

The KM6LYW Radio DigiPi Project



Download*
Ver 1.8-2

Bookworm
Pi5 Support

* Password is currently available to patrons on the [KM6LYW Patreon Page](#)

Why the paywall? Anything gets you access to the DigiPi image, even a dollar. The point is not to keep the software locked up, but to ultimately throttle the questions and support load. Plus it gives you priority access to design decisions, code contributions and early releases. DigiPi is community driven and open source. I assure you there are no commercial interests, other than beer money. At some point, once development settles down, we'll make a more public release.

Please share with friends, but do not post this image online. All of the software carries an open-source license and is freely available, just not all in one place in a bootable image.

Thank you for your support.

What is a DigiPi?

The DigiPi is the ultimate hot-spot for all amateur radio data modes, including APRS, ax.25, winlink email, ft8, js8cal, slowscanTV, PSK31, packet and even CW. The implementation is an elegant, inexpensive, low-power, open-source Raspberry-Pi-based amateur radio data transceiver, managed exclusively by web browsers or smart-phone apps, with no bulky keyboards, monitors or complicated wiring.

Packet radio Terminal Node Controller KISS interface via wifi or bluetooth
Use with xastir, yaac, woad, aprsdroid, and any open-standard KISS apps

APRS WebChat interface
Send instant messages over the APRS packet network via your web browser

APRS Packet Radio Network digipeater
Repeat packets heard on 144.390 and 144.800(europe)

APRS Packet Radio network IGate

Bridge APRS Network to the Internet for email, sms, and other online services

Winlink email server

Listen for Winlink radio clients requesting to send/recieve email

Winlink email client

Pat, web-based inbox/outbox email interface

ARDOP sound modem to connect to winlink servers world-wide on HF bands

Woad Winlink Android app connects to DigiPi via wireless TNC/KISS interface

WSJT-X FT8

Ultra low signal-to-noise ratio contacts via web-browser/wifi/phone

JS8 Call

Ultra low signal-to-noise ratio keyboard-to-keyboard via web-browser/wifi/phone

FLDigi

CW, PSK31, RTTY, Contessa, FSQ, Hell, IFKP, MFSK MT63, Olivia, PSK

QPSK, 8PSK, PSKR, THOR, Throb, WeatherFax

Slow Scan TV

Send/receive images via web-browser/wifi/phone

AX.25 Networking

Radio connected network protocol used for winlink/node services

IP tunnel, with actual address on the internet (44.* for amateur radio)

Node Services

Run your own bulletin board, or messaging service

Connect to other nodes, via intermediate nodes

Components

Raspberry Pi (Pizero, Pi3 or Pi4)

Audio board: Fe-Pi Audio Z v2 *or* Audio Injector Z (edit /boot/config.txt)

A simple push-to-talk circuit using a FET, resistor and gpio pin, or

A USB cable for radios which support cat/rig control and audio over USB

An optional Adafruit 1.3" TFT display

Optional LEDs for transmit/receive/bluetooth

Pre configured software on DigiPi Rapberry Pi SD card image:

Direwolf sound modem and TNC

Direwatch display driver

LinuxRMS Winlink server

Pat web-based winlik email client

Web-based mangement interface

Bluetooth rfcomm serial port

Wifi autohotspot

AX.25 Networking, IP, ax25d services

Virtual display driver to use interactive apps via web-browser/wifi/phone

WSJT-X FT8

JS8Call

FLDigi

qSSTV

Linux Node service, netrom, bulletin board, Infocom games

Audio driver and mixer settings for audio hats (FE-Pi and Audio Injector)

ARDOP modem for 300baud packet on HF bands
Rig Control (rigctld) for CAT/audio on USB-connected radios
Web-based wifi setup, log viewers, and axcall tty interface

Shopping list

There are two different DigiPi builds. A PTT-circuit build, and a USB-connected build. Radio's with USB ports (ic7300, yaesu991, ic705, etc) do not need all of these parts, just the Raspberry Pi and a USB cable is all you need. If your radio has a conventional PTT circuit/wire (yaesuFTM400, dual band rigs, etc), you'll need the FET/resistor to trigger push-to-talk, an audio card, and will need to fabricate a cable for your radio, see the wiring diagrams below. The screen, while totally cool, is optional and can be attached to either build.

Bill of Materials, including PTT circuit

A Raspberry Pi, ideally a Pi Zero 2W [Amazon Adafruit Chicago_Dist](#) (\$15)
Watch <http://rpilocator.com> during the global supply chain crisis and chip shortage.

If using USB, a USB "OTG" cable between your pi and radio radio.

If NOT using USB, you'll also need the following:

Audio hat, one of:

Fe-Pi Audio Z v2 [x] 1 *Fe-Pi Sound Card without kit* [WB7FHC](#) (\$24)
Audio Injector Z [Amazon](#) (\$20) (edit /boot/config.txt to enable)

Stacking header Adafruit(best) [Amazon](#) (\$3)

2N7000 N-Channel FET [Amazon](#) (\$2)

100K 1/8 watt resistor [Amazon](#) (\$2)

An optional Adafruit 1.3" small ST7789-based TFT display [Adafruit Amazon](#) (\$16)
Alternative 2.8" large ILI9341 display: [Adafruit](#) (\$45)
(edit direwatchy.py and digibanner.py to enable the larger display)

Optional LEDs for transmit/receive/bluetooth [Amazon](#) (\$9)

Ferrite Bead around all the wires between the radio and the audio board (\$5)

Hardware Configuration

A [step-by-step hardware build video](#) is now available on the KM6LYW Radio youtube channel.

