

# BASIC TROUBLESHOOTING of the TNC-PI

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## PURPOSE

As a regular user of the YAHOO group Raspberry\_PI\_4\_Ham\_RADIO, I have discovered some individuals need more help than others. Every newbie who has assembled his TNC-PI happens to be asking the same questions. There is a wealth of information on the internet, but there are some dead spots. The purpose of this paper is to set a baseline of “things to do” before you go off and start driving others crazy posting questions and problems that can be and have been resolved here.

We first have to thank Coastal Chipworks – John Hansen, W2FS for his excellent work to provide the TNC-PI to Amateurs at a very reasonable price. Hopefully he will welcome the “off loading” of some of the questions he receives by this paper. With the demise of HEATHKIT, the days of an electronic moron building something are over. Simply put, kits, electronic projects, experimenting, and amateur radio have evolved far beyond the status quo of the 1950’s, 1970’s and 1990’s. Welcome to the 21<sup>st</sup> century! If you think this is technically tough, just wait another 20 years. On the positive side a TNC in 1984 was \$150. A GPS – well only the military had them and an Apple II was \$1295- and it had a 2 megahertz 8 bit 6502 processor. I paid \$277 for my first 5 channel 1 watt 2 meter FM HT. Today a Baofeng UV5A dual band 5 watt HT is \$45.

## PREREQUISITES

We have to assume, you can read and write, solder, have some electronic-technical ability. Unless you live in the Sahara desert, you should have some ham buddy that can help you out. Join a local ham radio club whenever possible.

BECOME FAMILIAR WITH THESE WEB SITES:

<http://tnc-x.com/TNCPi.pdf>

[http://ohiopacket.org/files/wiring\\_diagrams/web.archive.org/web/20000902104029/www.packetradio.org/tnc2rad.htm](http://ohiopacket.org/files/wiring_diagrams/web.archive.org/web/20000902104029/www.packetradio.org/tnc2rad.htm)

In Addition to an ELMER-

1. A good set of hand tools.
2. A magnifying glass.
3. A Voltmeter –
4. Jumpers and other such ham radio type things.
5. Need a scope? Under \$50? Go see this:

<http://www.seedstudio.com/depot/Digital-Storage-Oscilloscope-with-Panels-p-514.html?cPath=63>

You have a RASPBERRY PI that you have played with. You can boot it, run programs and connect to it. You have used it in some capacity prior to Deciding you are going to try a TNC-PI. Now GO FOR IT!

# START HERE:

. You have ordered, and received your TNC-PI... Spend the time to read and reread the assembly instructions. Check the parts carefully. It's easier to check twice than solder twice. 1<sup>st</sup> time assembly should take about 4 hours. There are no points for speed. Accuracy counts.

## THE 1<sup>st</sup> MOMENT OF TRUTH-

After you've assembled your TNC-PI per the instructions, but before you set software try these steps: Disconnect the PI from ALL cables- But leave the SD memory card in the slot. Connect the TNC-PI to the PI. Be sure the double header lines up. I installed the aluminum standoff on the TNC-PI but not to the PI so you can remove the TNC-PI.

Now power up the PI by connecting the micro USB port to a 5volt 1 amp power supply. Feel free to do this over and over, I have.

### On the TNC-PI:

DCD (yellow) and PTT (red) LEDs will come on for about a second.

Yellow will stay on longer.

Both will then just flash at the same time quickly (1/5 sec)

### On the PI:

Red PWR will stay on

Green ACT will blink then solid 3 seconds, off 6 seconds, then blink 17 seconds..(may be longer, my PI is in turbo mode !Ghz. clock speed.)

On the TNC-PI DCD will flash once or twice almost randomly.

All chips on TNC-PI should be cool to the touch.

If all the above has happened, **YOU HAVE PASSED THE SMOKE TEST!!!**

## IF NOT--- GO NO FARTHER!!

If you perform the same test with Keyboard, Video and Mouse (KVM) NO NETWORK – you will be able to see and use the PI. Click on LXTERMINAL with the mouse and the PI green ACT light will light. If the PI does not work with the TNC-PI attached, remove the TNC-PI and see if at least the PI still works. SORRY!!!

