Westmoreland Emergency Amateur Radio Service
RADIO MAIL SYSTEM
ARCHITECTURE AND OPERATION
As of March 2016

The purpose of this document is to describe the WEARS Radio Mail System (RMS), explain its components, and describe how it is intended to be used.

The WEARS RMS is built around the components and capabilities of the Winlink 2000 system, if you are unfamiliar with this system, please read Appendix A, Getting Started with Winlink 2000, which is a document originally written by Phil Sherrod, W4PHS.

The central hub of the WEARS RMS is the RMS Gateway is housed at the EOC in Unity Township. The gateway currently operates only as a VHF gateway, using packet radio (KISS protocol) technology. Plans include adding an HF capability sometime in the future.

The Gateway primarily acts as an interface between the RMS and the internet. It consists of a VHF radio, a Terminal Node Controller, a power supply for the radio and TNC, and a desktop computer running Windows (currently the only operating system under which an RMS gateway can operate). The gateway operates with the callsign N5BLP-10 and the entire system operates on frequency 145.09.

The gateway software consists of two parts. The primary program is the Winlink RMS Packet program. This program takes packets that come in through the radio and TNC, establishes a connection to one of the Central Mail Servers (CMS) (see appendix A), and passes the traffic.

A supplemental program that operates in combination with RMS Packet is RMS Relay. This program has several operating modes. Its primary use is to act as a buffer between RMS Packet and the internet link. If the internet link were to go down, RMS Relay stores the messages that would have gone out and then automatically sends them when the link comes back up. This protects our operation against an unstable internet link causing connections to be rejected by gateway.

An alternate mode available to us in RMS Relay is to act as a local post office. If the internet link were to go down long-term, we could put RMS Relay into this mode. Our gateway would then act as a county-wide mail server, and allow us to continue passing messages among ourselves, or anyone else who could connect to our gateway.
   The gateway computer is set up to automatically reboot and restart both RMS Packet and RMS Relay in the event of a power interruption. The Supplemental EOC has building-wide generator backup; however, there is usually a short delay before the

generator starts up and supplies power. If this were to occur, the computer would lose power for a short time. Once power is restored (either normal or generator), the automatic reboot configuration would cause RMS Packet and RMS Gateway to automatically restart, and gateway operation would be restored.

The WEARS RMS also consists of a variable number of client stations. Appendix A describes what is involved in setting up a client, but it's basically just a radio, a packet TNC, and a computer. As an organization, WEARS currently only operates one client, set up in the CP600 Command Post vehicle.

The CP600 Digital Mode Station is capable of sending system email on VHF through the gateway at the Supplemental EOC, or HF through other existing HF gateways. It also has the capability of operating any digital mode supported by FLDigi, such as Olivia or PSK31. This station consists of the following:

      a. A Dell D830 laptop running the RMS Express mail client, as well as the FLDigi suite of programs.

      b. A Kantronics KPC-3+ Packet TNC, for communicating with the gateway.

      c. An Icom IC-2820H dual band radio. VFO b of this radio is tuned to 145.09, and is configured to communicate through the TNC. VFO a of this radio is left for voice operation.

      d. An Icom IC-706MkllG all band radio. This radio is connected to a SignaLink USB Sound Card Interface, which is in turn connected to the laptop. Using either VFO, this provides two capabilities.

            (1) Sending email over an HF link to an HF gateway anywhere in the country (or out of it, for that matter).

            (2) Operating FLDigi using Olivia 8/500 to communicate within the PaNBEMS system.

Other client stations, either fixed or mobile, are operated by WEARS members.

One of the weaknesses of the Supplemental EOC as a location for the RMS Gateway, is that it is in relatively low ground surrounded by ridges and hills. Because of this, a system of digital packet repeaters (digipeaters) is planned. A digipeater operates in a simplex (or half-duplex if you prefer) mode. Any packet it receives is automatically retransmitted on the same frequency. Its sole function is to extend the range of packet communications. There is no packet or message routing involved. There are no PL code restrictions.

The first one is planned for the Greensburg tower (the same location as the 147.18 W3LWW voice repeater). Once installed, this digipeater will have the callsign W3LWW, and will also operate on 145.09 simplex. Another planned location is the Derry tower (location of the 145.15 W3CRC repeater). Once installed, this digipeater will have the callsign W3CRC and will, of course, also operate on 145.09.

Once these digipeaters are operational, we should have complete countywide coverage, so any client station could send email through the RMS Gateway and out over the internet.