Radio's with USB ports (ic7300, yaesu911, ic705, etc) do not need the follwing wiring, just the PiZero and a USB cable is all you need.

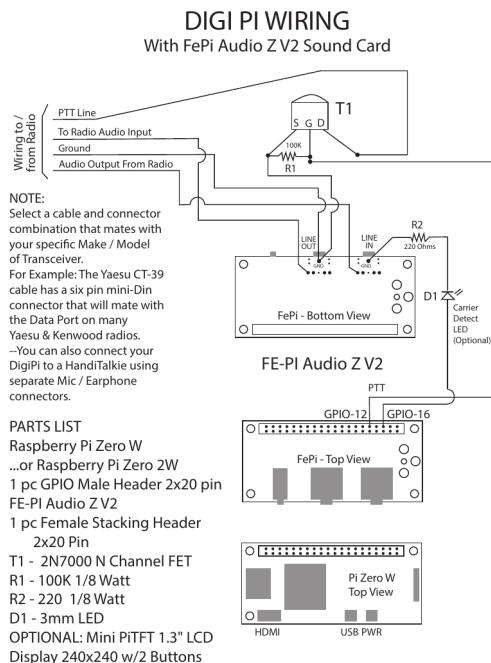
All other radios will require a sound card (yaesu ftm400, ftm100, 2980, all HT's). Choose either an "**Fe-Pi**" or "**Audio Injector Zero**" audio board, and refer to the respective wiring diagram below. The Fe-Pi is works with the broadest range of radio input/outputs, while the Audio Injector Zero shouldn't be used with radios that have low output (Baofengs, Kenwood HTs), as it introduces a -3dB cut on Line-In.

You might also try an audio dongle, but keep in mind they're typically "mic level" and not exactly compatible with a radio-speaker output from an impedance perspective. You might experiment with a voltage divider or inline-resistor to leverage these otherwise affordable USB dongles. They do tend to work well with HT's or low-output-audio radios like Baofengs and Kenwood HTs.

Sound-card-builds will also require a ferrite bead around the wires between the radio and the sound card.

Supply-chain chip shortages are very real! Get what you can while you can. Watch <http://rpilocator.com> for up-to-date inventory world wide. This is why I'm suggesting two alternative audio boards:

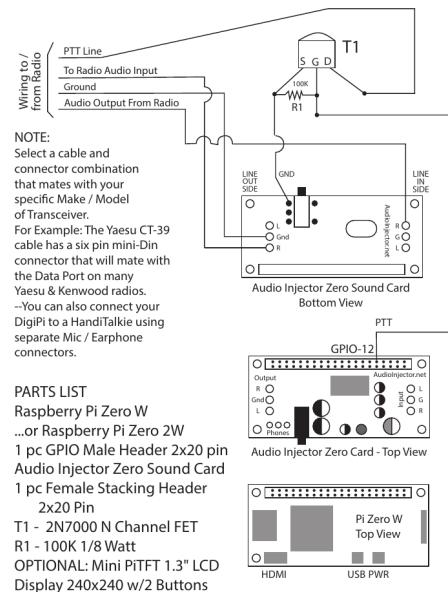
Choose either the Fe-Pi or Audio Injector Zero diagram



Craig Craiger KM6LYW Updated February 2022

Layout by W9GPI

DIGI PI WIRING
With Audio Injector Zero Sound Card



Craig Craiger KM6LYW -- Updated February 2022

Layout by W9GPI

Software Configuration

A [step-by-step software configuration video](#) is now available on the KM6LYW Radio youtube channel.

If you haven't already, build the hardware here: <https://youtu.be/io-YnP0Q-ow>

This will boot on a Raspberry Pi Zero(packet only), Pi Zero 2W, Pi3, Pi4 or Pi5.

You'll need to "unzip" the image first to decompress it. On Linux, it's
 unzip digipi-1.6-2.zip

Then flash it to your SD card. It'll fit on a 4G card with room to spare.

Look up how to do this. On Linux, it's

```
dd if=digipi-1.6-2.img of=/dev/sdX bs=4M
```

where sdX is the drive letter of your blank SD card (run dmesg to see).

On Windows, try this: <https://www.addictivetips.com/windows-tips/flash-sd-card/>

On Mac, try this:

<https://computers.tutsplus.com/articles/how-to-flash-an-sd-card-for-raspberry-pi--mac-53600>

Boot the Raspberry Pi with the newly flashed SD card.

Wait for the "DigiPi" wifi hot spot to appear on your phone or pc's wifi settings. Connect to the "DigiPi" hot spot with password "abcdefghij"

In a web browser, visit "<http://10.0.0.5/wifi.php>"

Enter your home wifi ssid and password and reboot. Once booted on your home network, visit the website <http://digipi/>.

If the host isn't found, login to your router and look for any newly connected wifi devices, and use the associated IP address. Also check to make sure the DigiPi hotspot no longer exists, if it still exists, this is a sign it had trouble connecting to your home wifi.

Now that the DigiPi is on your home network, click the "**Initialize**" link at the bottom of <http://digipi/>.

You need to add your callsign, passwords, grid squares and other localization items to your Pi.

<http://digipi/setup.php> :

DigiPi



DigiPi Initialization

Please try to fill out this form completely the first time, as you cannot currently come back and make changes here later. If you need to make subsequent edits, see `/home/pi/localize.sh` for a list of files you can tweak manually. You can always reflash your SD card and start over if not sure.

Callsign	KX6XXX	Base callsign, no sid/suffix
Winlink Password	xxxxxx	Create Account
APRS Password	12345	Generate
Grid Square	CN99mv	Find
Latitude	40.9999N	Locate
Longitude	120.9999W	Locate
AX.25 Node Pass	abc123	any alpha-numeric string
Enable FLRig	<input type="checkbox"/>	Use FLRig for CAT control
Large Display	<input type="checkbox"/>	Check if using PC or large tablet

USB-connected radios only

Rig number	3085	See rig list
Device file	ttyACM0	ys991,ic7300=ttyUSB0 ic705=ttyACM0
Baud rate	115200	ys991=38400, ic7300=19200, ic705=115200

[Initialize](#)

Keep in mind, once you change a value, you can't use this process to change it again. See `/home/pi/localize.sh` for the location of all the configuration files and feel free to make edits by hand if you need to add or change anything. Future versions of DigiPi will let you change things repeatedly via the web interface, it's on my todo list.

click [Initialize]

Once changes are made, reboot the DigiPi by clicking [Reboot] at the bottom of <http://digipi/>. This will boot the system back into firmware (read-only) mode.

Enjoy your DigiPi!

Community

<http://discord.gg/3X9bMjjwxw> (DigiPi live chat)
<http://groups.google.com/u/2/g/digipi> (Primary group/mailing list)
<http://groups.io/g/digipi/> (old/deprecated list, with some good info)

Additional information

The "pi" user password is "raspberry"

If not using a USB radio this expects a single audio device, possibly the FE-Pi Audio Z v2, or Audio Injector Z. Edit /boot/config.txt to switch between these two audio hats. The default is currently the FE-Pi.

The filesystem is "read only" to prevent SD card wear and so you don't have to do a clean shutdown (just turn off the power is fine). To make modifications, you must "sudo remount" first.

If you have a usb-connected radio, no soldering is required. For ft8/sstv/js8call, you'll want to configure your radio from within each app.

Yaesu 991 is rig 1035

Icom 7300 is rig 3073

Icom 705 is rig 3085

The GUI apps (js8call, fldigi, ft8, sstv) can be used with a VNC client on your phone. This can be considerably easier to use than a web browser, particularly when it comes to typing, zooming, etc. "VNC Viewer" on Google Play is sufficient. The VNC login parameters are:

host: "digipi:5901" or "10.0.0.5:5901" in the field
password: "test11"

Direwolf will exert a voltage on gpio pin 12 for Push-to-talk. It's up to you to use this signal to short your PTT wire to ground (see FET wiring diagram above).

If you hook up a green led (with 220ohm resistor inline) to gpio pin 16 it will light up when direwolf detects a carrier.

If you hook up a red led (with 220ohm resistor inline) to gpio pin 26 it will light up on transmit.

At the moment, for USB-connected radios, the transmit LED will not illuminate during transmit (limitation of direwolf, feature request was submitted).

If you hook up a blue led (with 220ohm resistor inline) to gpio pin 5 it will light up if you connect a bluetooth device like aprsdroid. I used a 3.2K resistor with this blue led in my implementation because blue

leds are oddly bright.

If you'd like to change the hostname (and bluetooth name), edit /etc/hostname and also add your hostname to the list next to 127.0.1.1 in /etc/hosts.

To use a bluetooth app (aprsdroid, woad) you'll need to pair the device first

```
sudo remount
sudo systemctl restart bluetooth
sudo bluetoothctl
scan on
# on phone/wifi device, open bluetooth settings, make visible for pairing
# watch for [NEW] Device FC:19:10:F7:55:C8 Device_name
pair FC:19:10:F7:55:C8
# click [pair] on phone
yes # on bluetoothctl prompt
      # press [yes] on droid device
trust FC:19:10:F7:55:C8
quit
# the USB led/icon will illuminate momentarily on the DigiPi
shutdown -r 0
```

When configuring aprsdroid, in connection settings, connection type, select "Bluetooth SPP". Select Channel "1". TNC Bluetooth Device should be "digipi".

This image supports a Pi TFT display (1.3 and 1.14" tested)

<https://www.adafruit.com/product/4393>

<https://www.adafruit.com/product/4484>

Buttons on the display will start the igate or digipeater services.

Adjust the volume on the receiver while "tail -f /run/direwolf.log" until the average audio volume is around "50(x,y)."

Run alsamixer and adjust the "line" level, while listening to transmitted packets to make sure they're not overdriven, and about the same volume as other aprs radios in your area.

the APRS Digipeater service will repeat WIDE1-1 traffic and relay all message-type packets sourced from the internet to targets within 160km of your digipi. Adjust ~/direwolf.digipeater.conf to taste.

The device becomes a hotspot if you don't setup your wifi, in which case the ssid is "DigiPi" and the default password is "abcdefghijkl". You'll find the device at <http://10.0.0.5/>. If you're in the field, obviously, this will be its address.

