Winlink Express Overview and Installation
WHAT IS WINLINK

- Worldwide system for sending e-mail via radio.
- Provides e-mail from almost anywhere in the world.
- Entirely supported and operated by amateur radio volunteers (Amateur Radio Safety Foundation, Inc.).
- Winlink Express software is the preferred client application.
- Adopted for contingency communication by many government agencies.
- Used by infrastructure-critical NGOs such as International & American Red Cross, Southern Baptist Disaster Relief, DHS Tiered AT&T Disaster Response & Recovery, FedEx, Bridgestone Emergency Response Team, etc.
WINLINK CONNECTION MODES

- **Telnet** – Non-radio connection through the Internet. **Good** for training (no radio equipment required) and use if radio is down or network is busy.

- **VHF/UHF Packet** (local LOS propagation) –
  - **9600 baud** – Fast, reliable, range may be limited and requires $400 modem (Kantronics or SCS Tracker) or a good soundcard (non-Signalink) modem. Radio must be 9600 capable.
  - **1200 baud** – Slower, but can use inexpensive TNC like Byonics TinyTrak-4, TNC-X, or even soundcard modems. Will work with virtually any FM radio.

- **Experimental Speeds** – Between 1200 and 9600 using PSK and sound card interfaces

- **VaraFM** – Mulit-carrier OFDM high speed connections
WINLINK CONNECTION MODES

- **HF WINMOR/ARDOP** – “Poor man’s Pactor”. Not as good as Pactor, but operates with an inexpensive sound card device ($100), speeds between Pactor 2 and 3.

- **HF Pactor 1, 2, 3 and 4** – Fast and reliable but requires an expensive modem ($1500+). Pactor 4 not permitted in US.

- **Vara** – Multi-carrier OFDM with 2.4kHz bandwidth. HF speeds approaching PACTOR 4

- All RF modes can be Peer-to-Peer (P2P).
RESOURCES NEEDED FOR WINLINK EXPRESS

VHF/UHF Packet Radio

- Computer running Windows 7 through Windows 10.
- Microsoft .NET 3.5 framework.
- V/UHF radio with data port (1200/9600) or speaker/mic connection (1200 only).
- Packet TNC (Kantronics, TNC-X, MFJ, etc.), or USB soundcard interface (SignaLink or similar). TNC might require a USB to RS232 Serial dongle.
- Note: Some new radios have built-insoundcards/TNC’s.
- Software downloads: winlink.org
- All software is free (except Vara), donation is suggested.
Can be simple KISS mode, or full function.
Cost from about $100 to $1500.
Radio needs to have a data port (1200/9600), or use microphone and speaker connections (1200 only).
Some radios include a built-in TNC or sound card.
Might require a USB to serial adapter (built-in on TNC-X)
  - Use FTDI chipset devices for best results
Prolific chipset USB to serial converters have driver issues.

Counterfeit Chinese products used Prolific product ID and “piggy backed” on official Prolific drivers.

Prolific countered by changing the hardware/drivers so the counterfeit devices would not work with their drivers.

This website may help:

Adapters based on the FTDI chipset do not have this problem (yet anyway).
Simple device powered by USB connection.

Cost is about $100 including radio-specific cable.

Radio needs to have a data (sound) port, or use microphone and speaker connections.

Need to run “Software TNC” application such as Direwolf, or UZ7HO soundmodem (for packet), or use Vara FM.
HARDWARE TNC OR SOUND CARD?
THERE ARE ADVANTAGES TO BOTH

Hardware TNC
- Relatively low cost (TNC-X), old one in the closet?
- Probably the simplest connection.
- No additional software needed.

Sound Card
- Can be used for other digital modes besides Winlink.
- Software TNC has superior decode over older hardware TNC.
- Can be used for both Packet, Winmor, ARDOP and Vara.
HARDWARE TNC OR SOUND CARD?
THERE ARE DISADVANTAGES TO BOTH

Hardware TNC
- Only does packet (or maybe Pactor too).
- Older units do not perform as well, no new development.
- Will require USB to serial adapter.

Sound Card
- Sound levels and other settings may be changed unintentionally.
- Requires additional software, and a slightly more complex operation (more training?).
Both Direwolf and UZ7HO provide several options for higher speed communications using PSK modulation. 4800 bps should be easy to achieve for most setups (not compatible with hardware TNCs). They also support G3RUH 9600 bps compatible with hardware TNCs. Modern radios should handle this speed.

