

WALLA WALLA COUNTY  
EMERGENCY OPERATIONS CENTER



STANDARD OPERATING PROCEDURES FOR WINLINK  
WALLA WALLA AMATEUR RADIO EMERGENCY SERVICES  
1 NOVEMBER 2018

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# Walla Walla ARES Winlink SOP for the County EOC

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## **OPERATOR CHECKLISTS**

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## Walla Walla ARES Winlink SOP for the County EOC

### General operations

WINLINK CALL SIGN: K7UH (e-mail ONLY). E-mail: [K7UH@winlink.org](mailto:K7UH@winlink.org)

TACTICAL VOICE CALL SIGN: Walla Walla EOC. Use your FCC call as legal ID, as per normal practice.

Communication Priorities (VHF only): (See Assumptions)

Table 1: PACE message routing priorities

PACE	Route	"Send As"	Instructions
Primary 1	AL1Q-10 on 145.07	Winlink Message	Access direct
Primary 2	AL1Q-10 on 145.07 via W2W	Winlink Message	Access by script "AL1Q-10 v W2W"
Primary 3	P2P on 145.03 via 145.07	Peer To Peer	Recipient identified by EC or EOC staff.
Alternate	N7MO-10 on 145.53 via W2W2	Winlink Message	Access by script "N7MO-10 v W2W2"
Contingency	Connect to nearest gateway via Eastern Washington Packet Network	Winlink Message	See Appendix C
Emergency 1	Send to designated hub for relay via HF radio	Winlink Message	See Appendix C
Emergency 2	Send to designated traffic relay station	Peer To Peer	See Appendix C
Emergency 3	Send via Hybrid Network, via traffic relay station	Radio-Only Message	Reserved for extreme conditions. Do not use unless directed

Primary P2P frequency: 145.03 MHz

Transfer protocol with EOC staff:

1. There is no direct e-mail with EOC staff. Exchange files using a thumb drive.
2. Record message transfer in station log by date, time, subject, and sender/recipient. Use ICS 309 generated by RMS Express to record radio traffic.
3. Confirm e-mail address with EOC shift supervisor.
4. Maximum message size, including attachments: 8 to 10 KB. Consult with releasing official if message is too large. Break message into multiple parts only if necessary.
5. Preferred attached file formats:
  - a. Plain text files (NOTEPAD)
  - b. HTML
  - c. PDF
  - d. JPG or PNG (grayscale or color acceptable)
6. Determine if message goes by GATEWAY or P2P on 2 meters. If further relay is

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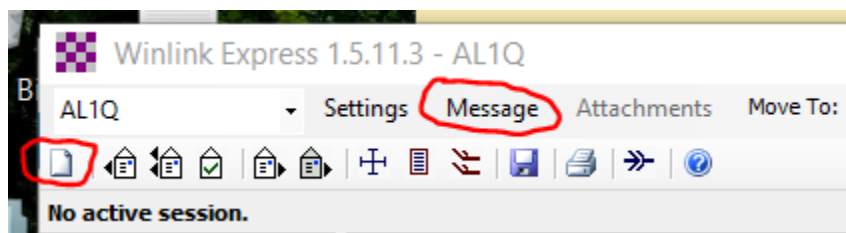
necessary (by either VHF or HF), identify relay station, and CLEARLY STATE recipient and contact method (name, organization, city; if outside of Walla Walla County, include e-mail address and/or telephone number) in message body.

7. Include this statement at the start of all messages addressed to non-Winlink recipients (the e-mail address is other than `...@winlink.org`): "THIS MESSAGE SENT BY AMATEUR RADIO FOR WALLA WALLA COUNTY EOC. SEND RESPONSE TO [insert instructions here]".
8. Send message.

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### Creating a message

1. In the Winlink Express window, click either the "New Message" icon, or "MESSAGE | NEW MESSAGE..." (see figure below).



2. The "Enter a new message" window appears. Enter the information as you would for a normal e-mail, except as follows (see Figure A):

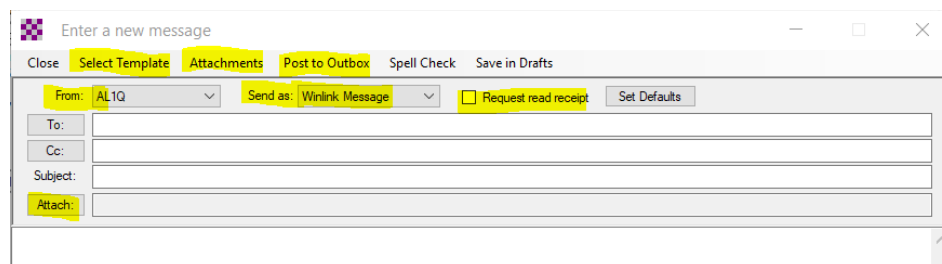


Figure A: Winlink message header

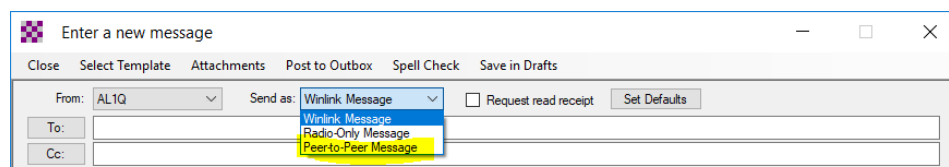


Figure B: Message sending options

- Select Template: See "[USE A TEMPLATE \(SELECT TEMPLATE\)](#)".
- Attachments/Attach: See "ATTACH FILES ("ATTACHMENTS")".
- From: Send ONLY from K7UH. Do NOT use your call sign.
- Subject: Include message precedence at the beginning, as follows
  - **//WL2K Z/** or **//WL2K O/** or **//WL2K P/**
  - **//WL2K R/**, or **//WL2K**, or no precedence (CMS assumes **//WL2K R/**)
- Send as: Your options are "Winlink Message", "Radio-only Message", or "Peer-to-Peer Message" (see Figure B). See "HOW DOES WINLINK WORK?", Table 2, for specifics.
- Post to Outbox: See #4, below.

