

AP2CJ  
PARS AGM 2019

AllStarLink



# History



## **ASTERISK**

1999 – Mark Spencer (Huntsville AL) started a Linux software company

The company grew and needed phone services. They discovered available systems were very expensive So they wrote their own PBX software. They formed a company called Digium in 2001 and their software... Asterisk... is now used to run the phone systems in thousands of companies worldwide. Asterisk is written to allow additional applications to extend its capability, it is its very nature!

## **App\_rpt aka ALLSTAR**

The app\_rpt application was written by Jim Dixon, WB6NIL (silent key) and Steve Rodgers, WA6ZFT in the mid 2000's for fulfill his need for a repeater controller and VOIP interface. Original system used a Quad PCI radio interface card Later used USB sound card interface





# WHAT IS THE ALLSTAR LINK SYTEM?

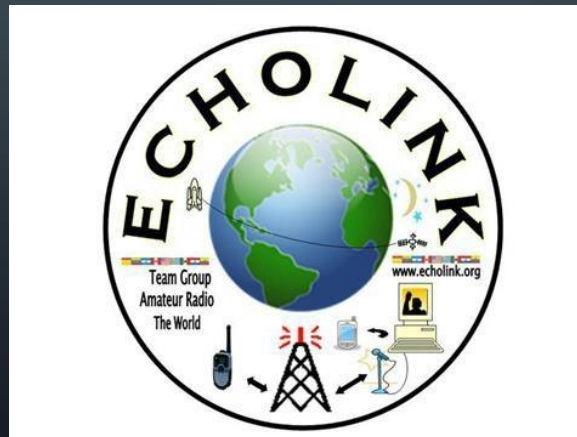
- ❑ A melding of Asterisk PBX and Linux based repeater control code. Completely free and open source.
- ❑ Allows agile linking of single nodes, hubs, repeaters, link radios, mode bridges, phones, auto patch, etc.
- ❑ Independent operation, no mother ship.
- ❑ Strong user community support.
- ❑ Large and growing user base, 2080+ nodes online around the world at this time.



# Comparison of Amateur Radio VOIP systems

## Echolink

- ❑ Free and convenient
- ❑ Not open source – limited API (Application Programming Interface)
- ❑ Limited audio quality – GSM – half duplex
- ❑ Relatively easy to use
- ❑ Large user base
- ❑ Largely computer or phone originated
- ❑ Stable
- ❑ Not best choice for repeater linking



# Comparison of Amateur Radio VOIP systems

## IRLP – Internet Radio Linking Protocol

- ❑ Not open source – requires hardware purchase
- ❑ Good audio quality – ADPCM – half duplex
- ❑ Smaller user base
- ❑ Only radio originated
- ❑ Low number of nodes
- ❑ Limited linking agility





## Comparison of Amateur Radio VOIP systems

### Allstar

- ❑ Fully open source hardware & software - free
- ❑ Excellent audio quality – full duplex
- ❑ Full repeater control imbedded!!
- ❑ Choice of codecs to meet available bandwidth
- ❑ Smaller user base - growing FAST - 2080 online now
- ❑ Radio, SIP phone or smart phone or computer originated.
- ❑ Endless linking and bridging capabilities
- ❑ Low cost
- ❑ Echolink, d-star, C4FM, P25 and other service bridges
- ❑ Requires some LINUX knowledge
- ❑ Strong user base support



# Comparison of Amateur Radio VOIP systems

## Other formats – WiresX, D-Star, DMR, P25

- .Mostly proprietary
- .Varying audio quality
- .Limited API





# ARM (processor) Allstar for the Raspberry Pi

## Features

- ❑ Linux operating system (Arch Linux distro)
- ❑ Fully open source – Modify and extend the code
- ❑ Easy to install and maintain – gets easier as time goes on and code matures.
- ❑ Runs on Rpi 2 or 3, not the Rpi model A or Pi Zero.
- ❑ Ability to select CODECS
- ❑ Great for restricted antenna areas – gives feel of radio
- ❑ Allows public or private connections
- ❑ Any number of nodes can be connected together
- ❑ Connection process totally at the discretion of the user
- ❑ Unlimited servers and nodes per IP address





# ARM (processor) Allstar for the Raspberry Pi

## Features Continued

- .Full Duplex
- .Integral Repeater Controller
- .Connections to/from Phone PBX via a sip, iax
- .No single point of failure – no mother ship
- .Build the system the way you want

# ARM (processor) Allstar for the Raspberry Pi

## CODECS

A codec is a device or computer program capable of encoding or decoding a digital data stream or signal.

### ULAW

- .64Khz
- .Lossless
- .Excellent quality
- .Least used

### ILBC

- .Internet Low Bandwidth Codec
- .1/3 BW of g726aa
- .Very close to g726 quality

### G726aa

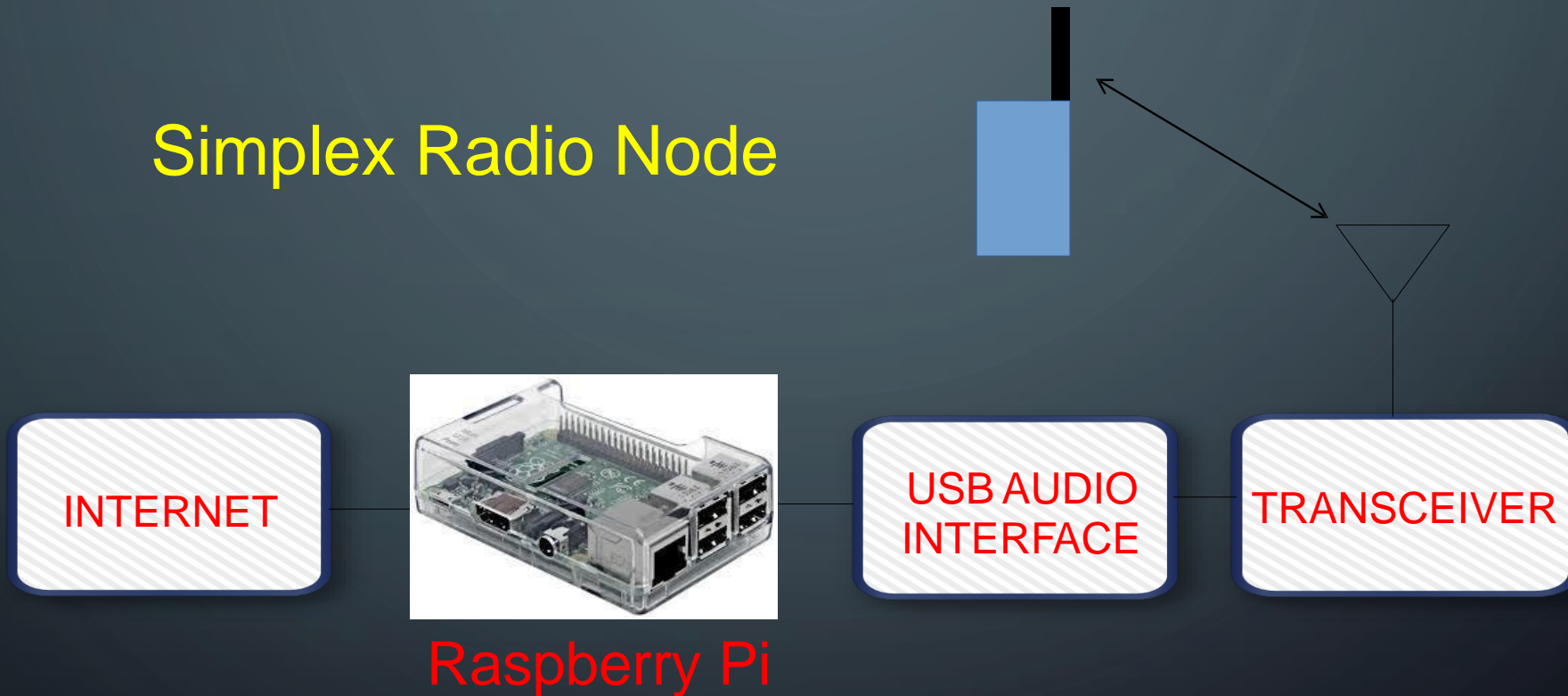
- .modified G726a
- .48Khz sample rate
- .Very good quality
- .Most used

### GSM

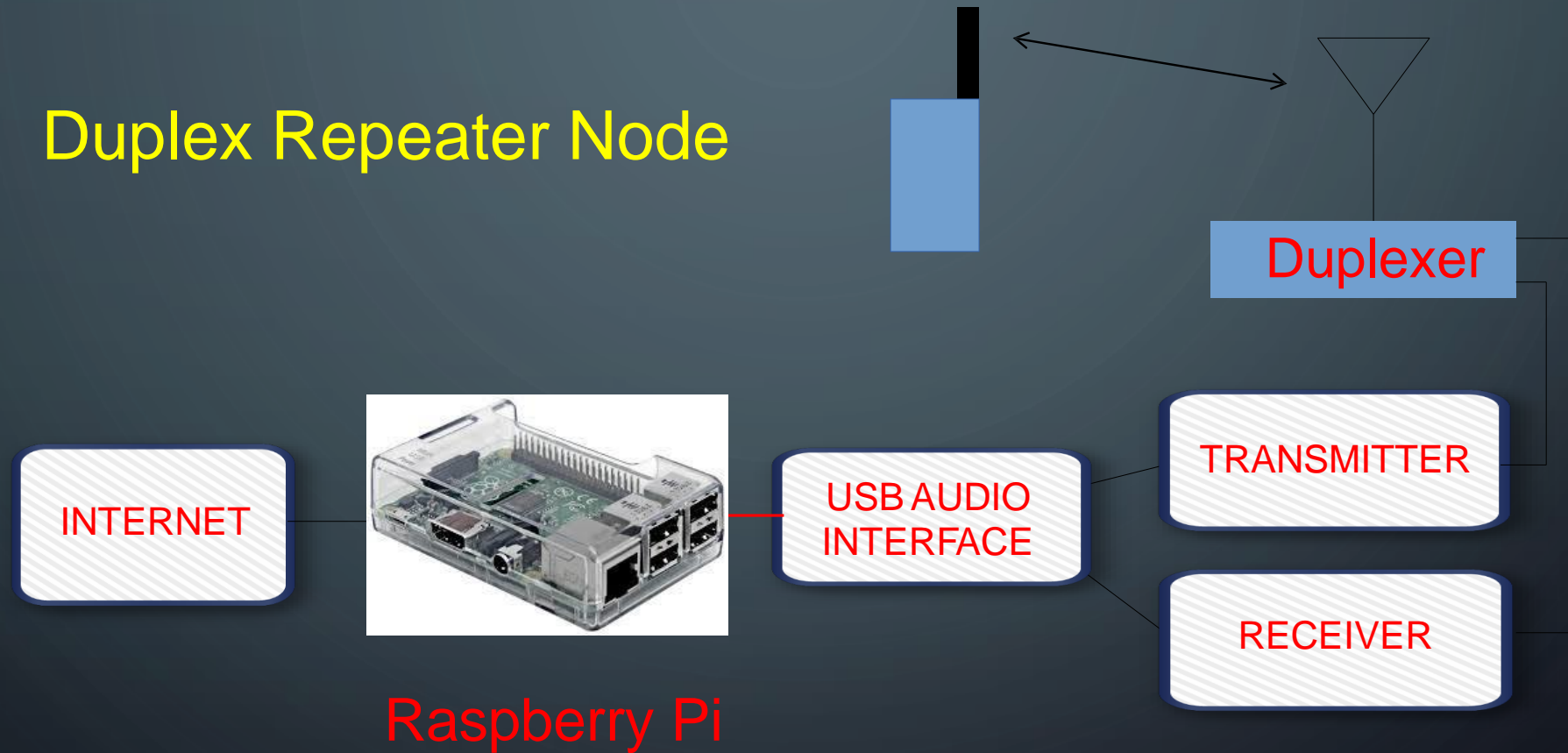
- .Very low sample rates
- .Low bandwidth
- .Fair quality
- .Seldom used over VOIP
- .Local voice messages

# What does a simple Allstar node look like?

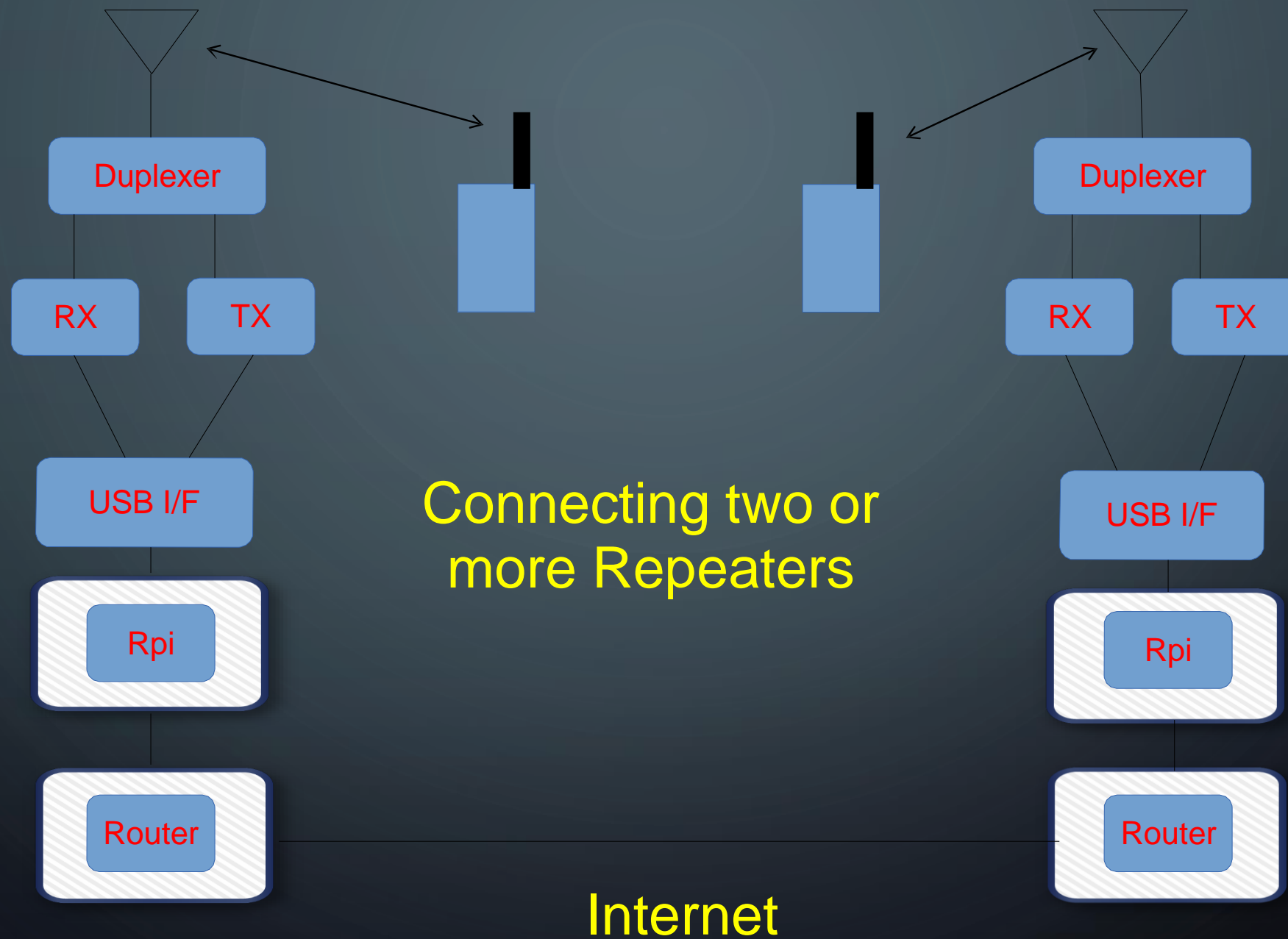
## Simplex Radio Node

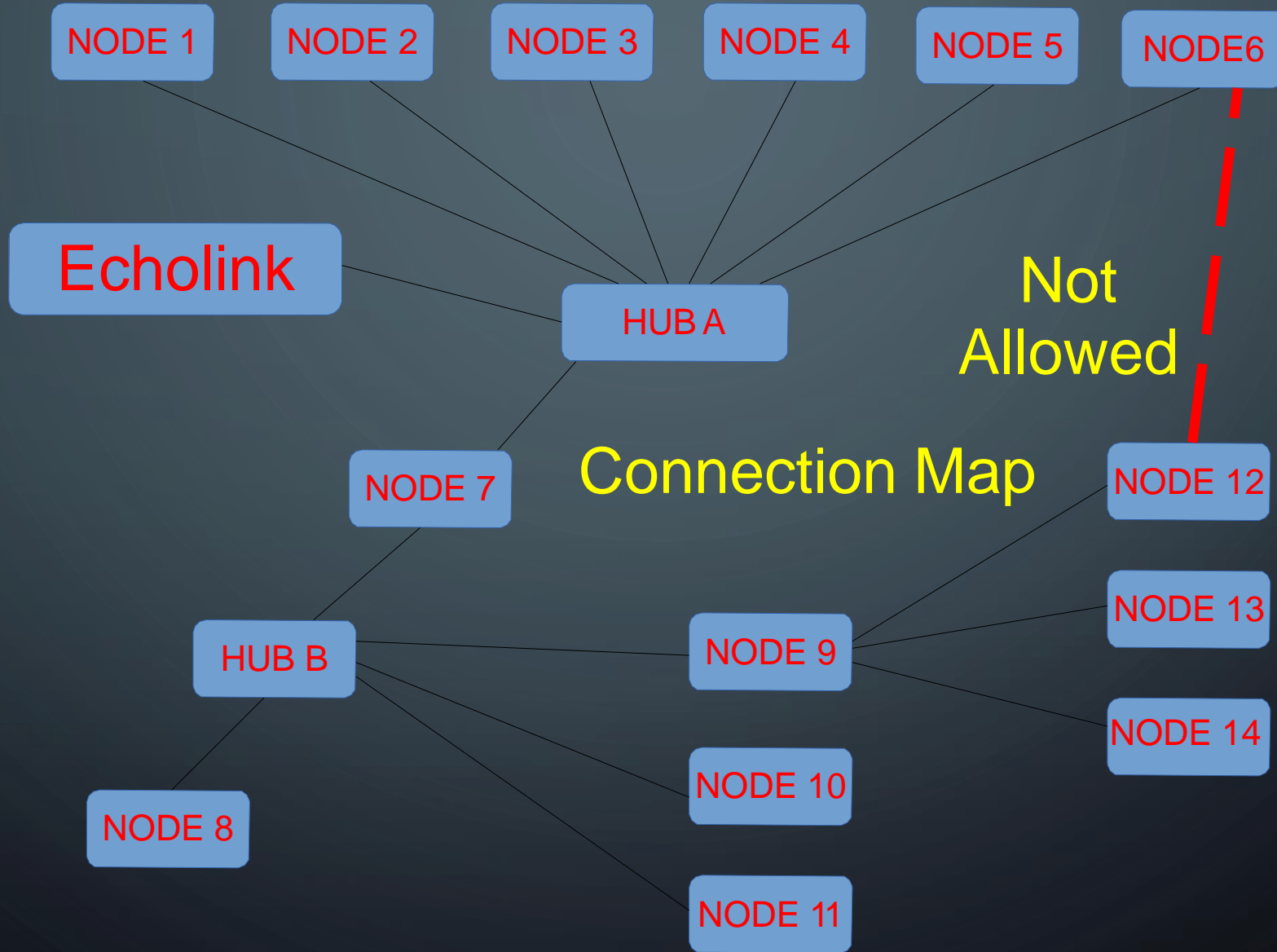


# Duplex Repeater Node











DMK Engineering URI (Universal Radio Interface)  
Little pricey ~\$70, but works GREAT and has added  
benefit of providing diode protected onboard 5vdc  
GPIO. The DMK URI is particularly well suited for use  
in a duplex Allstar repeater.

<http://dmkeng.com/>





# COMPONENTS



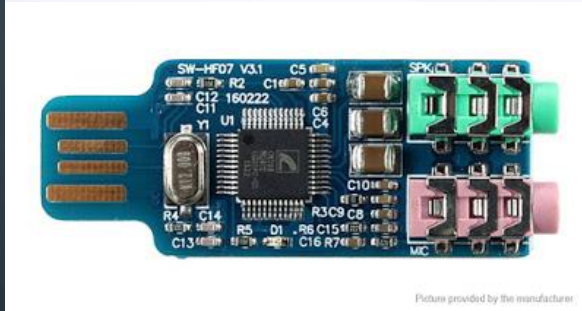
Quantity Item

1x CM108 USB Fob

Value

Notes

The CM108B, C108AH and DP108 will potentially work, but check support has been added to your chosen software. The pin out is the same.



1x

Resistor

4.7K

Photos show 10K, which works with my radio but has been reported to cause issues with others. Latest suggestion is 4.7K



1x

Multi-turn  
Potentiometer

100K

1x

BAT43 Diode

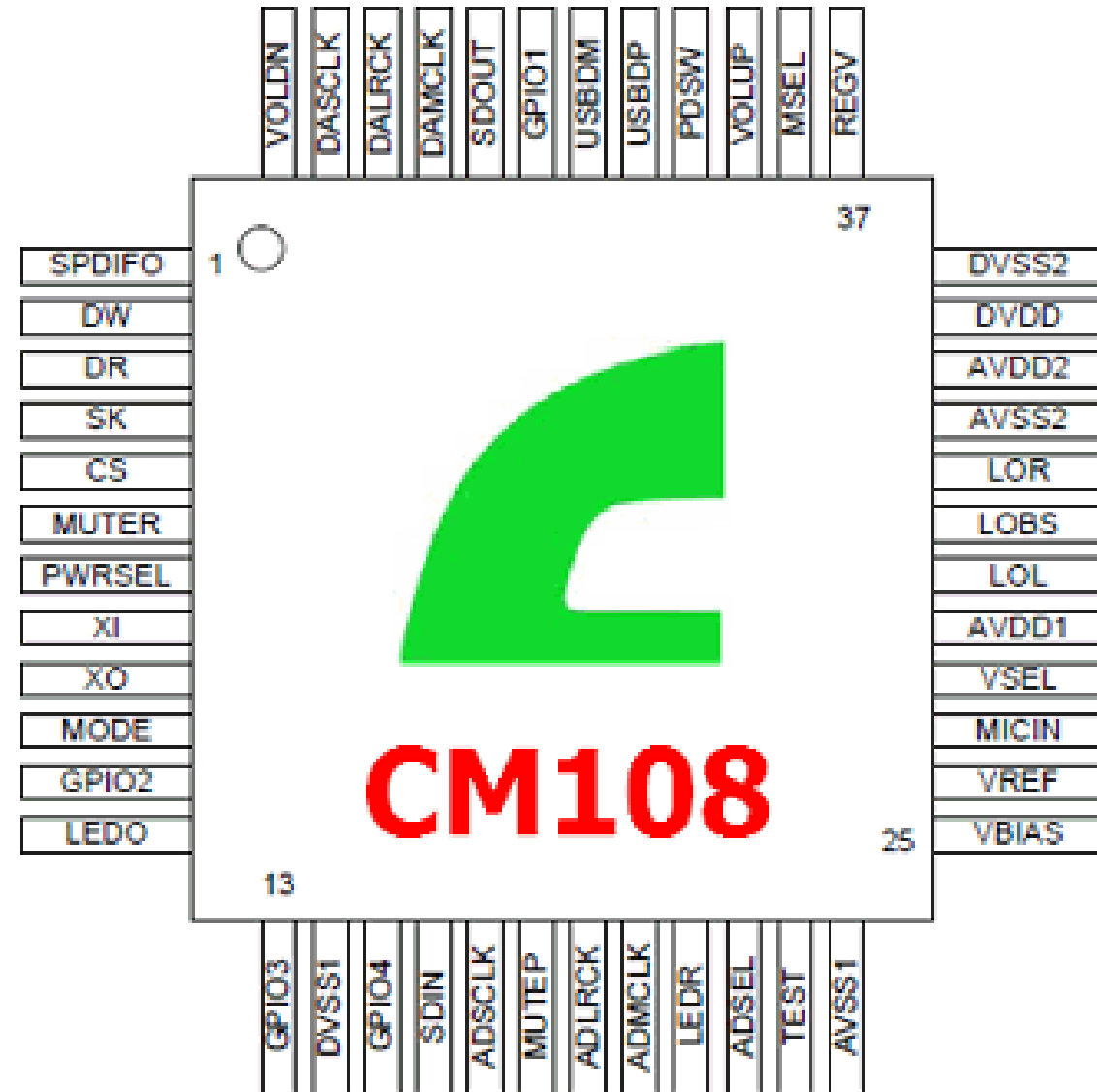
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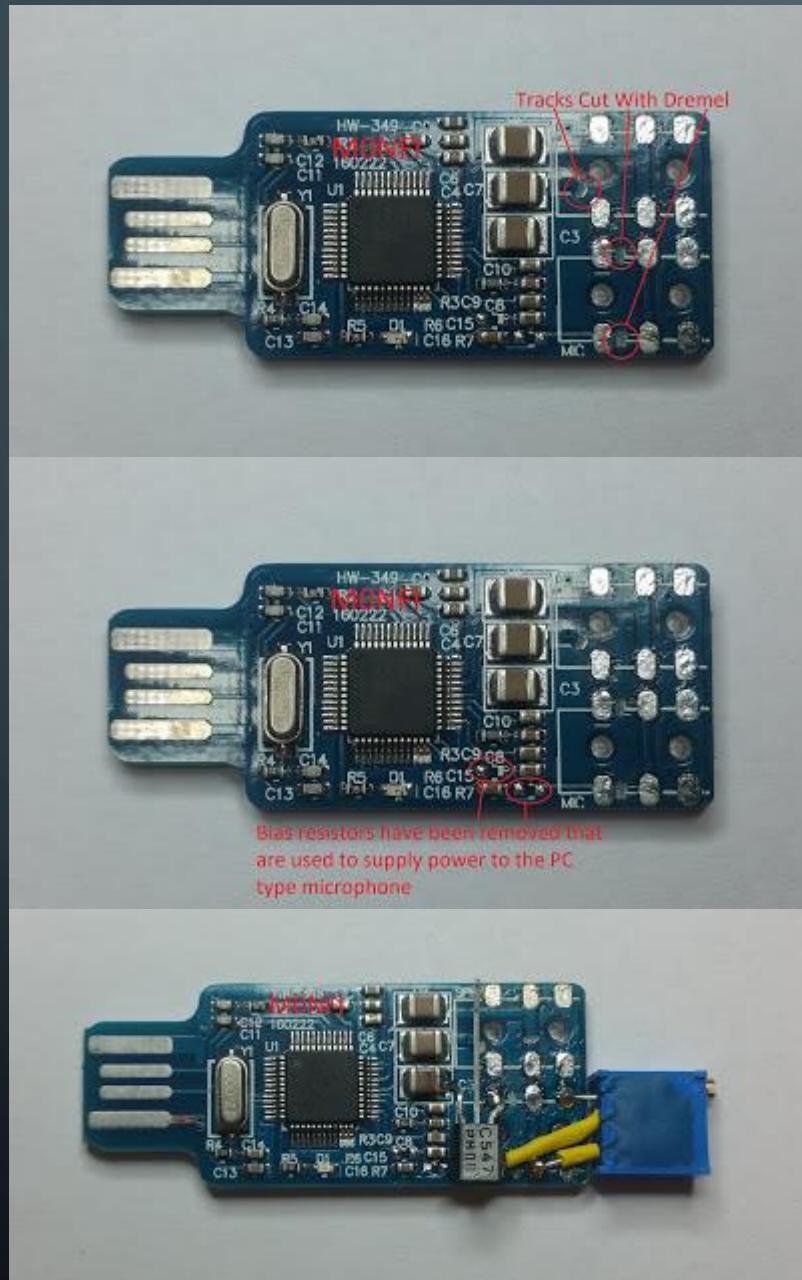
1x

C547B NPN  
Transistor

-

# CM108





## Removing the 3.5mm Jack Connectors

The first step is to remove the 3.5mm Jack Connectors from the PCB. I thoroughly recommend using hot air to remove them. I used an 858D, a cheap and cheerful hot air station that can be had for £30-35

## Cutting Tracks

The next step is to cut some tracks to free up some pads, so you can attach some additional components. You can use a Dremel, but I used a screw as a centre punch and then used a small drill bit. You don't need to go too deep, just enough to remove the copper. I then use a multimeter set to continuity mode to ensure the tracks really have been cut.

## Removing bias resistors

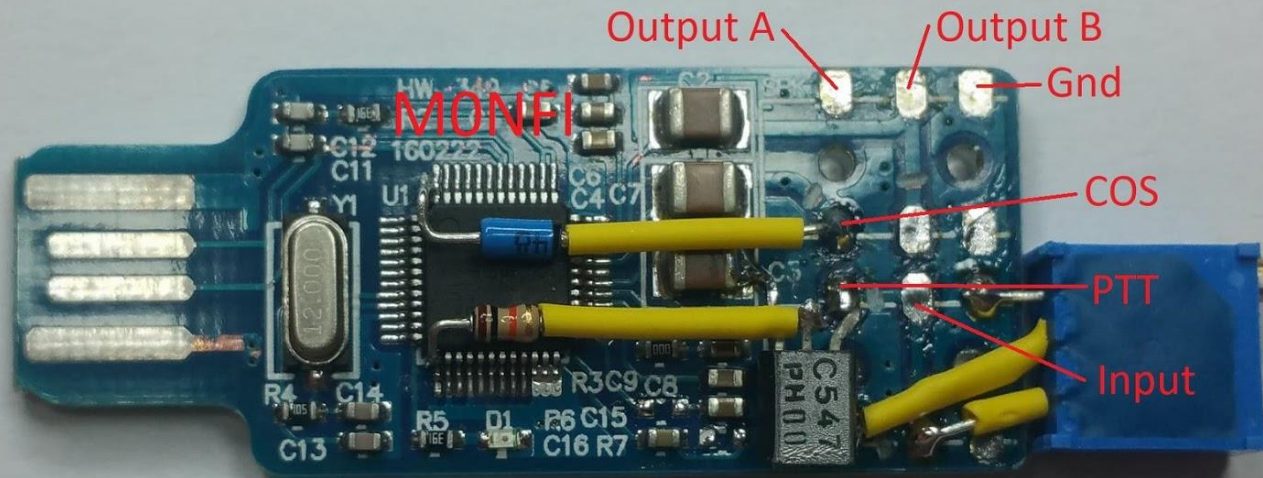
You will also need to remove the bias resistors. I used hot air for this, heating them up and then removing them with a pair of tweezers. You need to be careful not to apply too much heat or surrounding components may move or tombstone, but if one does move you can move it back in position and apply some hot air to re-solder it in place.

## Add the Potentiometer and Transistor

The next step is to add the potentiometer and transistor, in that order. I had to extend the central leg of the potentiometer so it could reach the correct pad. *Before* soldering the pot to the PCB, I also added lengths of 1mm heatshrink



## CM108 Modification For Allstar

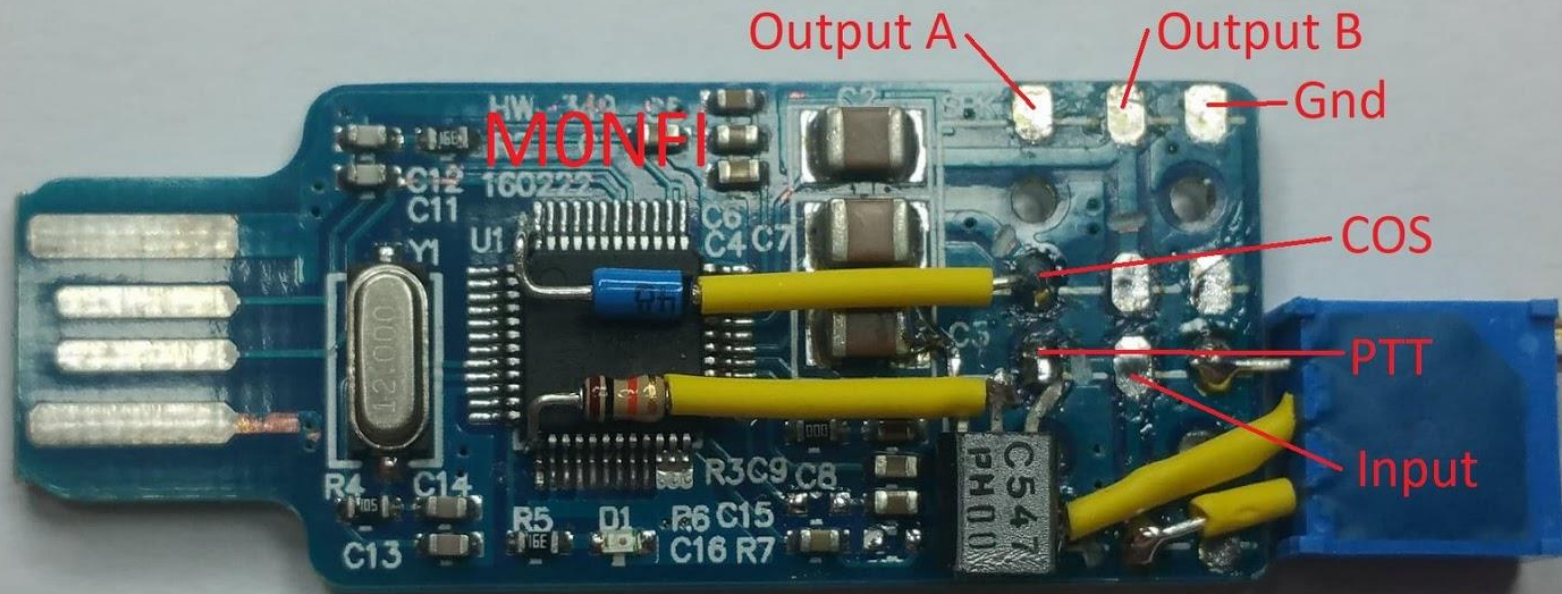


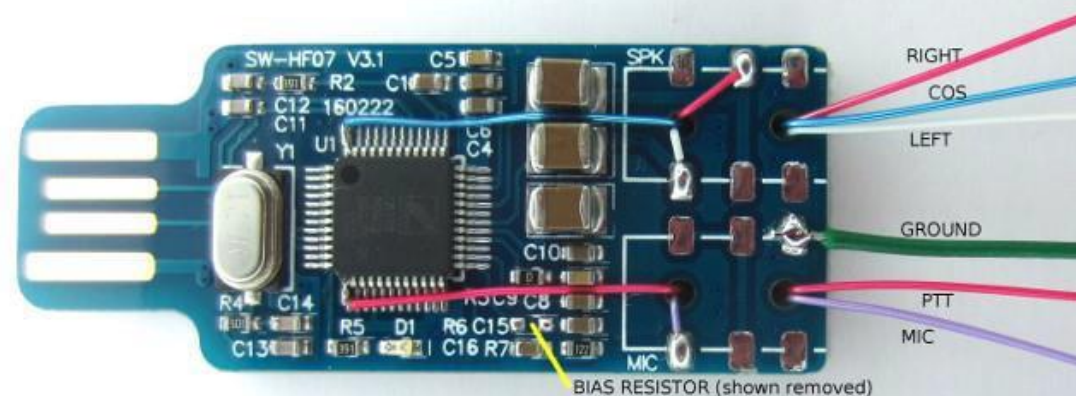
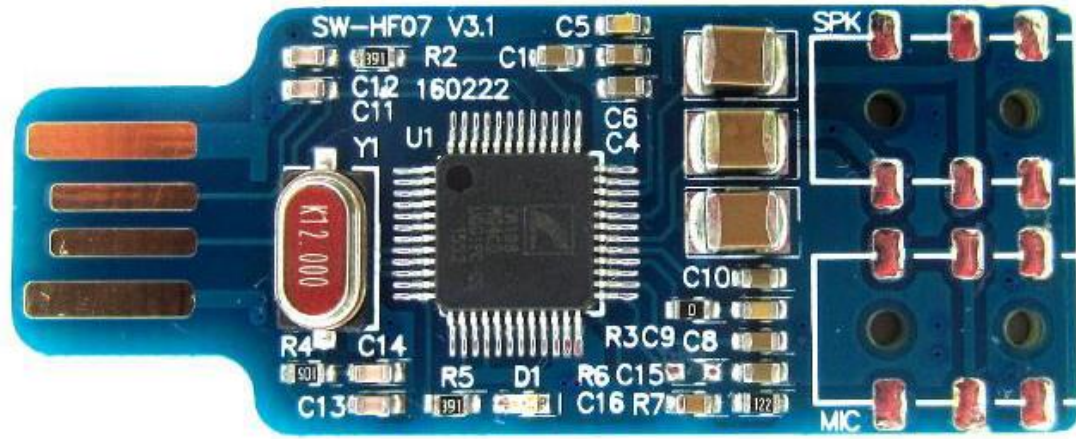
### Add the Diode and Resistor

Once the potentiometer and transistor have been added, it's time to add the diode and resistor. This involves soldering them to legs on the CM108 chip. It's fiddly, but fortunately as these are at the edges of the chip, its not impossible. Again, remember to add some heat shrink before soldering them to the PCB.



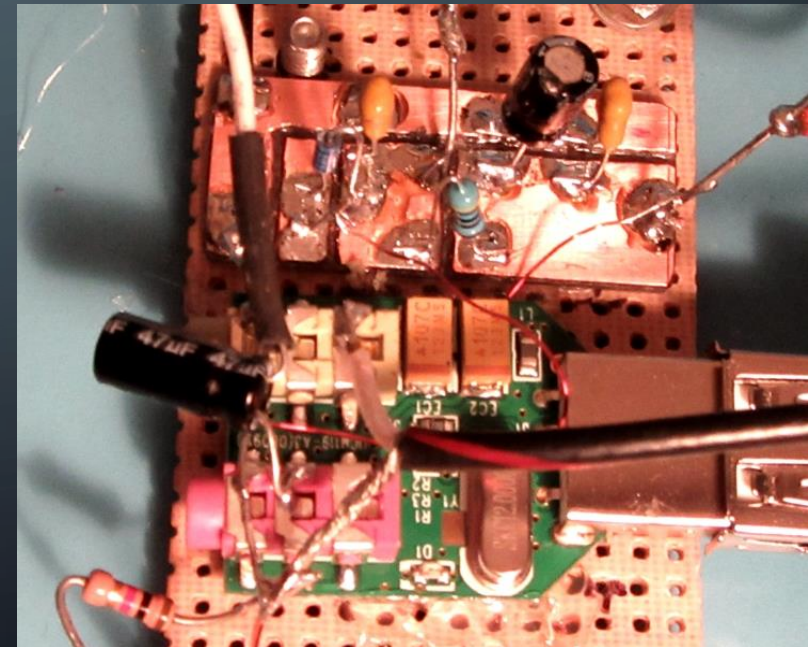
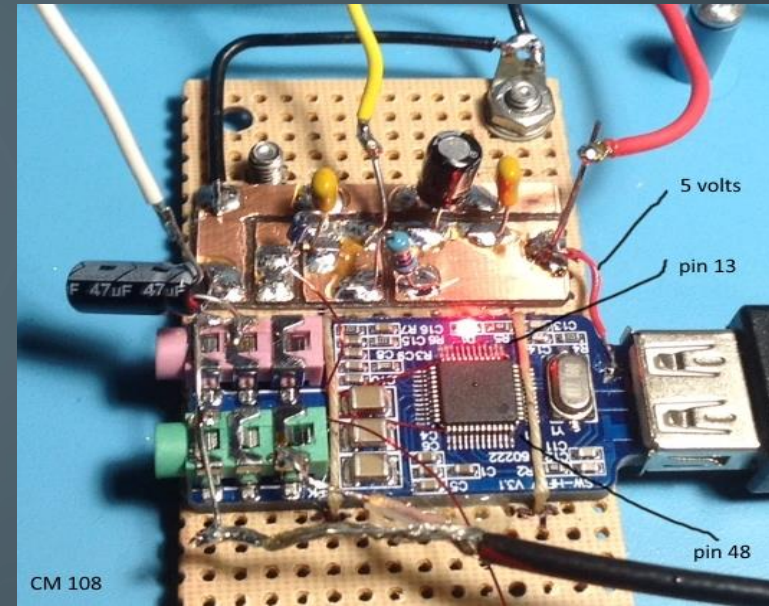
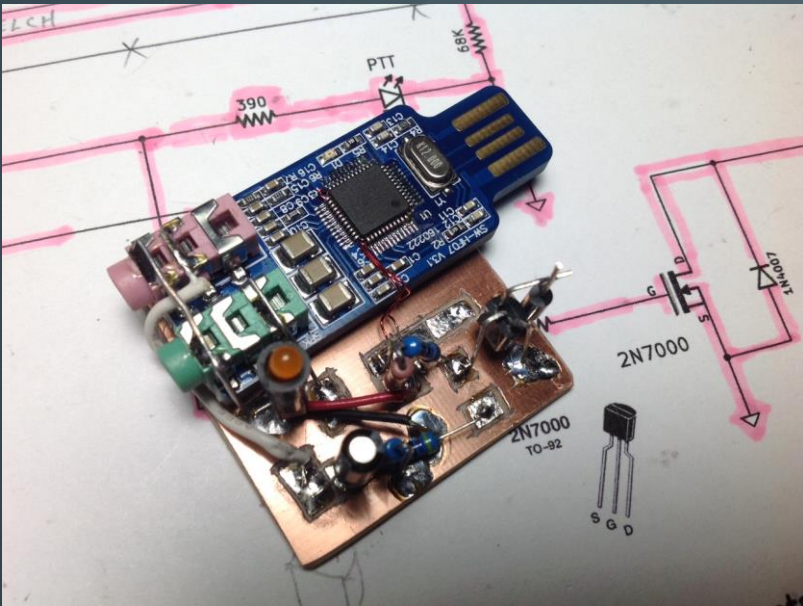
## CM108 Modification For Allstar





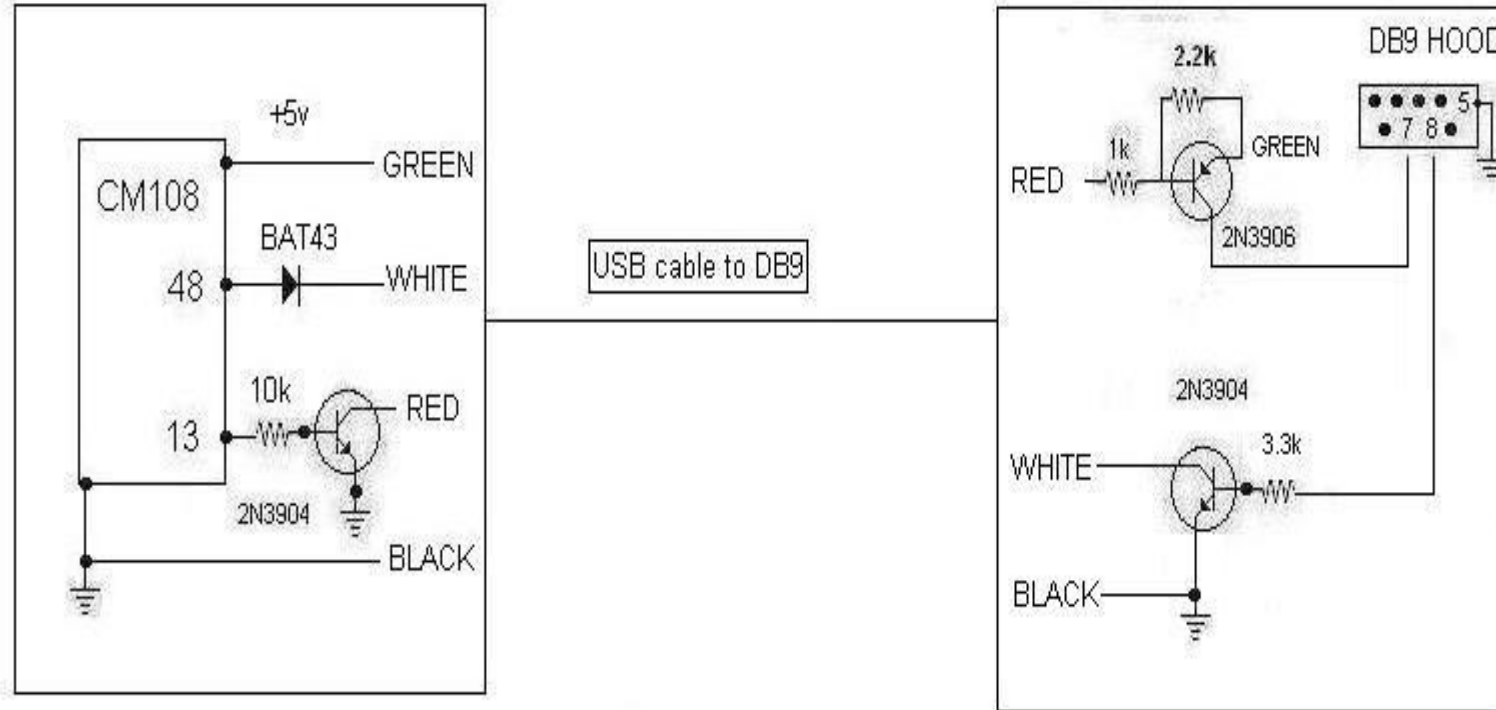
**MODIFIED USB SOUNDCARD FOB.  
CM108 USB AUDIO SOUND CHIP.**



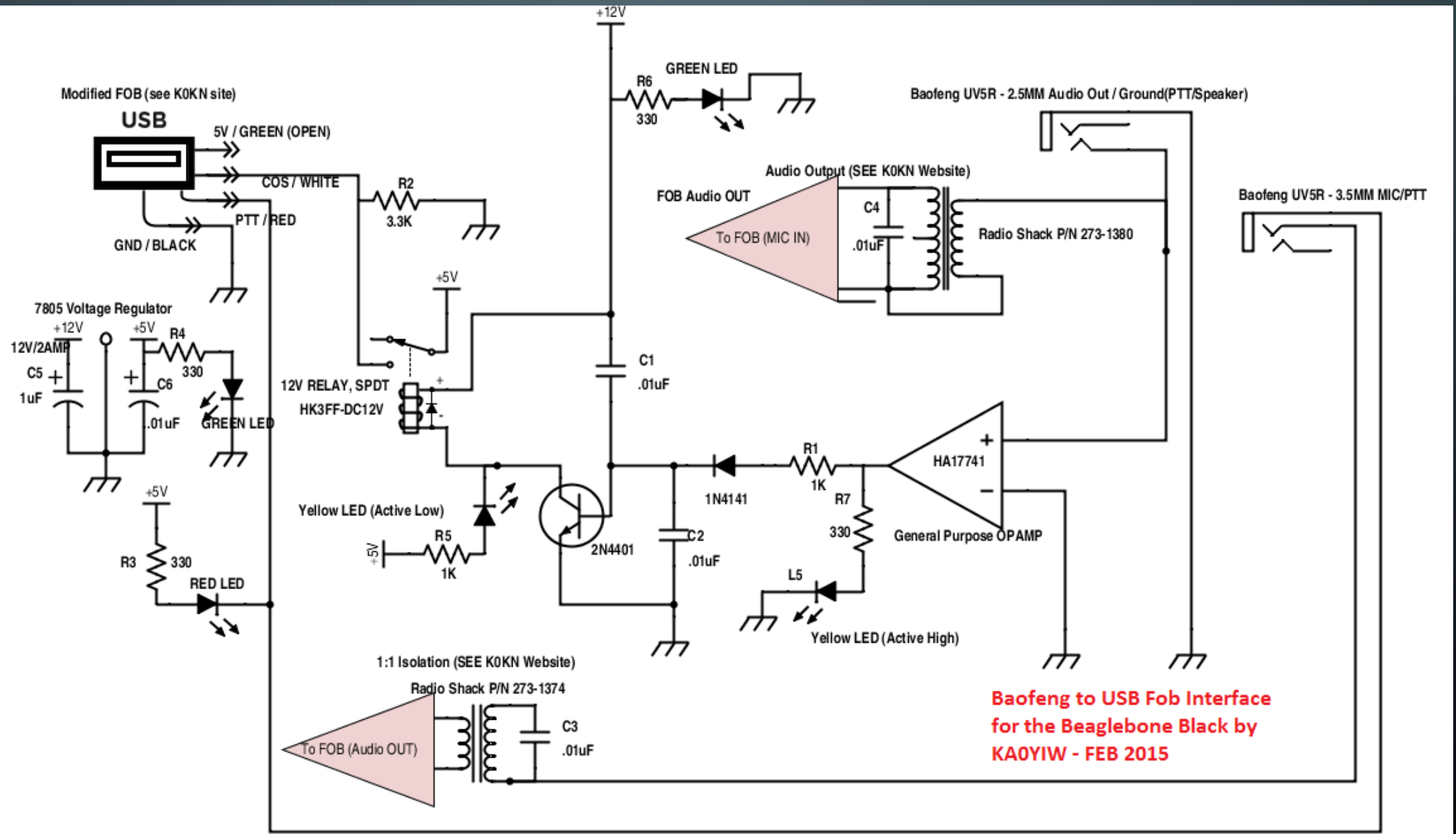


StarTech.Com CM108 USB Fob Modification by Kyle Yoksh, K0KN, January 2011.

This modification brings COS and PTT lines from your CM108 fob, and allows the fob to drive a standard Echolink-type serial interface. The article detailing the modification can be found at [http://www.qsl.net/k0kn/cm108\\_mod.html](http://www.qsl.net/k0kn/cm108_mod.html)



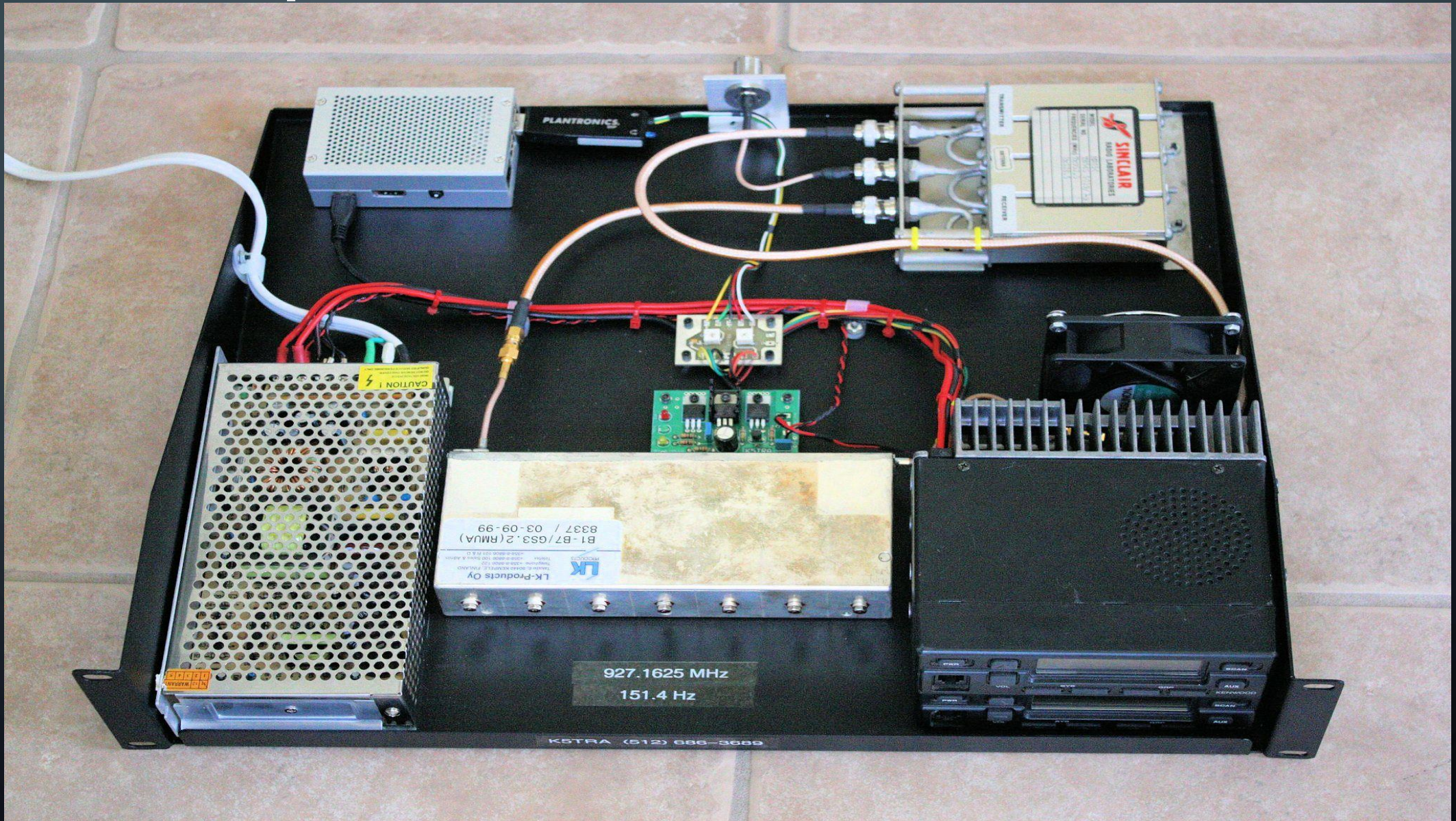






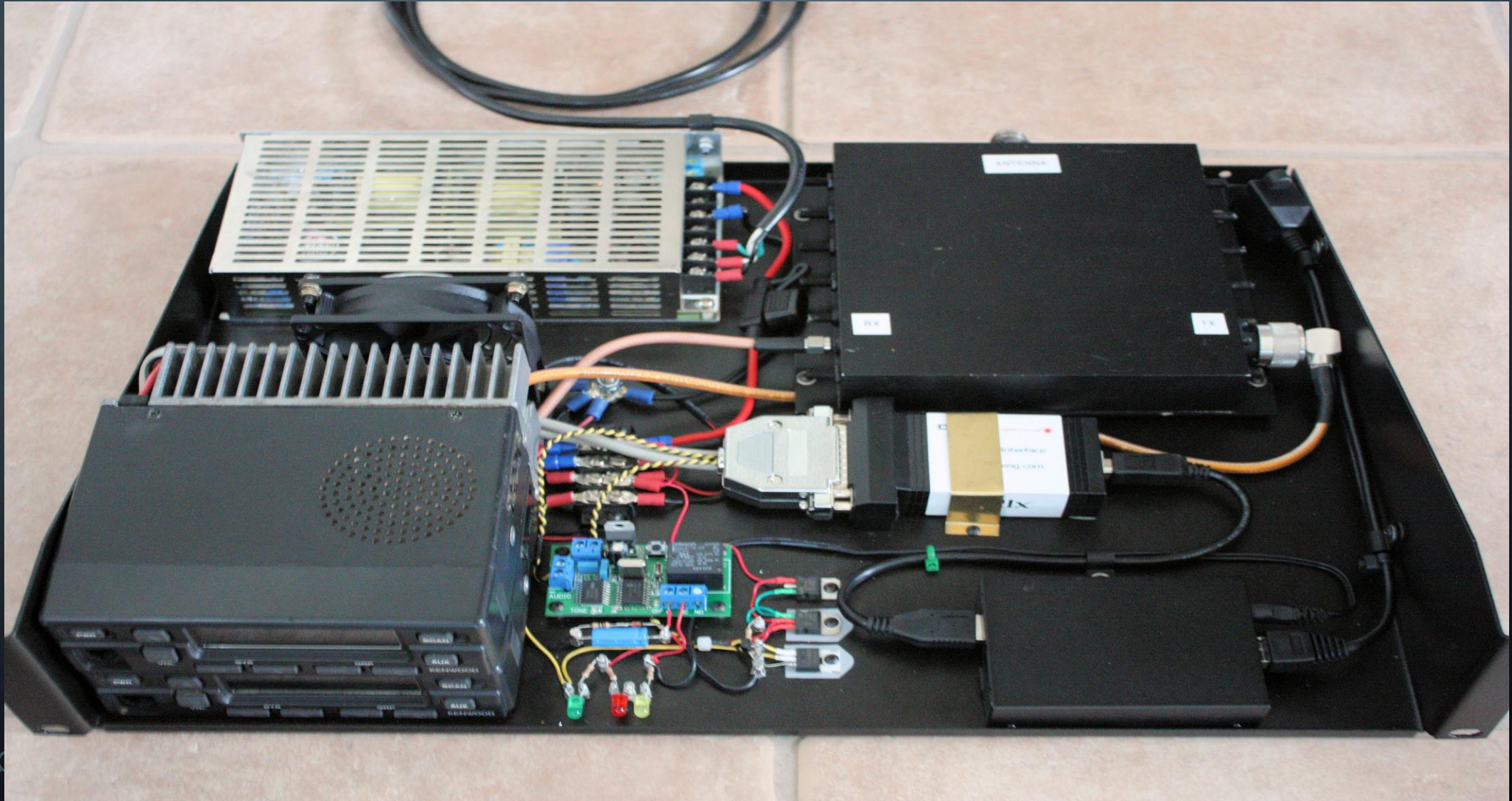


# Repeater USB





# Repeater URI





# Repeater integration





# Repeater Controller

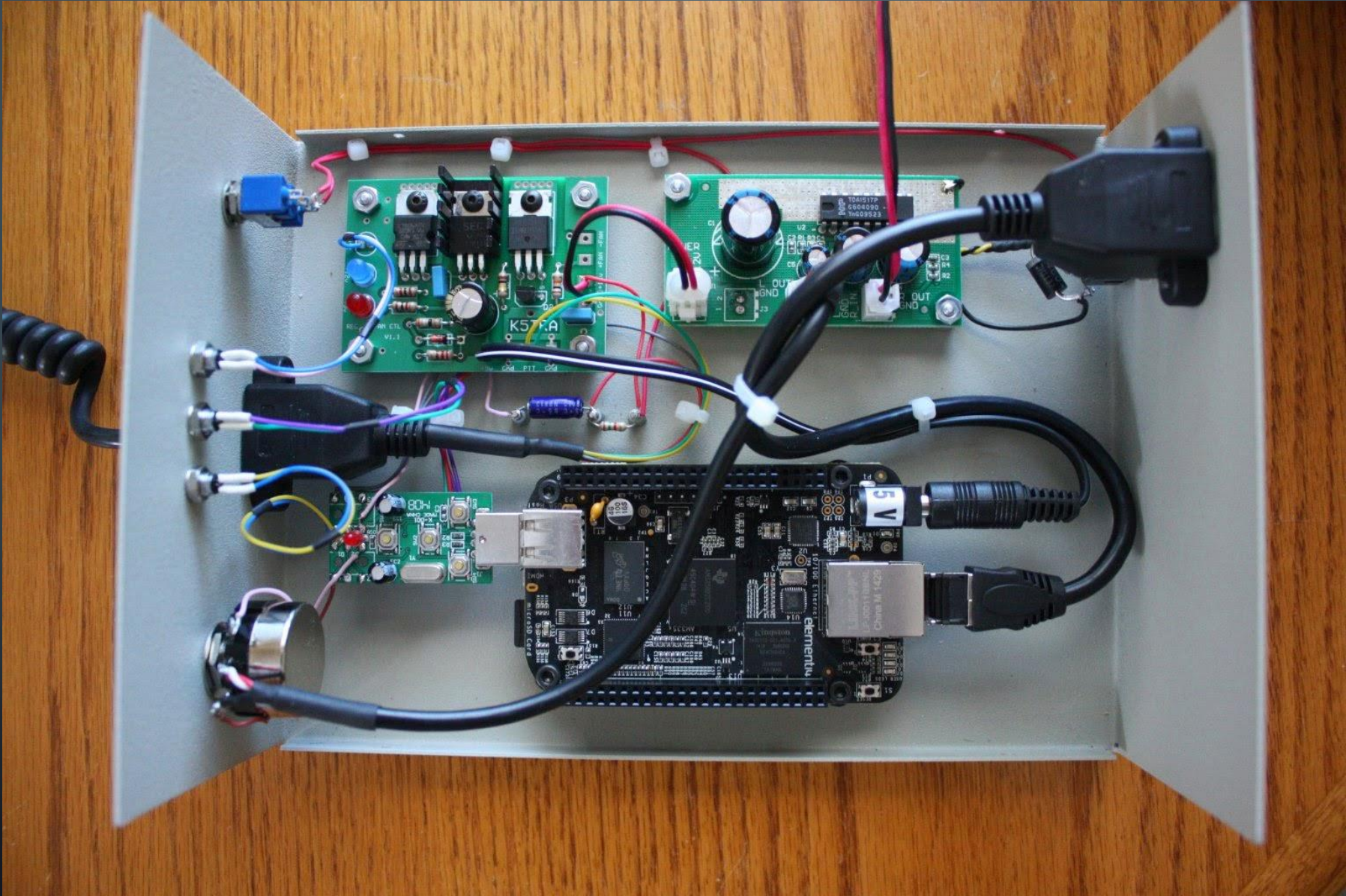




# Radioless Node









For more documentation on AllStar and all the many things you can do with it, go to [The AllStar Wiki](#).

If you have any questions, ask in the [AllStar group](#).

Enjoy AllStar on your Raspberry Pi!

<https://icemanjeep.blogspot.com/2018/06/allstar-link.html>

<https://allstarsetup.com>

<http://www.pakhams.com>