Vara-FM provides speeds better than 9600 (up to 17,957 bps) using simple interfaces or Signalink.
INSTALLING WINLINK EXPRESS

- Download zip file: winlink.org
  - Search engines may send you to fakes
- Extract the .msi installer from the zip file and run it.
- Complete the setup screens (call sign, location, etc.).
- Browse C:\RMS Express\, right click on.
  - RMS Express.exe and select option to create a shortcut.
  - Change the shortcut name to Winlink Express.
WINLINK EXPRESS INITIAL SETUP

Please Donate
Click “Files” followed by “Preferences/Message Notification”
INITIAL PACKET SETUP
HARDWARE TNC

Image showing a software interface with a focus on the initial packet setup for hardware TNC.
INITIAL PACKET SETUP
HARDWARE TNC COM PORT
INITIAL PACKET SETUP
HARDWARE TNC SELECTION
INITIAL PACKET SETUP
SOUND CARD INTERFACE

- Download zip file (UZ7HO low speed):
  - [http://uz7.ho.ua/packetradio.htm](http://uz7.ho.ua/packetradio.htm)
  - Look for “Soundmodem”
  - Extract the program from the zip file and run it.
  - Configuration settings from the drop down menus.
  - Windows only, firewall message.

- Download zip file (UZ7HO high speed):
  - [http://uz7.ho.ua/packetradio.htm](http://uz7.ho.ua/packetradio.htm)
  - Look for “hs_soundmodem”
  - Extract the program from the zip file and run it.
  - Configuration settings from the drop down menus.
  - Windows only, firewall message.
Download zip file (Direwolf):
- [https://github.com/wb2osz/direwolf/releases](https://github.com/wb2osz/direwolf/releases)
- Extract the program files from the zip file and run the app.
- Edit the CONF file to configure.
- Multi-platform capable, for Linux/OS-X, download the source and compile (git clone, etc.)
- Perhaps build your own RasPi based soundcard hardware device
INITIAL PACKET SETUP
SOUND CARD INTERFACE (UZ7HO AND SIGNALINK)

Set in SoundModem
INITIAL PACKET SETUP
SOUND CARD INTERFACE (UZ7HO HIGH SPEED)
UZ7HO and Direwolf both create “KISS TNC” servers within the network stack, ports on the firewall must be opened to allow Winlink Express (and other applications) to use the virtual TNC.
UZ7HO and Direwolf both allow for multiple modems using a “stereo” sound card, for Signalink, only modem “A” is available. Set to AFSK AX.25 1200bd modem.

Both programs can try to correct single bit errors. This is NOT advised for EMCOMM.
UZ7HO and Direwolf both allow for multiple modems using a “stereo” sound card. For initial setup, only use modem ch “A”. Set to FSK G3RUH 9600bd modem.
INITIAL PACKET SETUP
SOUND CARD INTERFACE (DIREWOLF AND SIGNALINK)

---

```plaintext
# TEXT TO SPEECH COMMAND FILE
#
#
# SPEECH dwspeak.bat
#
#
# VIRTUAL TNC SERVER PROPERTIES
#
#
# Dire Wolf acts as a virtual TNC and can communicate with
# client applications by different protocols:
# - the "AGW TCP/IP Socket Interface" - default port 8000
# - KISS protocol over TCP socket - default port 8001
# - KISS TNC via serial port
#
#
AGMPORT 8000
KISSPORT 8100

# Some applications are designed to operate with only a physical
# TNC attached to a serial port. For these, we provide a virtual
# port that appears to be connected to a TNC.
# Take a look at the User Guide for instructions to set up
# two virtual serial ports named COM3 and COM4 connected by
# a null modem.
```

---

Packet Winlink/P2P Setup

- **Packet TNC Type:** KISS
- **Packet TNC Model:** NORMAL
- **Serial Port:** TCP
- **TCP Host/Port:** 127.0.0.1 8100
INITIAL PACKET SETUP
SOUND CARD INTERFACE (DIREWOLF HIGH SPEED)

Uncomment desired

Specify PTT port used
Direwolf startup shows available audio devices. Signalink shows as USB Audio Codec.

Sound card to use needs to be set in the configuration file (there are multiple ways to do this).
INITIAL PACKET SETUP
SOUND CARD VIRTUAL TNC

Reading config file direwolf.conf
Available audio input devices for receive (*=selected):
  0: Microphone Array (Realtek High
  * 1: Microphone (USB Audio CODEC) (channel 0)
Available audio output devices for transmit (*=selected):
  0: Speakers / Headphones (Realtek
  * 1: Speakers (USB Audio CODEC) (channel 0)
Channel 0: 1200 baud, AFSK 1200 & 2200 Hz, E+, 44100 samples
Note: PTT not configured for channel 0. (Ignore this if using
Ready to accept KISS client application on port 8100 ...
Ready to accept AGW client application 0 on port 8000 ...

