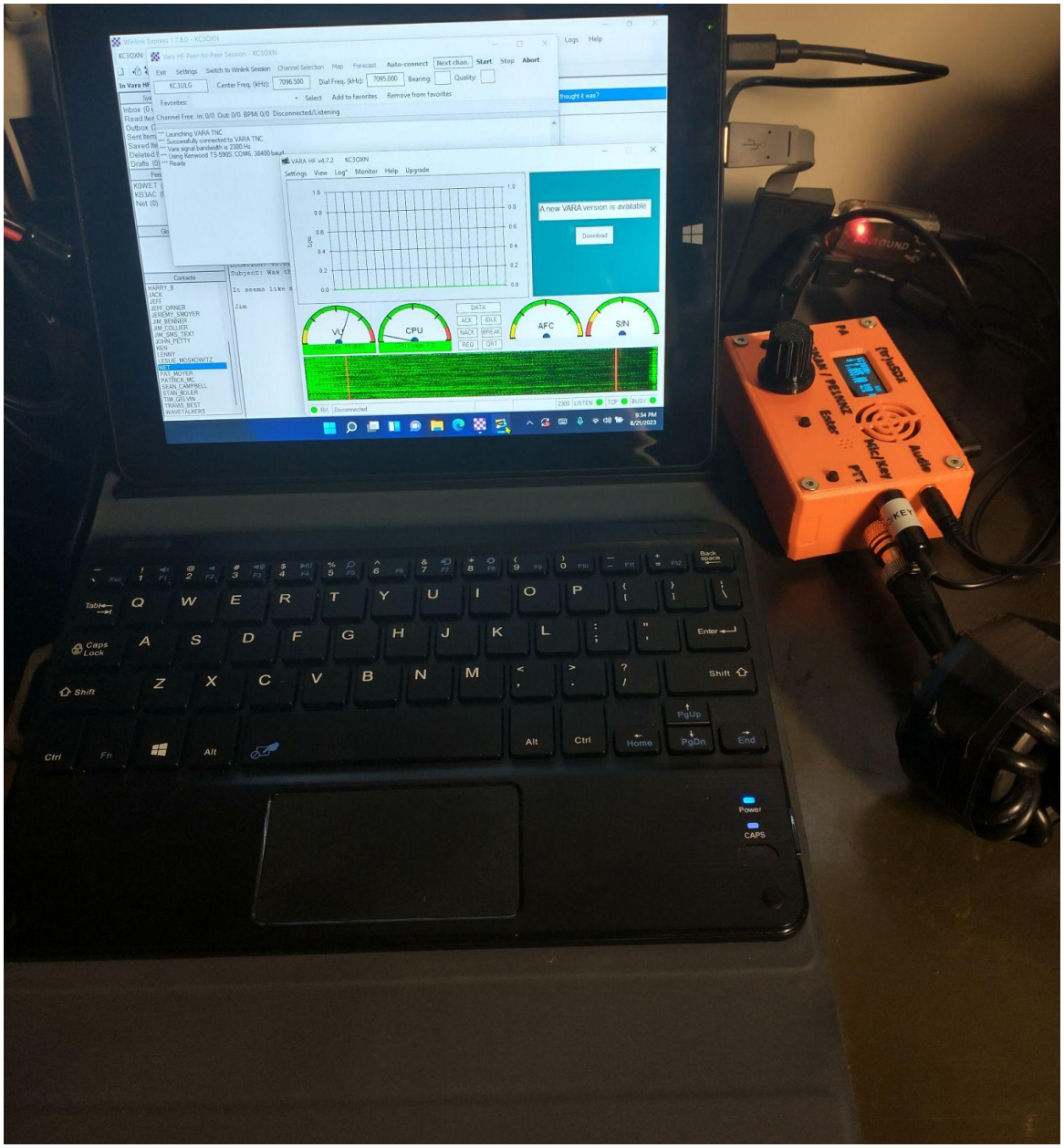
# WINLINK P2P TEST REPORT

*Making internetless emailing possible using amateur radio!*

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# INTRODUCTION

An effort was made to create a low cost “automatic” peer to peer (P2P) Winlink station for the purpose of emergency communications, within an established network of Winlink users, in the event that the internet is unavailable, and when emergency messaging is necessary.  Winlink is an email software utilizing radio as the mechanism for sending and receiving messages from user to user. Using data modulation modes like VaraHF, AX.25 Packet, Pactor, as well as others, it’s possible to send and receive Winlink email messages over long distances without the use of the internet. Much like a packet BBS, a station left unattended can automatically receive and store messages. The connection of P2P stations is a simplex connection, eliminating intermediate infrastructure between the two stations. The resulting communication is more robust because it is simpler and lacks the need for repeaters, digipeaters, nodes, or the internet.

An automatic P2P Winlink station can also readily be converted to a Radio Mail Server “RMS  gateway station”, or just “gateway” for short, by adding an internet connection and running the appropriate software. A gateway, rather than storing messages locally on the station’s hard drive, uploads the messages to an internet server where it can be accessed by all of the gateways. A Winlink user can then access any of  these gateways through an RF connection and retrieve their messages. The downside of the gateway network is its reliance on internet service and the servers they’re connected to.