3. Enter the message as necessary.

4. When the message is finished, click POST TO OUTBOX. If you want to save it as a draft, for working on it later, or to send by precedence, click SAVE IN DRAFTS.

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## Walla Walla ARES Winlink SOP for the County EOC

### Logging onto the EOC Computer

1. Turn on the computer.
2. At the Windows sign in prompt, click on "Other user", and enter the following in the user name field:

WALLACOUNTY\ARES

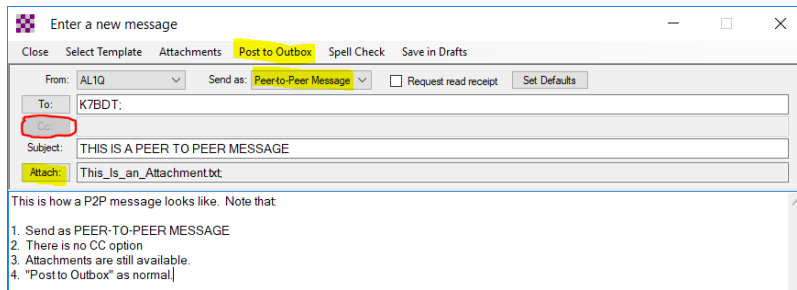
3. Enter the password in the next field.
4. Hit ENTER.
5. The computer will log on, and bring up the ARES desktop.
6. Open Winlink.

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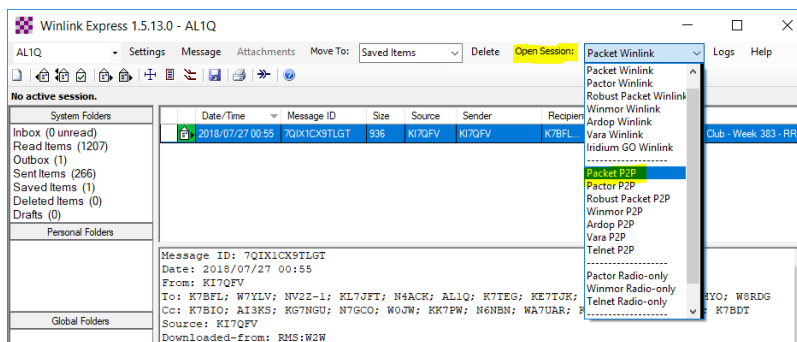
# Walla Walla ARES Winlink SOP for the County EOC

## Making a Peer To Peer (P2P) Connection

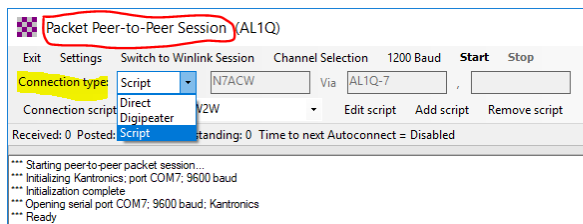
1. Prepare P2P message traffic as per the "Create Message Checklist". Send as "Peer-to-Peer Message", and then "Post to Outbox", as per the figure below:



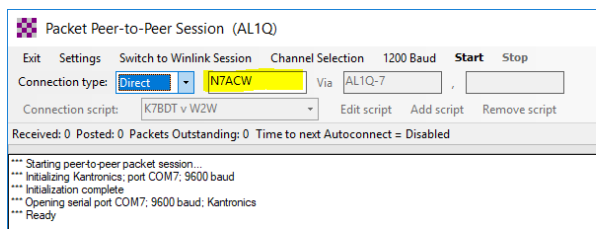
2. Open a "Packet P2P" session:



3. In the "Packet Peer-to-Peer Session" window, select "Connection type" as either DIRECT, DIGIPEATER, or SCRIPT.

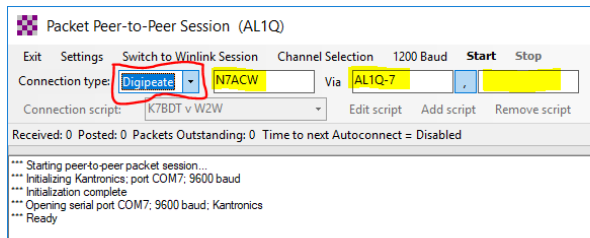


For DIRECT connections: Type in the call sign of the destination station.

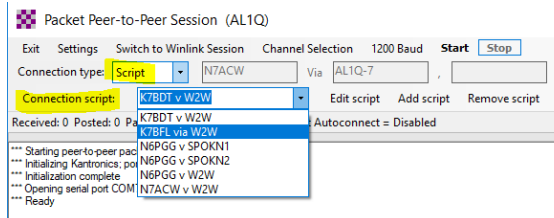


## Walla Walla ARES Winlink SOP for the County EOC

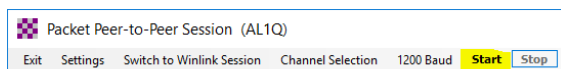
For DIGIPEATER: Type in the call sign of the destination station, and up to digipeater call signs.