Howto videos and screenshots

DigiPi Build

Part 1: Hardware



Welcome to KM6LYW Radio download

DigiPi

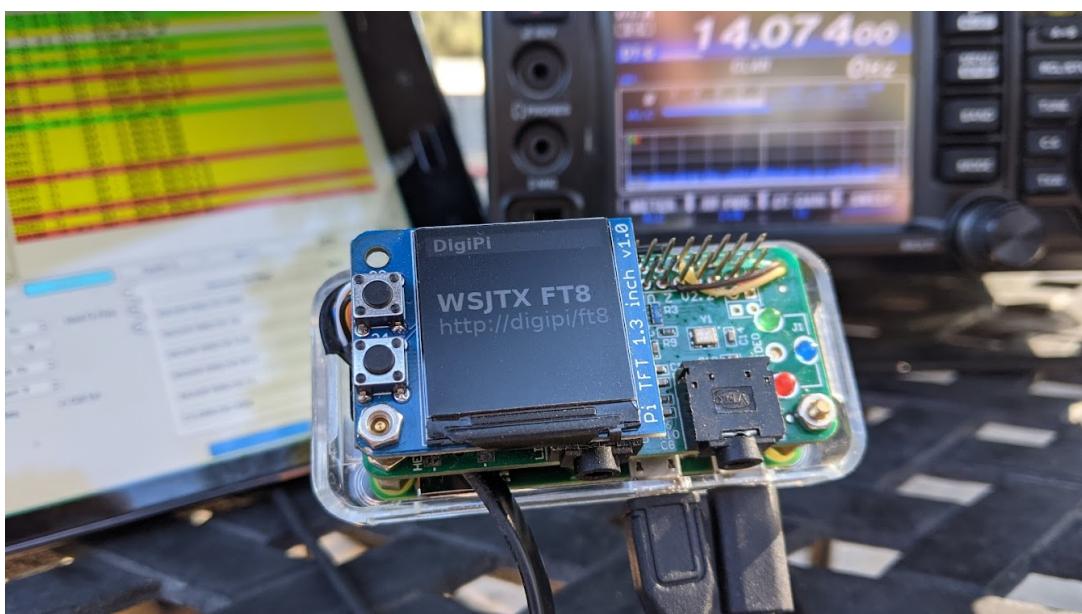
Software Configuration Step-by-Step

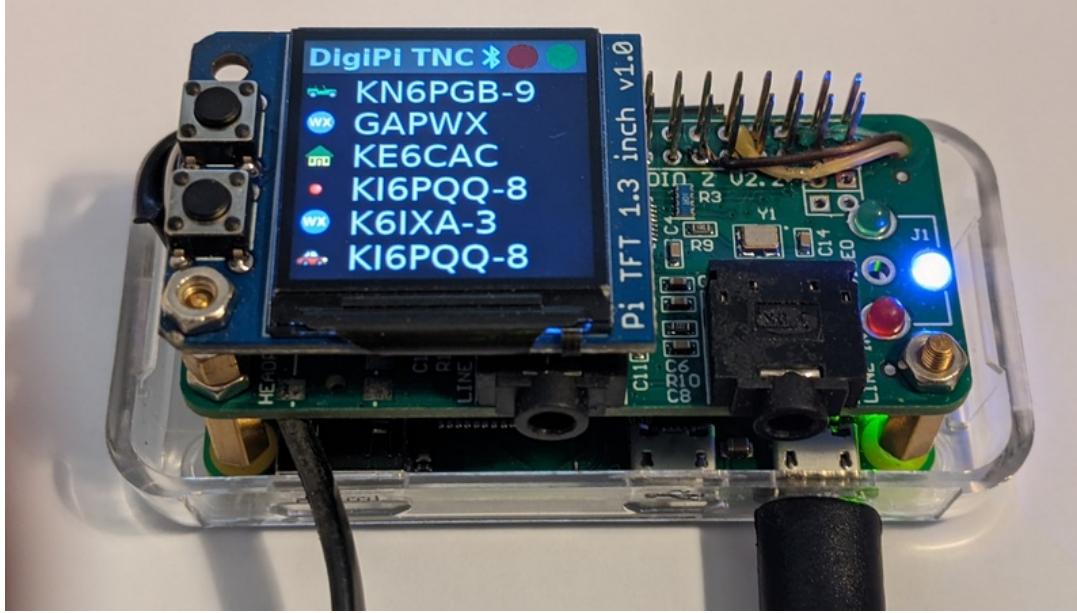
WARNING: GEEK ZONE! Some Linux skills are required! Editing files, rebooting, flashing a card image, wifi configuration. Ideally, though not necessary, you could load your this image on your computer first, edit the files, especially the wifi password, then flash card to the Pi. This is not yet a "turn key" instantly works image for the non-technical user. This shouldn't be your first raspberry pi project.

Build the hardware here: <https://youtu.be/io-YnP00-ow>

If you just want to make a receive only device (igate, etc), no soldering is required, just audi-o out from the radio to the audio-in of your audio dongle/hat. If you want to transmit, you'll need to follow most of the instructions in the video above.. couple resistors, RG12 cable, and a FET.







