digi Pi HAT

Guide

Rev 1.2

Elekitsorparts Store

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digi Pi Software Guide

Introduction

This is a step by step guide of configuration for getting the digi Pi to work on Raspberry Pi4. For Raspberry Pi3, the steps and guides here may not have very big differences. However, we suggest to upgrade your Pi3 to Pi4 (4GB or larger), as the Pi4 is more powerful and has a bigger RAM, it should work friendly and smoothly with the various ham radio softwares on linux.

This tutorial suppose you have had your own Raspbian freshly installed and configured with your WiFi. If not, please go to www.raspberrypi.org , download a new copy of Raspbian (with GUI desktop), and follow their guides to have it installed. Do not forget to add the WiFi connection or just use the Ethernet port.

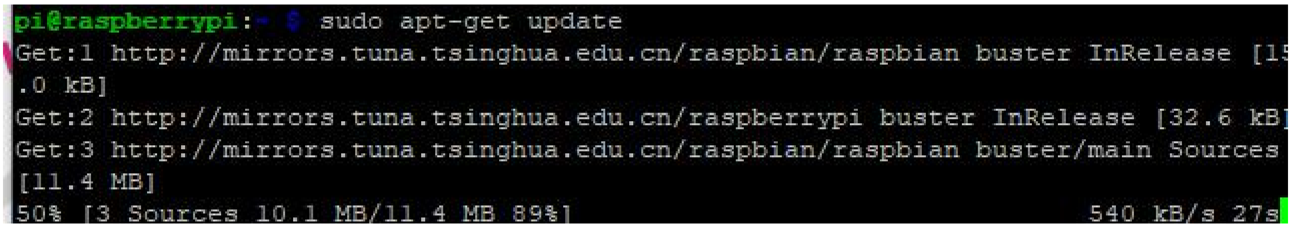
If there is no monitors connected to your Pi, do not forget to open SSH and start the VNC service.

Please note that this guide only focus on software configuring of digi Pi's internal sound card and the true hardware serial port on Pi4, the installation of ham radio digi mode softwares in Linux and the use of them are not covered, so you have to read other documents or manuals for detailed information. We highly recommend to use the "HAM PI" image, which has integrated most of the ham radio softwares in Linux, for more info, see https://github.com/dslotter/HamPi, http://hampi.radiowaves.ca/

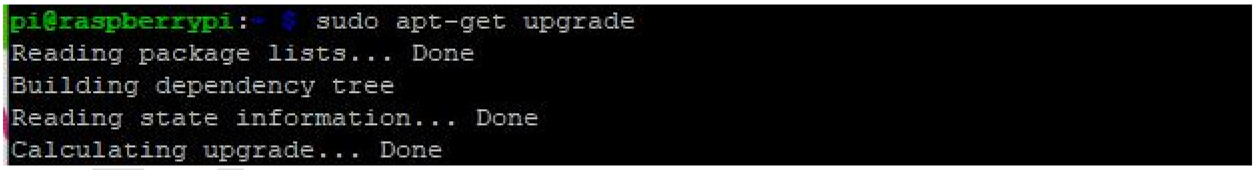
VERY IMPORTANT: Please open a terminal on your Pi and run software update process before we go to next step.

sudo apt-get update

sudo apt-get upgrade



```
pi@raspberrypi:~ $ sudo apt-get update
Get:1 http://mirrors.tuna.tsinghua.edu.cn/raspbian/raspbian buster InRelease [15
.0 kB]
Get:2 http://mirrors.tuna.tsinghua.edu.cn/raspberrypi buster InRelease [32.6 kB]
Get:3 http://mirrors.tuna.tsinghua.edu.cn/raspbian/raspbian buster/main Sources
[11.4 MB]
50% [3 Sources 10.1 MB/11.4 MB 89%]                          540 kB/s 27s
```



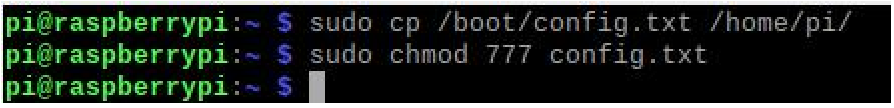
```
pi@raspberrypi:~ $ sudo apt-get upgrade
Reading package lists... Done
Building dependency tree
Reading state information... Done
Calculating upgrade... Done
```

Sound Card Configuration

Refer to "digi Pi Hardware Manual" and plug your digi Pi onto Pi4, connect a monitor and turn on your Raspberry Pi4. Start your Pi4 to the GUI desktop, and open a terminal and type the following commands:

sudo cp /boot/config.txt /home/pi/

sudo chmod 777 config.txt



```
pi@raspberrypi:~ $ sudo cp /boot/config.txt /home/pi/
pi@raspberrypi:~ $ sudo chmod 777 config.txt
pi@raspberrypi:~ $
```

sudo nano config.txt

Find out the line that says:

dtparam=audio=on

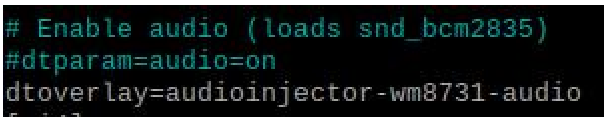
modify this line to:

#dtparam=audio=on

this will disable the original sound card on Pi4.

Next, add the following:

dtoverlay=audioinjector-wm8731-audio



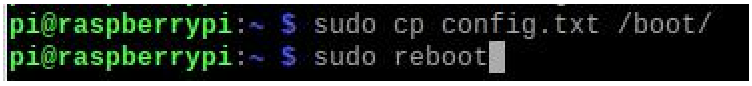
```
# Enable audio (loads snd_bcm2835)
#dtparam=audio=on
dtoverlay=audioinjector-wm8731-audio
```

Next, press CTRL+O, and then CTRL+X, this will exit the NANO editor. Now, in the terminal, type:

sudo cp config.txt /boot/

This will copy config.txt back to its original location. It’s time to reboot...

sudo reboot



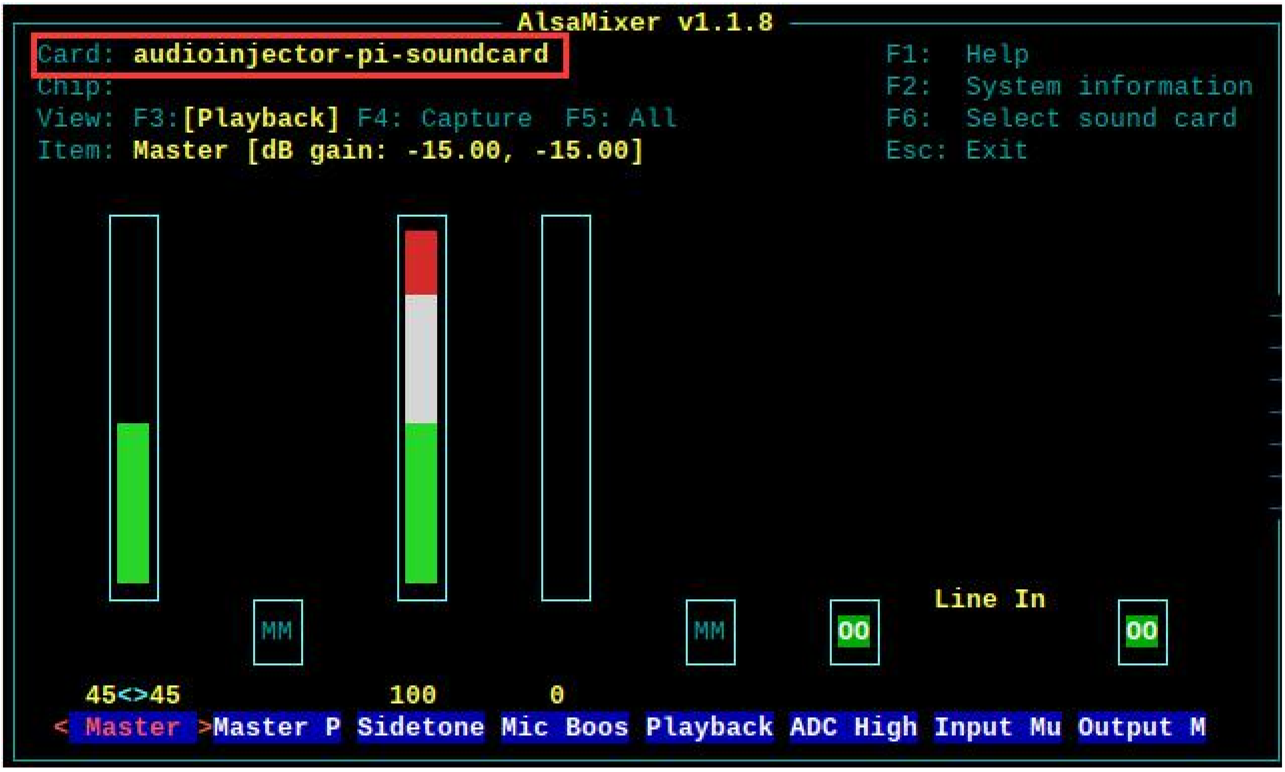
```
pi@raspberrypi:~ $ sudo cp config.txt /boot/
pi@raspberrypi:~ $ sudo reboot
```

Once rebooted, open a terminal in GUI desktop again, type: alsamixer and press ENTER

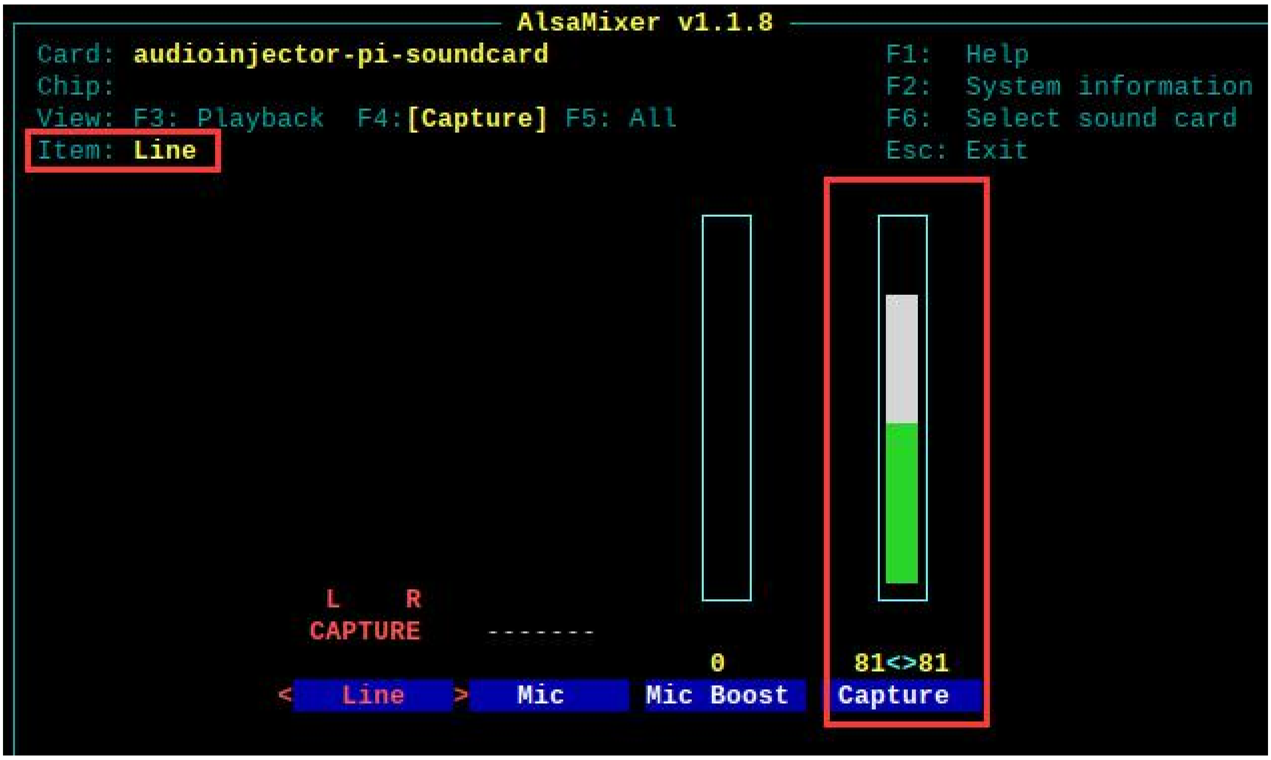
alsamixer

```
pi@raspberrypi:~ $ alsamixer
```

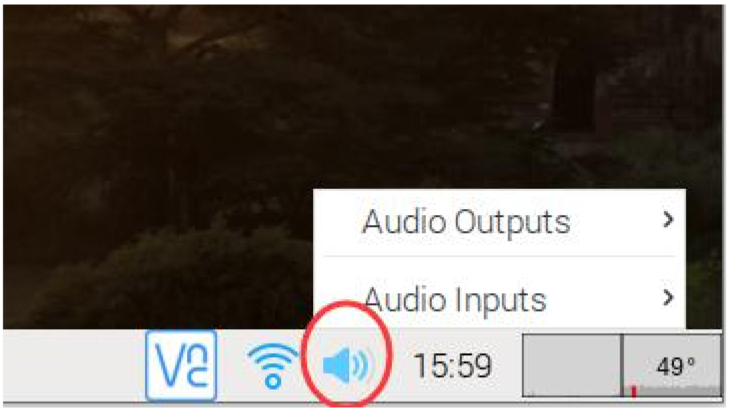
You will find that the name of sound card has been changed to “audioinjector-pi-soundcard”, press F4 on your keyboard, it will switch to another view. You can change the capture gain with the arrow keys on keyboard, you can also do it from the “Input Device Options” window(right click the speaker icon on the bottom right corner).

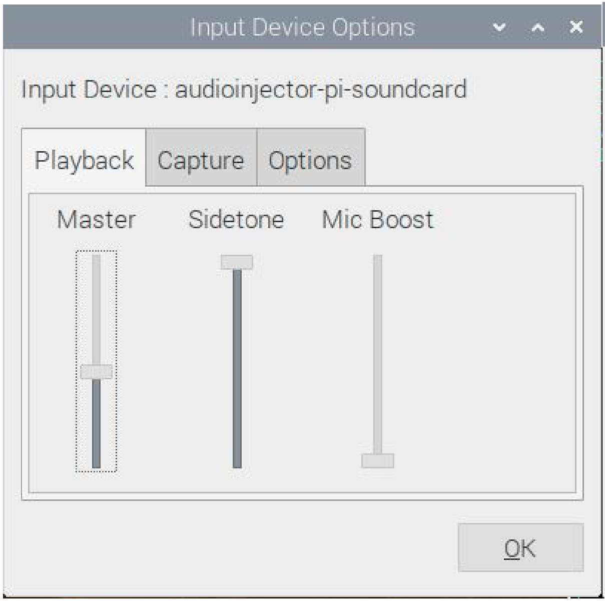


```
                          AlsaMixer v1.1.8
Card: audioinjector-pi-soundcard                  F1:  Help
Chip:                                             F2:  System information
View: F3:[Playback] F4: Capture  F5: All          F6:  Select sound card
Item: Master [dB gain: -15.00, -15.00]            Esc: Exit

                                                          Line In
           MM                      MM      OO                      OO

 45<>45              100      0
< Master >Master P Sidetone Mic Boos Playback ADC High Input Mu Output M
```

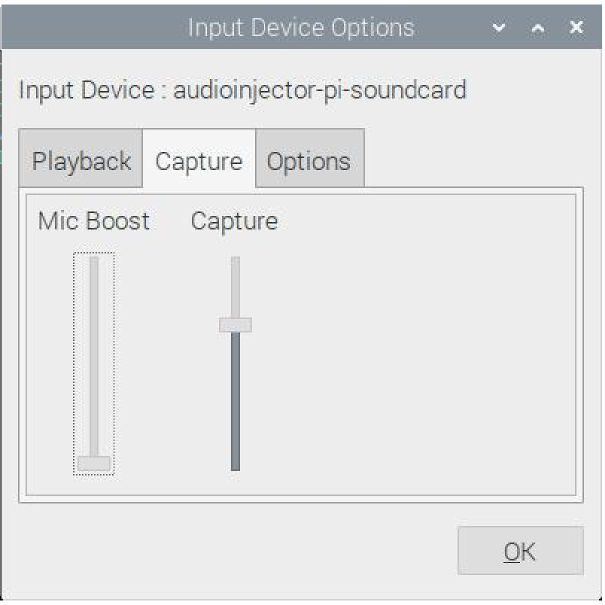


```
                          AlsaMixer v1.1.8
Card: audioinjector-pi-soundcard                  F1:  Help
Chip:                                             F2:  System information
View: F3: Playback  F4:[Capture] F5: All          F6:  Select sound card
Item: Line                                        Esc: Exit

                   L    R
                  CAPTURE     -------
                                          0        81<>81
                 <  Line   >   Mic     Mic Boost  Capture
```

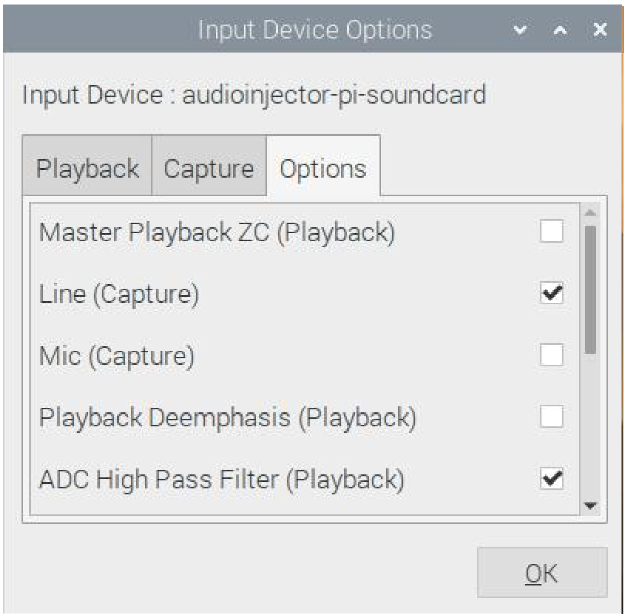




Input Device : audioinjector-pi-soundcard

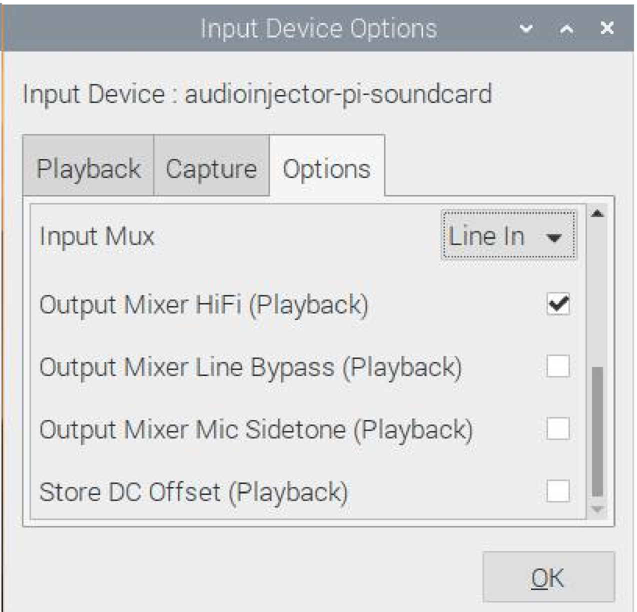


Input Device : audioinjector-pi-soundcard



Input Device : audioinjector-pi-soundcard

- Master Playback ZC (Playback) □
- Line (Capture) ☑
- Mic (Capture) □
- Playback Deemphasis (Playback) □
- ADC High Pass Filter (Playback) ☑



Input Device : audioinjector-pi-soundcard

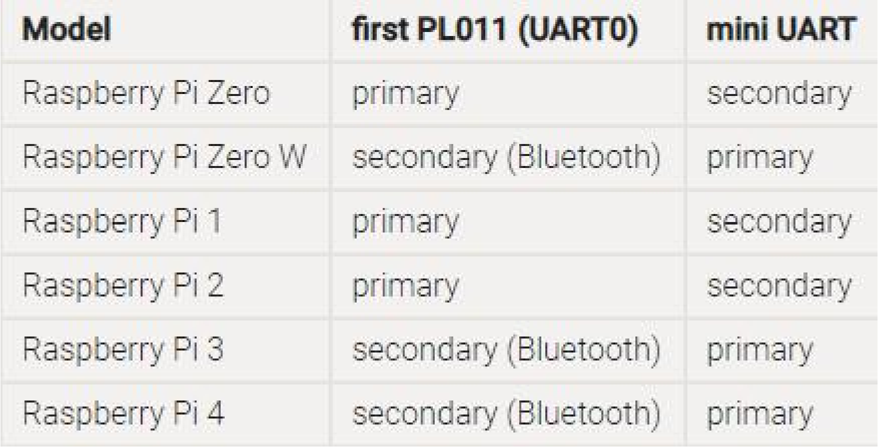
- Input Mux: Line In
- Output Mixer HiFi (Playback) ☑
- Output Mixer Line Bypass (Playback) □
- Output Mixer Mic Sidetone (Playback) □
- Store DC Offset (Playback) □

Now, connect an earphone to the MON jack on digi Pi, open “Chromium”, go to www.youtube.com, find a video and play it, and you will hear the audio from MON port, when playing, set the Playback volume to your preferred level.

Hardware Serial Port Configuration

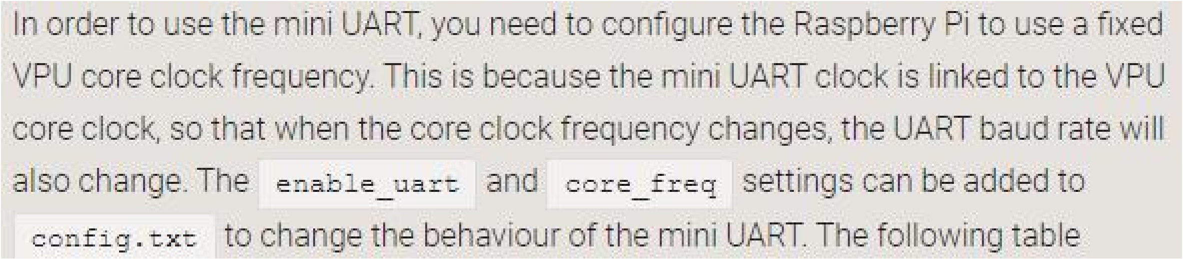
The digi Pi uses raspberry Pi's hardware serial(GPIO14 and GPIO15) for communication with your radio and external GPS. There is an on-board switch for switching between GPS and Radio.

On Pi4, the true hardware serial [first PL011(UART0)] is not enabled, and it is assigned to the bluetooth radio by default. Check here https://www.raspberrypi.org/documentation/configuration/uart.md for the more information.



Model	first PL011 (UART0)	mini UART
Raspberry Pi Zero	primary	secondary
Raspberry Pi Zero W	secondary (Bluetooth)	primary
Raspberry Pi 1	primary	secondary
Raspberry Pi 2	primary	secondary
Raspberry Pi 3	secondary (Bluetooth)	primary
Raspberry Pi 4	secondary (Bluetooth)	primary

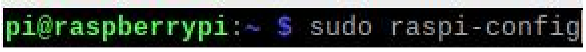
So we need to enable the hardware serial first, and then disable the bluetooth, these 2 steps will finally assign the 2 GPIOs to work with external GPS or your radio's CAT/CIV communication. If you just enable the hardware serial and not disable the bluetooth, the GPIO14 and GPIO15 will be combined to mini UART, which is complex to configure, and this is not what we want.



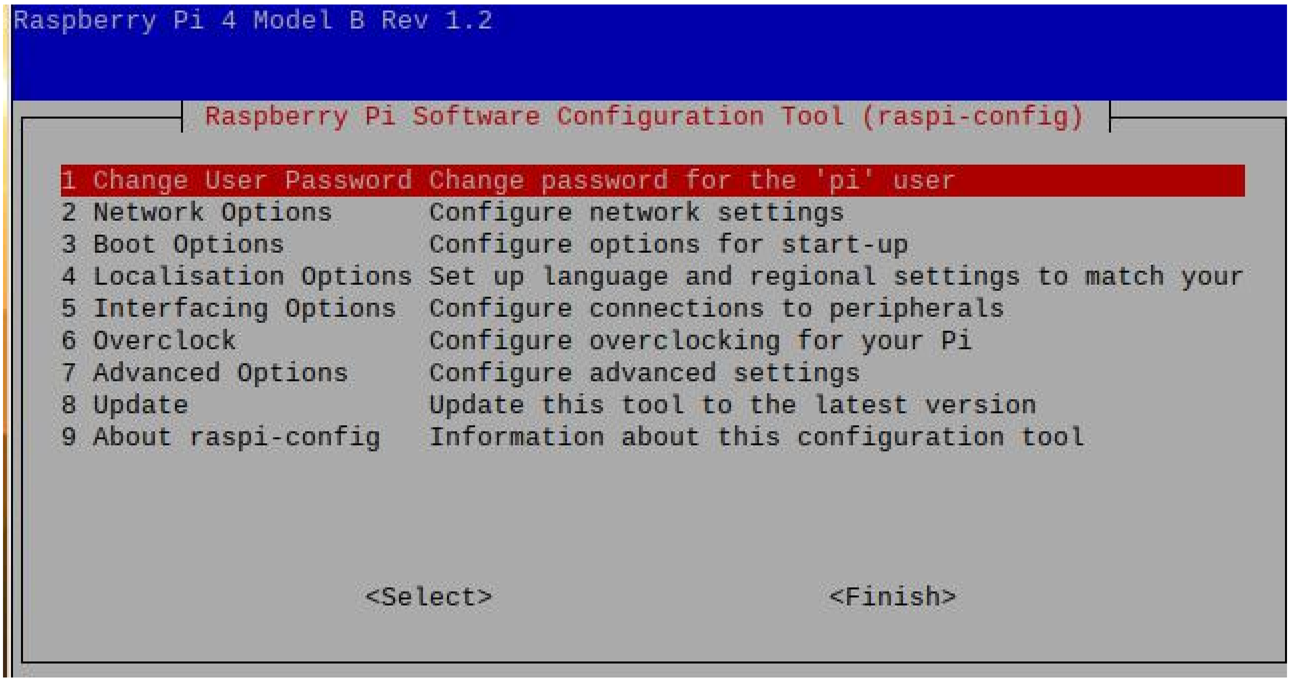
In order to use the mini UART, you need to configure the Raspberry Pi to use a fixed VPU core clock frequency. This is because the mini UART clock is linked to the VPU core clock, so that when the core clock frequency changes, the UART baud rate will also change. The `enable_uart` and `core_freq` settings can be added to `config.txt` to change the behaviour of the mini UART. The following table

Open a terminal from the GUI desktop, type:

sudo raspi-config

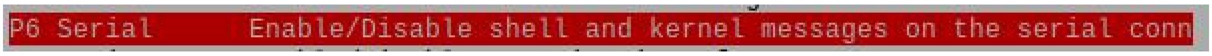


```
pi@raspberrypi:~ $ sudo raspi-config
```

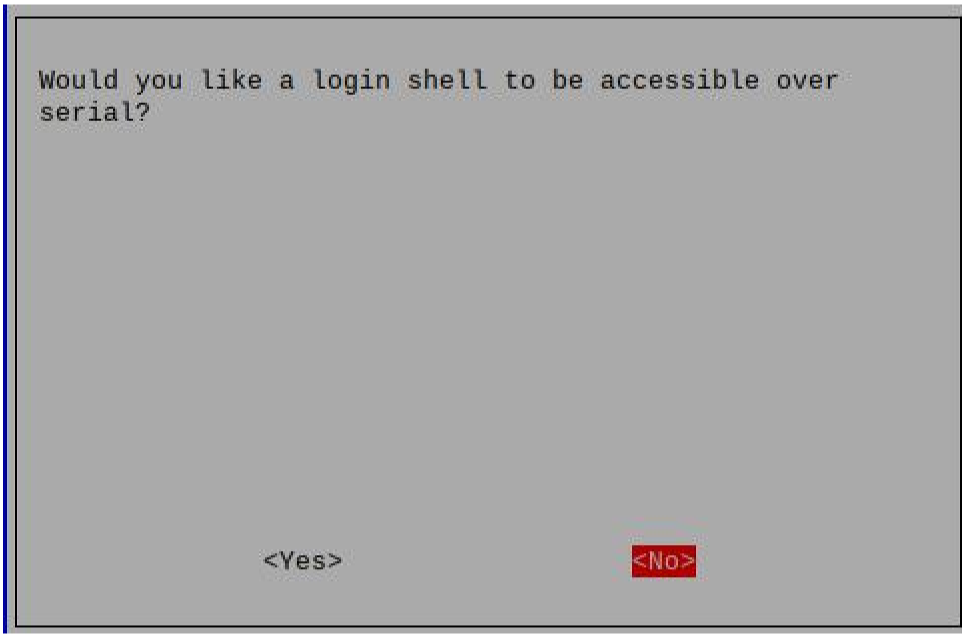


```
Raspberry Pi 4 Model B Rev 1.2

          Raspberry Pi Software Configuration Tool (raspi-config)

 1 Change User Password Change password for the 'pi' user
 2 Network Options      Configure network settings
 3 Boot Options         Configure options for start-up
 4 Localisation Options Set up language and regional settings to match your
 5 Interfacing Options  Configure connections to peripherals
 6 Overclock            Configure overclocking for your Pi
 7 Advanced Options     Configure advanced settings
 8 Update               Update this tool to the latest version
 9 About raspi-config   Information about this configuration tool


                 <Select>                    <Finish>
```

Select 5 to enter Interfacing Options, and then select P6 to get into Serial configuration. Now a message will prompt up, choose <No> and press ENTER.

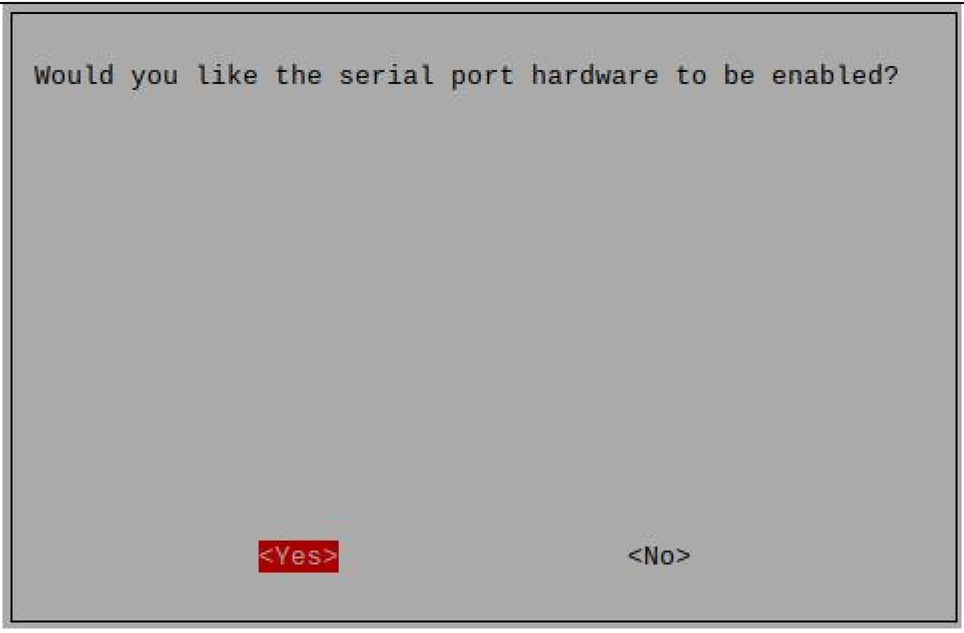


```
P6 Serial      Enable/Disable shell and kernel messages on the serial conn
```

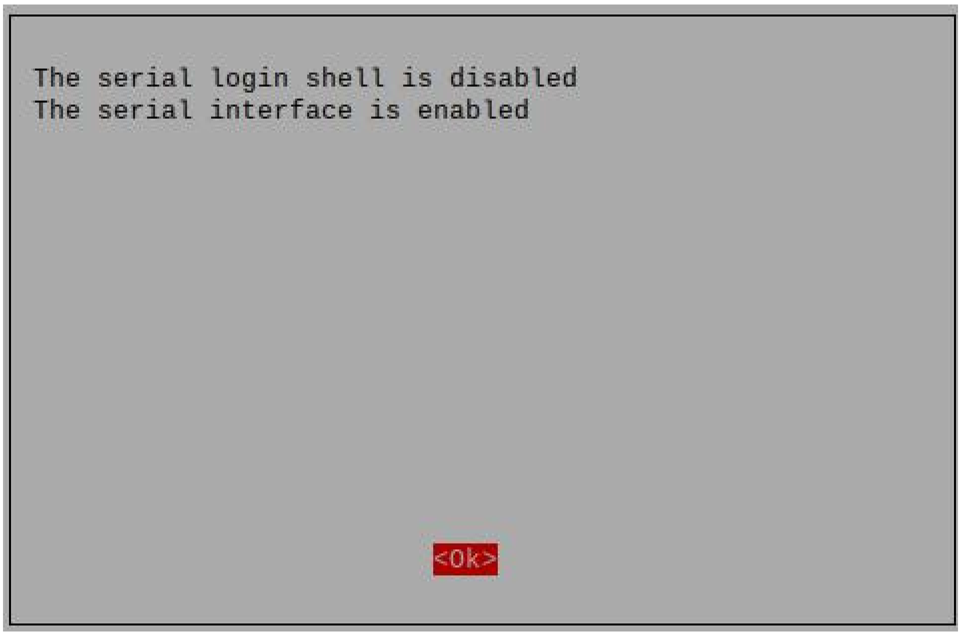


```
Would you like a login shell to be accessible over
serial?


          <Yes>                     <No>
```

On the next window, choose <Yes>.

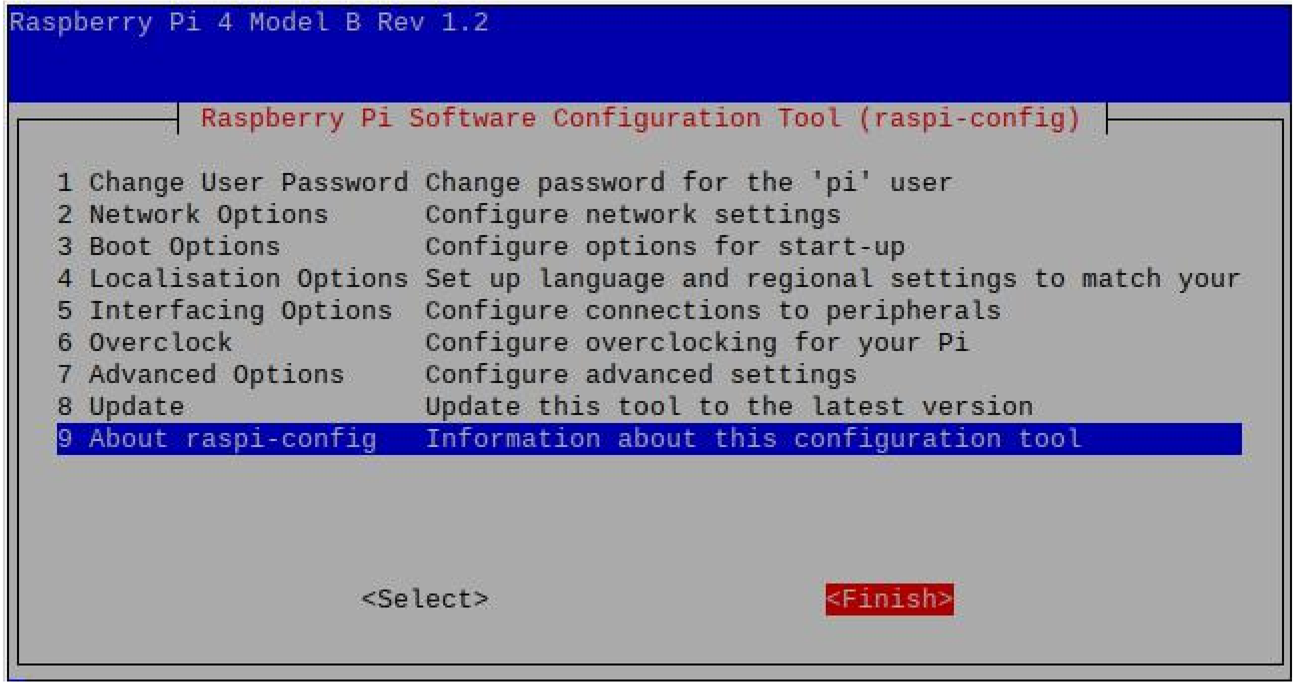


```
Would you like the serial port hardware to be enabled?
```



```
The serial login shell is disabled
The serial interface is enabled
```

Now return to the main menu, and choose <Finish> to exit to the terminal.



```
Raspberry Pi 4 Model B Rev 1.2

Raspberry Pi Software Configuration Tool (raspi-config)

1 Change User Password Change password for the 'pi' user
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6 Overclock            Configure overclocking for your Pi
7 Advanced Options     Configure advanced settings
8 Update               Update this tool to the latest version
9 About raspi-config   Information about this configuration tool
```

We have to reboot the system now, in terminal, type:

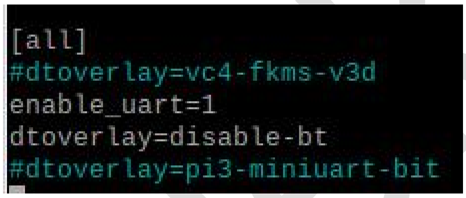
sudo reboot

We have to edit the config.txt again, so after reboot, open a terminal in GUI desktop, type:

sudo nano config.txt

In config.txt, go to the text section labeled with [ALL], change the text content with the following:

```
[ALL]
#dtoverlay=vc4-fkms-v3d
enable_uart=1
dtoverlay=disable-bt
#dtoverlay=pi3-miniuart-bit
```



```
[all]
#dtoverlay=vc4-fkms-v3d
enable_uart=1
dtoverlay=disable-bt
#dtoverlay=pi3-miniuart-bit
```