For SCRIPT: Select the appropriate script.



4. Check that the radio is on and set to the correct frequency. Click "Start".



5. Winlink will walk through the connection and message exchange process at this time.



## **EMERGENCY E-MAIL SUPPORT FOR THE COUNTY EOC**

### Purpose

This section is a primer for County EOC staff to understand how Amateur Radio conducts emergency communications (EMCOMM), and the requirements of radio operators to handle and process EOC radio message traffic efficiently, and legally.

### The Amateur Radio Service

Radio traffic handling was the basis for the formation of the Amateur Radio Service, and a sizable segment of amateurs still makes this its principal Amateur Radio operating activity. The Amateur Radio Service does not compete with other services, since there are no charges and no guarantee of delivery. Amateur radio operators volunteer their services "...solely with a personal aim and without pecuniary interest" (see US Code, §97.3(4)). Hence, amateur radio operators may not accept any remuneration or other kind of compensation for use of an amateur station. Provided FCC and international regulations are complied with, most voice and written (e-mail) messages may be accepted from anyone for transmission by Amateur Radio.

Any EOC traffic relating to on-going emergency operations, or in support of legitimate government activities during a loss of commercial communication services, may be passed as legal messages by members of the Amateur Radio Service. This is known as "third party traffic", or communications on behalf of a third party or agency. Message traffic may be passed domestically, or internationally with most countries.

Some transmissions are prohibited under U.S. Code §97.113(a); those directly relevant to the EOC are summarized below:

- (1) Communications specifically prohibited elsewhere in U.S. Code 97;
- (2) Communications for hire or for material compensation, direct or indirect, paid or promised, except as otherwise provided in U.S. Code 97;
- (3) Communications in which the station licensee or control operator has a pecuniary interest, including communications on behalf of an employer, with exceptions (noted above).
- (4) Music using a phone emission except as specifically provided elsewhere in this section; communications intended to facilitate a criminal act; messages encoded for the purpose of obscuring their meaning, except as otherwise provided herein; obscene or indecent words or language; or false or deceptive messages, signals or identification.
- (5) Communications, on a regular basis, which could reasonably be furnished alternatively through other radio services.

### Using radios to support the EOC

Radio message traffic for the EOC may be sent by one of the following means:

- Orally, either tactical (real time), or by relaying a written message.

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- Morse Code ("CW"), from a written message.
- Facsimile, from hardcopy or electronic documents (computer files).
- Digitally, by a computer connected to a radio, using one of many software packages.

Actual transmission and delivery is accomplished by one of several techniques:

- a. The message is read by the sending station, and heard directly by the addressee;
- b. Two (or more) non-Amateur operators communicate directly by voice under the supervision of licensed Amateur operators;
- c. The message is transcribed from oral to written (paper or electronic), by the Amateur Radio operator from the sender, and passed to the addressee by oral, facsimile, or digital means.
- d. The message is sent from one station to another using a computer connect to a radio, which is then passed by the operator to the addressee orally, in hardcopy, or electronically, and;
- e. The message is formatted and sent as e-mail through an INTERNET gateway for delivery as normal e-mail by a non-Amateur Radio operator, or sent to another station for relay to the addressee.

### Exchanging message traffic with EOC staff

There is no direct connection between the County network and the Winlink computer. The ARES computer accesses the INTERNET for updates, and the Winlink e-mail system (by both radio and INTERNET), but not the county network. While the ARES computer may sit inside the EOC, it operates outside the county network.

By policy, all e-mail traffic must be processed by county servers before entering the networks. Files from external sources are also scanned for intrusive software. This helps to protect the county network from attacks and intrusions from external sources (e.g., hackers). The Winlink computer does not do this, by design, since it uses systems not controlled by the county.

Hence, all e-mail traffic passing through Winlink has to be sent or received outside the county network, and passed as separate files between EOC staff and the duty operator using an "air gap" (or "air gapping"). An air gap is a network security measure that ensures that a secure computer network is physically isolated from unsecured networks, such as the public Internet. The name arises from the technique of creating a network that is physically separated (with a conceptual air gap) from all other networks.

This is an added layer of work for all concerned, and is inconvenient. But this satisfies network security requirements and supports emergency communication needs of the County EOC.

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The Winlink process requires that received e-mail traffic is converted to a stand-alone format that is less likely to be infected, and passed to EOC staff through an "air gap". Outgoing messages are given to the duty operator as hardcopy for scanning or manual transcribing, or more preferable, in electronic format through the air gap for suitable processing.

The air gap is a thumb drive passed between the EOC staff and on-duty ARES operator. The thumb drive should be scanned regularly throughout the shift. The duty operator will have to process these files between Winlink and standard file formats (most typically, text, PDF, and scanned images). Manual transcribing from hardcopy is the least preferred method, as it is time consuming and error prone.

### Message Handling by Amateur Radio Operators for the EOC

Messages are either informal or "tactical" messages (brief oral or informal written messages, intended for direct and immediate delivery), or formal messages (written messages sent in a standardized format). Formal messages must be prepared for the Amateur Radio operator, including an addressee, by EOC staff.

Informal messages may be oral, but must have an addressee. They should be written to facilitate transmission and delivery, as well as documentation. Informal messages will be noted on station logs before being sent.

