root@beaglebone:~# ifconfig wlan0 up
```

e) Check the WIFI status:

```
root@beaglebone:~# ifconfig
```

Check the WIFI status



There's no AP connected, therefore, the wlan0 RX TX packets are both 0.

f) Config the wlan0 IP:

```
root@beaglebone:~# ifconfig wlan0 192.168.2.107
```

g) Config the gateway:

```
root@beaglebone:~# route add default gw 192.168.2.1
```

h) Config the DNS:

```
root@beaglebone:~# vi /etc/resolv.conf
```

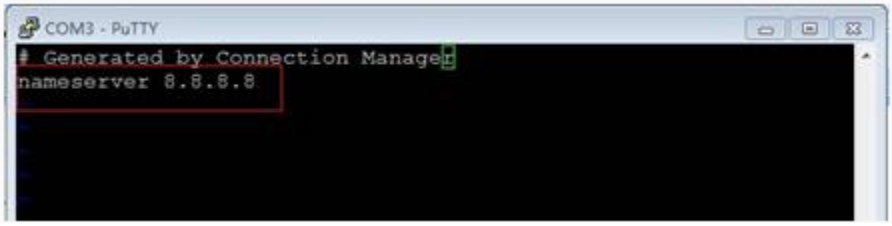
Edit

nameserver 127.0.0.1

As:

nameserver 8.8.8.8

Configure the DNS

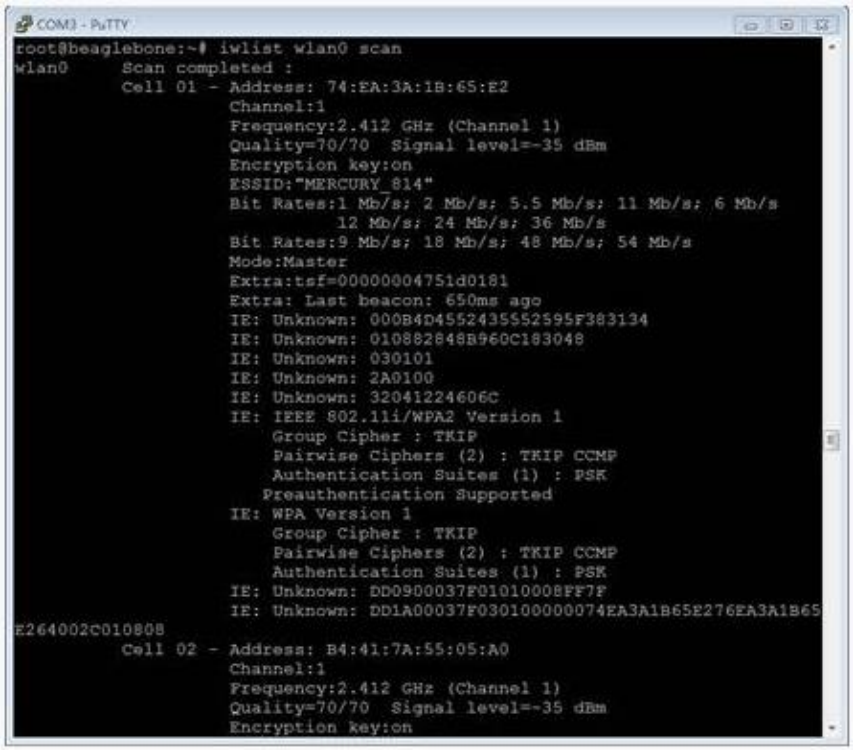


Save and exit.

i) Scan wireless router:

```
root@beaglebone:~# iwlist wlan0 scan
```

Scan wireless router



2) Connect to the router:

a) Config the key file /etc/wpa_supplicant.conf:

```
root@beaglebone:~# vi /etc/wpa_supplicant.conf
```

Edit:

```
network={

    key_mgmt=NONE
```

```
}
```

As:

```
network={
    ssid="waveshare"
    psk="12345678"
}
```

Save and exit.

b) Connect manually:

```
root@beaglebone:~# wpa_supplicant -B -i wlan0 -c /etc/wpa_supplicant.conf
```

c) Test the connection:

```
root@beaglebone:~# ping www.baidu.com
```

Test WIFI connection: