email USING HAM RADIO

1.0 INTRODUCTION

It is possible to send and receive normal email messages using ham radio, both VHF and HF. You can send email to any valid email address and receive email at yourcallsign@winlink.org or at your normal email address.

The system to do this was formerly known as Winlink 2000. Recently the 2000 nomenclature has been dropped. This is a general description about the features and requirements of Winlink. For specific information, go to www.winlink.org. **This is not the WIN system using linked repeaters.**   On the Winlink site you can find more information with the Book of Knowledge there.

2.0 USE

Winlink is intended to provide an interface to the internet via ham radio for the purpose of passing email to any normal email program on the internet.

This system has become the recommended format for emergency communications (EMCOMM) to government and non-government response and relief agencies by the ARRL when possible.

Although slow by modern internet standards, it is still faster than CW and voice radiograms and delivers the message directly to the computer of the addressee. Even attachments are allowed by the program although the relatively slow transmission speed should encourage short messages.

This system does not replace the Narrow Band Emergency Message Service (NBEMS) using fldigi and flmsg but directly places email messages on the internet without requiring trained amateur radio operators at the receiving end of these messages.

3.0 TRANSMISSION MODES

On HF, Winlink previously used the Pactor protocol via a network of land based gateway stations. Effective baud rate was approximately 300 for Pactor I and successively higher transmission rates with later versions – depending on conditions of course. The FCC earlier restricted digital transmissions on HF to 300 Baud but recently removed this restriction and replaced it with a bandwidth restriction of 2.8 kHz. Gateway stations were staffed by real operators to monitor the activity and make any minor adjustments required (such as RIT). Pactor modems are quite expensive and have only one manufacturer.

Subsequently a computer sound card based modem called WINMOR had been adopted. WINMOR allowed higher transmission speeds and much lower costs. This uses an external computer sound card (such as SignaLink USB) that can also be used for the fldigi/flmsg methods. Then another mode known as ARDOP was introduced which was even faster than WINMOR.

More recently another mode called VARA has been adopted. This is another low cost mode also using an external computer sound card. This is reported to be even faster and more reliable than ARDOP. Most users rely on the free download for VARA HF although there is a more costly version that is supposed to be 10 times faster. Naturally on HF you will need a General Class or higher license.

On VHF, Winlink may use the AX.25 protocol just like a standard packet station for a packet gateway. The main difference is that Winlink nodes (called Radio Message Servers (RMS) do not ordinarily act a digipeaters. Due to equipment and bandwidth limitations in many cases, the transmission baud rate is usually 1200 bps.. The VHF Packet RMS Gateway for Winlink locally is on Laughlin Ridge at 145.050 MHz with call sign W6PKT-10.

The new preferred mode for VHF Winlink is VARA FM. Again there is both a free version and a faster version at some cost. At the present time, there is no VARA FM RMS in Mendocino County. It has been reported that an Winlink email message would take about 2 minutes to transmit using the packet mode. Using VARA FM, the transmission time is reported to be as short as 20 seconds and it is more resistant to interference and fading than packet mode. If a VHF RMS is established, even a Technician Class license can operate the system.

3.1 Radio Message Servers (RMS)

The ham radio station accesses the Winlink system using one of the Radio Message Server stations established around the world. Both HF and VHF stations are in use. These are also known as Gateway stations. The VHF RMS stations resemble an ordinary repeater (digipeater) except for a connection to the internet. These stations use a single frequency for receive and transmit. Many RMS stations are dedicated to EmComm use only by their owners but many others are open to all public use. Maps and partial information on RMS stations can be found on https://winlink.org/content/gateway_locations You will have to pan the map to select a given geographical area and will also have to select a mode.

3.2 Common Message Servers (CMS)

The internet traffic used to pass through one or more Common Message Servers (CMS). The CMS previously located in San Diego, Halifax, Perth, and Wein (Vienna), etc have been replaced with a "cloud" based server network hosted by Amazon Web Services. . These CMS convert the radio email messages back to ordinary SMTP protocol using TCP/IP and put them on the internet, and vice versa.