Consistent with this, the Amateur Radio Service establishes one or more emergency nets for the transmission and delivery of traffic. These nets are commonly known as:

- Traffic net: Handles formal written messages in a specific format, generally for delivery between EOCs, across a region, or nationally.
- Tactical net: Handles primary EMCOMM needs for the EOC and on-site operations. There may be more than one tactical net for a given operation, depending on the need. A tactical net may handle both formal and informal messages.
- Resource or logistics net: Used to acquire or coordinate resources and volunteers for EMCOMM needs.
- Information net: An informal net used to collect or share information on a developing situation, including official bulletins.

These nets can and will use all of the above techniques to send and deliver formal and informal messages. The techniques preferred for EOC support are:

- Informal message traffic documented on the Walla Walla EOC message form, ICS 213or both), and sent orally;
- Informal messages provided orally, and sent orally;
- Informal message traffic sent as e-mail using Winlink Express software, and;
- Formal message traffic sent as e-mail using Winlink Express software.

### What Amateur Radio operators need from the EOC

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Most importantly, the Amateur Radio operator needs to know WHERE the message must go. The operator will find the best way to get it there. The following is a set of guidelines on how to give the operator the best possible information to avoid issues and assure delivery.

1. All messages sent from the EOC Amateur Radio station require the following, at the minimum:
  - a. All Private Health Information (PHI) and Personally Identifiable Information (PII), including attachments, is processed appropriately.
  - b. Addressee: Name, location, or e-mail address. A telephone number may be needed as well.
  - c. Sender: Name and position from the EOC.
  - d. Message content, composed by the sender as formal or informal, depending on the EOC SOP and immediate requirements.
  - e. Message release authorization, as per the EOC SOP.
2. Recommended for formal traffic addressee:
  - a. Message precedence.
  - b. Name of individual or agency office.
  - c. Complete mailing address, to include street and number, direction, city and state and zip code.
  - d. Contact phone number to include area code.
  - e. For all Winlink traffic: E-mail address.
  - f. Call signs and contact information for Amateur Radio operators supporting the addressee.

### Address Requirements

You should have address lists on hand at the time of EOC activation. Maintain a copy of the current address list to the Amateur Radio. New addresses may be added required after activation, but the initial list will be a good place to start.

### Message Precedence.

The Winlink system uses an optional precedence indicator. This is set as per the EOC SOP, and must be provided to the Amateur Radio operator by the author or EOC Manager. The priority establishes the place of the message in the outgoing message queue. That precedence will have no impact on message handling through any e-mail server. Its sole purpose is to tell the operator how soon a given message should be sent. The precedence indicators are as follows:

- FLASH (Z): Handle in the order received and ahead of all messages. If feasible, interrupt any traffic of lesser precedence.

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- IMMEDIATE (O): Handle as fast as possible, ahead of all other messages except those with FLASH precedence.
- PRIORITY (P): Reserved for messages which require expeditious action, sent ahead of ROUTINE messages.
- ROUTINE (R): Routine communications that require rapid transmission but not preferential handling. Handle last, or not at all, when busy with higher-precedence traffic. Send in the order which they are submitted to the operator

The precedence will be included in the subject line as per WL2K FAQ A690 (for example, "//WL2K R/"). EOC staff will set the precedence for all messages, as directed by the EOC manager, and consistent with their SOP. ARES operators will not set precedence above ROUTINE. If no precedence is provided by EOC staff, the precedence is automatically ROUTINE.

### Message content recommendations

Winlink (written) message traffic is different than talking on a telephone or voice radio operations, or even regular e-mail. Keep all messages short and to the point, 25-30 words for informal messages. Larger messages can be broken into smaller ones. Formal messages should stay within the context of the forms. Ideally, this will be provided in a digital format (e.g., by thumb drive), but hardcopy (printed or written) is feasible. However, the operator will have to transcribe the message to the computer, and will delay message transmission. If multiple addressees are needed, separate messages may be required.

Winlink Express permits attachments to your messages, but must be kept as small as possible to reduce transmission time. The recommended limit is 10KB for the entire message, but up to 90K is acceptable, assuming the recipient is able to download a file of that size. This should be established as part of the EOC SOP.

### Information Security

Information security is generally defined as "The protection of information and information systems from unauthorized access, use, disclosure, disruption, modification, or destruction in order to provide confidentiality, integrity, and availability."

However, by federal law (U.S. Code 97.113(a)), the Amateur Radio Service is prohibited from sending "...messages encoded for the purpose of obscuring their meaning, except as otherwise provided herein...". The authentication required for log on to the Winlink system is an example of an exception.

Digital communications (including Winlink) are not excepted. These use open source protocols to convert text, graphics, etc., into a format that can be sent by radio. This is not immediately readable, and appears to be encrypted (i.e., it can't be read with decoding it), but it is not secret encryption by legal definition, as the protocol is openly available.

Thus, any such message could be decrypted using the appropriate radio equipment and software, and is not encrypted for the purpose of obscuring their content. In practice, the message content can't be openly read during transmission, but it could be recorded and decoded later. This is a difficult task, but not an impossible one.

Further, message traffic sent through a remote gateway passes through central mail servers unencrypted. Gateway operators have the ability to read those messages due to their legal responsibility to monitor all third party traffic.

Hence, from an information security perspective, protection "...to provide confidentiality..." is legally constrained for the Amateur Radio Service. Hence, there can be no expectation of privacy on any messages sent over Amateur Radio frequencies. This is a legal concern for Personally Identifiable Information (PII) and Personal Health Information (PHI) for radio operations, who are trained to review the messages before sending. Any questionable content will be returned for revision, anonymizing, or acceptance of risk by the message originator.

#### HIPAA compliance in Amateur Radio messages

The Health Insurance Portability and Accountability Act (HIPAA) requires the protection and confidential handling of PDI under the Privacy Rule.

As discussed above, privacy can't be assured for HIPAA, as unauthorized parties could intercept, decrypt, and read the content. For example, Winlink uses the B2F protocol for packet radio. B2F also compresses the message content to save transmission time, resulting in what looks to be gibberish. Figure 1 is an example of that.

Thus, Winlink does not meet the legal requirements for the protection of PHI, as required under HIPAA. As Amateur Radio operators in the EOC are considered by law of an unpaid business association of this agency, they are liable under federal law for HIPAA violations.

Disaster relief organizations such as the American Red Cross need not obtain permission to share PHI if doing so would interfere with the organization's ability to respond to the emergency.

During an emergency, patient information may be shared as follows:

- As necessary to provide medical treatment.
- To identify and locate, family members, guardians, and other responsible for victim care. This includes giving information to the press, to law enforcement and to the public.
- To prevent or lessen a serious and imminent threat to the health and safety of a person or the public.

Avoiding HIPAA violations during an emergency means that the message originator **must** assure that any messages with PHI meet one or more of these requirements:

- EOC staff and stakeholders must continue to implement reasonable to safeguards protect patient information.

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- EOC staff and stakeholders must make reasonable efforts to limit the information disclosed to that which is the “minimum necessary” to accomplish the purpose.
- The inclusion of a name (or names) in any message during an emergency has been requested by medical personnel (e.g., hospital staff).

Figure 1: Demonstration of B2F Protocol over RF

```
stuffery@WL2K-AL1Q: ~
File Edit Tabs Help
stuffery@WL... x stuffery@WL... x
0: fm AL1Q-15 to AL1Q-10 ctl RR7v 17:03:06
0: fm W2W to AL1Q ctl RR7+ 17:03:08
0: fm W2W to AL1Q ctl I77^ pid=F0(Text) len 5 17:03:10
FS Y
0: fm W2W to AL1Q ctl RR7- 17:03:16
0: fm AL1Q-15 to AL1Q-10 ctl I76^ pid=F0(Text) len 128 17:03:24
A//WL2K Demonstration of B2F protocol over RF
0
0: fm W2W to AL1Q ctl RR2v 17:03:24
0: fm AL1Q-15 to AL1Q-10 ctl I77^ pid=F0(Text) len 128 17:03:26
g...I...:..XX...A...}...g.8...Z...*...8...\"...-
.*...I...XGy)...$.0.II.nBw...QA...dbcz9...}.E./Q.3r0...ji.
k...b...I.=.....@
0: fm AL1Q-15 to AL1Q-10 ctl I70^ pid=F0(Text) len 128 17:03:27
Q...\"..._E.U...72{.c...u...a~3...D!&H...R2}w.y}S...B...L.GM<]e6n].BVk...?.q...=.Le{y:|.o]R...hD.....Z....
@...Sv...>.H...^pCC...N...M.j...yp...5
0: fm AL1Q-15 to AL1Q-10 ctl RR7+ 17:03:34
0: fm AL1Q to W2W ctl RR0+ 17:03:39
0: fm W2W to AL1Q ctl RR2- 17:03:40
```

Examples of meeting these requirements are:

- Alternate means of communications are considered (e.g., courier).
- Names and medical conditions are anonymized before submitting for transmission over Amateur Radio frequencies.
- Radio operations are adjusted accordingly:
  - Use the lowest transmit power that is practical
  - Choose radio frequencies with minimal activity, when available

The radio operator may refuse to transmit any messages which do not meet these criteria.

The rule of thumb for this matter is to respect the rights and privacy of others, and treat them as good or better than you would want to be treated. If in doubt, don't send the information by Amateur Radio.

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## **BASICS**

### What is Winlink?

The Winlink System (winlink.org) is a versatile digital messaging technology that allows amateur radio operators to send e-mail messages over HF, VHF or UHF radio frequencies (RF) to other amateur radio operators. These radio connections are to gateways which pipes the messages to a Central Mail Server (CMS). This is called Winlink 2000 (WL2K), or just Winlink. Winlink permits sending e-mails to nearly every e-mail address available, amateur radio operator or not.

The software that you will use in the EOC is Winlink Express. This acts like an e-mail client such as MS Outlook™, or Outlook Express™. The major differences between the Winlink System and other e-mail systems are:

- A valid amateur callsign is required to access the Winlink system.
- All messages are limited in size due to bandwidth limits on amateur radio frequencies. Hence, message content is limited to text only and small attachments.
- As the Winlink operator, you have to select the routing for any Winlink message traffic.

Other software packages may be used with Winlink, but Winlink

### Winlink versus other software packages

This document focuses on Winlink Express, a software package developed by the Winlink Development Team (see <https://winlink.org/>). Other packages are available, such as AirMail or Paclink. These are not used in the Walla Walla EOC, and hence are not included in this document. They are compatible with Winlink, but the users of those software package will have to troubleshoot their own problems.

### How does Winlink work?

Winlink sends messages by one of the "SEND As" options, using one of the operating modes available to Winlink Express. The "SEND As" options determine where the message(s) will be sent to, or the "routing". Routing precedence are set by the PACE message routing priorities (see Table 1).

In practice, the operator either sends the traffic to a Winlink gateway, a local message hub, or to a specific station ("peer to peer"). Sending to a Winlink gateway means that message routing and delivery is affected by a CMS through the INTERNET; the operator only has to successfully upload the messages from another gateway, or through another e-mail provider.