The purpose of this test was to prove the P2P capabilities of a simple 5 watt Winlink station for regional emergency communications, and to encourage other amateur radio operators interested in Winlink networking to build their own P2P or gateway stations. In so doing, it was demonstrated that an inexpensive station, if properly configured, can serve as an efficient automatic message handling system.

**This report is not intended to be an instruction on how to configure and run a P2P station, but as a general overview of what I used and what I encountered setting up a station of this type.*

## Why Winlink?

Winlink is the Crème de la crème of amateur radio message services. Being able to use multiple RF modulation modes, a familiar email client interface, and to interoperate with the internet really sets it apart from the others. With the ability to simply send and receive emails from normal internet email accounts, interact with websites, and send text messages to cell phones… 'nuff said.

## Why VaraHF?

The VaraHF data modulation mode was selected for its speed and affordability. VaraHF is free to download and use, but with a paid registration ($69) it has increased data transfer rates. Its speed rivals all other RF modulation modes with the exception of PACTOR, which requires proprietary and very expensive equipment placing it out of reach for most people.

## HARDWARE/SOFTWARE USED

1. (tr)uSDX QRP Transceiver
2. USB sound card dongle (audio in/out)
3. 3.5mm stereo (TRS) audio cable
4. 3.5mm stereo (TRS) audio cable, modified.
5. MicroUSB to USB-A cable (12"L with 3 clip on ferrites)
6. Windows 11 tablet (12vdc power input)
7. 12V battery (recharged from solar power)
8. Winlink Express (RMS Express) software (free).
9. VaraHF, software (free).

## WINLINK P2P PROCEDURE

1. With the computer and transceiver configured properly and all hardware connected, open Winlink Express and create a new message. In the “Send as:” drop-down, select “Peer-toPeer Message”, and complete the message as normal by addressing it to an operator's call sign, writing a subject, adding an attachment (optional), writing a text message, and clicking “Post to Outbox”.
2. Next, select “Vara HF P2P” from the session drop-down and click “Open Session:” If everything is configured properly the session will open, the radio will interface with the computer, and the Vara HF program will open and start. *(Note: Vara HF monitors the audio coming from your radio as a “modem” (modulate/demodulate), and the Winlink session controls the PTT of the radio as well as CAT control if the radio has those capabilities, which the (tr)uSDX does support CAT control.*

   In the session monitor window it will display the following:

   ***Launching VARA TNC
   ***Successfully connected to VARA TNC.
   ***Vara signal bandwidth is 500Hz.
   ***Using Kenwood TS-590S, COM9, 38400 baud
   ***READY

3. With the session opened, the top of the window should display “Vara HF Peer-to-Peer Session - Your Call Sign”. **At this point the P2P station is listening and ready for incoming queries from other Vara HF P2P stations.** (See step 5 for setting the operating frequencies.)
4. Sending to a P2P station: In the empty box in the top left, place the callsign of the other station you wish to send to. *(Note: While it’s necessary to have a call sign entered to call to a specific station, it doesn’t matter what the call sign is when it’s sitting idle waiting for stations to connect. When another station connects and it queries for messages, Winlink looks at the outbox for outgoing messages, if there are messages for the querying station, the transfer is made.).*
5. Then enter the center frequency being used (e.g., 7096.5). The dial frequency will autofill to the correct one needed for Vara HF operation (e.g., 7095), and this will be the displayed frequency on your radio. *(Note: HF data modes use USB even in the lower HF frequencies where LSB is normally used in voice operations.)*
6. The session can now be started by clicking “Start” in the top right section of the session window. *(Note: Winlink will feed data through Vara HF which will modulate the data into tones that are transmitted over RF. When the other station’s*

*Vara HF modem "hears" this transmission it demodulates the data and sends the information to their Winlink program. This transfer goes back and forth, sending and receiving the data, and acknowledging receipt with 100% accuracy. If a packet of data is not received properly, a request for a resend is sent and the dropped data is sent again. This process goes on until the message is completed or a connection is timed out.*

The session window should display something like this:

```
***Peer to Peer Vara Connection to KC3…
; FW …
[RMS …
KC3QLX DE KC3OXN>
  ;FW: KC3QLX
[RMS …
  ;KC3OXN DE KC3…
  ;PM: KC3OXN HG73H90…
FC EM HG73H90…
F> 3A
  FS Y
*** Receiving HG73H90…
*** HG73H90…
*** Bytes : 2237. Time :01:26, bytes/minute :1557
  ;PM: KC3QLX YLN066P…
  FC EM YLN066P…
  F> AA
FS Y
*** Sending YLN066P…
FF
*** Completed send of message YLN066P…
…
*** Disconnecting
*** Disconnected from Peer : KN3QLX @ 2023/08/30 …
Session : 2.9 min; Avg Throughput : 937 Bytes/min…
```

A P2P station can be left unattended, and will upload messages *to* others or download messages *from* others automatically when they connect to your station. Messages can be forwarded from one user to another as well, by posting the forwarded message to the outbox, addressed to the intended station's call sign. The forwarded message is then downloaded normally when *that* station connects.