These servers and the entire Winlink effort are a project of the Amateur Radio Safety Foundation, Inc. http://www.arsfi.org/ a non-profit organizations depending on memberships and donations for funding.

4.0 USER EQUIPMENT

The VHF ham radio digital terminal used to be a normal packet station with a Terminal Node Controller (TNC) (in KISS mode), computer, and interface to a VHF radio. It was possible to also use a sound card modem. Many packet station hardware TNCs from the past saw new use with this mode.

Now with the change to VARA FM, the user VHF station would use an external computer sound card with a USB interface to a user computer.

For use with a VHF Packet RMS, a terminal node controller, hardware or software, is required. See section 6 of this document for a software TNC.

The HF ham radio terminal uses a single-sideband radio with a sound card modem. It is highly recommended to use a transformer isolated interface device between the computer and the radio. The SignaLink USB device comes highly recommended.

Any radio equipment used for Winlink must have a data connection with the audio signals both receive and transmit plus a signal present and a transmit line.

Some radios have a Data connector on them which looks like a PS/2 mouse connector – a Mini-DIN 6 pin female. These are usually found on dual-band (or more) VHF and some HF to VHF/UHF radios. The audio levels on this connector are usually in about the 300 mV P-P range although you may wish to attenuate the level to the transmitter to minimize distortion in both VHF FM and HF USB modes. Alinco transceivers often have a DE-9S connector for this connection.

Some radios have an internal sound card with a USB interface to connect to the computer. This will replace any external sound card such as a SignaLink USB or DRA device from Masterscommunications.

Use an appropriate connector and cable your radio to your Interface Device.The TX audio level to the radio is critical. Too high and the peaks will be clipped with a loss of data. Some repeaters will refuse to carry this data if at too high a modulation level and will drop out due to excess modulation level.

Too low a TX audio level and the output at the other end will be too low for reliable reception. This is a particular problem when the received signal is noisy and the noise overcomes the tones.

Normal audio may sound lower than voice level (but like noise). Technically the peak deviation should be about 3 kHz or less on FM but most will not have deviation monitors available so some experimentation may be required.

On HF, you will want the sound level to produce a transmitter power output at 25% of the maximum rated output or even less. Ensure that any speech compressor is turned off and that any Automatic Level Control does not operate.

At this time two commercial products have been identified that can act as an interface device between the radio and the computer.   The first one is the SignaLink USB device by Tigertronics, the second one is the DRA (Digital Radio Adapter) by Masters Communications.

SignaLink USB Device
Here is a link to the instructions for setting up and using this device
http://www.tigertronics.com/files/slusbman.pdf
This is a 12 page pdf document.

These are specialized instructions for using a SignaLink USB device for VARA FM
https://winlink.org/sites/default/files/RMSE_FORMS/vara_fm_for_winlink_with_sign alink_on_windows_v4_0.pdf
This is a 16 page pdf document/

Digital Radio Adapter by Masters Communications
Here is a link to the various DRA devices
https://masterscommunications.com/products/radio-adapter/dra/dra-description.html
This is a 5 page html document.

These devices are basically similar different mainly in the cables used for connection to the radio. Both units use a USB Type B connector for connection to the computer. The radio connector to the radio from the SignaLink USB device is an RJ-45 similar to a wired Ethernet cable connector while the DRAs offer a variety of connectors depending on model number. In either case a cable to the radio must be procured or made depending on the connector on the radio. The SignaLink device has an internal plug-in wiring adapter to accommodate different radio connections.

5.0 USER PROGRAMS

Formerly several email programs could be used such as PacLink, Airmail, and RMS Express. Even Outlook and Outlook Express could be used but this is no longer recommended. The present email program recommended is called Winlink Express and is similar to the former RMS Express with several significant improvements.