Sending to directly to another station is known as Peer To Peer (P2P). Both stations must be on the same frequency, mode, and using the same protocol. P2P is used when there is no other route to the recipient, or it is a direct route (i.e., faster) than sending by Winlink.

## Walla Walla ARES Winlink SOP for the County EOC

The recipient may be another EOC or agency, or it may be a *hub* or *traffic relay station*, which will forward the traffic to the next available gateway. These are:

Table 1: PACE message routing priorities

PACE	Route	"Send As"	Instructions
Primary 1	AL1Q-10 on 145.07	Winlink Message	Access direct
Primary 2	AL1Q-10 on 145.07 via W2W	Winlink Message	Access by script "AL1Q-10 v W2W"
Primary 3	P2P on 145.03 via 145.07	Peer To Peer	Recipient identified by EC or EOC staff.
Alternate	N7MO-10 on 145.53 via W2W2	Winlink Message	Access by script "N7MO-10 v W2W2"
Contingency	Connect to nearest gateway via Eastern Washington Packet Network	Winlink Message	See Appendix C
Emergency 1	Send to designated hub for relay via HF radio	Winlink Message	See Appendix C
Emergency 2	Send to designated traffic relay station	Peer To Peer	See Appendix C
Emergency 3	Send via Hybrid Network, via traffic relay station	Radio-Only Message	Reserved for extreme conditions. Do not use unless directed

- Radio-only post office (local message hub): This is a message bulletin board, using a local database, where you can leave and pick up messages. It is not part of the WL2K system, and does not connect to any WL2K CMS. This is commonly called a "hub", and generally uses RMS Relay as a forwarding service. Messages are forwarded by INTERNET (if/when available), or HF radio (a/k/a Tri-Mode).
- Traffic relay station: A message may be sent P2P to another station for manual relay by what's available (INTERNET, VHF/UHF, or HF Radio). This is not a built in feature of Winlink, but requires the relay station to manually forward the traffic to designated recipients. This is similar to a hub in effect, but is strictly manual in operation. The relay station may forward as P2P or as a Radio-Only message.

Table 2 summarizes the "SEND As" options. Once a routing option is selected, Winlink may be used in one of several protocols to send the traffic. Not all of these are available at the EOC, but are available to other stations in the area. You may send a message – using Winlink – to one of those stations for relay. These are the available operating modes (Table 3 summarizes their use):

- Packet: Operates on VHF FM only. Only this is in the EOC.
- PACTOR: Operates on HF radio only. Not used in the EOC.
- Robust Packet: Operates on HF radio only. Not used in the EOC.
- WINMOR: Operates on HF radio only. Not used in the EOC.

## Walla Walla ARES Winlink SOP for the County EOC

- Iridium GO: Sends messages through an Iridium satellite line by relay Not used in the EOC.
- Telnet: This makes a connection to the CMS through the INTERNET or local network. May be available, under some circumstances.
- Telnet Post Office: Connects by INTERNET or local network (internal or MESHNET) to a central server (using RMS Relay). May be available, under some circumstances.

Table 2: Message Routing Options

<b>"SEND AS" option</b>	<b>Description</b>	<b>Details</b>
Winlink Message	Send through a Winlink gateway or RMS Relay based hub	<ul style="list-style-type: none"> <li>• Routing is performed by the CMS, based on the address. Can use call signs or INTERNET addresses.</li> </ul>
Peer to Peer Message	Exchange traffic directly with another Winlink station.	<ul style="list-style-type: none"> <li>• Routing is identified by the sender.</li> <li>• Use call signs only, no INTERNET addresses.</li> <li>• May be a direct send, or through a traffic relay station.</li> <li>• The receiving user must be listening on the right frequency.</li> <li>• Does not connect to an RMS or the CMS.</li> <li>• The CC address is disabled in Winlink.</li> </ul>
Radio Only Message	Designates message for the Hybrid Network. Does not include radio-only hubs.	<ul style="list-style-type: none"> <li>• Intended for complete loss of INTERNET.</li> <li>• Do not use for messages from the EOC unless directed.</li> </ul>

Table 3: Winlink routes, by protocol, available at the WWEOC

<b>Protocols</b>	<b>Winlink</b>	<b>Peer To Peer (Traffic Relay)</b>	<b>Radio-Only</b>
Telnet	Yes <sup>1</sup>	Yes	No
Telnet Post Office	Yes <sup>1</sup>	No	No
Packet	Yes	Yes	No
PACTOR	Not Available	Not Available	Not Available
Robust Packet	Not Available	Not Available	Not Available
WINMOR	Not Available	Not Available	Not Available
Iridium GO	Not Available	Not Available	Not Available

<sup>1</sup> Assumes INTERNET connectivity

### Nodes versus digipeaters

Nodes and digipeaters are a special purpose terminal node controller (TNC) and radio placed at high points. These allow connections between stations in spite of the terrain, similar to what a voice repeater does. However, they operate on simplex, working as a "record and forward" system, when two stations are connected via packet. The TNC as a "digital repeater", from whence comes the term "digipeater". Originally, only digipeaters were used, but were not particularly efficient. Packet network schemes, using packet nodes, were developed.

A packet node is a special purpose TNC using custom firmware, while a digipeater uses common firmware. Nodes are an radio frequency based computer network, with routes between nodes "managed" by a simple scheme. The operator does not need to know what route to take, only where the start and end of a connection is. Digipeaters require that the operator know what route to know.

Packet nodes are in place throughout the region, and allow access to other gateways. They are limited by bandwidth (1200 baud), and use by others. Weather conditions and iced antennas can block RF signals as well. There are no Winlink digipeaters in eastern Washington, although they are used in western Washington.