W7EFR-10 audio level = 64(30/19) [NONE] 11111111
[0.3] W7EFR-10>BEACON:EF&R Winlink RMS Packet Server<0x0d>
Unknown message type E, motorcycle

W7EFR-1 audio level = 63(30/18) [NONE] 11111111
[0.3] W7EFR-1>ID:Network Node (COUGAR)<0x0d>
Unknown message type N, Ambulance

K7CST-10 audio level = 92(44/23) [NONE] _11111111
[0.4] K7CST-10>BEACON:Winlink 2000 RMS Packet Server<0x0d>
Make sure your Virtual TNC server TCP ports do not conflict with the Winlink Express forms server (Direwolf default KISS port settings will).
INITIAL PACKET SETUP

SET YOUR TRANSMIT LEVELS CORRECTLY!
(IT IS NOT PLUG AND PLAY)


- [http://www.zeitnitz.de/Christian/scope_en](http://www.zeitnitz.de/Christian/scope_en)
INITIAL PACKET SETUP

SET YOUR TXD AND VOX CORRECTLY (THIS ISN’T PLUG AND PLAY EITHER)

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**Initial Packet Setup Diagram**

1. **Carrier Detect**
   - Delay

2. **PTT**
   - TXDEPAY
   - AX.25 Frame(s)
   - TXTAIL

3. **My Transmit Audio**
   - Digital Data as Audio
   - VOX delay
   - Not Adjustable on Baofeng HT!!!

4. **PTT from VOX**

5. **Another station**
   - Digital Data as Audio
INITIAL PACKET SETUP

IMPORTANT PARAMETERS

- TX Delay (TXD)
- Packet Length
- Max Frames
- Frack
- Max Retries
- AutoConnect Time

Note: For soundcard configurations, TXD is set in the Software TNC application.
INITIAL PACTOR SETUP
PTC MODEM
RESOURCES NEEDED FOR WINLINK EXPRESS

HF WINMOR/ARDOP/VARA

- Same computer and software requirements as V/UHF Packet. Winmor and ARDOP modems are included with Winlink Express.
- HF radio with data (sound) port and optionally computer control (CI-V, CAT, etc. for rig control).
- SignaLink or similar soundcard interface, may be built-in on newer HF radios.
- All software is free, donation is suggested, license fee for Vara ($69 per license, $50 for groups of 10).
CONFIGURING SOUND LEVELS WATCH DRIVE/ALC LEVELS ON TRANSMITTER

Set to Max

Note: Adjust SignaLink TX level for minimum or no ALC action on HF transmitter
INITIAL WINMOR/ARDOP SETUP
SELECTING THE AUDIO DEVICE
WINMOR/ARDOP
RADIO SETUP
RIG CONTROL PARAMETERS

Winmor WL2K Settings

- **Radio Selection**
  - **Select Radio Model**: Icom Amateur Radios
  - **Antenna Selection**: Default
  - **Icom Address**: 00
  - **USB**
  - **USB Digital**
  - **FM**
  - **Use Internal Tuner**

- **Radio Control Port**
  - **Serial Port to Use**: COM7
  - **Baud**: 19200
  - **Enable RTS**: ✔
  - **Enable DTR**: ✔
  - **TTL**

- **PTT Port (Optional)**
  - **Serial Port to Use**: External
  - **Baud**: 38400
  - **Enable RTS**: ✔
  - **Enable DTR**: ✔

- **Buttons**
  - Update
  - Close
VARA SETUP
TCP Ports
TXD and retries
Sound card selection and drive
WINMOR/ARDOP
RADIO SETUP

ADJUST TX LEVEL FOR MINIMUM ALC ACTION
(ADJUST A LITTLE HIGHER FOR VARA)
COMPOSING A MESSAGE

- Click "To" or "CC" for contacts
- Multiple recipients and CC
- File attachments
- New Message Button
- Post to Outbox
- Request Read Receipt
Open Session
Successful connections end with FF and FQ commands, followed by a disconnect. If these are missing, the session failed and must be retried.
PACKET RADIO SESSION

SELECT MODE AND OPEN SESSION
Gateways based on your grid square and service codes selected in setup

<table>
<thead>
<tr>
<th>Callsign</th>
<th>Frequency (MHz)</th>
<th>Baud</th>
<th>Grid Square</th>
<th>Group</th>
<th>Distance (mi)</th>
<th>Bearing (Degrees)</th>
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 PACKET SESSION
TNC
CONNECT, HANDSHAKE, SEND MESSAGE, DISCONNECT

