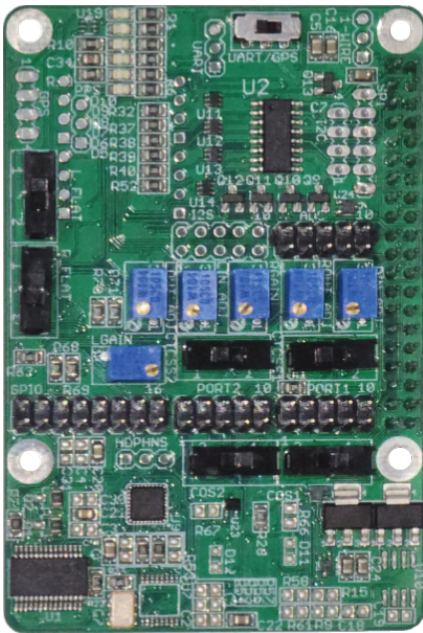
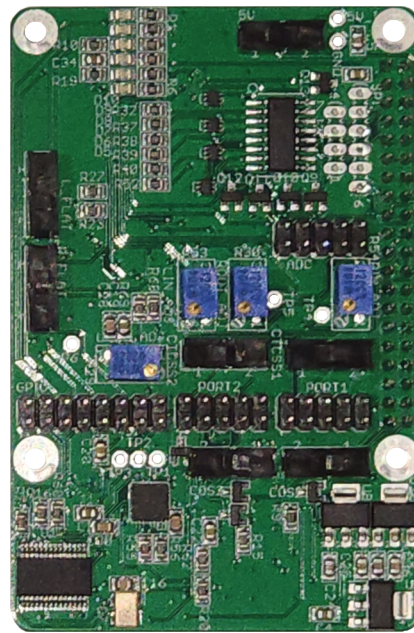


PI-REPEATER-2X



Hardware Version 3



Hardware Version 4



Controller Features	3
Version 3 & Version 4 Hardware	3
Version 4 Hardware only	3
Version 3 Hardware only	3
Introduction	4
Controller Revision 3.x Interfaces	5
Controller Revision 4.x Interfaces	6
Radio Interface Options	7
Radio interface Ports	7
Controller Revision 3.x HW Pinouts	8
Controller Revision 4.x HW Pinouts	9
Hardware Assembly (Cabled interfaces)	10
Hardware Assembly (Adapter PCBA)	11
Loading Chipsets into OS	12
Independent Radio Channels	15
Flat Audio Select	16
Input Audio Adjustments	16
Output Audio Adjustments	17
Analog to Digital Converter	18
GPIO EXPANSION	18
GPS EXPANSION (HW V3.x ONLY)	19
I2C EXPANSION	20
SPI EXPANSION	20
I2S (AUDIO) EXPANSION (HW V3.x ONLY)	21
1-WIRE EXPANSION (HW V3.x ONLY)	21
UART HEADER (HW V3.x ONLY)	21
PI STACKING HEADER	22
Hardware GPIO Pin number assignments	22

Controller Features

Version 3 & Version 4 Hardware

- Built In Stereo Audio Codec
- 2 independent configurable ports, Simplex or Duplex Capable
 - 2 independent Input Audio Channels
 - 15-Turn adjustment Input Audio Level
 - 2 independent Output Audio Channels
 - 15-Turn adjustment Output Audio Level
 - Switch Selectable Active High / Active Low COS Input
 - Switch Selectable Active High / Active Low CTCSS Input
 - Switch Selectable Flat Audio
- Analog to Digital Converter (8 inputs)
- I2C Expansion Header
- SPI Expansion Header
- GPIO expansion Header
- Stacking Header for Additional Hats

Version 4 Hardware only

- Selectable 5V Source (RPi or External)
- Power Consumption **1.5W** (Including RPi 3B, 2GB)
- Multiple Audio Path Test Points

Version 3 Hardware only

- GPS Expansion Socket (Obsoleted)
- UART Expansion Header
- 1-Wire Expansion Header
- Power Consumption 0.2W (Including RPi 3B)

Introduction

Thank you for purchasing the PI-REPEATER-2X, the first repeater controller board designed to be powered by the ubiquitous Raspberry Pi computer systems. This little piece of hardware mates to the Raspberry Pi just like any other daughter card you may have used for the Raspberry Pi, Arduino, or other development platform.

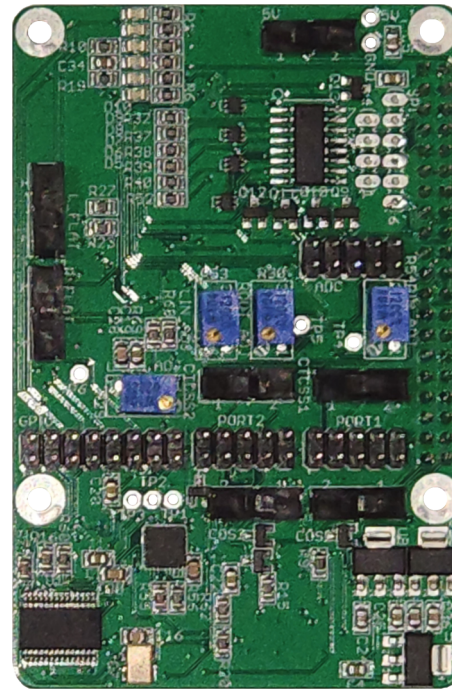
This system enables you to have a variety of control options for your station, including simplex, duplex, 2 independent repeaters, a voting station, etc. Anything you can imagine that can be done with 2 receive radios and 2 transmit radios is possible.

We use multi-turn potentiometers for fine adjustment of the audio, offer hardware pre-emphasis filtering, active high / active low selects for each COS / CTCSS input signal, and have inputs tolerant to 18Vdc for the signals coming from the radio.

This board will work with any software that is capable of interacting with the sound card, and GPIO (I2C required)) for radio interfaces. We recommend getting started with SVXLink, but the choice is ultimately yours! Feel free to experiment and decide which system best fits your requirements.

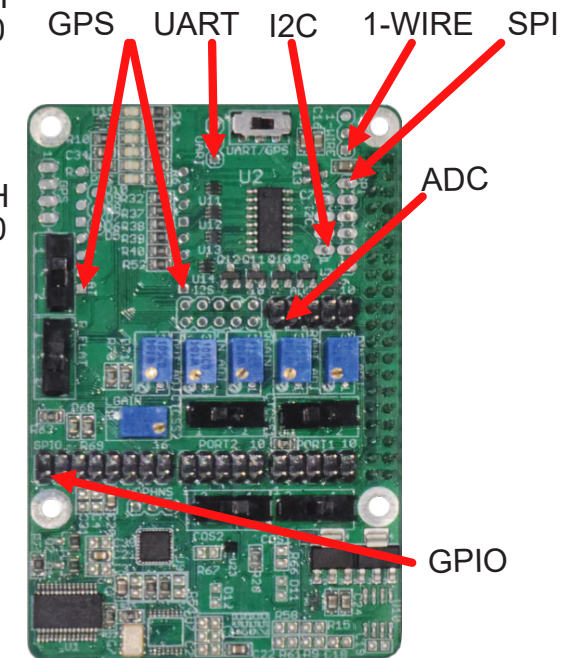
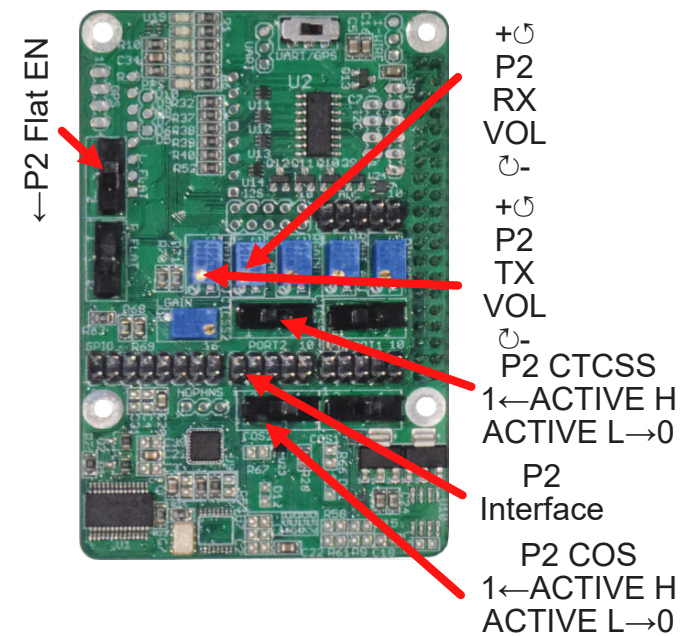
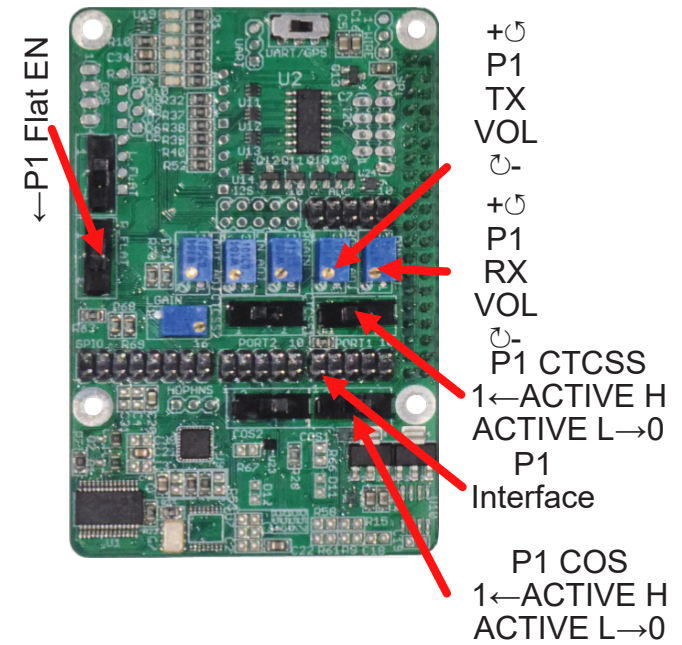
Software - As the software is user selected (typically SVXLink/Open Repeater), **this manual will not cover the repeater software installation.** Guidance on how to load the various chip sets into the Raspberry Pi operating system will be detailed, repeater controller aspects will not be covered.

For Schematics, please consult the documents page at <https://ics-ctrl.com/docs/>



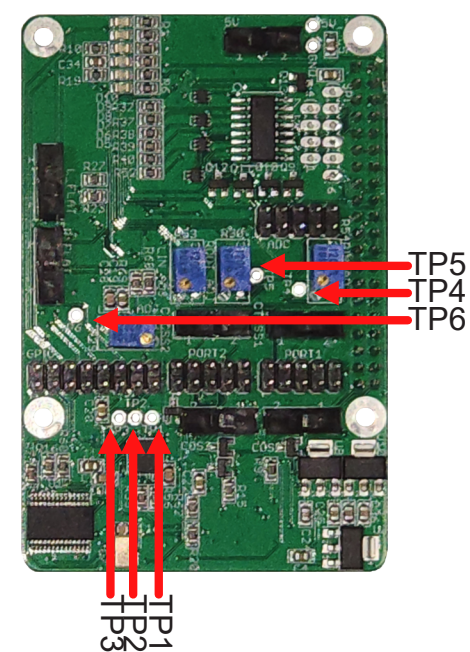
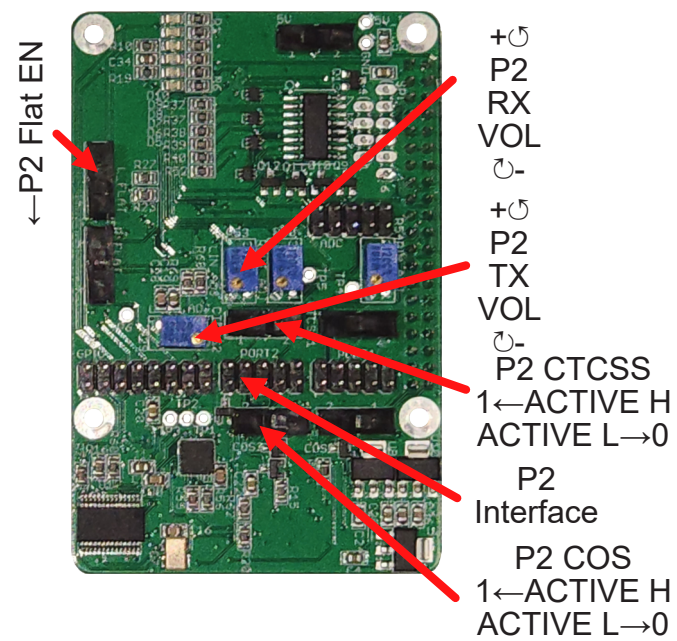
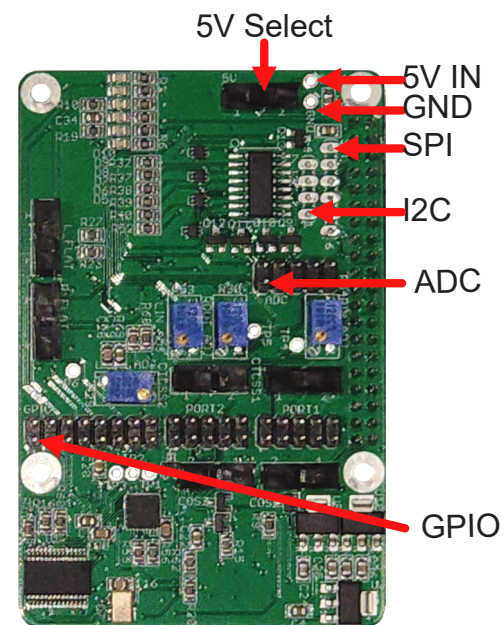
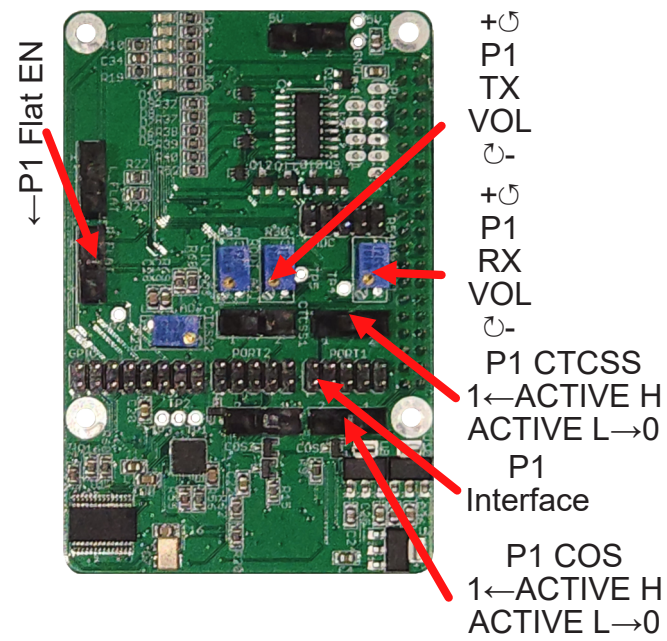
Controller Revision 3.x Interfaces

Arrows indicate Pin 1 where applicable



Controller Revision 4.x Interfaces

Arrows indicate Pin 1 where applicable



Radio Interface Options

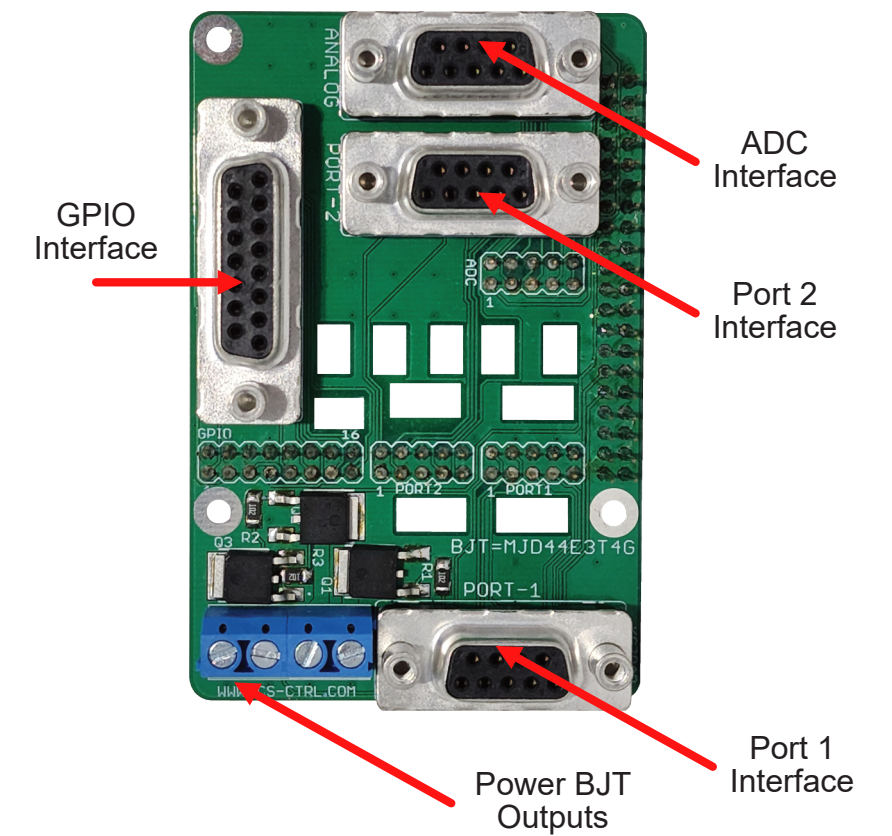
Depending on when you purchased your interface board, you may have received either loose cables or an adapter PCBA. The cables were introduced with all original shipments and the adapter PCBA replaced the cables in mid 2022.

Both cables and adapter PCBA break out the header pins to D-SUB connectors to provide a robust cable interface that is easier to work with than the standard header pins.

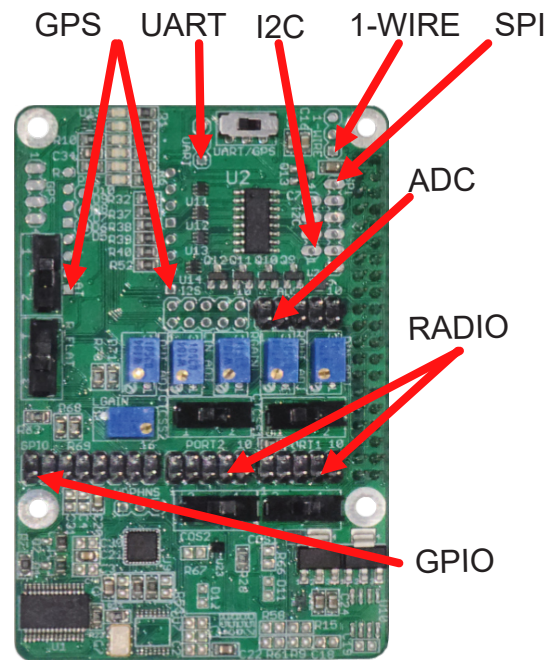
In both options, the pin mapping from the header pins are 1:1 to the DSUB connectors;

Radio interface Ports

Header Pin	D-SUB Pin	Function
1	1	CTCSS Encode Output
2	2	CTCSS Input
3	3	Push To Talk (Open Collector)
4	4	Audio Output to TX
5	5	Audio Input from Rx
6	6	Ground
7	7	COS Input from Rx Radio
8	8	Ground
9	9	Ground
10	shell	Ground

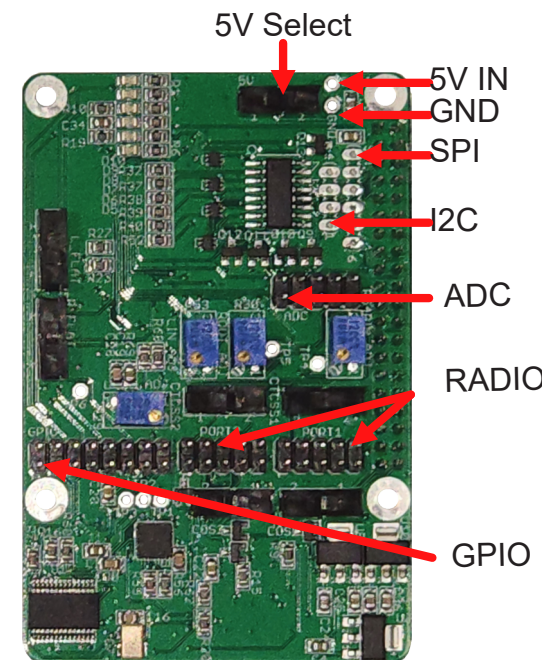


Controller Revision 3.x HW Pin-outs



RASPBERRY PI 40 PIN			
(1) +3.3V			+5V (2)
(3) I2C - SDA			+5V (4)
(5) I2C - SCL			GND (6)
(7) AVAILABLE			UART - TX (8)
(9) GND			UART RX (10)
(11) AVAILABLE			I2S - BLCK (12)
(13) CTCSS EN PORT 2			GND (14)
(15) AVAILABLE			COS PORT 2 (16)
(17) +3.3V			CTCSS PORT 1 (18)
(19) SPI - MOSI			GND (20)
(21) SPI - MISO			CTCSS PORT 2 (22)
(23) SPI - SCLK			SPI - CS0 (24)
(25) GND			SPI - CS1 (26)
(27) RESERVED			RESERVED (28)
(29) AVAILABLE			GND (30)
(31) AVAILABLE			GPIO_INTA (32)
(33) CTCSS EN PORT 1			GND (34)
(35) I2S - LRCK			GPS - PPS (36)
(37) COS PORT 1			I2S - STDO (38)
(39) GND			I2S - STDI (40)

Controller Revision 4.x HW Pin-outs



RASPBERRY PI 40 PIN			
(1) +3.3V			+5V (2)
(3) I2C - SDA			+5V (4)
(5) I2C - SCL			GND (6)
(7) AVAILABLE			UART - TX (8)
(9) GND			UART RX (10)
(11) AVAILABLE			I2S - BLCK (12)
(13) CTCSS EN PORT 2			GND (14)
(15) AVAILABLE			COS PORT 2 (16)
(17) +3.3V			CTCSS PORT 1 (18)
(19) SPI - MOSI			GND (20)
(21) SPI - MISO			CTCSS PORT 2 (22)
(23) SPI - SCLK			SPI - CS0 (24)
(25) GND			SPI - CS1 (26)
(27) RESERVED			RESERVED (28)
(29) AVAILABLE			GND (30)
(31) AVAILABLE			GPIO_INTA (32)
(33) CTCSS EN PORT 1			GND (34)
(35) I2S - LRCK			GPS - PPS (36)
(37) COS PORT 1			I2S - STDO (38)
(39) GND			I2S - STDI (40)

PIN #	RADIO	GPIO	ADC	SPI	1-Wire	I2C	UART	GPS (2X8)	GPS
1	CTCSS EN (Out)	GPA0	A0	GND	GND	GND	GND	VBAT	GND
2	CTCSS (In)	GND	A1	~CS1	1-Wire	SCL	TX	GND	PPS
3	Push To Talk (Out)	GPA1	A2	SCLK	+3.3V	SDA	RX	NAV	+3.3V
4	TX Audio (Out)	GND	A3	MISO		+3.3V		PPS	
5	RX Audio (In)	GPA2	A4	MOSI				RX1	
6	Ground	GND	A5	+5V				TX1	
7	RX COS	GPA3	A6					SCL	
8	Ground	GND	A7					SDA	
9	Ground	GPA4	GND					NC	
10	Ground	GND	GND					NC	
11		GPA5						NC	
12		GND						NC	
13		GPA6						GPS_RX	
14		GND						GPS_TX	
15		GPA7						+3.3v	
16		GND						GND	

PIN #	RADIO	GPIO	ADC	SPI	1-Wire	I2C	UART	5V SELECT	TEST POINT
1	CTCSS EN (Out)	GPA0	A0	GND	GND	GND	GND	5V(RPI)	L-AUDIO
2	CTCSS (In)	GND	A1	~CS1	1-Wire	SCL	TX	5V(AUX)	R1 AUDIO
3	Push To Talk (Out)	GPA1	A2	SCLK	+3.3V	SDA	RX		R2 AUDIO
4	TX Audio (Out)	GND	A3	MISO		+3.3V			R-AUDIO
5	RX Audio (In)	GPA2	A4	MOSI					T1 AUDIO
6	Ground	GND	A5	+5V					T2 AUDIO
7	RX COS	GPA3	A6						
8	Ground	GND	A7						
9	Ground	GPA4	GND						
10	Ground	GND	GND						
11		GPA5							
12		GND							
13		GPA6							
14		GND							
15		GPA7							
16		GND							

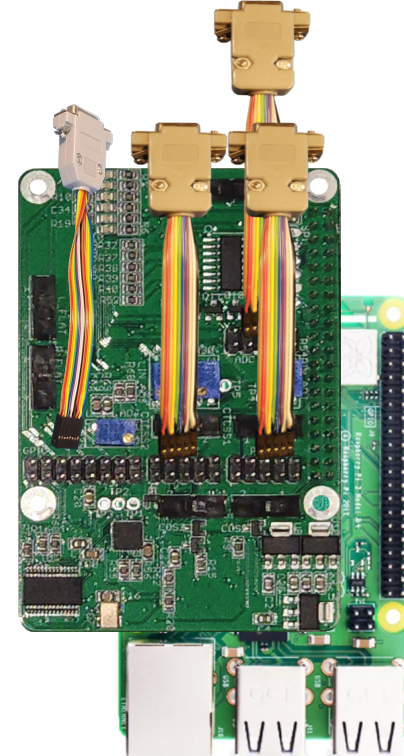
Hardware Assembly (Cabled interfaces)

Components Required

- 3@ DB9 Female cables (included)
- 1@ DB15 Female cable (included)
- 1@ Controller Interface board (included)
- 1@ Raspberry Pi (user provided)
- 1@ MicroSD Card (16GB+) (user provided)
- 1@ USB Power Supply 5V@3A (user provided)

Optional Components

- 4@ 17mm F/F standoffs (not included)
- 8@ standoff screws (not included)



Step1 - Install the Controller Board onto the raspberry pi using the 40 pin interface connector

Step 2 - Install the pre-programmed microSD card into the Raspberry Pi. We recommend starting with Open Repeater which has verified settings to ensure a successful startup.

Step 3 - Install the DB15 pin cable with the brown wire oriented to the left as shown

Step 4 - install the 3@ DB9 cables to the 10 pin headers with the brown wire oriented to the left as shown.

Step 5 - Install network connection to the Raspberry Pi

Step 6 - apply power to the Raspberry Pi

At this point your controller is connected to the Raspberry Pi and the Raspberry Pi should boot and acquire a network address from your router. From here, you will need to consult the software manuals for configuring the respective applications.

NOTE: If using stand-offs, you will need to slightly drill out the raspberry pi holes to fit an M3, this is safe as long as you stay in the area free of metal on the RPI holes. Go slow!

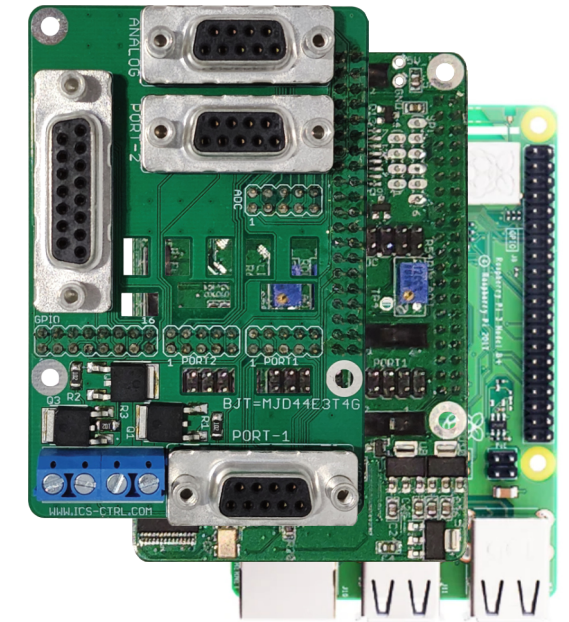
Hardware Assembly (Adapter PCBA)

Components Required

- 1@ Adapter PCBA (included)
- 1@ Controller Interface board (included)
- 1@ Raspberry Pi (user provided)
- 1@ MicroSD Card (16GB+) (user provided)
- 1@ USB Power Supply 5V@3A (user provided)

Optional Components

- 4@ 17mm F/F standoffs (not included)
- 4@ 17mm M/F standoffs (not included)
- 8@ standoff screws/nuts (not included)



Step1 - Install the Controller Board onto the raspberry pi using the 40 pin interface connector

Step 2 - Install the pre-programmed microSD card into the Raspberry Pi. We recommend starting with Open Repeater which has verified settings to ensure a successful startup.

Step 3 - Install the adapter PCBA on top of the controller PCBA using the 40 pin interface connector.

Step 4 - Install network connection to the Raspberry Pi

Step 5 - apply power to the Raspberry Pi

At this point your controller is connected to the Raspberry Pi and the Raspberry Pi should boot and acquire a network address from your router. From here, you will need to consult the software manuals for configuring the respective applications.

NOTE: If using stand-offs, you will need to slightly drill out the raspberry pi holes to fit an M3, this is safe as long as you stay in the area free of metal on the RPI holes. Go slow!

Loading Chipsets into OS

To use the controller with the Raspberry Pi operating system, it is necessary to tell the operating system which chipsets are available and a few configuration variables.

If you are using the Open Repeater images, all this work is already done for you. If starting from scratch, you will need to edit a few files using a text editor.

1) /boot/config.txt - Copy the following and add to the bottom of the text file

```
#####  
#ICS Required Drivers/Overlays  
#####  
dtoverlay=fe-pi-audio  
dtoverlay=i2s-mmap  
#####  
#Enable mcp23s17 Overlay  
#####  
dtoverlay=mcp23017,addr=0x20,gpiopin=12  
#####  
#Enable mcp3208 adc overlay  
#####  
dtoverlay=mcp3208:spi0-0-present,spi0-0-speed=1000000
```

This will cause the audio codec chip to automatically be initialized and the Raspberry Pi will treat it as a native sound card. Additionally the MCP23017 gpio expander chip will be loaded automatically and the GPIO will become native GPIO for the processor.

The ADC chip is SPI based, and will be available via text file for collecting the sample data. It is necessary to close and reopen the reading file to acquire refreshed data samples.

2) /etc/asound.conf - Copy the following and add to the bottom of the text file

```
pcm.dmixed {  
    type dmix  
    ipc_key 1024  
    ipc_key_add_uid 0  
    slave.pcm "hw:0,0"  
}  
pcm.dsnooped {  
    type dsnoop  
    ipc_key 1025  
    slave.pcm "hw:0,0"  
}  
pcm.duplex {  
    type asym  
    playback.pcm "dmixed"  
    capture.pcm "dsnooped"  
}  
pcm.left {  
    type asym  
    playback.pcm "shared_left"  
    capture.pcm "dsnooped"  
}  
pcm.right {  
    type asym  
    playback.pcm "shared_right"  
    capture.pcm "dsnooped"  
}  
# Instruct ALSA to use pcm.duplex as the default device  
pcm.!default {  
    type plug  
    slave.pcm "duplex"  
}  
ctl.!default {  
    type hw  
    card 0  
}  
# split left channel off  
pcm.shared_left {  
    type plug  
    slave.pcm "hw:0"  
    slave.channels 2  
    ttable.0.0 1  
}  
# split right channel off  
pcm.shared_right {  
    type plug  
    slave.pcm "hw:0"  
    slave.channels 2  
    ttable.1.1 1  
}
```



```
#dtparam=i2s=on
pcm_slave.hw_loopback {
    Pcm "hw: loopback, 1.2"
    Channels 2
    Format RAW
    Rate 16000
}
pcm.plug_loopback {
    Type plug
    Slave hw_loopback
    Ttable {
        0.0 = 1
        0.1 = 1
    }
}
}
```

3) It is necessary to configure the ALSA sound settings to use the line-in and line-out option of the codec chip. This can be done by issuing the following commands on a terminal.

```
amixer set 'Headphone' 86%;
amixer set 'PCM' 75%;
amixer set 'Lineout' 58%;
amixer set 'Mic' 59%;
amixer set 'Capture Mux' LINE_IN;
```

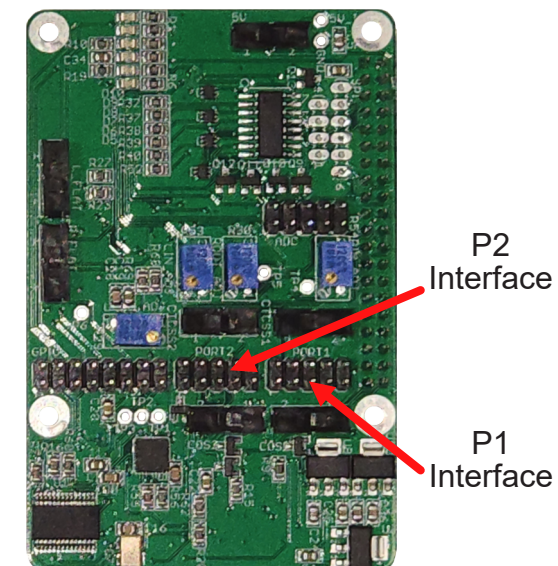
After running the commands, the settings are not saved until a reboot is performed. Reboot now is recommended.

NOTE If the interface board is removed and the Raspberry Pi is booted, these settings will be reset and there will be no audio present. You will need to setup these options again to regain audio from the controller board.

Independent Radio Channels

The board supports 2 independent repeater channels, or ports 1 and 2. This means you can use 2 receivers and 2 transmitters configured to your needs. Each repeater channel provides several helpful features

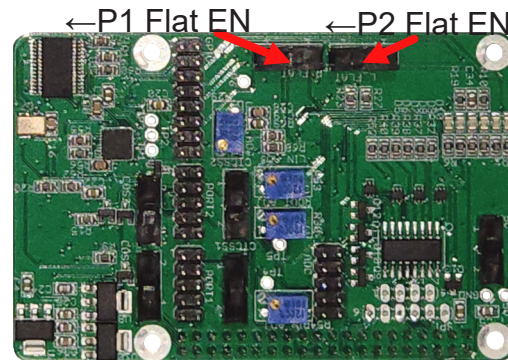
- Selectable High/Low COS/COR
 - Select the switch setting as shown in pages 5/6 to select the polarity of active signaling for your radio (often active low, but we recommend active high when available)
- Selectable High/Low CTCSS
 - Select the switch setting as shown in pages 5/6 to select the polarity of active signaling for your radio (often active low, but we recommend active high when available)
 - NOTE: By default SVXLink does not support CTCSS as a GPIO input, however you can create specialized logic in software if needed, or use external hardware logic gates to combine CTCSS and COS signaling.
- Selectable Flat Audio
- Adjustable audio input level via multi-turn potentiometers
- Adjustable audio output level via multi-turn potentiometers
- Software linkable for cross band / control port / voter / etc.



Flat Audio Select

This selection switch is used to select if the receive audio coming in requires the addition of a flat-audio filter (removes pre-emphasis). To enable the addition of the flat audio filtering, the switches should be in the left position. To pass the audio unfiltered, the switches should be in the right position.

To learn more about "Flat Audio" we recommend starting here:
<http://www.repeater-builder.com/tech-info/flat-audio.html>

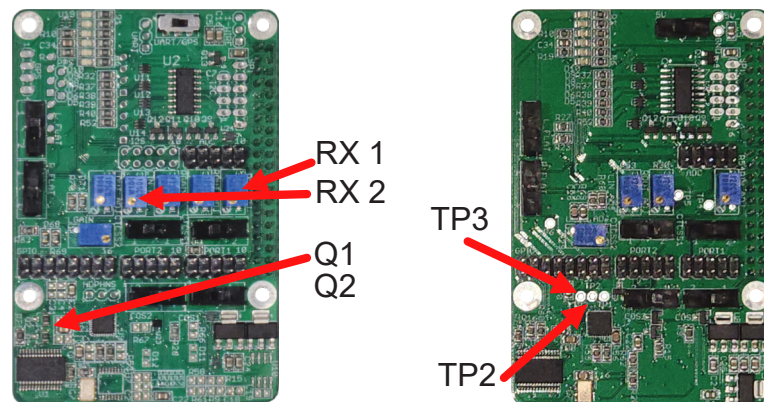


Input Audio Adjustments

The input audio adjustment potentiometer is used to adjust the amplitude of the volume coming from the receiver, with clockwise rotation turning the amplitude down. This is an 18 turn potentiometer, multiple turns are required to effect a large change in amplitude, while fractional turns yield fine resolution adjustments.

For hardware version 3.x (Left image below), the audio can be measured with an oscilloscope on part locations "Q1" and "Q2". These are not installed as transistors, but rather 0-Ohm resistors so either side of the resistor will work.

For hardware version 4.x (Right image below), the audio can be measured using the test points TP2 (Port 1 input audio) and TP3 (Port 2 input audio). These test points measure the audio immediately before it gets digitized in the audio codec chip. Any distortion or volume issue at this test point needs to be addressed in the analog circuitry.



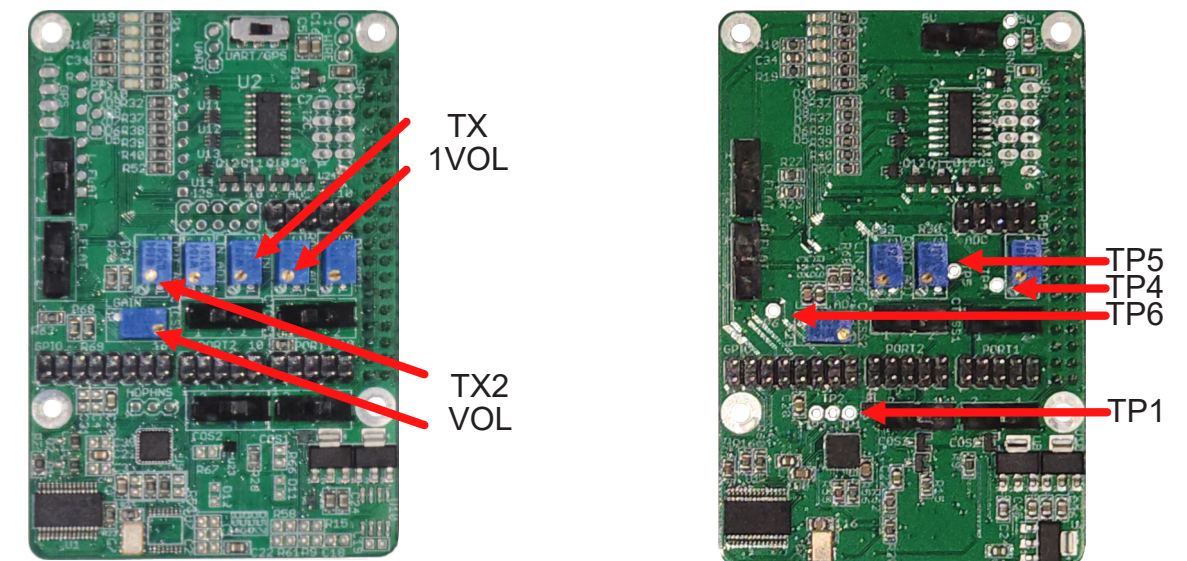
Output Audio Adjustments

The output audio adjustment potentiometer(s) is used to adjust the amplitude of the volume going to the transmitter, with clockwise rotation turning the amplitude down. This is an 18 turn potentiometer, multiple turns are required to effect a large change in amplitude, while fractional turns yield fine resolution adjustments.

For hardware version 3.x (Left image below), the audio adjustment is made with 2 potentiometers, one being labeled "GAIN" and one being labeled "OUT_ADJ". The recommended starting point is to set GAIN to maximum, fully CLOCKWISE until it clicks. The OUT_ADJ should be turned fully COUNTER CLOCKWISE until it clicks, then 3 full rotations clockwise. One set to this position, we recommend to only adjust the OUT_ADJ potentiometer.

For hardware version 4.x (Right image below), the audio output has been simplified, using only the OUT_ADJ potentiometers along with a more balanced configuration. Additionally, test points have been added for taking in circuit measurements during adjustment.

The output audio can be measured using the test points TP4 (Port 1 codec output), TP5 (Port 1 Adjusted volume) and TP1 (Port 2 codec output) and TP6 (Port 2 Adjusted volume). These test points measure the audio immediately after it gets converted to analog by the audio codec chip and then the user adjusted analog voltage. Any distortion at the codec test points will need to be addressed either in the **ALSA** volume settings, or possibly the input audio source. ALSA volume can be adjusted using the console command "alsamixer".

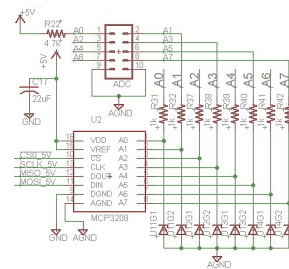


Analog to Digital Converter

A MCP3208 is built into the system to provide analog input capabilities with support for 8 channels with 12-bit resolution per channel. Each channel is provided with some input protection through a current limiting resistor and a Zener diode. It is the user's responsibility to ensure the inputs are not over driven beyond a 5V maximum input voltage to prevent damage to the ADC unit.

Channel A0 has a unique configuration to allow for the use of a LM335 temperature sensor device. It is recommended to use this channel last to minimize potential confusion due to the unique configuration.

Refer to the interfaces section to identify the location of this expansion port.



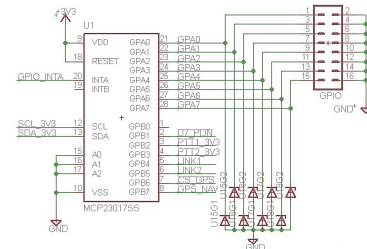
GPIO EXPANSION

As the repeater board consumes most of the signals from the 40 pin header, an additional 8 pins are made available through a 16 pin header. This header connects to PORT A on a MCP23017 IC, and provides input circuit protection through Zener diodes which limit the input voltage to 3.5V maximum. Caution should be exercised to ensure only 3.3V logic levels are used to connect to these pins.

The GPIO expander provides the option to include pull-up resistors should your circuit need these, but are not turned on by default, you will be responsible for configuration of these pins if used.

Connector Selection: Due to the tight spacing of the board, it is important to select mating connectors that do not exceed the width of the male pin alignment blocks, or you risk mechanical interference with the port 2 header. For custom cables we suggest using connector block [952-2037-ND from Digikey](#), or a similar variant. A **STANDARD IDC RIBBON CABLE CONNECTOR WILL NOT FIT.**

Refer to the interfaces section to identify the location of this expansion port.



GPS EXPANSION (HW V3.x ONLY)

An expansion header is provided so you may add an off-the shelf GPS board ([SparkFun.com #GPS-11058](#)). The use of this GPS unit also requires the purchase of [qty 2, PN ED5908-ND from Digikey](#), and the GPS antenna of your choice with SMA interface. We have tested [Sparkfun #GPS-00464](#), but any passive GPS antenna should work fine.

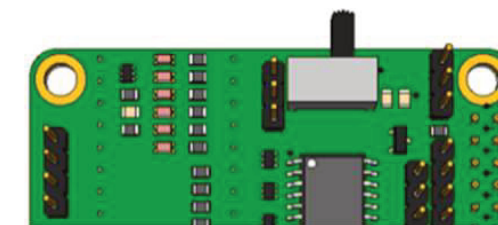
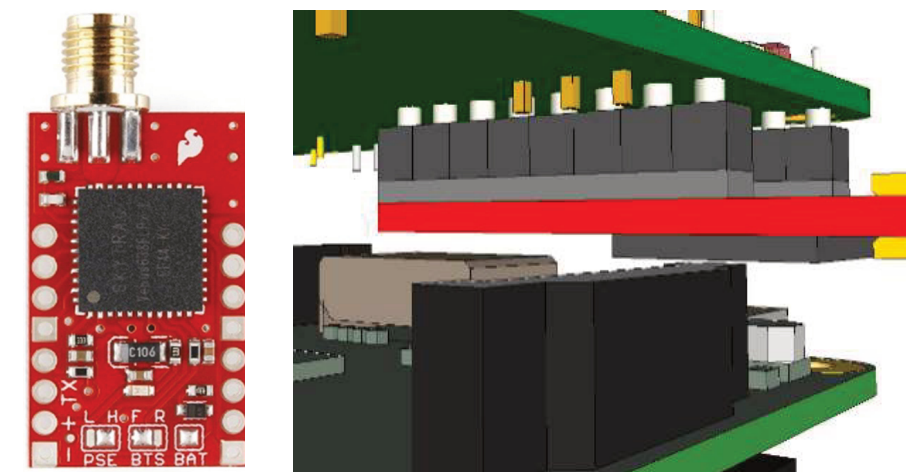
Installation of the GPS antenna requires the connectors be soldered on the BOTTOM of the GPS board as indicated by the silk screen.

We suggest installing the pins first into the repeater board sockets, mounting the GPS board to the pins and then soldering to ensure proper alignment as the female sockets float a bit in the holes and may also be slightly angled.

NOTE: using the GPS board is very close to the LCD flex cable socket, and may interfere with the ability to use a touch screen depending on the cable used. We have successfully folded back a ribbon cable while having the GPS unit installed, but the clearances are tight and the tight bend radius may damage your flex cable, have a spare flex cable and proceed with caution.

NOTE: "UART/GPS" switch must be in the correct position as shown for the GPS to communicate with the Raspberry Pi platform.

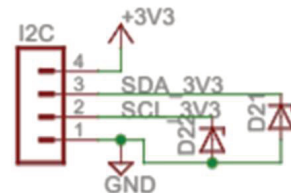
NOTE: **THIS GPS UNIT HAS BEEN DISCONTINUED.** Any GPS unit will work as long as the user supplied adapter board conforms to the mechanical dimensions, pinout and electrical specifications of the GPS-11058.



I2C EXPANSION

4 pin header has been included to allow you to expand the I2C bus to include your own devices, but you must ensure that the signals are 3.3V. Voltages above 3.3V will damage both the Raspberry Pi and the repeater board. Zener Diodes are included in the data signals, but should not be counted upon to protect the boards from over-voltage. It is recommended to utilize MCP23017 gpio expander device if additional gpio functionality is desired. The MCP23017 device is recommended due to wide market usage and support provided by current Raspberry Pi operating system distributions.

Refer to the interfaces section to identify the location of this expansion port.



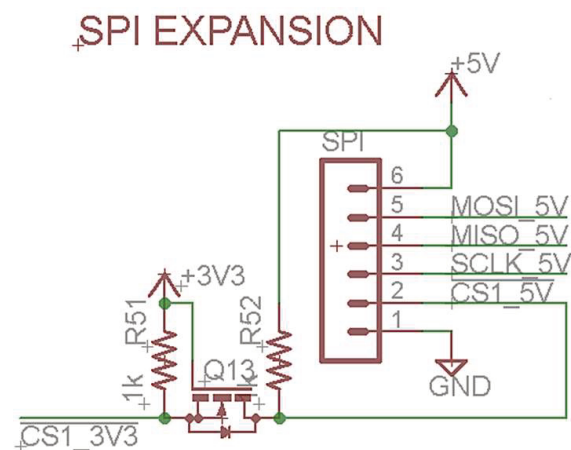
SPI EXPANSION

A SPI expansion header has been included for the user to be able to install any SPI device desired. It should be noted that this header only supports 5V logic devices. If you install 3.3V logic devices, they may become damaged. It is the user's responsibility to provide logic level translation if a 3V3 device is used in the port.

The Chip Select CS1 has been routed to this port, which is supported natively with Device Tree Overlays for convenience, additional SPI devices can be used on this port as well, but the user is responsible for providing the Chip Select connectivity.

It is recommended to utilize MCP23S17 gpio expander device if a Chip Select source is needed for multiple SPI devices are desired. The MCP23S17 device is recommended due to wide usage and support provided by current Raspberry Pi operating system distributions.

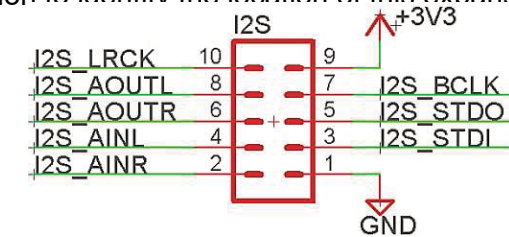
Refer to the interfaces section to identify the location of this expansion port.



I2S (AUDIO) EXPANSION (HW V3.x ONLY)

A 10 pin header has been included to allow for specialized I2S sound card devices to be used. This is provided for user design. **INSTALLED I2S SOUND CHIPS IN LOCATIONS U7 OR U9 MUST BE REMOVED PRIOR TO INSTALLING ANYTHING ON THIS HEADER.**

Refer to the interfaces section to identify the location of this expansion port.

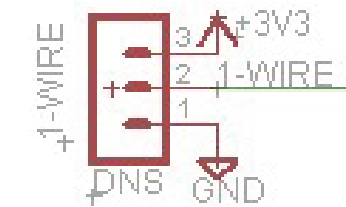


1-WIRE EXPANSION (HW V3.x ONLY)

A 3 pin header has been included to allow for specialized 1-wire devices to be used. This is provided for user design and devices on this port are not supported by ICS-CTRL.

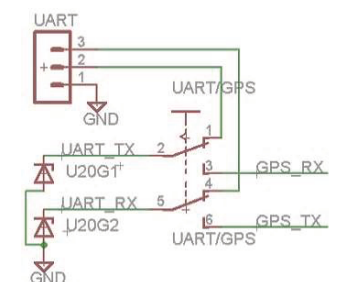
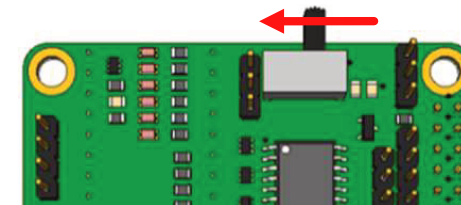
This port connects directly to the processor and inappropriately connected devices may cause damage to the system. Please use appropriate precautions to prevent damage to your Raspberry Pi.

Refer to the interfaces section to identify the location of this expansion port.



UART HEADER (HW V3.x ONLY)

The UART interface from the Raspberry Pi has been brought out to a switch that allows the user to select to use the UART for either a terminal or other serial device, or, to use the UART interface to receive data from the optional GPS board. The signal levels on this connection are all 3.3V logic, and Zener diodes have been included to help protect the devices, but are intended to protect against transient voltage spikes resulting from mating connectors or similar. These will not protect against improper voltages applied to the pins.

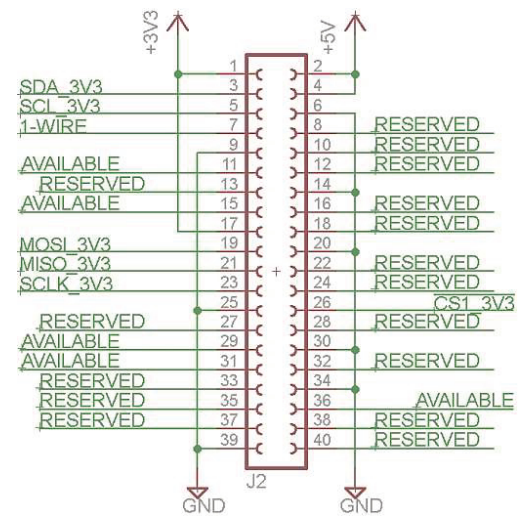


PI STACKING HEADER

For users may wish to design custom daughter boards, the primary 40 pin header has been left exposed so the user may design standard form-factor boards. It is important to remember that the majority of the native GPIO pins have already been utilized and these pins must be left unconnected in any custom designed daughter boards.

The illustration shows the availability of each of the pins on the 2x20 header, along with shared bus pins that must be used as configured for the system to maintain functionality.

Signals such as the I2C, SPI, 1-wire, etc. are broken out into dedicated headers that may or may not be simpler to design around, this is left to the user to decide. It is critical to remember that the signals on this connector are 3.3V logic, and 5V logic levels can damage your devices.



Hardware GPIO Pin number assignments

The GPIO numbers on the GPIO port expanders have been known to move around in various versions of Raspberry Pi hardware and software OS revisions. These are provided as a baseline, but may need to be adjusted. These are based on the Raspberry Pi 3B, we know **Raspberry Pi Zero needs to be offset by +8 on any GPIO above 128** as the 3B has an extra internal usage of 8 GPIO numbers.

SIGNAL	PORT 1	PORT 2
PTT	GPIO506	GPIO507
COS	GPIO26	GPIO23
CTCSS	GPIO24	GPIO25
TX-AUDIO	Right Channel	Left Channel
RX-AUDIO	Right Channel	Left Channel

SIGNAL	GPIO Number
GPA0	GPIO496
GPA1	GPIO497
GPA2	GPIO498
GPA3	GPIO499
GPA4	GPIO500
GPA5	GPIO501
GPA6	GPIO502
GPA7	GPIO503