Press CTRL+O to write out and CTRL+X to exit. Now, reboot the Pi again.

sudo reboot

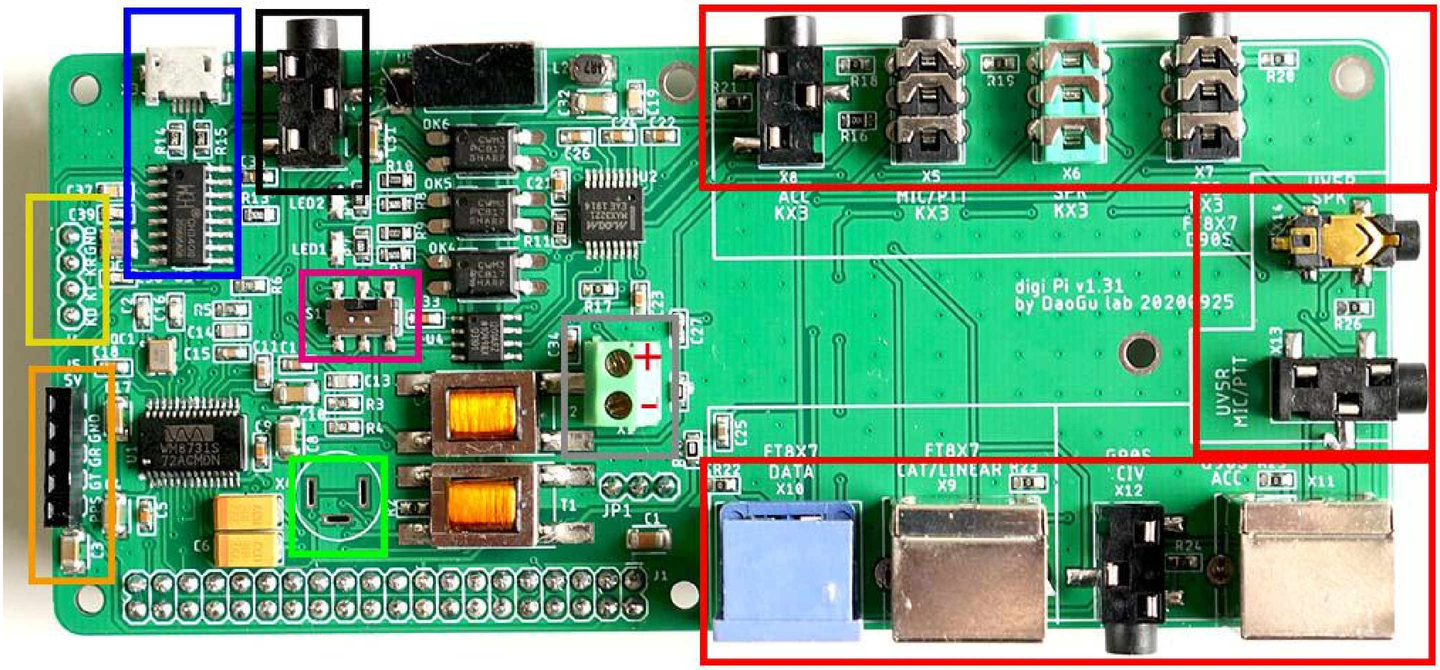
Now the GPIO14 and GPIO15 will be released from bluetooth radio, and the bluetooth is disabled also.

digi Pi Hardware Note

GPIO17 for PTT

GPIO16 for KX3 PWR REMOTE

Hardware Serial(GPIO14 and GPIO15): ttyAMA0



Ports: To Radios (KX3, FT8x7, G90, UV5R)

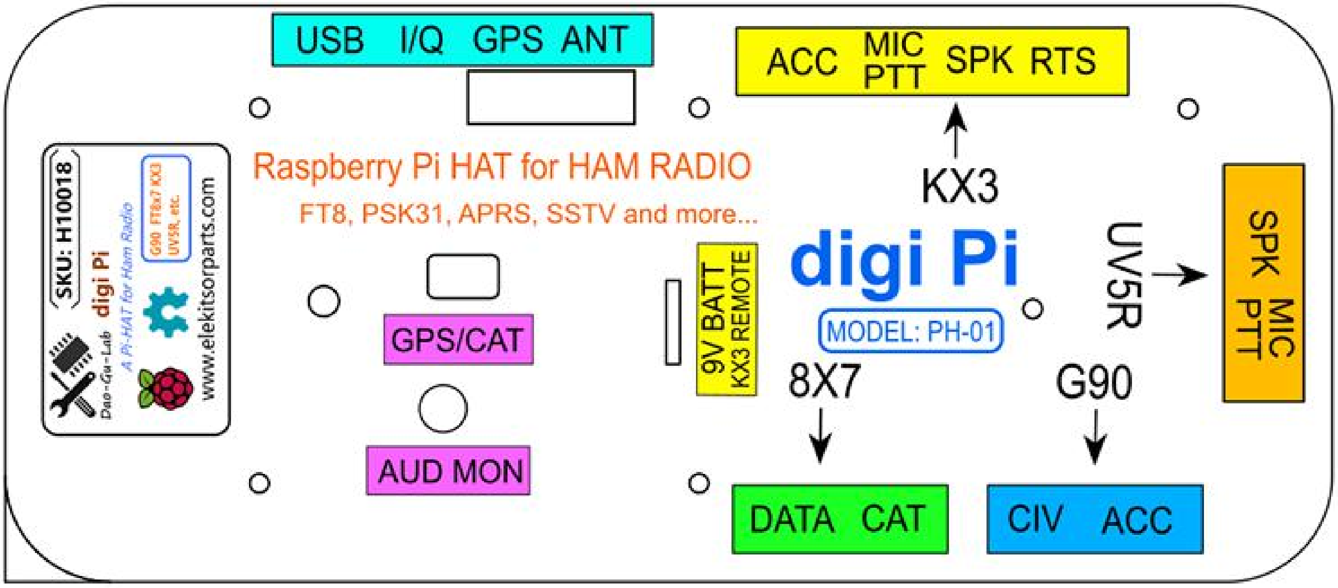
X3: MicroUSB to Raspberry Pi, optional, only for RST signal

