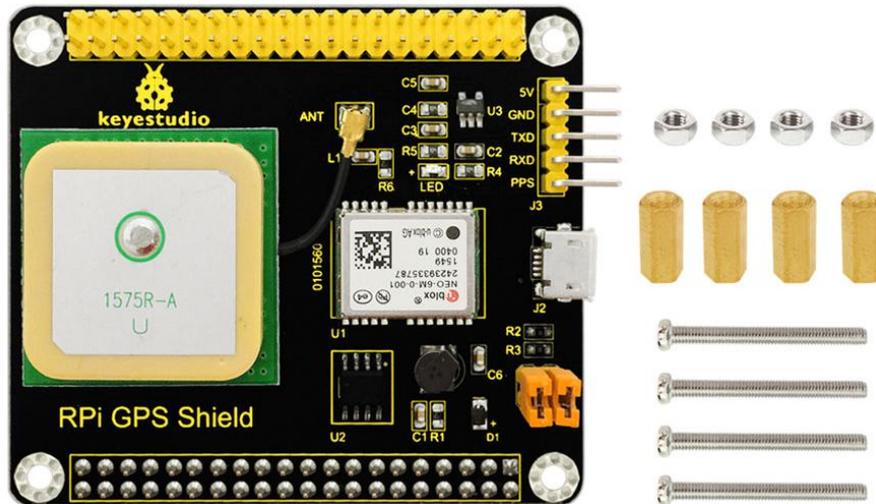


keystudio

keystudio RPi GPS Shield



1. Introduction

It is based on NEO-6 u blox 6 GPS module, compatible with Raspberry Pi 3. Plug it into Raspberry Pi 3. Upload correct codes to Raspberry Pi 3, and you can find your exact location within a few meters.

It also provides you with a very accurate time! It can be used in car navigation, personal positioning, fleet management, navigation and so on.

2. Features

- Use active GPS antenna

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- With 40 pins, convenient to connect external devices
- Comes with screws, nuts, copper pillars, easy to fix in Raspberry Pi.

3. Connection Method

To get started, hook the GPS module up to your Pi as follows, cross-connecting the TX and RX pins (TX on one device goes to RX on the other and vice versa), and supply 5V from the Pi to the VIN pin on the GPS module.



4. Usage

A. We use raspberry pi official system (2017-01-11-raspbian-jessie-lite), using SSH to log in, and you need to place a ssh file in the root directory.



B. Bluetooth and Debug share the same serial port together and, but you can just use BT or Debug on one time.

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For the Raspberry Pi 3 you need to explicitly enable the serial port on the GPIO pins. The reason for this is a change with the Pi 3 to use the hardware serial port for Bluetooth and instead use a slightly different software's serial port for the GPIO pins.

A side effect of this change is that the serial port will actually change speed as the Pi CPU clock throttles up and down--this will unfortunately cause problems for most serial devices like GPS receivers!

Step by step as shown below:

1) There is now a device tree file called pi3-miniuart-bt which makes the Raspberry Pi 3 disable the Bluetooth and map pl011 UART on pins 14 and 15 as before.

Add device tree to **/boot/config.txt** to disable the Raspberry Pi 3 Bluetooth:

```
sudo vi /boot/config.txt
```

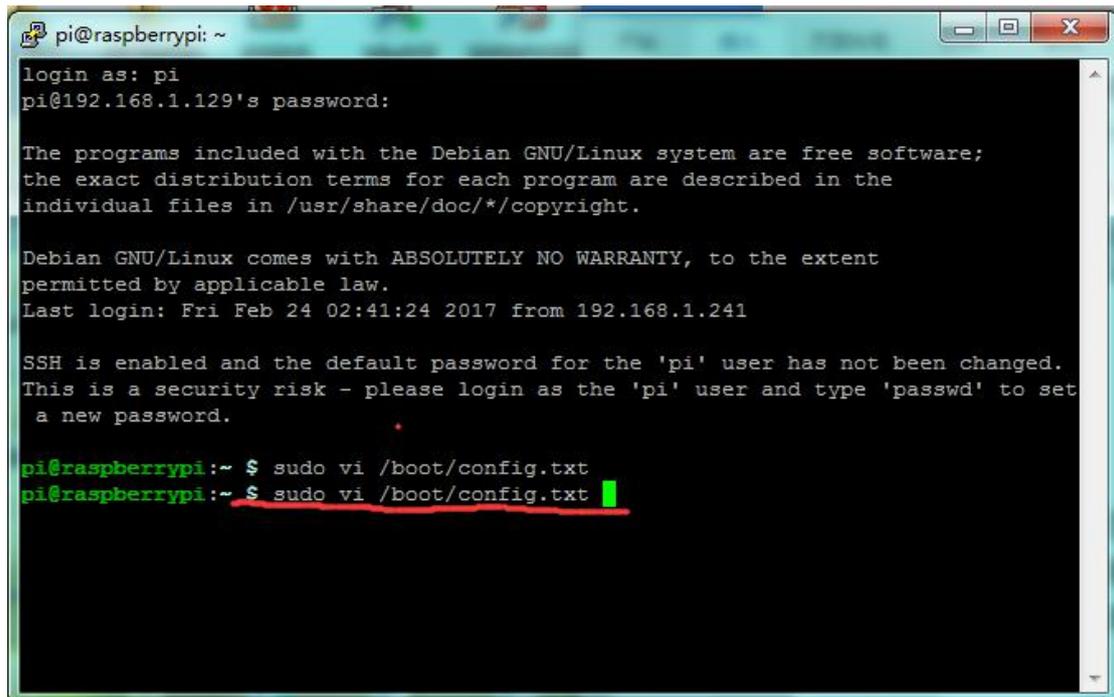
Add at the end of the file:

```
dtoverlay=pi3-miniuart-bt
```

```
enable_uart=1
```

Exit and save your changes.

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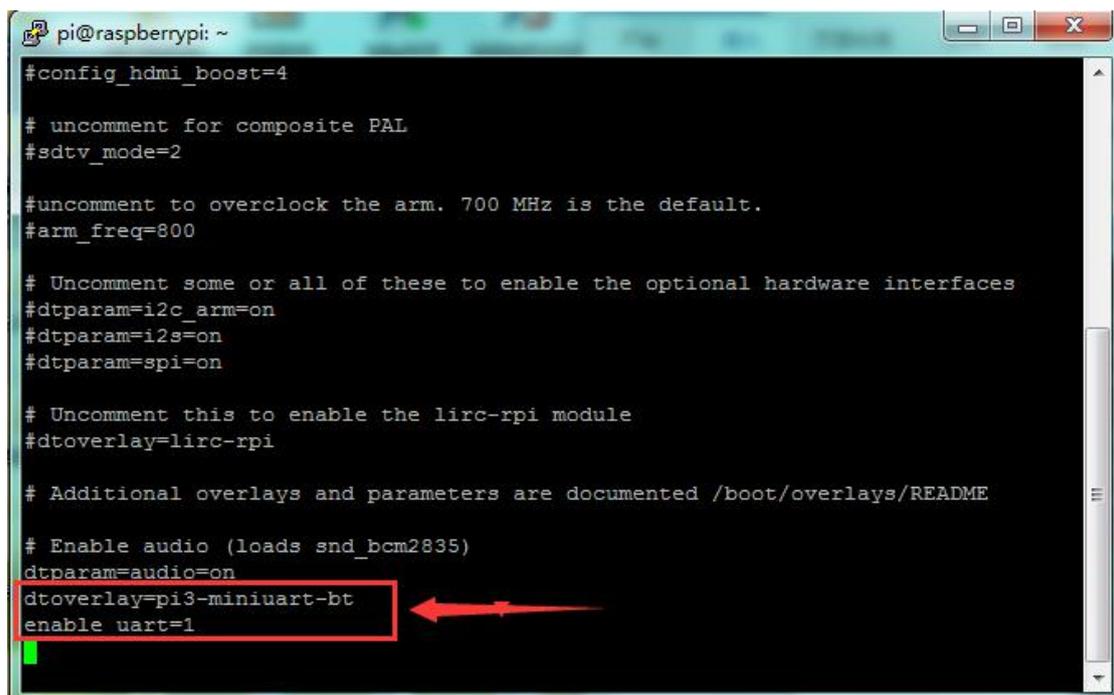
```
pi@raspberrypi: ~
login as: pi
pi@192.168.1.129's password:

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Fri Feb 24 02:41:24 2017 from 192.168.1.241

SSH is enabled and the default password for the 'pi' user has not been changed.
This is a security risk - please login as the 'pi' user and type 'passwd' to set
a new password.

pi@raspberrypi:~ $ sudo vi /boot/config.txt
pi@raspberrypi:~ $ sudo vi /boot/config.txt
```



```
pi@raspberrypi: ~
#config_hdmi_boost=4

# uncomment for composite PAL
#sdtv_mode=2

#uncomment to overclock the arm. 700 MHz is the default.
#arm_freq=800

# Uncomment some or all of these to enable the optional hardware interfaces
#dtparam=i2c_arm=on
#dtparam=i2s=on
#dtparam=spi=on

# Uncomment this to enable the lirc-rpi module
#dtoverlay=lirc-rpi

# Additional overlays and parameters are documented /boot/overlays/README

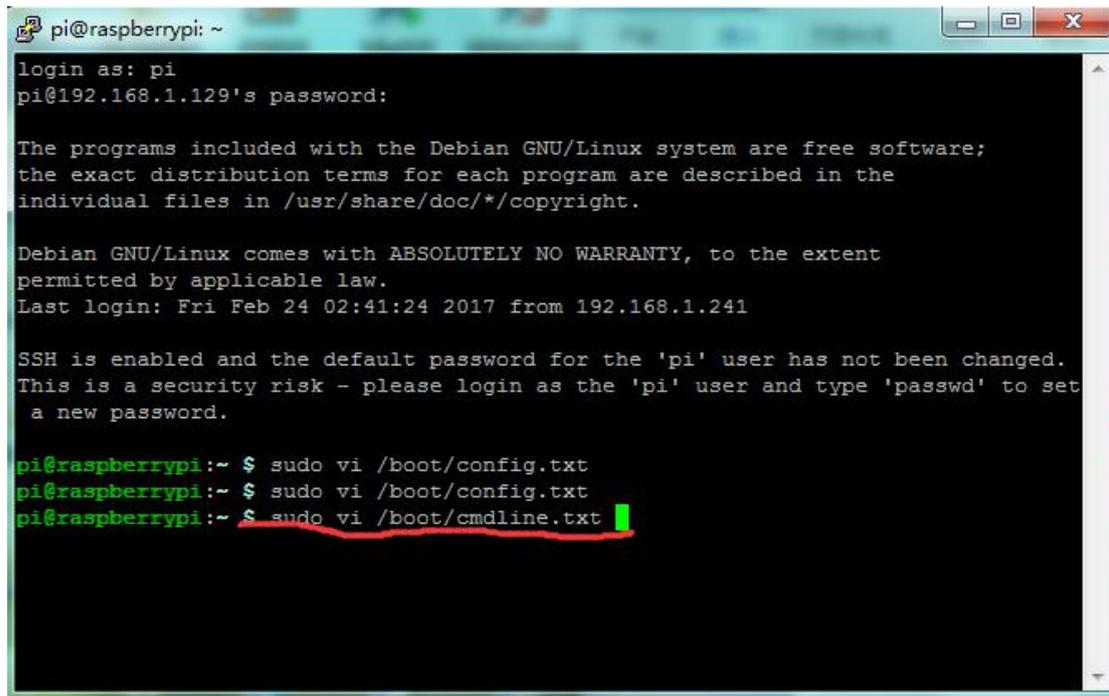
# Enable audio (loads snd_bcm2835)
dtparam=audio=on
dtoverlay=pi3-miniuart-bt
enable_uart=1
```

2) To enable the serial console, you need to edit the `/boot/cmdline.txt` file:

Change the file to the following:

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console=ttyAMA0,115200



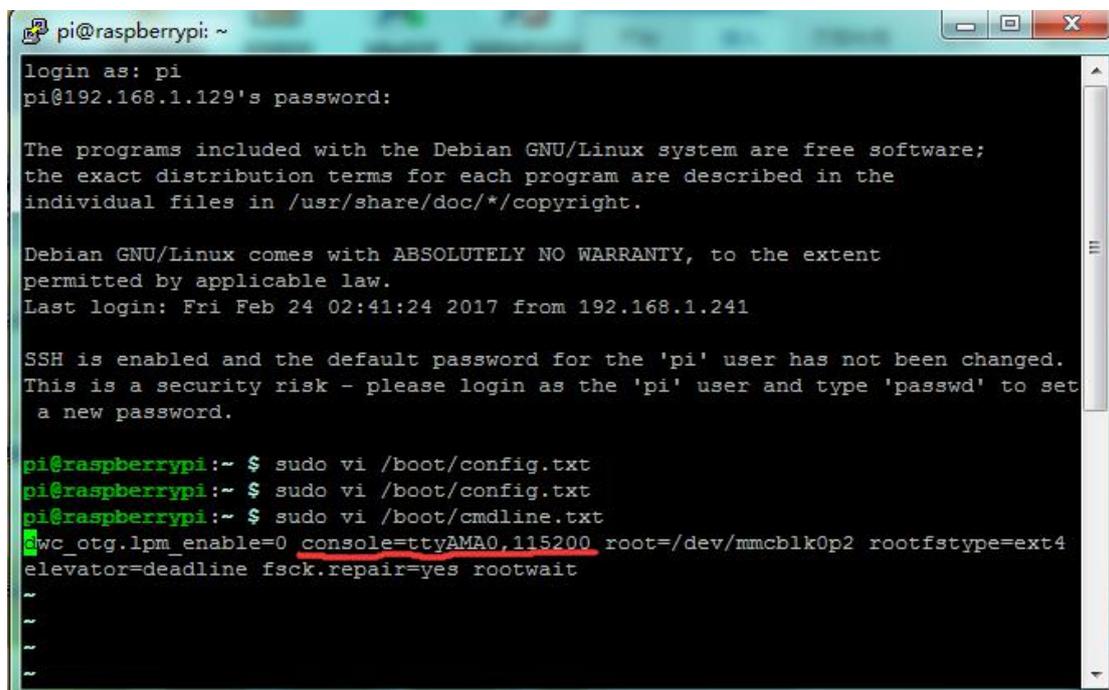
```
pi@raspberrypi: ~
login as: pi
pi@192.168.1.129's password:

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Last login: Fri Feb 24 02:41:24 2017 from 192.168.1.241

SSH is enabled and the default password for the 'pi' user has not been changed.
This is a security risk - please login as the 'pi' user and type 'passwd' to set
a new password.

pi@raspberrypi:~ $ sudo vi /boot/config.txt
pi@raspberrypi:~ $ sudo vi /boot/config.txt
pi@raspberrypi:~ $ sudo vi /boot/cmdline.txt
```



```
pi@raspberrypi: ~
login as: pi
pi@192.168.1.129's password:

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Fri Feb 24 02:41:24 2017 from 192.168.1.241

SSH is enabled and the default password for the 'pi' user has not been changed.
This is a security risk - please login as the 'pi' user and type 'passwd' to set
a new password.

pi@raspberrypi:~ $ sudo vi /boot/config.txt
pi@raspberrypi:~ $ sudo vi /boot/config.txt
pi@raspberrypi:~ $ sudo vi /boot/cmdline.txt
cwc_otg.lpm_enable=0 console=ttyAMA0,115200 root=/dev/mmcblk0p2 rootfstype=ext4
elevator=deadline fsck.repair=yes rootwait
~
~
~
```

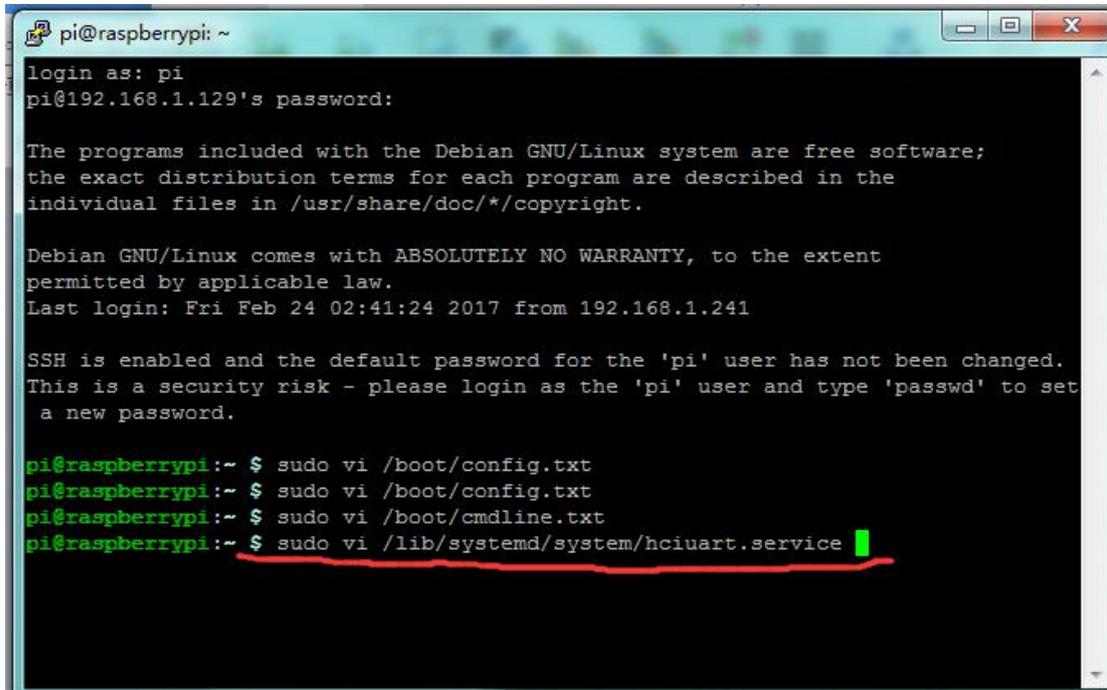
3) Edit/lib/systemd/system/hciuart.server

Change the file to the following:

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ExecStart=/usr/bin/hciattach /dev/ttyAMA0 bcm43xx 115200

noflow -



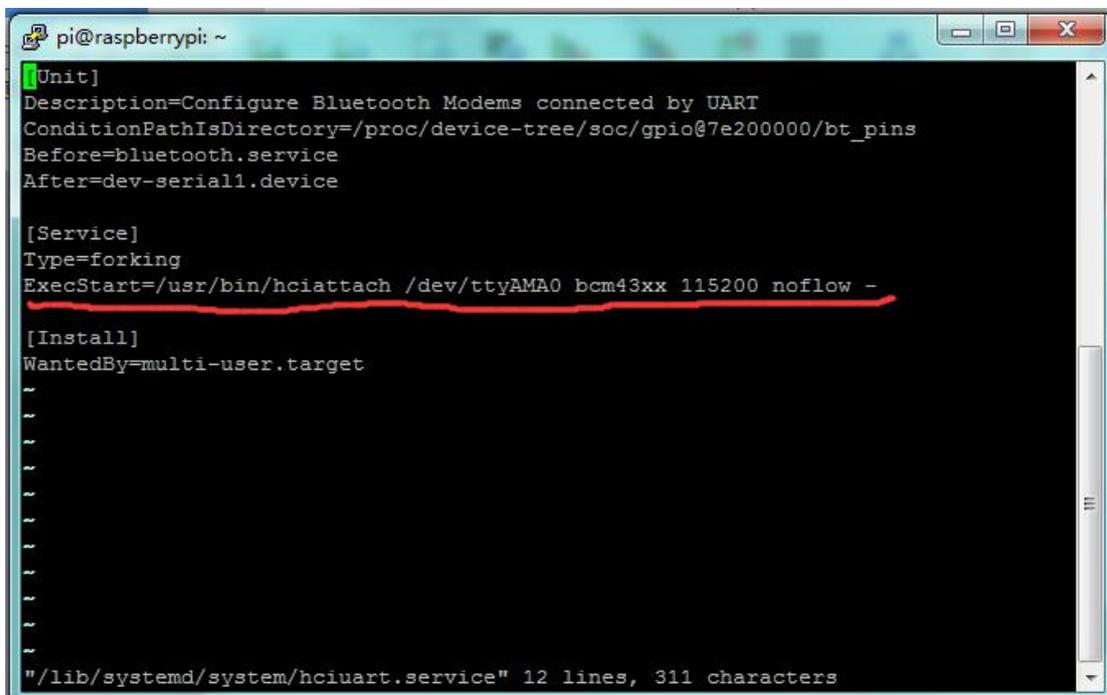
```
pi@raspberrypi: ~
login as: pi
pi@192.168.1.129's password:

The programs included with the Debian GNU/Linux system are free software;
the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Fri Feb 24 02:41:24 2017 from 192.168.1.241

SSH is enabled and the default password for the 'pi' user has not been changed.
This is a security risk - please login as the 'pi' user and type 'passwd' to set
a new password.

pi@raspberrypi:~ $ sudo vi /boot/config.txt
pi@raspberrypi:~ $ sudo vi /boot/config.txt
pi@raspberrypi:~ $ sudo vi /boot/cmdline.txt
pi@raspberrypi:~ $ sudo vi /lib/systemd/system/hciuart.service
```



```
pi@raspberrypi: ~
[Unit]
Description=Configure Bluetooth Modems connected by UART
ConditionPathIsDirectory=/proc/device-tree/soc/gpio@7e200000/bt_pins
Before=bluetooth.service
After=dev-serial1.device

[Service]
Type=forking
ExecStart=/usr/bin/hciattach /dev/ttyAMA0 bcm43xx 115200 noflow -

[Install]
WantedBy=multi-user.target

~/lib/systemd/system/hciuart.service" 12 lines, 311 characters
```

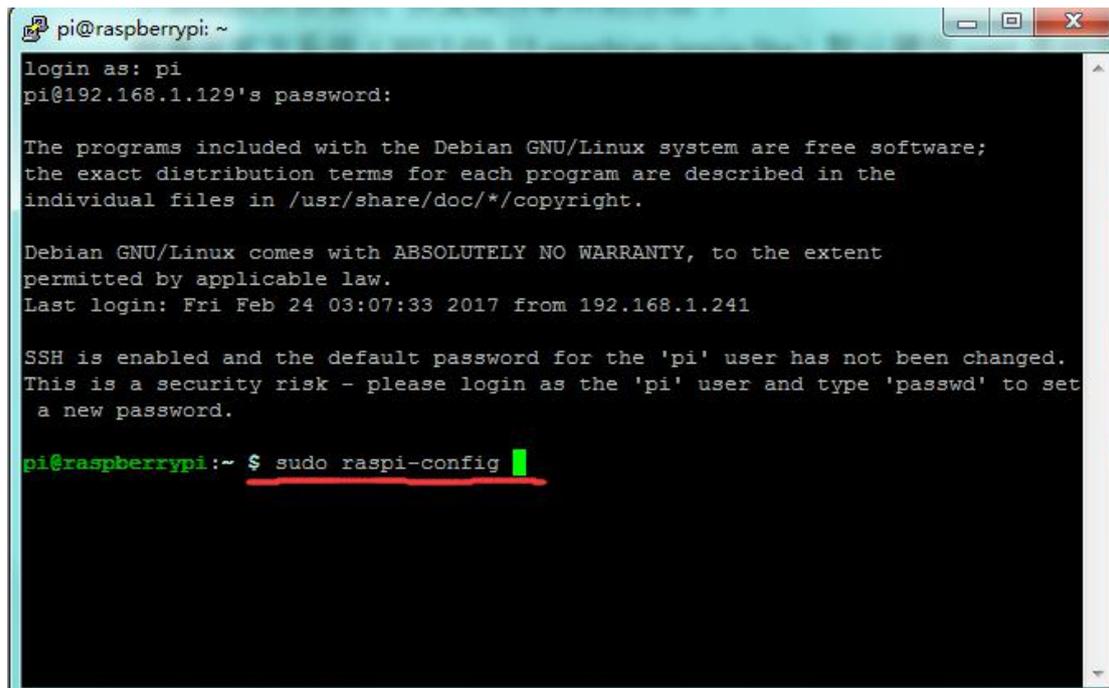
4) Reboot the RPi

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sudo reboot

C. Write **sudo raspi-config** in the terminal, select **Advanced Options**

---> **Serial** ---> **disable** to close serial port debugging.



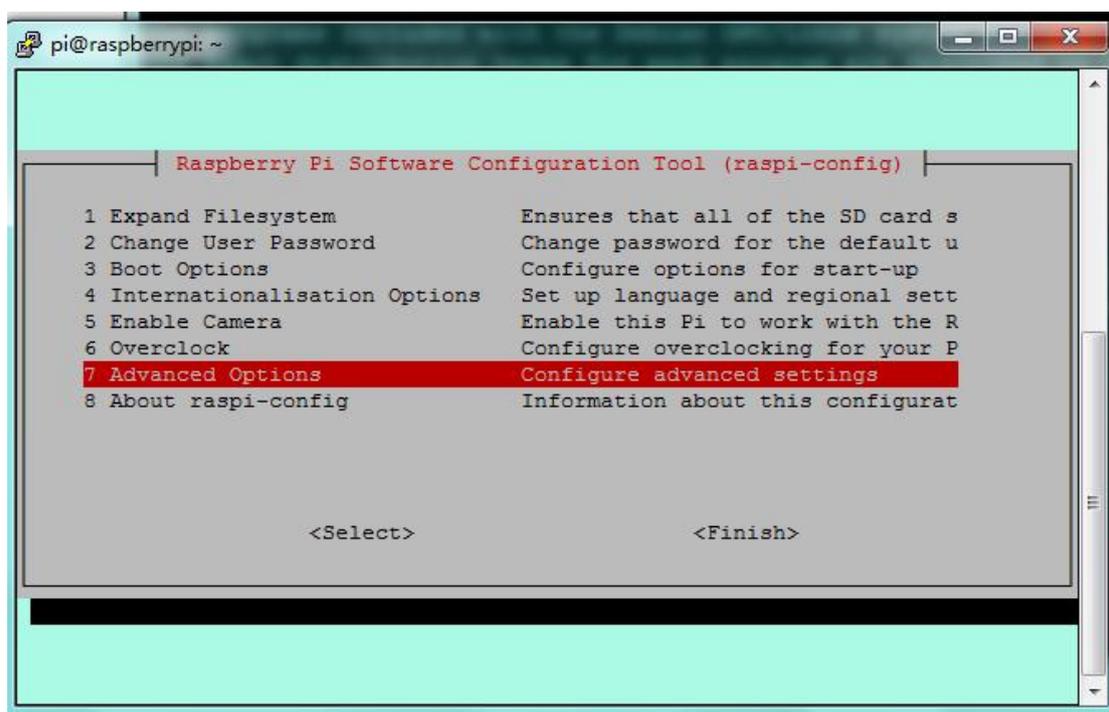
```
pi@raspberrypi: ~
login as: pi
pi@192.168.1.129's password:

The programs included with the Debian GNU/Linux system are free software;
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individual files in /usr/share/doc/*/copyright.

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permitted by applicable law.
Last login: Fri Feb 24 03:07:33 2017 from 192.168.1.241

SSH is enabled and the default password for the 'pi' user has not been changed.
This is a security risk - please login as the 'pi' user and type 'passwd' to set
a new password.

pi@raspberrypi:~ $ sudo raspi-config
```

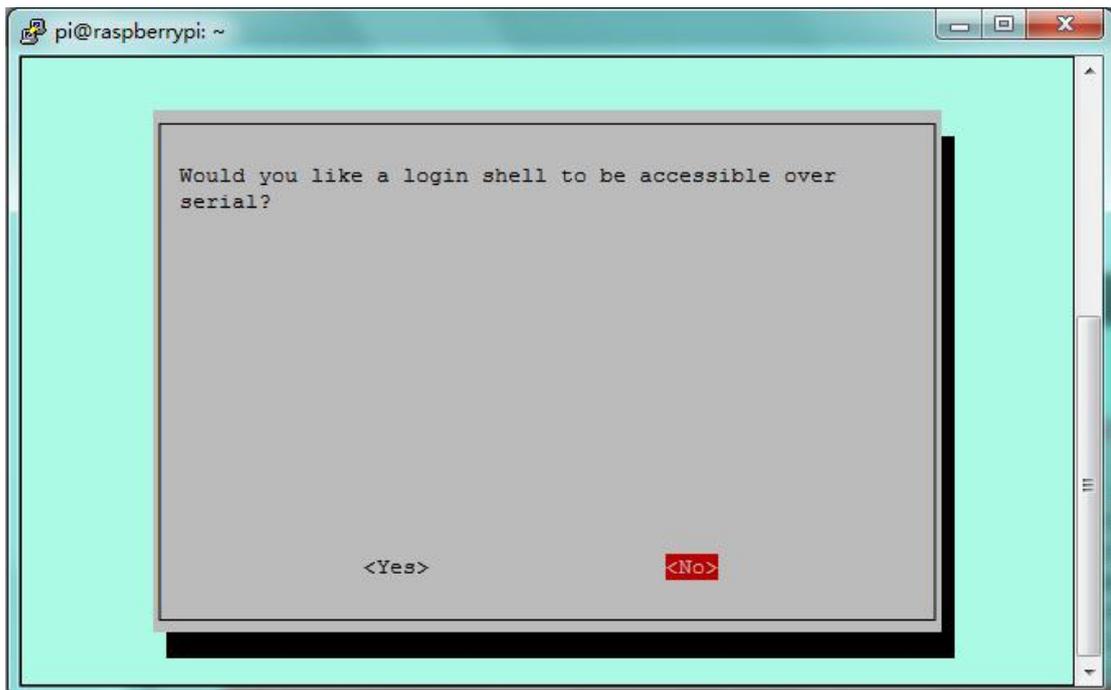
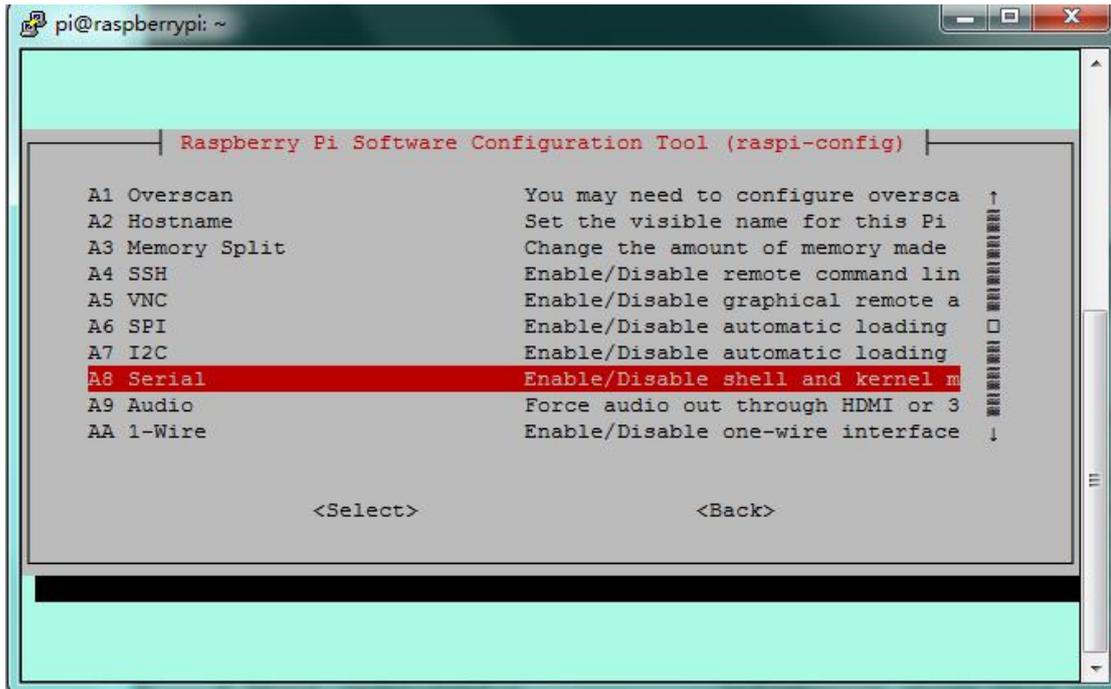


```
pi@raspberrypi: ~
Raspberry Pi Software Configuration Tool (raspi-config)

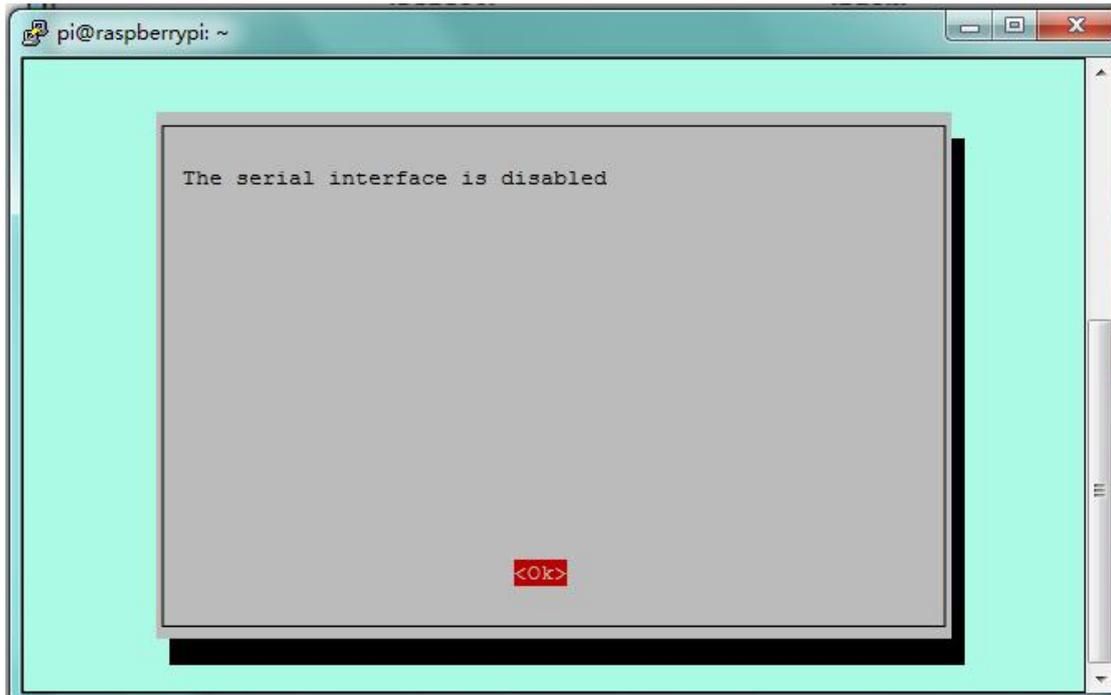
1 Expand Filesystem          Ensures that all of the SD card s
2 Change User Password       Change password for the default u
3 Boot Options               Configure options for start-up
4 Internationalisation Options Set up language and regional sett
5 Enable Camera              Enable this Pi to work with the R
6 Overclock                  Configure overclocking for your P
7 Advanced Options          Configure advanced settings
8 About raspi-config         Information about this configurat

<Select>                    <Finish>
```

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D. Reboot the Pi

sudo reboot

E. A great way to test out the serial port is to use the minicom program.

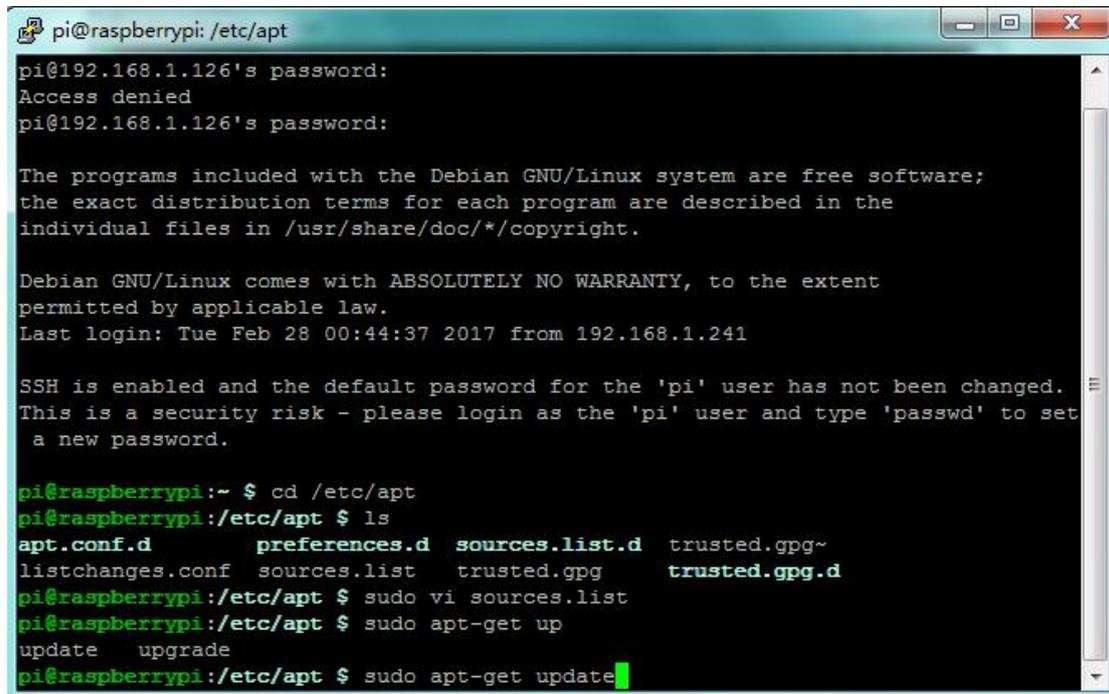
When installing it, you may sometimes can't find download path of source code.

So you can write `cd /etc/apt` in the terminal, and then edit **sudo vi sources.list** to modify address.

```
deb http://mirrors.tuna.tsinghua.edu.cn/raspbian/raspbian/ wheezy main contrib r
on-free rpi
# Uncomment line below then 'apt-get update' to enable 'apt-get source'
#deb-src http://archive.raspbian.org/raspbian/ jessie main contrib non-free rpi
~
```


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Save your change and exit. Write `sudo apt-get update` in the terminal to update.



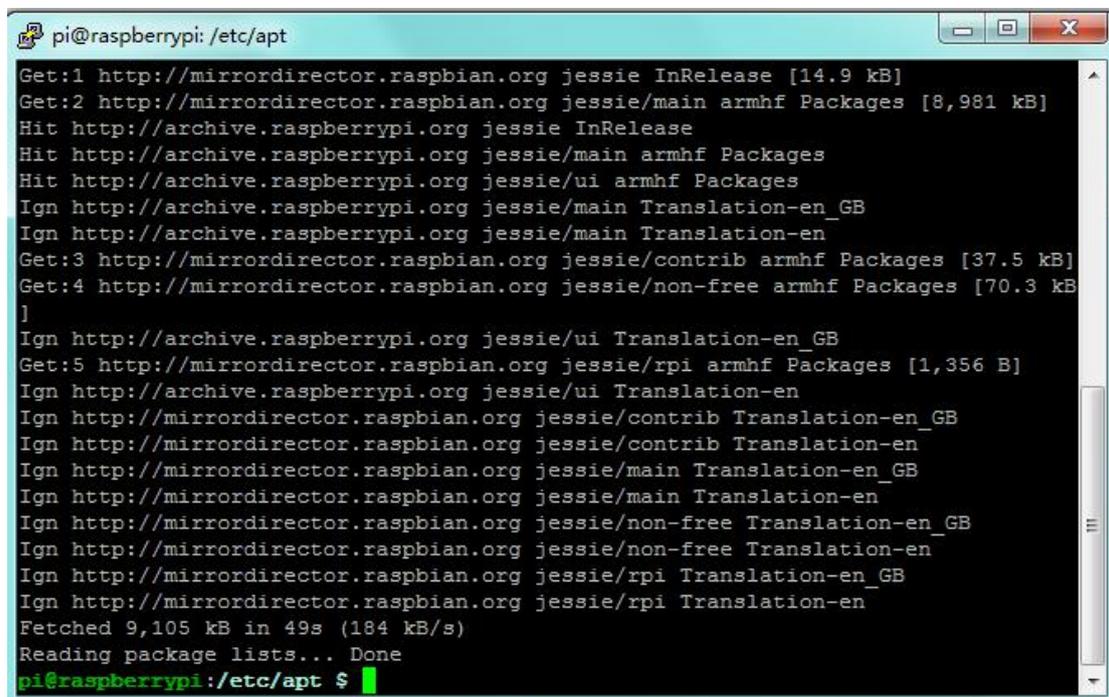
```
pi@raspberrypi: /etc/apt
pi@192.168.1.126's password:
Access denied
pi@192.168.1.126's password:

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the exact distribution terms for each program are described in the
individual files in /usr/share/doc/*/copyright.

Debian GNU/Linux comes with ABSOLUTELY NO WARRANTY, to the extent
permitted by applicable law.
Last login: Tue Feb 28 00:44:37 2017 from 192.168.1.241

SSH is enabled and the default password for the 'pi' user has not been changed.
This is a security risk - please login as the 'pi' user and type 'passwd' to set
a new password.

pi@raspberrypi:~ $ cd /etc/apt
pi@raspberrypi:/etc/apt $ ls
apt.conf.d      preferences.d  sources.list.d  trusted.gpg~
listchanges.conf  sources.list  trusted.gpg     trusted.gpg.d
pi@raspberrypi:/etc/apt $ sudo vi sources.list
pi@raspberrypi:/etc/apt $ sudo apt-get up
update upgrade
pi@raspberrypi:/etc/apt $ sudo apt-get update
```