### Why Winlink Express is used at the EOC

Voice traffic will be used extensively during any emergency, but current practices for all EOCs is use to electronic data transfer where ever possible. Winlink Express offers a basic e-mail capability that was designed for Emergency Communications (EMCOMM).

So, the Walla Walla County Emergency Operations Center (EOC) has been equipped with a dedicated packet radio station and laptop, and Walla Walla Amateur Radio Emergency Services (ARES) works with the County EOC to keep it maintained for rapid use. Regionally, Winlink is used by the states of Washington, Oregon, and Idaho for EMCOMM data transfer, on both HF and VHF. The primary use is for formal message traffic (such as the ICS 213 form) and the transfer of small files with logistical and administrative information.

### Winlink limitations

Bandwidth is limited to 1200 baud on VHF, 9600 baud on UHF, and 200 to 3200 baud on HF (depending on conditions, equipment, and protocol). This means that messages must be small in size:

- All messages are sent as plain text, no formatting allowed.
- Binary files (photos, PDF, data) may be sent, but text is preferred.
- The maximum compressed size is 120 kilobytes (KB). This includes the header, text, and any attachments.
- The EOC Winlink station is configured so that the CMS will not download a message larger than 80KB to the station.

## Walla Walla ARES Winlink SOP for the County EOC

- All message traffic is subject to Part 97 rules, and the contents are open for review by the system operator (sysop) at any gateway.

### Finding help for Winlink Express

There are three sources of help for the operator on duty:

- Winlink Express has a HELP function, accessed through the **HELP | HELP CONTENTS** menu option.
- Reviewing the WinLink Frequently Asked Questions (FAQ); a copy is kept in the ARES folder on the desktop of the laptop.
- For further details on Winlink, go to the Book of Knowledge at [www.winlink.org](http://www.winlink.org) (if the INTERNET is available). The most recent Winlink FAQ is posted there, as well as other references and articles.

## **ASSUMPTIONS**

### Why Assume Anything?

This SOP is prepared for when the County EOC is activated **and** emergency communications are required. However, the exact circumstances that drive the requirement are not known. For simplicity, the SOP was written with specific assumptions in mind. If the assumptions aren't valid for the current situation, these procedures will need to be adjusted accordingly.

### Operating assumptions for the EOC Amateur Radio Station

- The EOC is activated for an exercise or training, whereupon the following assumptions are built into the event.
- The EOC has been formally activated for an incident or event impacting Walla Walla County.
- EMCOMM is required by the EOC due to one or more of the following conditions:
  - Normal communication systems are unavailable or unreliable for the EOC. This includes, but is not limited to, the following:
    - Loss of connectivity to the County network.
    - Loss of the County Voice Over INTERNET Protocol (VOIP).
    - Commercial providers are unavailable, unreliable, or are overwhelmed.
    - Public service systems are unavailable, unreliable, or are overwhelmed.
  - Communications are required with a remote location in or near Walla Walla County, where reliable commercial or public service communications are not available.
  - Regional events require EMCOMM to supplement or replace primary or alternate communication systems.

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- WWARES has been requested to provide EMCOMM to the EOC.
- As a result, Winlink activities are necessary due to one or more of the following:
  - The EOC can't send or receive e-mail in any way
  - Data communications with a remote location are necessary
  - Commercial systems are not able to support current operations

### **PASSING TRAFFIC BETWEEN THE RADIO STATION AND EOC STAFF**

#### General

Winlink traffic will generally be non-tactical in nature, most likely logistical requests, situation reports, and information sharing with other EOCs and agencies (e.g., weather forecasts, shelter operations, and supply requests). In general, messages will be written, either by hand, printed, or (preferably) electronic. You may be asked to use a specific form. Specific procedures are below.

#### Message handling

Incoming messages should be given to the EOC manager for routing, unless you are told otherwise. All outgoing messages require the following, at the minimum:

1. All messages sent from the EOC Amateur Radio station require the following, at the minimum:
  - a. All Private Health Information (PHI) and Personally Identifiable Information (PII), including attachments, is processed appropriately.
  - b. Addressee: Name, location, or e-mail address. A telephone number may be needed as well.
  - c. Sender: Name and position from the EOC.
  - d. Message content, composed by the sender as formal or informal, depending on the EOC SOP and immediate requirements.
  - e. Message release authorization, as per the EOC SOP.
2. Recommended for formal traffic addressee:
  - a. Message precedence.
  - b. Name of individual or agency office.
  - c. Complete mailing address, to include street and number, direction, city and state and zip code.
  - d. Contact phone number to include area code.
  - e. For all Winlink traffic: E-mail address.
  - f. Call signs and contact information for Amateur Radio operators supporting the addressee.

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### Electronic

This is the preferred method. For traffic coming to the EOC, you can print to PDF, or save the message to text (MESSAGE | SAVE MESSAGE AS .....). These two techniques preserve the header information. You can also copy and paste between text files, as well. The file(s) can then be transferred electronically. Use the EOC Folder on the hard drive, and advise the EOC manager. Or use a thumb drive, and deliver to the EOC manager for routing. There is no forwarding by e-mail to EOC staff.

For traffic leaving the EOC, the sender should compose the message electronically, in a text or word file, with the information noted above. Once complete, transfer the file(s) through the EOC folder or a thumb drive.

### Hand written or computer printed

Outgoing messages will come in on the General EOC Message form (see Figure 2 and "[Select Template](#)"), possibly with attachments. These will have to be transcribed and/or scanned in. This is least preferred method. The radio station does not have access to a printer. All messages MUST be transferred electronically to the EOC manager.