## STEP TWO-

So far we all have the same PI and same TNC-PI. This is where we diverge. We are not totally on our own, BUT--- This is the downfall of 2 individuals I have helped. It even confuses me and I've only been a ham since 1965.

NOW is the time to build or buy the interface to the radio. It may be a handheld. It may be a surplus commercial land mobile radio that have become very available because they have been mandated retirement by the FCC as of February 1<sup>st</sup> of 2013. If you don't have a radio or want to dedicate something to PACKET-ARPS, Go Baofeng UV5A or a variant... Available eBAY – Amazon.com etc.

I am going to demystify this procedure of getting you on packet. This is the part that has not been documented and the "guts" of this paper.

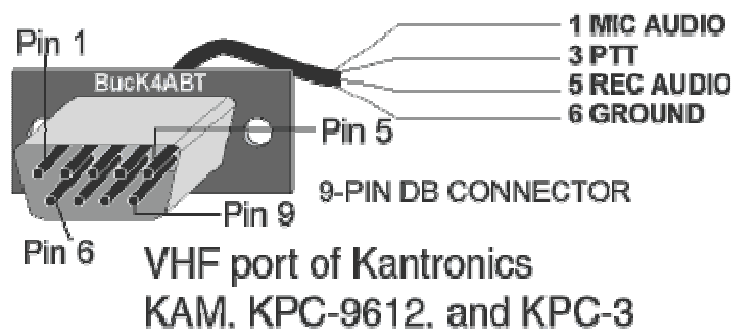
## BUILDING A TNC-PI to RADIO CABLE.

We are going to use both Baofeng UV5A dual band 5 watt hand held radio and a YAESU-VERTEX FT60 as our specific examples. We are also going to give you the “big picture” of how to do it, no matter what radio you plan on using. The Baofeng radio has a ton of accessories available in the internet for cheap money. If you purchase one, it comes with an earphone-miniature mic, that is cheesy but has the makings of the TNC-PI to radio interface. If you order the radio, order a programming cable and the Battery eliminator-an empty battery pack with a cigar lighter adapter. That way you can power the radio without worrying about a dead battery.

No matter what radio we are going to use, we need to go to a website and obtain the schematic to build the interface cable. Now having said that, you can also buy that cable all ready made.

FIRST- the TNC-PI 9pin connector –Audio port- radio port- as it’s called interchangeably, is also known as a Kantronics KPC/KAM series connection...It actually is known as a DB-9M connector. Even Radio Shack can sell you one and be sure to buy a hood. The interface cable we need is commonly called KAM to “whatever radio you own” radio cable. It can be purchased pre-made from my good friend Buck Rogers. K4ABT at his website:

<http://www.buxcomm.com/catalog/>



This drawing depicts the VHF radio port of the Kantronics KPC/KAM series. Credit to K4ABT

This is the same connection on the TNC-PI

FIGURE 1

Now if you decide to build your own cable, and in my case I did as actually I first built a cable to my YAESU FT60-VX-3, for experimentation. But my APRS station will be the Baofeng.

Go to this website and find the cable schematic for your radio. You can also go to the manual for your radio. One way or another, the above illustration FIGURE 1. is ½ of the needed cable wiring. You can find many layouts at this web site:

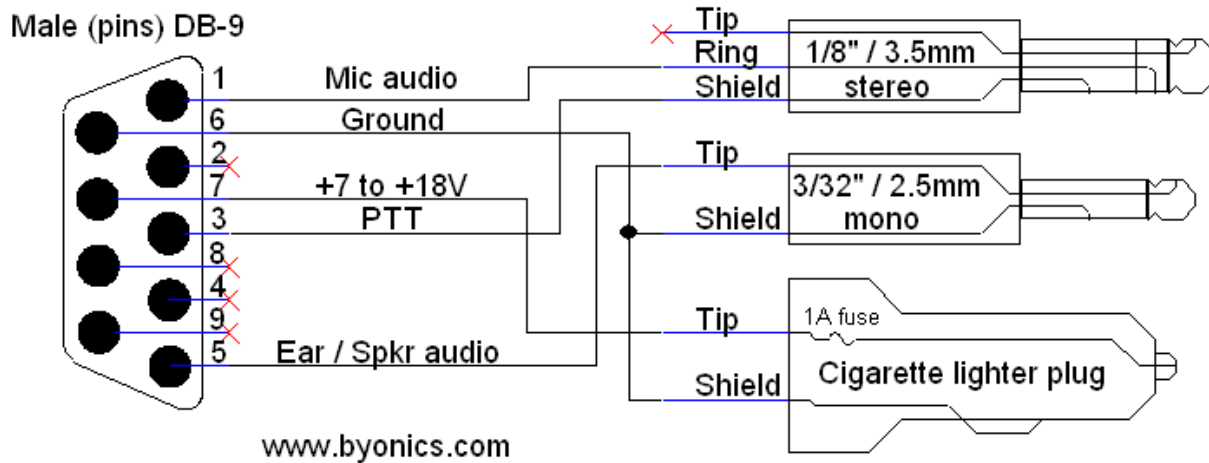
[http://ohiopacket.org/files/wiring\\_diagrams/web.archive.org/web/20000902104029/www.packetradio.org/tnc2rad.htm](http://ohiopacket.org/files/wiring_diagrams/web.archive.org/web/20000902104029/www.packetradio.org/tnc2rad.htm)

Well, Guess what?!?!? The Baofeng UV5A is not covered. But I know it is sold under a couple of names and is interchangeable with certain Woxuns and Kenwoods.

Now a \$45 hand held isn't going to have a good manual, if you are going to purchase one, this is the repository of information. Learn all about it here:

<http://www.miklor.com/uv5r/>

# Byonics HTKC Cable



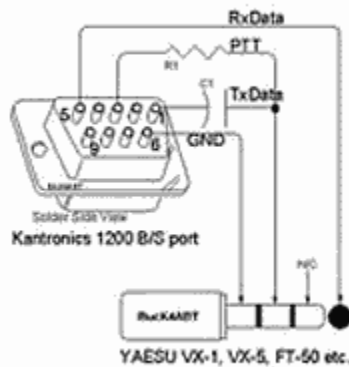
The BOAFENG UV5A comes in a number of flavors and is worth the investment. You can buy it on eBAY and Amazon.com

Now we do further research and find.. That our friends at Byonics.com. Show a wiring diagram for the Kenwood cable but make this important distinction when using it with a Baofeng::

*We have recently found that the above cables do not seem to work as well with the Wouxun and Baofeng radios, though they work fine with Kenwood radios. The HTK2 cables seem to work better with the Wouxun and Baofeng radio. These HTK2 cables have a single molded connector for the 2.5mm and 3.5mm plug, where the HTK cables above have them as 2 separate plugs and wires. The HTK2 cables also have a stereo plug on both connectors.*