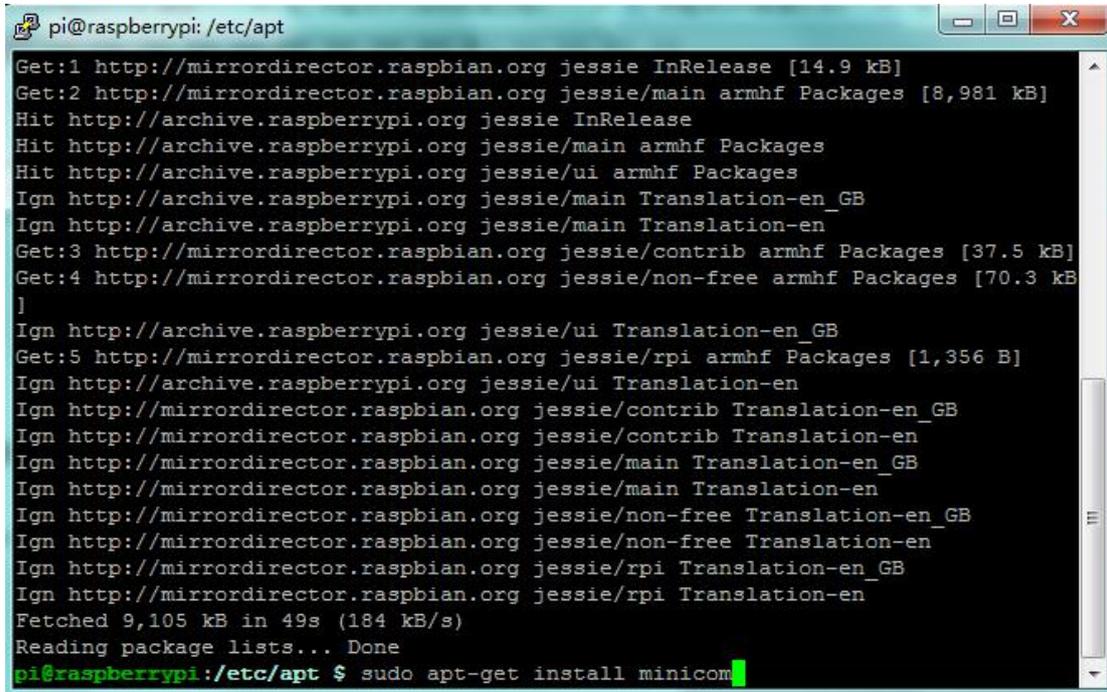


```
pi@raspberrypi: /etc/apt
Get:1 http://mirrordirector.raspbian.org jessie InRelease [14.9 kB]
Get:2 http://mirrordirector.raspbian.org jessie/main armhf Packages [8,981 kB]
Hit http://archive.raspberrypi.org jessie InRelease
Hit http://archive.raspberrypi.org jessie/main armhf Packages
Hit http://archive.raspberrypi.org jessie/ui armhf Packages
Ign http://archive.raspberrypi.org jessie/main Translation-en_GB
Ign http://archive.raspberrypi.org jessie/main Translation-en
Get:3 http://mirrordirector.raspbian.org jessie/contrib armhf Packages [37.5 kB]
Get:4 http://mirrordirector.raspbian.org jessie/non-free armhf Packages [70.3 kB]
]
Ign http://archive.raspberrypi.org jessie/ui Translation-en_GB
Get:5 http://mirrordirector.raspbian.org jessie/rpi armhf Packages [1,356 B]
Ign http://archive.raspberrypi.org jessie/ui Translation-en
Ign http://mirrordirector.raspbian.org jessie/contrib Translation-en_GB
Ign http://mirrordirector.raspbian.org jessie/contrib Translation-en
Ign http://mirrordirector.raspbian.org jessie/main Translation-en_GB
Ign http://mirrordirector.raspbian.org jessie/main Translation-en
Ign http://mirrordirector.raspbian.org jessie/non-free Translation-en_GB
Ign http://mirrordirector.raspbian.org jessie/non-free Translation-en
Ign http://mirrordirector.raspbian.org jessie/rpi Translation-en_GB
Ign http://mirrordirector.raspbian.org jessie/rpi Translation-en
Fetched 9,105 kB in 49s (184 kB/s)
Reading package lists... Done
pi@raspberrypi:/etc/apt $
```

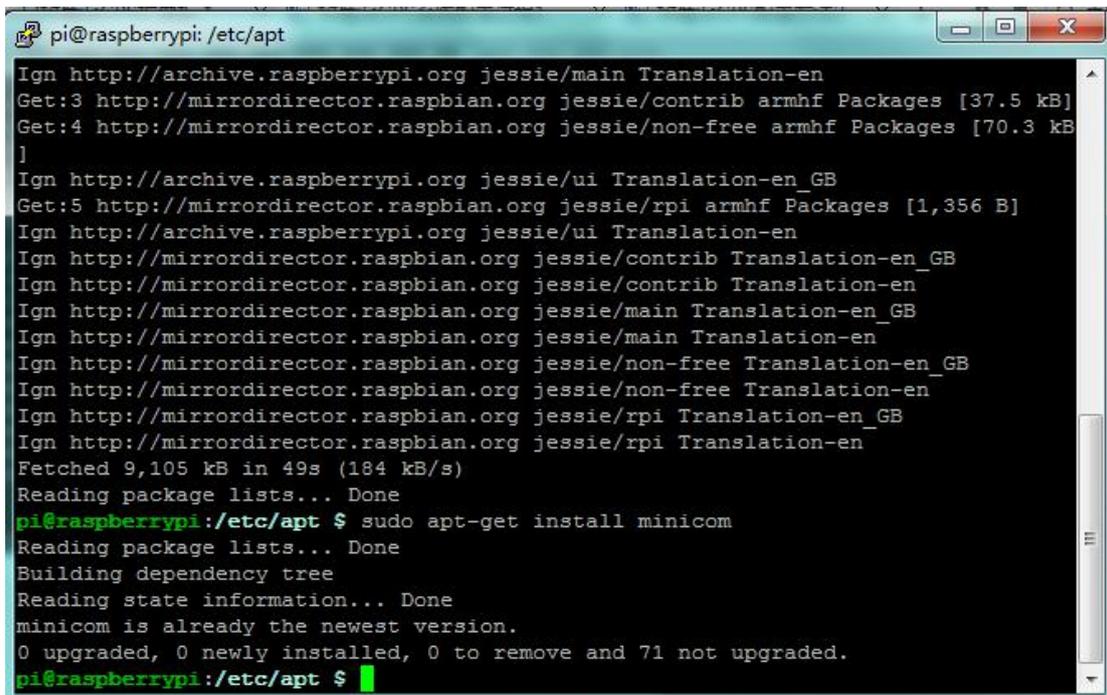
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F. You can install Minicom using the following command:

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



```
pi@raspberrypi: /etc/apt
Get:1 http://mirrordirector.raspbian.org jessie InRelease [14.9 kB]
Get:2 http://mirrordirector.raspbian.org jessie/main armhf Packages [8,981 kB]
Hit http://archive.raspberrypi.org jessie InRelease
Hit http://archive.raspberrypi.org jessie/main armhf Packages
Hit http://archive.raspberrypi.org jessie/ui armhf Packages
Ign http://archive.raspberrypi.org jessie/main Translation-en_GB
Ign http://archive.raspberrypi.org jessie/main Translation-en
Get:3 http://mirrordirector.raspbian.org jessie/contrib armhf Packages [37.5 kB]
Get:4 http://mirrordirector.raspbian.org jessie/non-free armhf Packages [70.3 kB]
]
Ign http://archive.raspberrypi.org jessie/ui Translation-en_GB
Get:5 http://mirrordirector.raspbian.org jessie/rpi armhf Packages [1,356 B]
Ign http://archive.raspberrypi.org jessie/ui Translation-en
Ign http://mirrordirector.raspbian.org jessie/contrib Translation-en_GB
Ign http://mirrordirector.raspbian.org jessie/contrib Translation-en
Ign http://mirrordirector.raspbian.org jessie/main Translation-en_GB
Ign http://mirrordirector.raspbian.org jessie/main Translation-en
Ign http://mirrordirector.raspbian.org jessie/non-free Translation-en_GB
Ign http://mirrordirector.raspbian.org jessie/non-free Translation-en
Ign http://mirrordirector.raspbian.org jessie/rpi Translation-en_GB
Ign http://mirrordirector.raspbian.org jessie/rpi Translation-en
Fetched 9,105 kB in 49s (184 kB/s)
Reading package lists... Done
pi@raspberrypi: /etc/apt $ sudo apt-get install minicom
```



```
pi@raspberrypi: /etc/apt
Ign http://archive.raspberrypi.org jessie/main Translation-en
Get:3 http://mirrordirector.raspbian.org jessie/contrib armhf Packages [37.5 kB]
Get:4 http://mirrordirector.raspbian.org jessie/non-free armhf Packages [70.3 kB]
]
Ign http://archive.raspberrypi.org jessie/ui Translation-en_GB
Get:5 http://mirrordirector.raspbian.org jessie/rpi armhf Packages [1,356 B]
Ign http://archive.raspberrypi.org jessie/ui Translation-en
Ign http://mirrordirector.raspbian.org jessie/contrib Translation-en_GB
Ign http://mirrordirector.raspbian.org jessie/contrib Translation-en
Ign http://mirrordirector.raspbian.org jessie/main Translation-en_GB
Ign http://mirrordirector.raspbian.org jessie/main Translation-en
Ign http://mirrordirector.raspbian.org jessie/non-free Translation-en_GB
Ign http://mirrordirector.raspbian.org jessie/non-free Translation-en
Ign http://mirrordirector.raspbian.org jessie/rpi Translation-en_GB
Ign http://mirrordirector.raspbian.org jessie/rpi Translation-en
Fetched 9,105 kB in 49s (184 kB/s)
Reading package lists... Done
pi@raspberrypi: /etc/apt $ sudo apt-get install minicom
Reading package lists... Done
Building dependency tree
Reading state information... Done
minicom is already the newest version.
0 upgraded, 0 newly installed, 0 to remove and 71 not upgraded.
pi@raspberrypi: /etc/apt $
```

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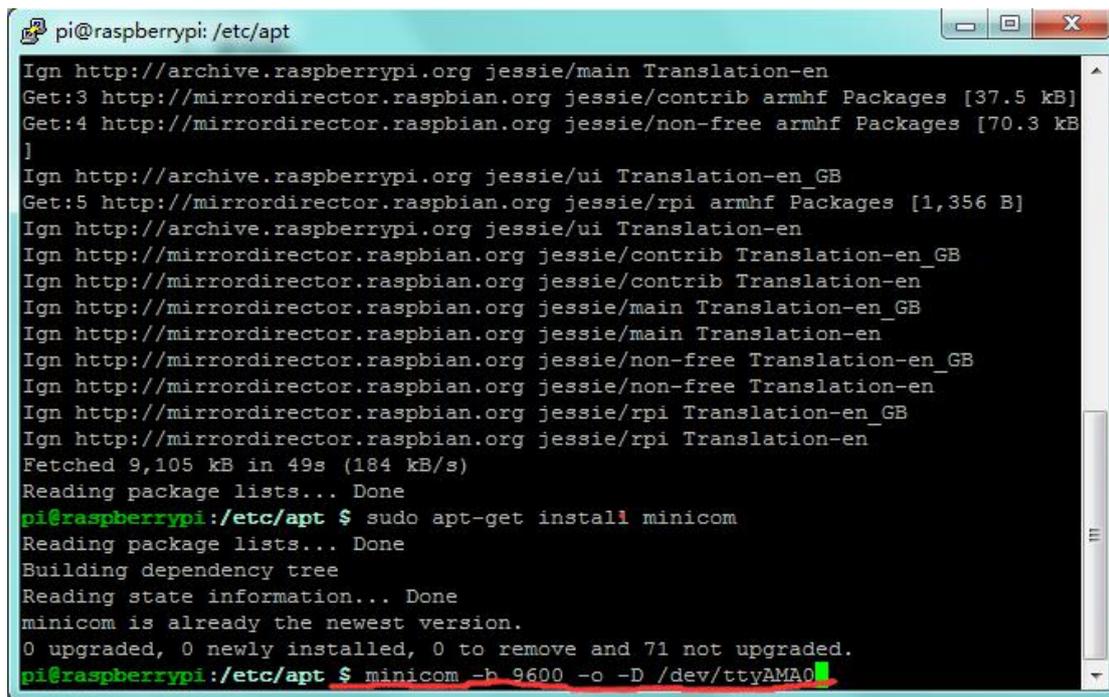
G. You can then use Minicom to send and receive data over the serial

port: `minicom -b 9600 -o -D /dev/ttyAMA0`

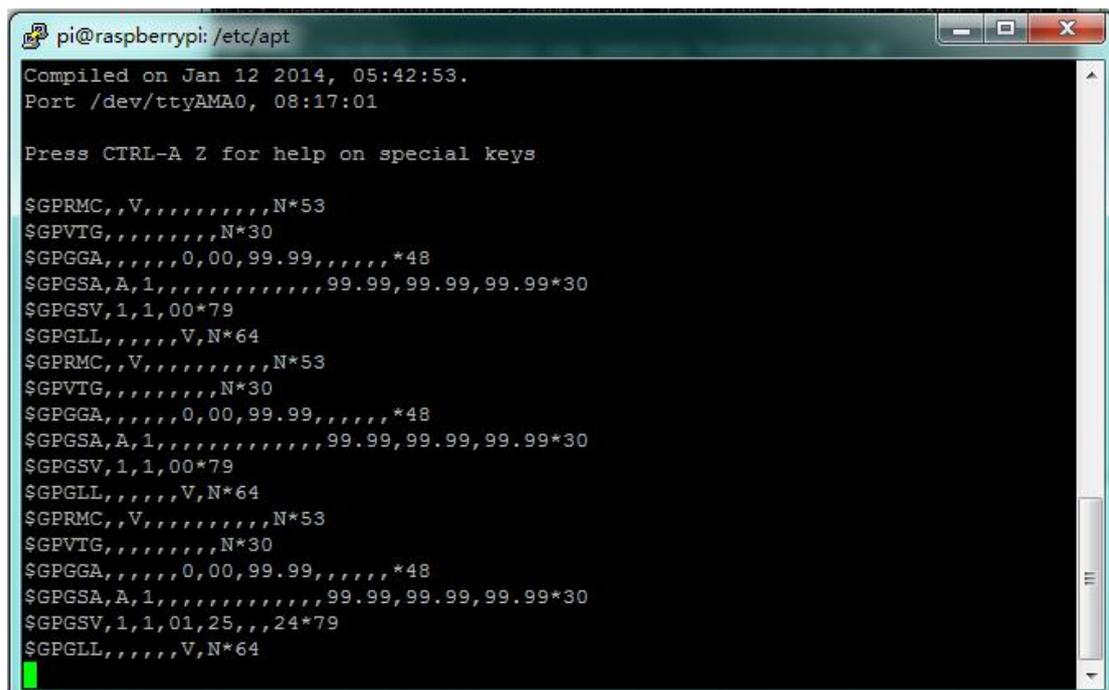
-b to set baud rate, the same as that of module;

-o dis-initialized Mode and an unlock file;