Winlink Express includes a number of standard message forms selectable by the user. This software also uses its own email format. This program is written and supported by the Winlink team and is the presently recommended program to use.

Users of the Winlink system must register in advance by establishing an account on the Winlink web site. Once this is done, send and receive a Winlink email message. It is not possible to register without using a RMS node on the system. Your Winlink email address will be yourcallsign@winlink.org although, of course, normal email addresses are applicable for land based internet email reception. Any user registered Winlink email address will be cancelled after 400 days of inactivity.

6.0 SOFTWARE

This document assumes that the reader knows how to create folders (directories) on their computer, knows how to download files to folders, and knows how to extract zip files to folders. This document also assumes that the reader knows how to open, read, and/or print portions or all of pdf files.

1) Download and install the basic Winlink Express software from https://www.winlink.org/WinlinkExpress On installation, you might be invited to make a donation but this is totally voluntary and you can still use the software without receiving a Registration Number . **Caution:** Some virus blocking software will try to delete Winlink Express when you try to install it. Be sure to allow it rights to install. Install the software on the C:\ drive. If you choose another folder, the program may not be able to locate standard or custom message forms or other software needed.

    This program may be identified as RMS Express on your computer.

2) Next download and install the VARA HF and VARA FM software from https://rosmodem.wordpress.com/ on the c:\ drive.
   You may get the same anti-virus warning but allow the programs to install.

There is a lot of other information on this site, some of it in Spanish. See if the Google translator works for you.

3) Terminal Node Controller
If you intend to use a VHF Packet Gateway, you must either have a hardware Terminal Node Controller (from the 1980's) or a sound modem program such as http://uz7.ho.ua/packetradio.htm

You will probably want to download the
http://uz7.ho.ua/modem_beta/soundmodem114.zip file
Extract the zip file to the c:\ drive.

http://uz7.ho.ua/modem_beta/user_guide_v114_EN.pdf file
The user guide is a 12 page pdf document.

Here are installation tips for that soundmodem.
https://winlink.org/sites/default/files/RMSE_FORMS/quick_setup_guide_for_winlink_sound_card_packet_for_vhf-uhf_on_windows_v1.2.pdf
This is a 19 page pdf document.

Be sure that you configure the sound modem software in conformance with the setup guide above. Double click on the installed soundmodem.exe file to view or edit the configuration items.

7.0 RECEIVE AND TRANSMIT AUDIO LEVELS

This is probably the most critical adjustment that will allow the system to work under many conditions. The problem is that every computer and every operating system has a different way of adjusting computer input and output audio signal levels.

The TX audio level to the radio is critical. Too high and the peaks will be clipped with a loss of data. Some FM repeaters will refuse to carry this data if at too high a modulation level and will drop out. Too high a level may also cause the HF transceiver to operate at a high power level which causes signal distortion which often causes the incoming signal to the receiver to be in error.

Too low a TX audio level and the output at the other end will be too low for reliable reception. This is a particular problem when the received signal is noisy and the noise overcomes the tones

Fortunately the result we are looking for can be achieved in various ways. Tigertronics / SignaLink has provided guidance for computers running variations of Windows but that guidance would also apply to DAT devices from Masters Communications or those transceivers that have an internal sound card with a USB interface.

For transceivers that have internal sound cards, TX and RX levels plus any delay settings would be set using the menus for those transceivers.

For information on configuring various versions of Windows, go here:
https://tigertronics.com/sl_suprt.htm#Windows%2010%20Information
Be aware that this is a multipage document that involves multi-page scrolling and also has some other documents within it that you may wish to download separately.

In this all-purpose SignaLink configuration document, Windows 11 is the first one listed but you can scroll down to find equivalent guides for Windows 10, Vista, 7-8, and 2000/ME/XP and a second copy of the Windows 11 guide.