Web/Phone Interface

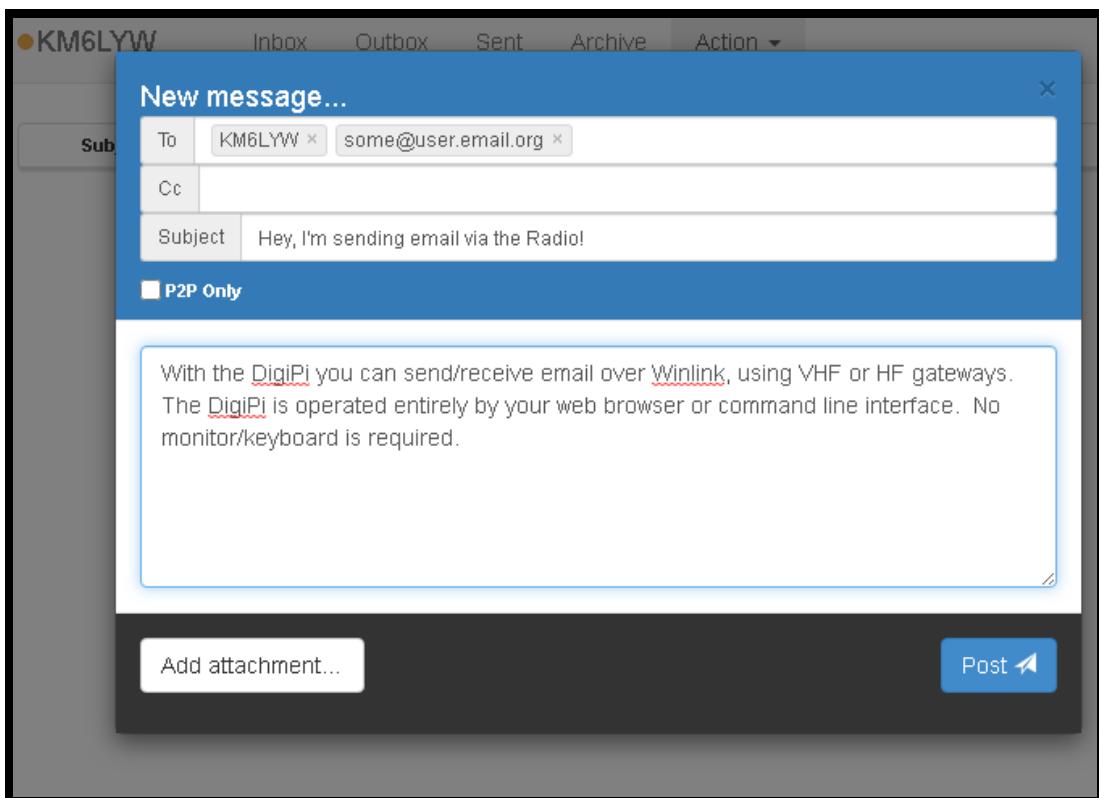
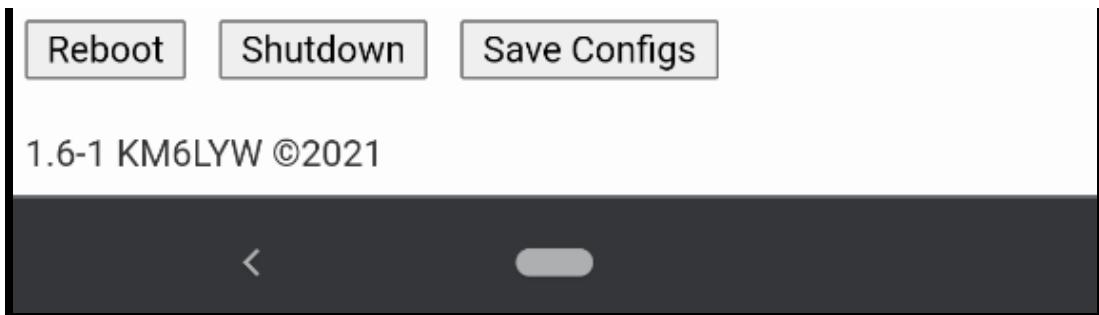
12:24 ⚡ 🔋 94%