-D define interface.



```
pi@raspberrypi: /etc/apt
Ign http://archive.raspberrypi.org jessie/main Translation-en
Get:3 http://mirrordirector.raspbian.org jessie/contrib armhf Packages [37.5 kB]
Get:4 http://mirrordirector.raspbian.org jessie/non-free armhf Packages [70.3 kB]
]
Ign http://archive.raspberrypi.org jessie/ui Translation-en_GB
Get:5 http://mirrordirector.raspbian.org jessie/rpi armhf Packages [1,356 B]
Ign http://archive.raspberrypi.org jessie/ui Translation-en
Ign http://mirrordirector.raspbian.org jessie/contrib Translation-en_GB
Ign http://mirrordirector.raspbian.org jessie/contrib Translation-en
Ign http://mirrordirector.raspbian.org jessie/main Translation-en_GB
Ign http://mirrordirector.raspbian.org jessie/main Translation-en
Ign http://mirrordirector.raspbian.org jessie/non-free Translation-en_GB
Ign http://mirrordirector.raspbian.org jessie/non-free Translation-en
Ign http://mirrordirector.raspbian.org jessie/rpi Translation-en_GB
Ign http://mirrordirector.raspbian.org jessie/rpi Translation-en
Fetched 9,105 kB in 49s (184 kB/s)
Reading package lists... Done
pi@raspberrypi: /etc/apt $ sudo apt-get install minicom
Reading package lists... Done
Building dependency tree
Reading state information... Done
minicom is already the newest version.
0 upgraded, 0 newly installed, 0 to remove and 71 not upgraded.
pi@raspberrypi: /etc/apt $ minicom -b 9600 -o -D /dev/ttyAMA0
```



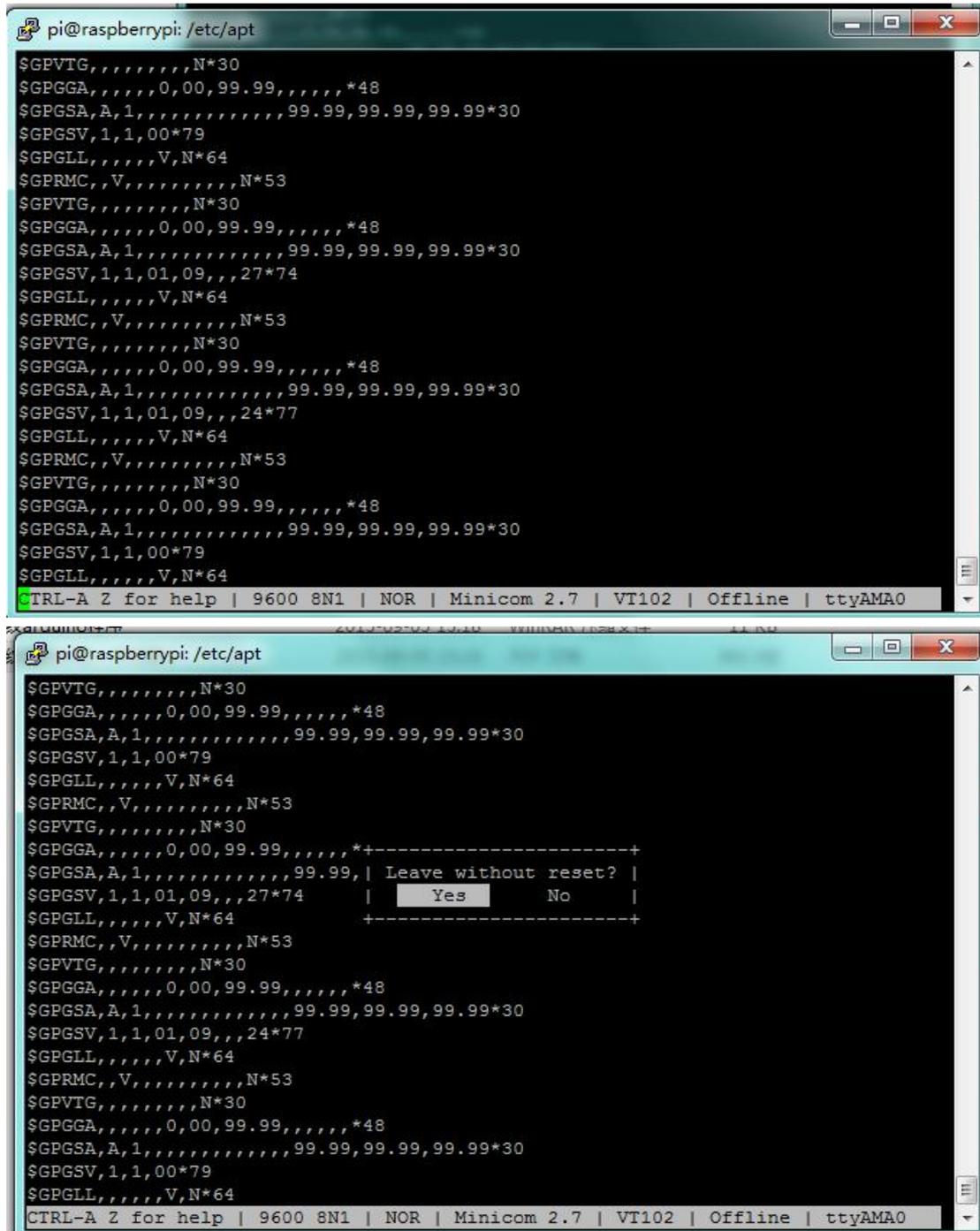
```
pi@raspberrypi: /etc/apt
Compiled on Jan 12 2014, 05:42:53.
Port /dev/ttyAMA0, 08:17:01

Press CTRL-A Z for help on special keys

$GPRMC,V,,,,,,,,,N*53
$GPVTG,,,,,,,,,N*30
$GPGGA,,,,,0,00,99.99,,,,,*48
$GPGSA,A,1,,,,,,,,,99.99,99.99,99.99*30
$GPGSV,1,1,00*79
$GPGLL,,,,,V,N*64
$GPRMC,V,,,,,,,,,N*53
$GPVTG,,,,,,,,,N*30
$GPGGA,,,,,0,00,99.99,,,,,*48
$GPGSA,A,1,,,,,,,,,99.99,99.99,99.99*30
$GPGSV,1,1,00*79
$GPGLL,,,,,V,N*64
$GPRMC,V,,,,,,,,,N*53
$GPVTG,,,,,,,,,N*30
$GPGGA,,,,,0,00,99.99,,,,,*48
$GPGSA,A,1,,,,,,,,,99.99,99.99,99.99*30
$GPGSV,1,1,01,25,,24*79
$GPGLL,,,,,V,N*64
```

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H. Ctrl+A , press Q to exit.



The image shows two screenshots of a terminal window on a Raspberry Pi. The terminal title is 'pi@raspberrypi: /etc/apt'. The first screenshot displays a hex dump of data, with lines such as '\$GPVTG,,,,,,N*30', '\$GPGGA,,,,,0,00,99.99,,,,,*48', '\$GPGSA,A,1,,,,,,99.99,99.99,99.99*30', '\$GPGSV,1,1,00*79', '\$GPGLL,,,,,V,N*64', '\$GPRMC,,V,,,,,,N*53', '\$GPVTG,,,,,,N*30', '\$GPGGA,,,,,0,00,99.99,,,,,*48', '\$GPGSA,A,1,,,,,,99.99,99.99,99.99*30', '\$GPGSV,1,1,01,09,,,27*74', '\$GPGLL,,,,,V,N*64', '\$GPRMC,,V,,,,,,N*53', '\$GPVTG,,,,,,N*30', '\$GPGGA,,,,,0,00,99.99,,,,,*48', '\$GPGSA,A,1,,,,,,99.99,99.99,99.99*30', '\$GPGSV,1,1,01,09,,,24*77', '\$GPGLL,,,,,V,N*64', '\$GPRMC,,V,,,,,,N*53', '\$GPVTG,,,,,,N*30', '\$GPGGA,,,,,0,00,99.99,,,,,*48', '\$GPGSA,A,1,,,,,,99.99,99.99,99.99*30', '\$GPGSV,1,1,00*79', '\$GPGLL,,,,,V,N*64'. The status bar at the bottom reads 'CTRL-A Z for help | 9600 8N1 | NOR | Minicom 2.7 | VT102 | Offline | ttyAMA0'. The second screenshot shows the same hex dump, but with a confirmation dialog box overlaid on the lines '\$GPGSV,1,1,01,09,,,27*74' and '\$GPGLL,,,,,V,N*64'. The dialog asks 'Leave without reset?' and has 'Yes' and 'No' buttons. The status bar is the same as in the first screenshot.