**9600bd transfer**

Good sequence ends with FF followed by FQ
PACKET SESSION
SOUND CARD
CONNECT, HANDSHAKE, CHECK FOR MESSAGE, DISCONNECT
## HF Channel Selection

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<th>Frequency (kHz)</th>
<th>Mode</th>
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<th>Hours</th>
<th>Group</th>
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### Instructions:

- **Click to Sort**: Click on the header to sort by that column.
- **Update Channel List**: Update the channel list.
- **Double Click to Select**: Double click to select a channel.
- **All RMS or Radio-Only**: Select All RMS or radio-only options.
WINMOR HF SESSION
ARDOP HF SESSION
VARA HF SESSION
CHECK IF CHANNEL IS FREE

Free Channel:

Busy Channel:
WINMOR SESSION LOG
CONNECT, HANDSHAKE, SEND MESSAGE, DISCONNECT

** Connected to Winlink RMS: VA7DEP @ 2016/02/15 23:51:03 USB Dial: 7087.000 at 2016/02/15 23:51:03
RMS Trimode 1.3.4.0
NS7C has 190 minutes remaining with VA7DEP
(SFI = 108 on 2016-02-15 20:00 UTC)
[WL2K-3.2-62F/HJMS]
PQ: 1283/150
Perth CMS via VA7DEP >
FW NS7C
[RMS Express-1 3 9 0:62F/HJMS]
PR: 03925592
VA7DEP DE NS7C (CN87/WH)
FC EM 9KBNFO8500X9 265 226 0
FCA
FS Y
--- Sending 9KBNFO8500X9.
FF
--- Completed send of message 9KBNFO8500X9
--- Sent 1 message. Bytes: 260, Time: 00:14, bytes/minute: 188
FG
--- End of session at 2016/02/15 23:52:13 ---
--- Messages Received: 0. Total bytes received: 0. Total session time: 01:09, bytes/minute: 0
--- Disconnecting
--- Disconnected from Winlink RMS: VA7DEP @ 2016/02/15 23:52:35
--- Session: 1.4 min; Avg Thruput: 0 Bytes/min; 1 Min Peak Thruput: 552 Bytes/min
messages must be created as Peer-to-peer messages with the To field set to the P2P partner.

Station connection must match message destination.
WINLINK EXPRESS HTML FORMS

- HTML forms are efficient and professional looking.
- Forms can be simple or very complex.
- Forms can look as good as any web site.
- Forms are easy to use.
- Attractive forms are difficult to create unless you understand HTML, cascading style sheets and JavaScript.
- The Winlink team is building a library of forms.
- We need good HTML/JavaScript programmers.
HTML FORM AND TEMPLATE SET

- A full form set has three components:
  - A template that displays the form and generates the text message to be sent.
  - An input form that solicits input from the user.
  - A display form that formats and displays the information on the recipient’s computer.
- The form itself is not transmitted, only the data entered on the form.
- Forms may be very complex and feature rich, but the actual data transmitted is very compact.
- Receiving station must have the display form installed for proper display, but they will still receive a text-only version.
## General Message (ICS 213)

1. Incident Name: Auburn Wildfire

2. To (Name/Position): OPS Chief, King County EOC

3. From (Name/Position): Scott Currie, OPS Chief, Auburn EOC

4. Subject: Status Update

5. Date: 2019-6-24

6. Time: 20:22

7. Message:

Auburn brush fire has expanded to 100 acres and is 20% contained. Firefighters will be working property protection on the East side during the evening hours, and will resume attack on main fire line in the morning. WX report indicates east winds to 

8. Approved by: Jerry Thorson

Position / Title: EOC Manager
WINLINK EXPRESS FORMS
COMPLETED FORM READY TO SEND

Plain text version in message body

XML data from form fields attached
AVAILABLE WINLINK EXPRESS FORMS (ICS)
AVAILABLE WINLINK EXPRESS FORMS (GENERAL)
AVAILABLE WINLINK EXPRESS FORMS

- A full set of standard forms are included
  - Installed with the application
  - Maintained by WDT
  - Updates are downloaded whenever Winlink Express is started (via Internet)
  - Forms can be requested via radio
  - Form data can be saved and reloaded to save time when similar messages are sent
- Locally developed forms must be maintained by users
  - If there are enough users, local forms can be added to the distribution
This application provided by the WDT, will generate a communications log for a date range.
GENERATED ICS-309 PDF MESSAGE LOG REPORT
CONCLUSION

- Winlink Express use continues to grow, especially for EmComm.
- The Winlink Development Team continues to enhance capabilities to adapt to changing needs.
- Installation and set up is relatively easy.
- Familiar “e-mail” like interface.
- Supports multiple radio transfer modes.
- Support for both hardware and software interfaces.
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