## DISCUSSION

Using the equipment and procedures above, it was possible to send and receive messages automatically. Picture files and text based messages were downloaded to the inbox from other Winlink stations, and I was able to leave messages for group addresses as well as individuals for them to pick up. Creating a P2P message for a group address creates a separate message for each person in the group. I was able to create a “Welcome to the KC3OXN P2P station!” message, address it to my group address “Net”, and post it to my outbox as a Peer-to-Peer message. This created 35 separately addressed messages that can be individually picked up by each person as their time permits. As a net control station this is invaluable. Posting notifications and updates to a select group without the need to create individual messages, and with an asynchronous time frame, will allow for less confusing and more efficient traffic handling. It’s easy then to determine who had picked up their message by glancing at the “Sent” box where the time is recorded for reference. I can see how this would positively affect situational awareness, as members of a net can get updates on an incident or leave updates on their own situation when they are free to do so, and by not being tied to the radio room at a specified time.

The Vara HF mode proved to work extremely well using QRP levels of power, both for regional NVIS connections, and for long distance skywave connections. I was able to test various connection conditions with a station in Colorado, 1,400 miles away, neighboring Ohio, and with folks in my county and surrounding counties with reliable results. It wasn’t necessary to change anything to achieve this. The station was monitored each day but output power and the antenna were left as is the entire time.

The secret sauce to QRP operation is the antenna, and I believe that the configuration used here is ideal for what it is I was trying to achieve. The antenna is a half-wave dipole that is tuned to resonance at 7.100 MHz with 1.1:1 SWR, stretched horizontally North to South at 25 feet off the ground. The ground at the location is moist red clay rich with iron, adding conductivity for NVIS operation. Having the most resonant point of the antenna in the “digital” portion of the 40m band is also optimum, leaving nothing to chance.

The transceiver is an SDR based (software defined radio) design and not of the highest quality at that. Initial testing using SSB revealed extremely poor selectivity, where multiple stations separated by more than 3KHz were picked up and heard at once. Any noisy environment rendered it useless on SSB. Its size is ultimately a factor in its filtering

ability, and I don't believe that it was truly designed to be an SSB dominant radio. But, in CW and data modes, where the bandwidth is narrow, it performs quite well. The SDR technology really shines when using data modes and this little radio is perfectly suited for them. With CAT control abilities and easy connectivity to a PC, coupled with an extremely low price of around $90 in kit form or $130 assembled, it's a great introduction into the realm of HF data modes. All that is needed is a Windows PC with a built-in sound card (or a USB sound card), a couple of 3.5mm TRS audio cables (one of which needs altered to eliminate keying the PTT), a micro-USB to USB-A data cable (I recommend getting the highest quality that you can find, but any usable data cable will do), and the aforementioned software. That's it! You won't have to bother with a bulky and expensive "TNC" because it's integrated into the Vara software. Also, both of the software aren't taxing on the processor or memory so an outdated or "slow by today's standards" PC will work fine. I recommend purchasing one that runs and charges on 12vdc, making power options easier. The 9" Tributa Windows 11 tablet that I have uses a USB-C 12v input for charging, so I snipped off the wall wort and installed some powerpoles.

The whole station running natively on 12v was connected to a large SLA deep-cycle battery that charges from a solar array. Also, there is a 30w power supply connected for redundancy and to lessen the wear and tear of recharging on the main battery bank. If grid power were lost solar charging would take effect, and the combination of low power consumption with large storage capacity would ensure that the station runs indefinitely, granted that the solar panels see some sunny days now and again.

## CONCLUSION

This test revealed that it is possible to create a reliable, complete, and easy to put together HF data station, within a small budget of under $300 (less the power source). This station, being able to function as a Winlink P2P station, can also then function as a Winlink RMS gateway if the RMS software were added to the PC and an internet connection was available. The small form-factor of the components and the low power consumption of this station results in a portability that matches its capability; it's possible to relocate the station anywhere and power it from a vehicle if need be, making it ideal for emergency communications. I recommend building this station to anyone looking to create a stand-alone HF Winlink station with full capabilities, and to those interested in setting up a Winlink RMS gateway so that others can more readily connect to a CMS (Common Message Server), in so doing, helping to make Winlink a more robust data communication service.

## PRODUCT LINKS & More Information

1. https://winlink.org/ link to Winlink Express information
2. https://dl2man.de/ link to the (tr)uSDX 5-Band, Multi-mode Transceiver
3. https://rosmodem.wordpress.com/ link to Vara downloads and information.

   An interesting note for those less inclined to be willing to pay for the Vara license, if a station is running as a "sysop" RMS gateway the full speed of Vara is enabled automatically, presumably to make it more effective for any other user of the gateway, and as a thank you for serving the Winlink community. I think this is a very thoughtful gesture on the part of both the Winlink and Vara developers. The combination of Vara and Winlink is a proven platform in many serious EmComm schemes in use around the world.