J4: Additional TXD, RXD, DTR, GND signal from optional USB port

J5: For optional GPS module, PPS, TXD, RXD, GND

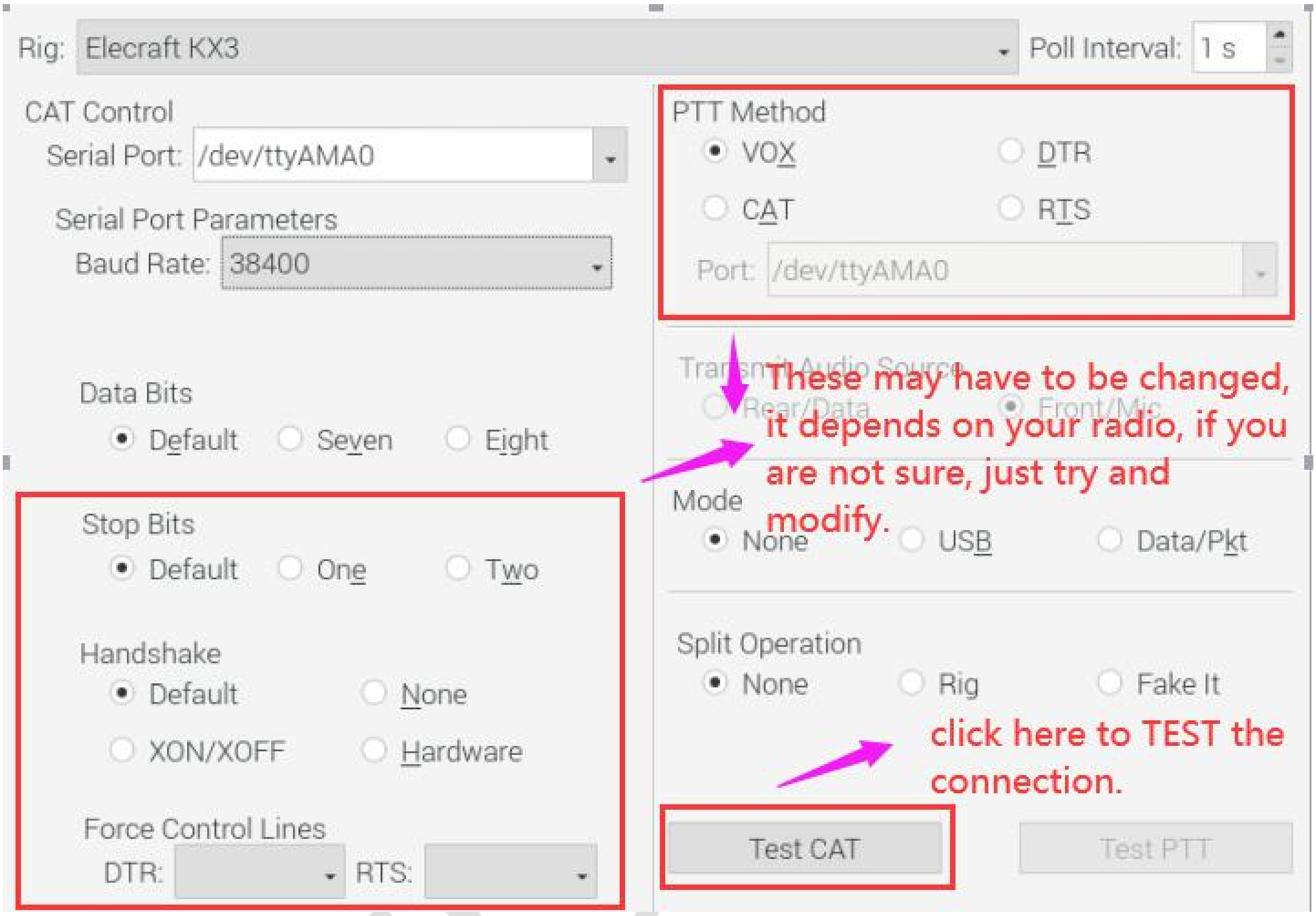
S1: Left for GPS, Right for CAT(Shared Hardware Serial)

X2: I/Q input X1: 9V BATT for KX3 Remote X4: TX Audio Monitor



Software Setting Examples:

Wsjtx:



Rig: Elecraft KX3 Poll Interval: 1 s

CAT Control
Serial Port: /dev/ttyAMA0

Serial Port Parameters
Baud Rate: 38400

Data Bits
● Default ○ Seven ○ Eight

Stop Bits
● Default ○ One ○ Two

Handshake
● Default ○ None
○ XON/XOFF ○ Hardware

Force Control Lines
DTR: RTS:

PTT Method
● VOX ○ DTR
○ CAT ○ RTS
Port: /dev/ttyAMA0

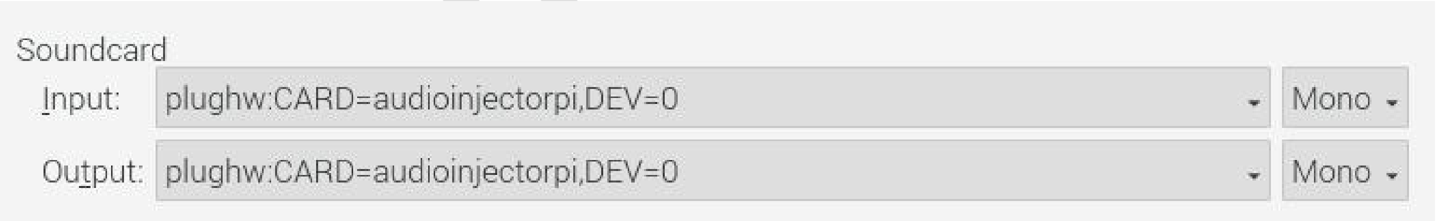
Transmit Audio Source
○ Rear/Data ● Front/Mic

Mode
● None ○ USB ○ Data/Pkt

Split Operation
● None ○ Rig ○ Fake It

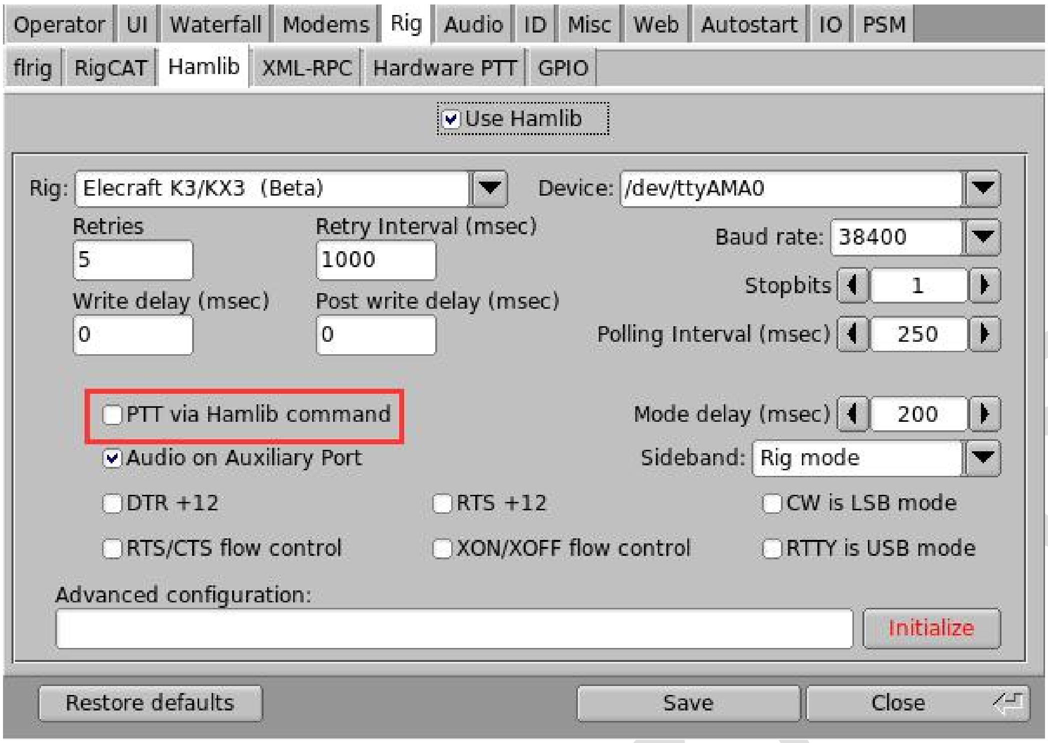
These may have to be changed, it depends on your radio, if you are not sure, just try and modify.

click here to TEST the connection.