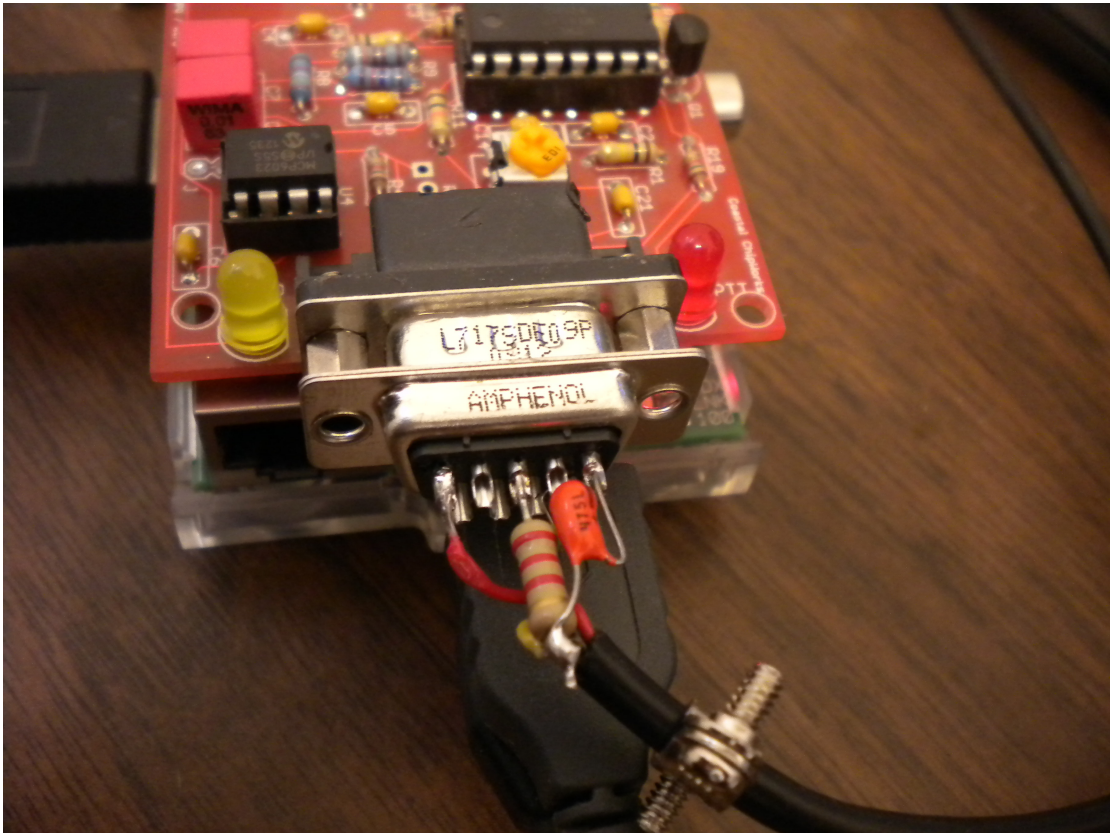
So there you go, almost the schematic we need. However.. We are not going to use the Cigar lighter plug and also as they specify, we need STEREO 2.5 and 3.5 mm connectors. The ring on the 2.5mm connector is not used. The tip on the 3.5mm connector is not used. In my case I am going to use an inexpensive FBI type earphone-mic I bought on eBAY for \$4. All I want is the cable and the molded connector.

I'm going to show my homemade YAESU FT60 to TNC-PI cable for a reason. The FT-60 uses a single 3.5mm jack that has 2 rings, not 1 ring like a stereo cable. I obtained the special 3.5mm plug on a molded cable from Digikey Electronics. The schematic to build the cable is from BUXCOMM and I again credit them.



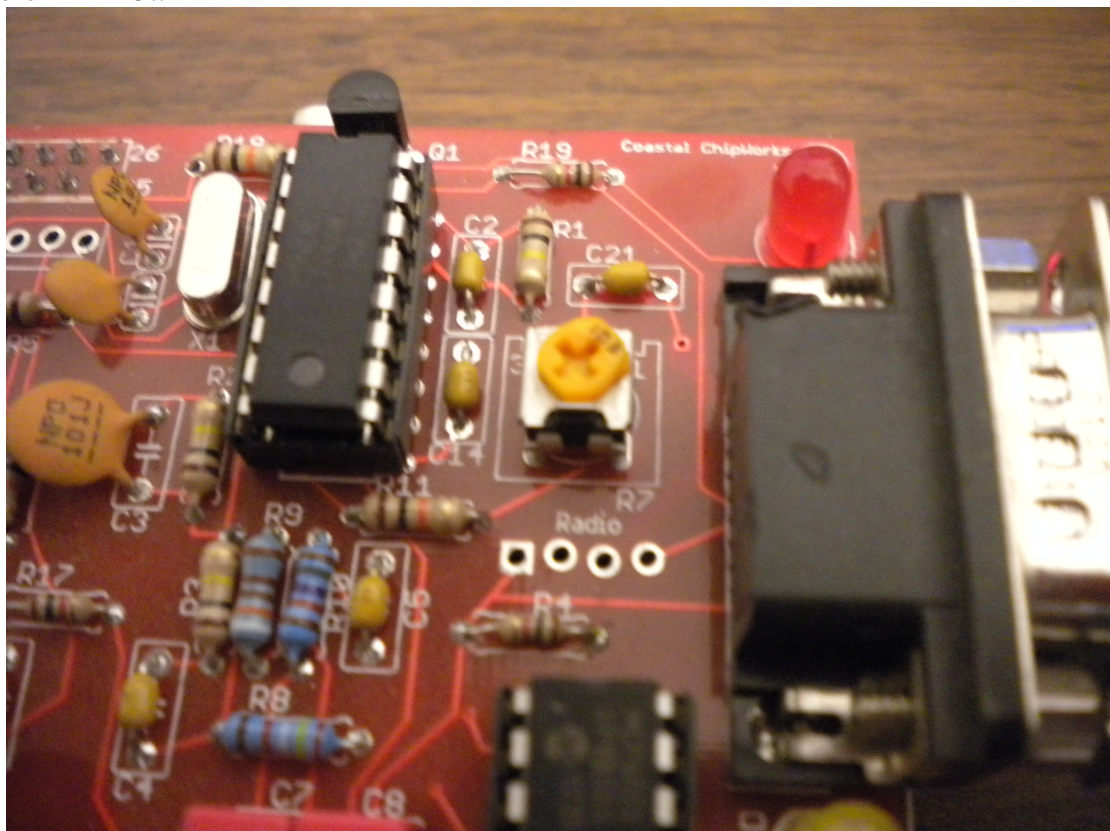
Note the capacitor and the resistor are unmarked in this schematic. I used a 4.7uf 25V tantalum and a ¼ watt 2200 ohm (red-red-red) resistor. Let's look at this actual back of the DB9 connector mounted on the TNC-PI.