The WEARS RMS system also easily interfaces with any Mesh network (or other long-range Wi-Fi network) operated by WEARS. In the CP600 Command Post, this is accomplished by having the Digital Mode Station's computer on the command post LAN. The RMS Express mail client program can be selected to operate in the Telnet mode. In this mode, messages will be sent out over any TCP/IP network to which the computer is connected. Thus, if the Command Post LAN is on the Mesh network, the mail will go out over the Mesh network. By connecting the RMS Gateway computer with the Mesh network instead of the internet, and placing it in the Post Office mode, we could then operated a self- contained county-wide email system over the Mesh network, if there was a total internet infrastructure failure. Other mail clients could join this network by operating a Mesh node transceiver connected to their computer and using the Telnet mode of their RMS Express client program.
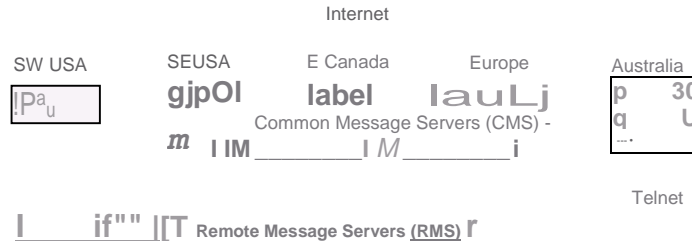
O   Getting Started with *Winlink 2000*

Phil Sherrod, W4PHS
Winlink Development Team

December 24, 2012

Introduction to Winlink:

Winlink 2000™ (www.Winlink.org) is a worldwide system for sending and receiving e-maii over radio. Since the connection from the client computer to the Winlink server does not depend on the internet, Winlink is widely used by mariners, RV campers, missionaries, and various agencies who need to communicate when the Internet is not available.

Internet

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Common Message Servers (CMS) -

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Telnet

I_____if"" l[T Remote Message Servers (RMS) r

HF Pactor, WINMOR, Robust Packet
VHF/UHF: Packet

The Winlink system consists of a group of Common Message Servers (CMS) placed at various locations around the world. These servers connect via the Internet to Radio Message Servers (RMS) in many geographic locations to form a star network configuration. The Radio Message Servers are the VHF, UHF, or HF RF gateway into the Winlink system. The final component is the client computer (i.e., your computer) which runs software to send/receive messages through your radio.

Like regular e-mail, Winlink messages are sent to a specific address, and they may contain file attachments such as pictures, weather maps, spreadsheets, ICS forms, etc. E-mails can be sent between Winlink stations and normal SMTP/POP3 e-maii servers such as gmail.com.

The ability of Winlink to transfer messages between system with different capabilities (VHF/UHF, HF, and standard e-mail) greatly increases interoperability in an emergency system. Also, since Winlink is a store-and-forward system, stations do not have to make simultaneous connections; this removes time constraints on communication.

Winlink is heavily used by the U S. and other governments, and many of the Radio Message Servers are restricted to non-amateur operations since they operate on non-amateur frequencies.

It is also possible to make direct, **peer-to-peer,** connections between two client computers (radio stations) that are within radio propagation range without going through a RMS. There are several situations where peer-to-peer connections are useful: (1) in a major emergency operation, traffic through the Winlink system may be very heavy, so a direct connection between two stations reduces the load on RMS and the Winlink system; (2) a station equipped only with VHF/UHF could make a peer-to-peer connection to a station with VHF/UHF and HF capability, and the second station could then forward the message into the Winlink system using HF.

Remember that e-mails sent through Winlink on the ham bands must follow the usual rules for amateur radio communication, and thus, may not be used for commercial operations, they may not be encrypted, and third-party traffic rules apply. Winlink messages are monitored by Winlink administrators.

You can visit this site to check the current status of RMS servers:
http://www.Winlink.org/RMSHFStatus

Winlink Connection Modes

There are four pathways for client computers to connect to the Winlink system:

- Via HF radio to one of the RMS hubs.

- Via VHF/UHF radio to a local RMS hub.

- Via the Telnet protocol over the Internet.

- Via Winlink WEBMAIL over the Internet.

Telnet connections are useful for testing the Winlink client software, but since the connection operates over the Internet, there isn't much advantage over using a regular e-mail service other than being good practice while learning to use the various Winlink client programs, or to keep from cluttering up the amateur spectrum, needlessly, during an emergency. The RMS Express program that is described in this paperworks with all connection modes.

VHF/UHF Winlink Operation

Local area connections to a Winiink RMS server can be made over VHF/UHF connections if you have a local RMS hub. This type of connection uses the AX.25 packet protocol, which is different from HF transmissions, and it requires a specific type of modem. If you wish to connect to Winlink through a VHF/UHF packet system, a 1200 or 9600 baud packet modem is required; the modem speed much match the capabilities of the local RMS node. The Kantronics <' KPC-9612+ (http://www.kantronics.com/products/kpc9612.htmn modem is recommended for X 9600 baud; it costs about $400. The Byonics TinyTrack4 (http://www.bvonics.com/tinvtrak4/˙) is recommended for 1200 baud; it costs about $100 including cable. Because VHF/UHF Winlink connections depend on having the local radio system and local Internet infrastructure operational, they are less well suited for emergency communications than Winlink via HF. The focus of this paper will be on Winlink operations over HF rather than VHF/UHF,