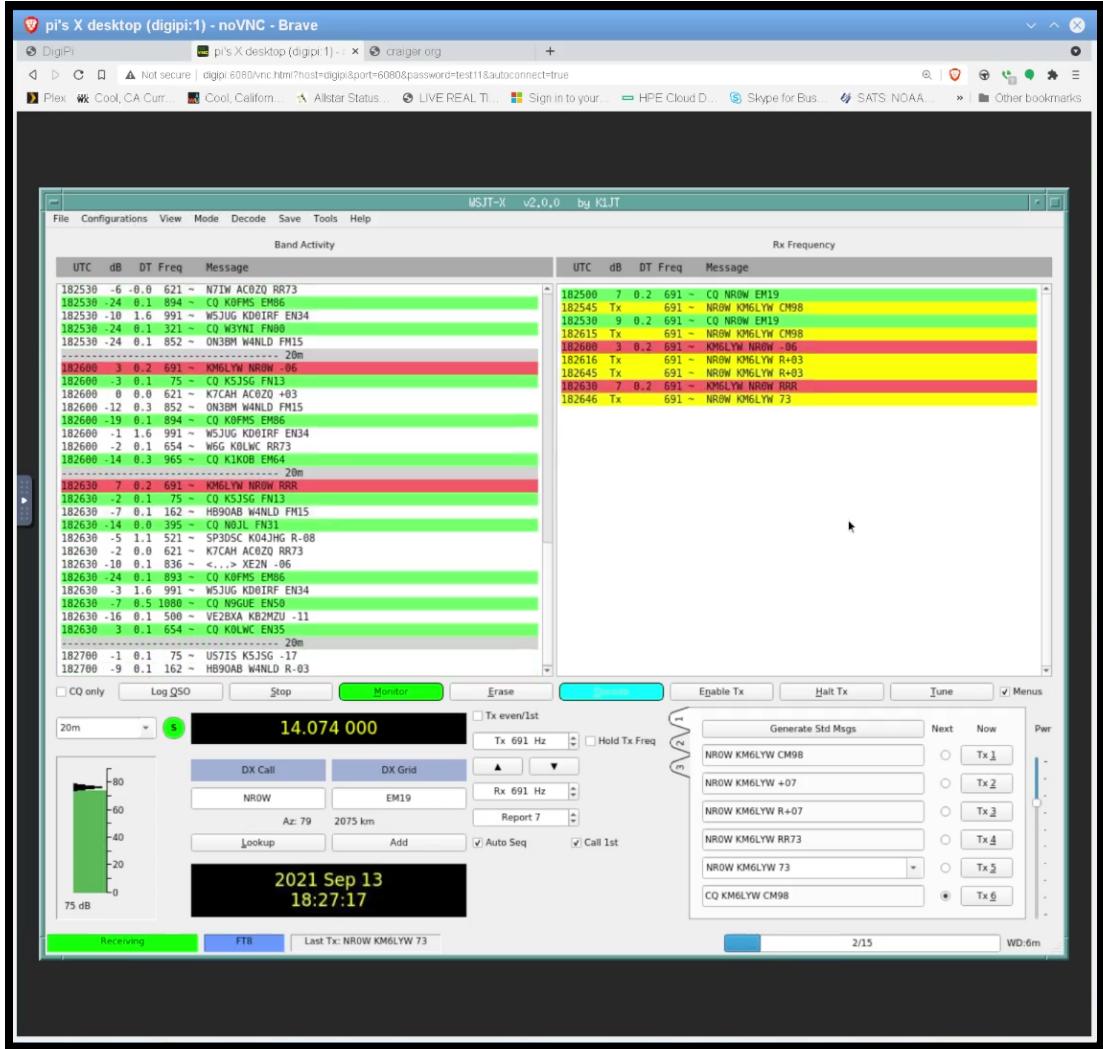
digipi/index.php

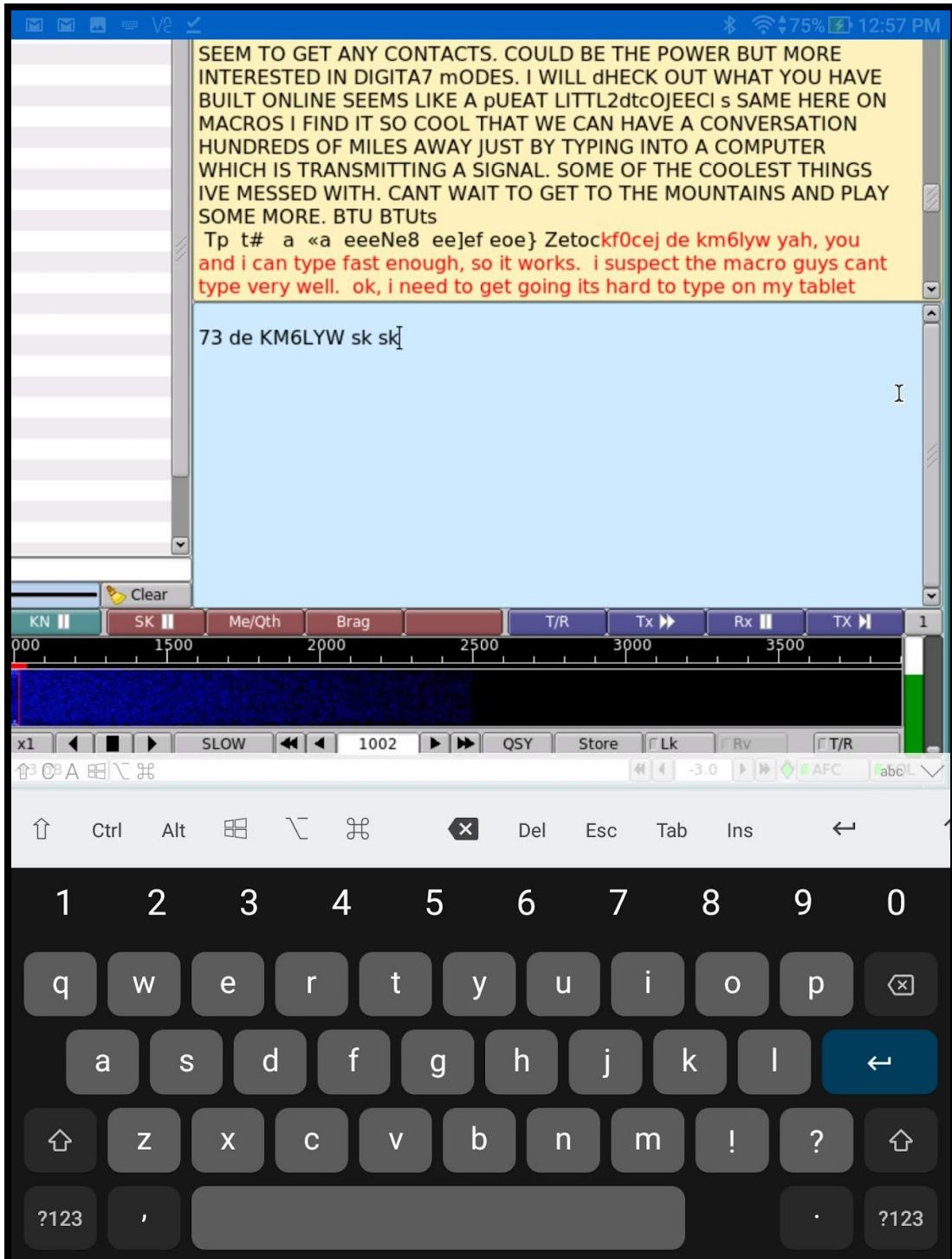
DigiPi

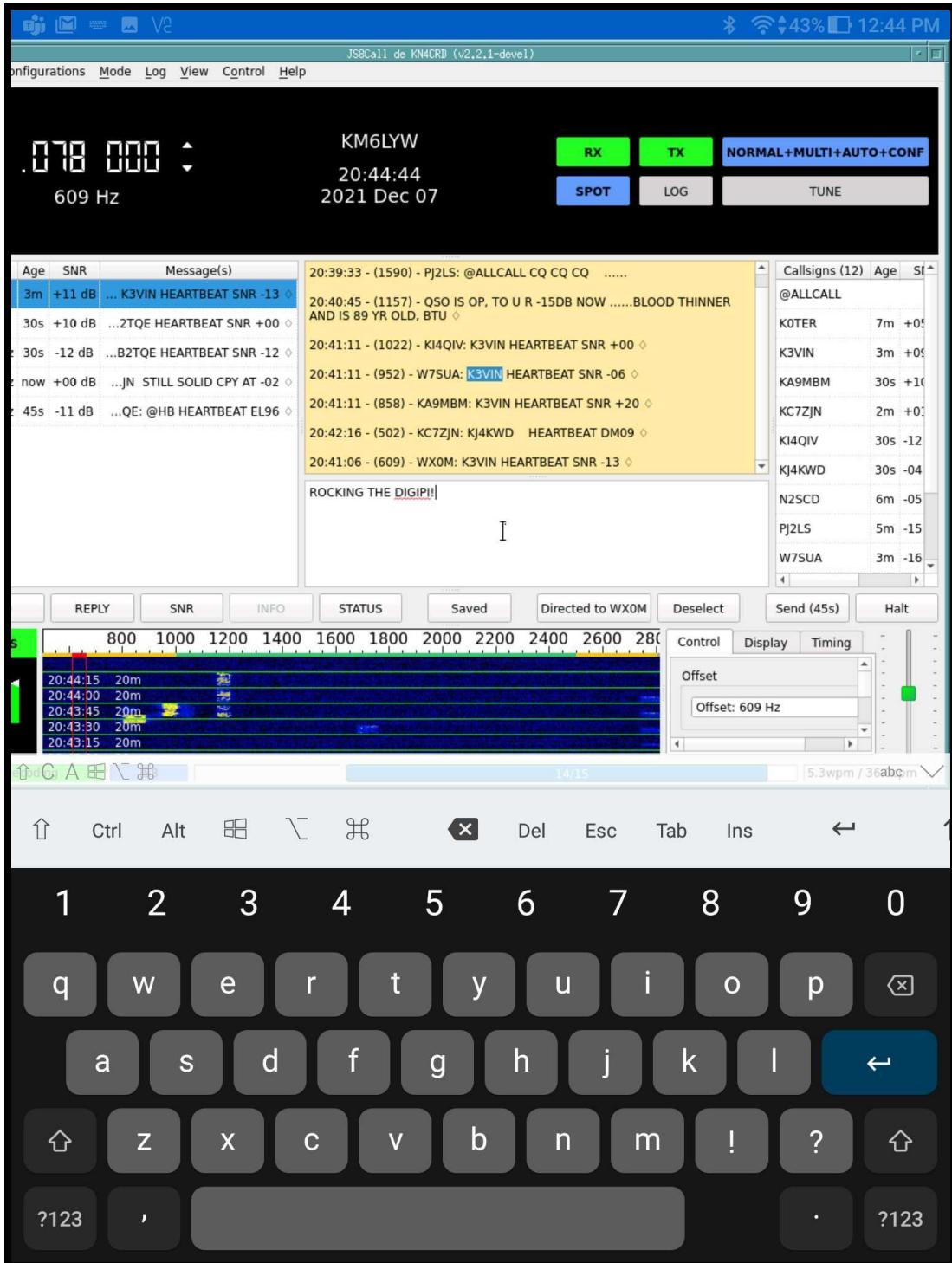
TNC & APRS Igate	on	off
TNC & APRS Igate (HF)	on	off
APRS Digipeater	on	off
Linux Node AX.25	on	off
Winlink Email Server	on	off
Pat Winlink Email Client	on	off
ARDOP Modem	on	off
Rig Control Daemon	on	off
WSJT-X FT8	on	off
Slow Scan TV	on	off
FLDigi	on	off
JS8Call (Pi3/4)	on	off