Soundcard
Input: plughw:CARD=audioinjectorpi,DEV=0 Mono
Output: plughw:CARD=audioinjectorpi,DEV=0 Mono

Fldigi:



☑ Use Hamlib

Rig: Elecraft K3/KX3 (Beta)

Device: /dev/ttyAMA0

Retries: 5

Retry Interval (msec): 1000

Baud rate: 38400

Stopbits: 1

Write delay (msec): 0

Post write delay (msec): 0

Polling Interval (msec): 250

□ PTT via Hamlib command

Mode delay (msec): 200

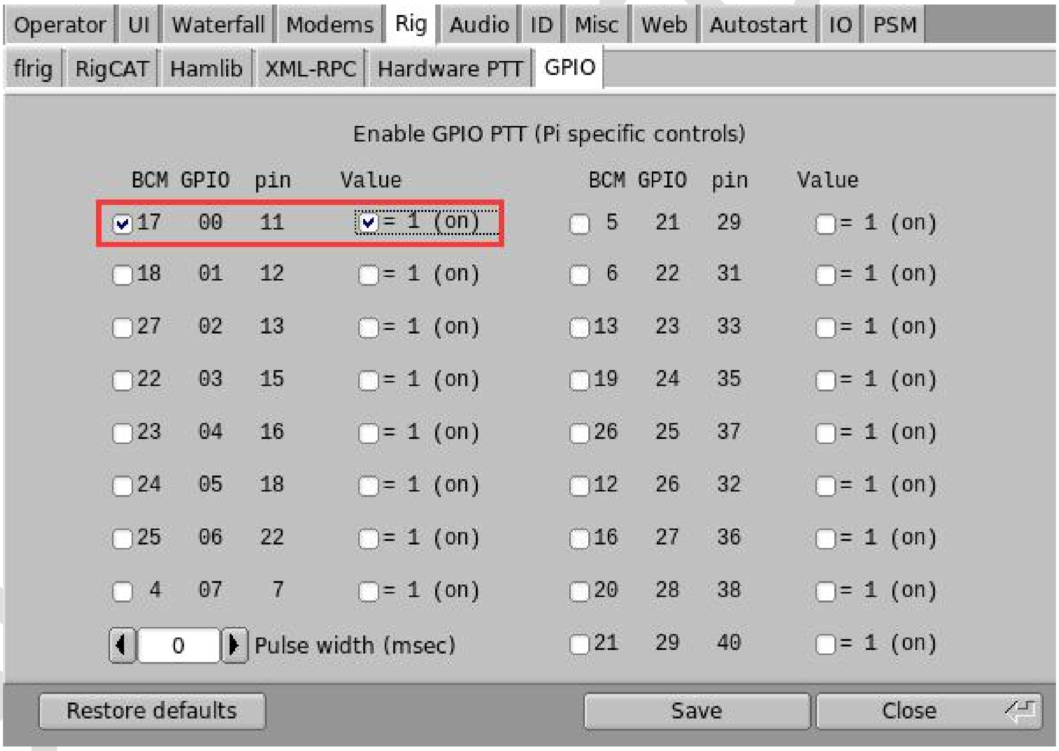
☑ Audio on Auxiliary Port

Sideband: Rig mode

□ DTR +12 □ RTS +12 □ CW is LSB mode

□ RTS/CTS flow control □ XON/XOFF flow control □ RTTY is USB mode

Advanced configuration:

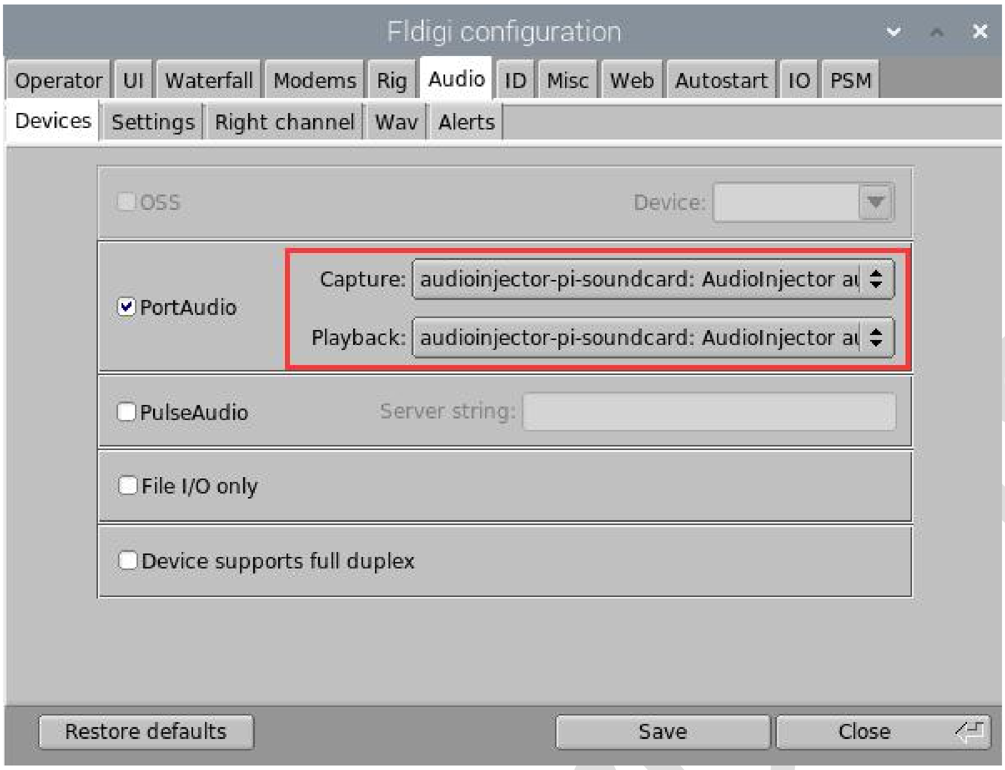


Enable GPIO PTT (Pi specific controls)

BCM	GPIO	pin	Value	BCM	GPIO	pin	Value
☑ 17	00	11	☑ = 1 (on)	□ 5	21	29	□ = 1 (on)
□ 18	01	12	□ = 1 (on)	□ 6	22	31	□ = 1 (on)
□ 27	02	13	□ = 1 (on)	□ 13	23	33	□ = 1 (on)
□ 22	03	15	□ = 1 (on)	□ 19	24	35	□ = 1 (on)
□ 23	04	16	□ = 1 (on)	□ 26	25	37	□ = 1 (on)
□ 24	05	18	□ = 1 (on)	□ 12	26	32	□ = 1 (on)
□ 25	06	22	□ = 1 (on)	□ 16	27	36	□ = 1 (on)
□ 4	07	7	□ = 1 (on)	□ 20	28	38	□ = 1 (on)
				□ 21	29	40	□ = 1 (on)

Pulse width (msec): 0

Use GPIO as the PTT method



Fldigi configuration

□ OSS Device:

☑ PortAudio Capture: audioinjector-pi-soundcard: AudioInjector au

Playback: audioinjector-pi-soundcard: AudioInjector au

□ PulseAudio Server string:

□ File I/O only

□ Device supports full duplex

KX3 Remotely Power ON:

Apply a 9V voltage to X1, pay attention to the polarity before doing it. Connect digi Pi (KX3 MIC/PTT port) to KX3's MIC port with a 3.5mm male stereo cable. Do not forget to connect your KX3 to a power supply. Run the following python code. Please make sure your Pi has installed the python3 environment. In a terminal, type: python3 kx3_power_on.py

```
#!/usr/bin/python3

import RPi.GPIO as GPIO
import time
kx3 = 36
GPIO.setmode(GPIO.BOARD)
GPIO.setup(kx3, GPIO.OUT)
GPIO.output(kx3, GPIO.LOW)

print('we will set KX3 to HIGH in 5 secs.')
time.sleep(5)
GPIO.output(kx3, GPIO.HIGH)
time.sleep(0.2)
GPIO.output(kx3, GPIO.LOW)
GPIO.cleanup()
```

The LED2 on digi Pi board will be ON during this process. This script will set the GPIO(PIN36) pin to HIGH for 200ms, and then it set the pin back to LOW. **You CAN NOT set both of the PIN36(KX3 POWER ON) and PIN11(PTT) to HIGH at the same time, especially when an external 9V is connected to X1.** You should always keep PIN36 to LOW all the time except when remotely powering your KX3 on.