Refer to the schematic. Pin 1 goes to the orange cap. Pin 3 is the resistor, pin 5 is Audio RX line. Ground is under and between pins 1 & 2. Remember- This works. If this is wired wrong. NO PACKETS!!!

This next picture is of the TNC-PI main board.... We are going to look at the solder pads just below the silkscreen word RADIO..



As you can see in photograph on page 5. There are 4 “solder” pads marked “RADIO” on the TNC-PI. The also can be used as test points and that is what we are going to do with them. The SQUARE ONE is PIN1. Then they number to the right.

PIN 1 – RX AUDIO - Receive Audio  
PIN 2 – GROUND -  
PIN 3 – TX AUDIO - Transmit Audio  
PIN 4 – PTT Push to Talk line..

**First a word about GROUND** On the TNC-PI The DB9 SHELL **IS NOT** GROUND. About the only other ground on the TNC-PI is pin 1 (the square marked pin) on the double row header. The DB9 shell floats. It is connected to nothing.. If you’re looking for a ground to clip to, use the micro usb cover or the HDMI cover on the PI. If you can’t easily attach to Pin 2 above.

I have found 2 individuals that miswired their DB9 and reversed RX and TX, then made pin 9 ground to the radio. (9 is floating) So guess what? NO PACKETS...

Now let’s see if we are getting audio from the radio to the TNC-PI.

1. Connect a speaker or earphone to test leads then connect to pin 1 and ground. Turn on the radio and open the squelch and run up the volume. You should hear audio at pin 1 and ground. If not that’s a problem. Determine if it is the radio or the cable. You could connect a scope at pin 1 if you have one.
2. Check Transmit by keying the radio and listening to a monitor on the transmitter frequency. You should hear a tone no matter what the PI is doing.. This is part of the R7 adjustment procedure. With an AC voltmeter, I measured about 0.8 volts with R7 midscale Pin 3 to ground.
3. PTT should measure +5V or more if the RADIO is connected...Taking the PTT pin to ground with just a jumper Pin 2 to pin 4 should key the radio. No radio present the pin 4 voltage is 0 volts.

We now know our radio can be “seen” by the TNC-PI. Time to investigate software. Better get coffee.

## CONCLUSION

This paper will not fix every and anything that may be wrong. But its purpose is to give you a start to where you can say to an experienced ham –on or off the Yahoo group forum. I did all of this and it works. This procedure at least eliminates a few possibilities and hopefully will provide some needed information.

Then we can go from here. Part of ham radio is pounding your head on the wall. But sooner or later you’ll get it. ENJOY the hobby.

73’s  
Larry W8LM