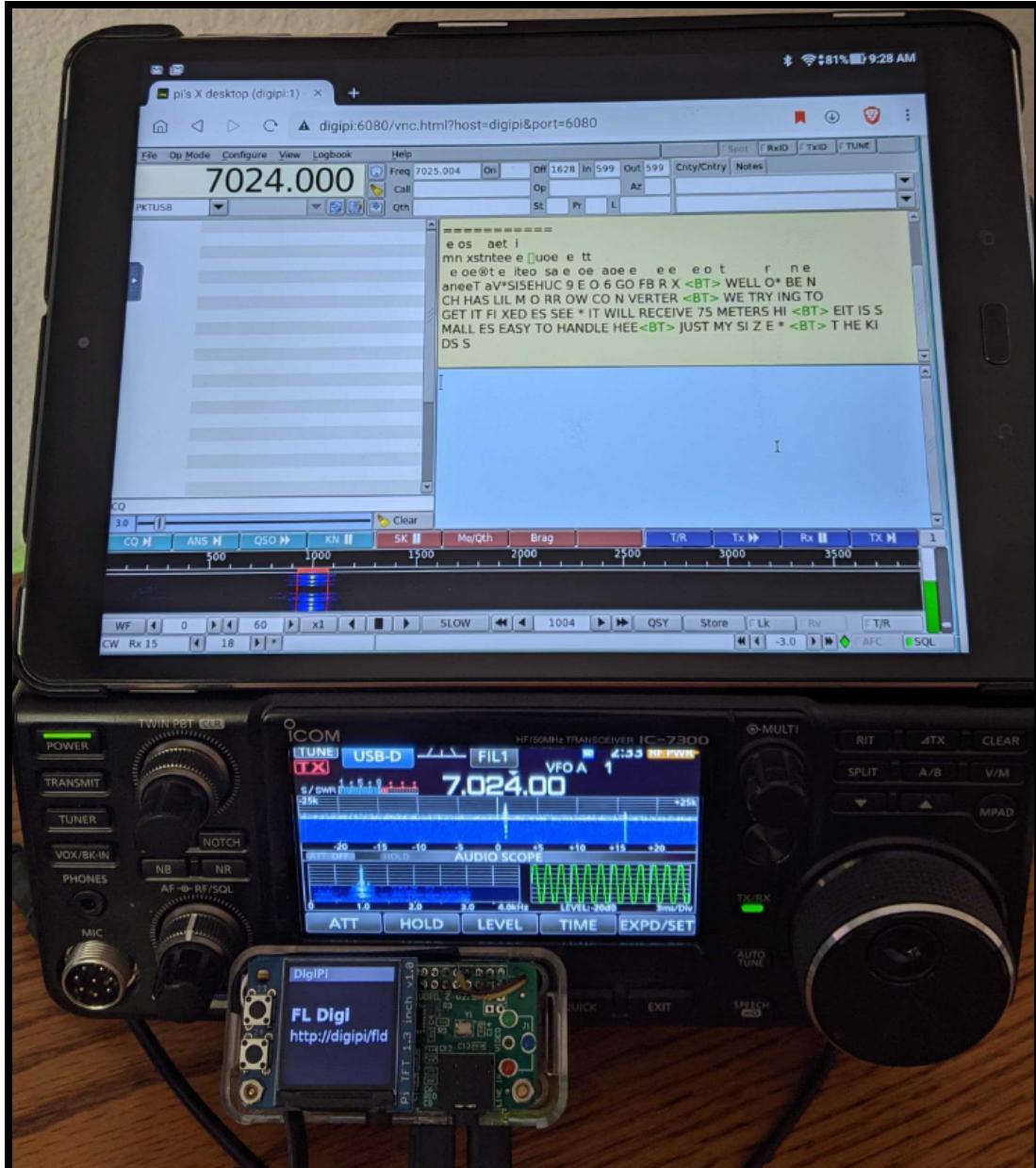
PatEmail AXCall JS8Call
FT8 SSTV FLDigi
Wifi Shell PktLog
SysLog Refresh Help
Initialize











The screenshot shows a VNC session with two windows:

- pi's X desktop (digipi:1) - noVNC - Brave**: This window displays an SSTV image of a yellow dog with the call sign KM6LYW. The image includes text overlays: "KM6LYW", "Cool, CA", "Craig", "CQ", and "KM6LYW".
- DigiPi - Brave <2>**: This window is a control interface for the DigiPi system. It includes sections for APRS digipeater settings, Winlink Email Server, and ARDOP Modem. Below this is a "World SSTV View KA8ONG" window, which shows a distorted SSTV image of the same yellow dog and text "de KM6LYW resting" and "KA8ONG".

A screenshot of a mobile terminal application interface. At the top, the status bar shows the time as 3:20, signal strength, battery level at 68%, and a small icon. Below the status bar, the connection information is displayed as ▲ 192.168.1.120:7682, accompanied by a red shield logo icon. To the right of the connection info are two small icons: a square with the number 2 and a vertical ellipsis.

The main terminal window displays the following text:

```
Password:  
DIGI:KM6LYW-4 Welcome to craiger  
  
USERS - list connected users  
TALK - TALK callsign "message  
EMAIL - Winlink command line ei  
WEB - Display web sites  
ZORK - Play Zork!  
HITCH - Play Hitchhiker's Guide  
NODES - List nearby nodenames  
CONN - CONNect radio nodename  
? - Complete list of commands  
  
--  
  
DIGI:KM6LYW-4> zork  
West of House  
  
ZORK I: The Great Underground Emp...  
Copyright (c) 1981, 1982, 1983 Infocom Inc.  
ZORK is a registered trademark of Infocom Inc.  
Revision 88 / Serial number 84072  
  
West of House
```

You are standing in an open field.
front door.



DigiPi



Wifi Setup

SSID:

PASS:

Wifi credentials updated.

Press Reboot for changes to take effect.