Tigertrionics also has a Frequently Asked Questions site about their products.
https://tigertronics.com/slusbfaq.htm

Masterscommunications has a simplified instruction site for their DRA devices which may be found useful.
https://www.masterscommunications.com/products/radio-adapter/faq/setting-audio-levels.html

Editors note: I found it necessary when I changed to a Windows 11 computer to install Jumper 1 on my old (prior to 2018) SignaLink USB device (the one with the through-hole parts) to increase the PTT sensitivity and Jumper 2 to increase the received signal to the computer. That might not be necessary with the newer models with the surface-mount components including the transformers.

8.0 OPERATIONS

This assumes that you have registered with Winlink Express providing your call sign and your grid square (6 letters and/or numbers) and other requested information. This also assumes that all of the software in section 6 of this document has been downloaded and installed.

1) If you are going to use a Packet Winlink gateway, ensure that the Winlink Express or RMS Express settings is set to open on Packet Winlink . Ensure that the configuration is in accordance with the provisions of section 6. 3) as found above. If you are going to use one of the VARA gateways, the Winlink Express or RMS Express settings should be set to open on startup to VARA FM Winlink or VARA HF Winlink as desired. Click on "Settings" then "Automatically open a session…". Select which mode you wish and click on "Update". Exit or close Winlink Express or RMS Express to save the setting.

2) Double click on the Winlink Express or RMS Express desktop shortcut icon. You **may** be presented with a window with the opportunity to make a donation,   or to enter your registration number, or just a Remind Me Later notice. You **may** be informed that Updates are available via the internet. Select Update if available and wait just a little bit. Whichever you choose you will get the next window.

After a short time, the default modem or TNC as selected in section 8 1) above should be loaded and installed. Close this pop-up window by clicking on the X at the upper right corner of the pop-up which should take to the message screen.

3) On the very left side of the window, just below your call sign, select the mode that is loaded. Mostly this should be Packet Winlink or VARA FM Winlink or VARA HF Winlink depending on what was selected in section 8 1) above. If you wish to select another mode, go back to section 8 1) of this document.

4)   Click on Message then New Message to start a new message. You can then start to compose a new message in plain text. If you want to have this message in any standard message form, click on Select Template, then Standard Templates. The templates are updated from time to time so if you receive that message, click on Update.

If you select a standard form from the templates listed, fill out the required data and click on the SUBMIT button on the lower left corner of the window. It you are using the plain text form, fill out everything you want to send and click on Spell Check. If you want to send an attachment, locate the attachment but be aware that Winklink transmissions may be a lot slower than broadband internet.

Click on either Save in Drafts or **Post to Outbox.**

5) Click on **Open Session**. The next pop-up window you will get depends on the mode selected in 1 above. Click on Settings and verify the options for the mode selected. Change what is needed and click on "Update" or "Cancel".

6) Click on Channel Selection. Depending on the mode selected, you will get a display of available gateway stations with an Update Table Via Internet command. You could also choose Update Table via Radio but this will be a Winlink email response and may take a lot longer.   On VHF this should be updated daily but on HF this should be updated hourly.

Double click on the desired channel. If you are in the Packet Winlink or the VARA FM modes, the gateway stations will ordinarily be sorted by the distance from your station to the gateway. Any VARA FM gateway in Wide mode will require a data signal ordinarily stated as 9600 Baud. Not all radios support this data rate and the older SignaLink USB devices produced prior to 2018 will not support this rate but the newer ones will. I believe that all the newer DRA devices will do so also.
If you are in the VARA HF mode, the gateway stations will be sorted by a predicted Path Reliability Estimate and a predicted Path Quality Estimated based on solar flux and time of day considerations. Unfortunately in reverse order with the worst first – just scroll up.

6) Click on **Start**. If all your configuration settings have been correct and if you have selected a Gateway station in range and if that station is not busy with another client, your computer and transceiver should start transmitting.

73,
W6FQX