The form is titled "GENERAL EOC MESSAGE". It has a header section with "Incoming message", "Outgoing message", "DATE:", "TIME:", and "AM/PM". Below this is a "Priority?" section with options: "Immediate (Known Life-Safety)", "Priority (Unknown Life-Safety)", and "Routine (Property or Public Asset)". To the right is a "Method of contact?" section with options: "Phone", "Radio", and "In Person". Below these is a "Contact Information" section with fields for "Name:", "Phone# for call back: Cell:", "Home:", "Other:", and "Business:". There are also fields for "Indicate one: Incoming message taken by:" and "OR Outgoing message made by:". The main body of the form is labeled "MESSAGE:" and has several lines for text entry. At the bottom is a section labeled "ACTION/RESPONSE:" with several lines for text entry.

Figure 2: General EOC message

the

### Message filing

Do not file hardcopies. This is the responsibility of EOC staff. All Winlink messages are stored in the Winlink Express READ folder, and are backed up daily by the software.

Generate the ICS-309 Communications Log as a PDF (under MESSAGE) at the end of your shift, and file on the EOC folder.

## **STATION LOGGING**

Use ICS 214 as your personal log. The following points should be recorded, at the minimum:

- Assumption of duties from the previous shift, and transfer of duties to the next shift.
- Opening and closing the station, including communication checks and voice contacts.
- Safety briefings
- Instructions from the EOC manager or County EC.
- Transfer of received messages to EOC staff.
- Receipt of messages submitted by EOC staff for transmission.
- Identify submitted messages that couldn't be sent; state reason why.
- Breaks

## Walla Walla ARES Winlink SOP for the County EOC

- Equipment issues.
- Issues and concerns not noted above.
- All traffic sent by other than Winlink (verbal, facsimile, etc) outside the EOC. Record by hand using the EOC message form, or ICS 213, as necessary. File a copy at the station.

Messages sent or received by Winlink are recorded by the software. Generate the Communications Log (ICS) as the last action before turn over (MESSAGE | GENERATE ICS-309 COMMUNICATIONS LOG). This will create a PDF document; file on the station computer, and copy to the EOC staff.

You should make a copy of the ICS 214 before departing, either with a copier, or taking a picture with your phone or tablet.

### **SETTING UP THE RADIO AND TNC**

#### Turning on the equipment

See the station "How to Manual" for turning on the equipment.

#### Operating frequencies

2-meter Winlink operations are typically simplex, either P2P or through a gateway (designated by the "-10" secondary station IS [SSID]). P2P is station to station, but messages can be relayed using the FORWARD function in Winlink, and sending to the next station. P2P connections can be direct, or through a node.

See "Appendix E: Walla Walla County ICS Forms 205" for operating frequencies. Tables 1, 2, and 3.

### **GETTING ON THE COMPUTER**

#### County policy

The computer is provided by Walla Walla County for the amateur radio station as part of their EOC system. This provides for sending/receiving e-mail traffic by Winlink on 2 meters. The computer is wirelessly connected to the county network, through a folder on their network (a shortcut is posted on the desktop). If the INTERNET is down, this folder is still available, as long as the county network is operational. But there will be no direct access to any internal servers, including the county e-mail system.

Therefore, Winlink traffic can't be transferred by e-mail. All such traffic must be passed manually VIA the network folder. Files of saved messages and attachments are posted to this folder by either the on-duty operator for the EOC staff, or by the EOC staff for transmission by the on-duty operator. If the folder is not available, thumb drives will be used.

This is due to the county network security policy. From their perspective



## Walla Walla ARES Winlink SOP for the County EOC

NOTE: Another software application, WebEOC, may be used if it is available. However, that server is located at Camp Murray, and depends on reliable INTERNET access. Hence, it is not included in this SOP.

### Logging on

These are maintained on the operator checklist at the start of this SOP.

## **USING WINLINK EXPRESS**

### Software controls

Winlink Express is similar in design to most e-mail applications, including "Reply", "Forward", and so on. However, it is written for Amateur Radio and Emergency Communications, and there are unique features.

Figure 1 shows the basic controls, as follows. Most functions are described under "Help"; look under CONTENTS | OPERATIONS | MAIN DISPLAY for details. Instructions specific to this station are noted below.

- Select call signs: Keep this on K7UH. Do NOT use your call sign.
- Drop down menus.
  - Settings: You should not need most of these options. The exceptions are CONTACTS, GROUP ADDRESSES, and ADD PERSONAL FOLDER.
  - Message: You should not need most of these options. The exceptions are SAVE MESSAGE AS and GENERATE ICS-309 COMMUNICATIONS LOG.
  - Logs. Generally used only by the technical specialist or communications technician for troubleshooting.
- Operating mode: This station operates on 2 meters in P2P and Winlink ("gateway") mode. There is no high frequency capability in the EOC at this time.
- Contacts: Do not delete any contacts. Recommend deletion to the County EC.

### Software settings

Do not adjust the settings. Contact the EC if you have operational issues

### Open packet session

To open an operating mode, select the desired session type on the drop-down box located on the main menu bar, and then click on OPEN SESSION. Your options are noted under Table 4; the EOC is limited at this time to Telnet and Packet modes.

### Confirm system is working

Turn on radio and TNC, and runs a test connection, either with a gateway, or by P2P. Be sure to log in the results.

## Walla Walla ARES Winlink SOP for the County EOC

Figure 3: Basic Navigation controls

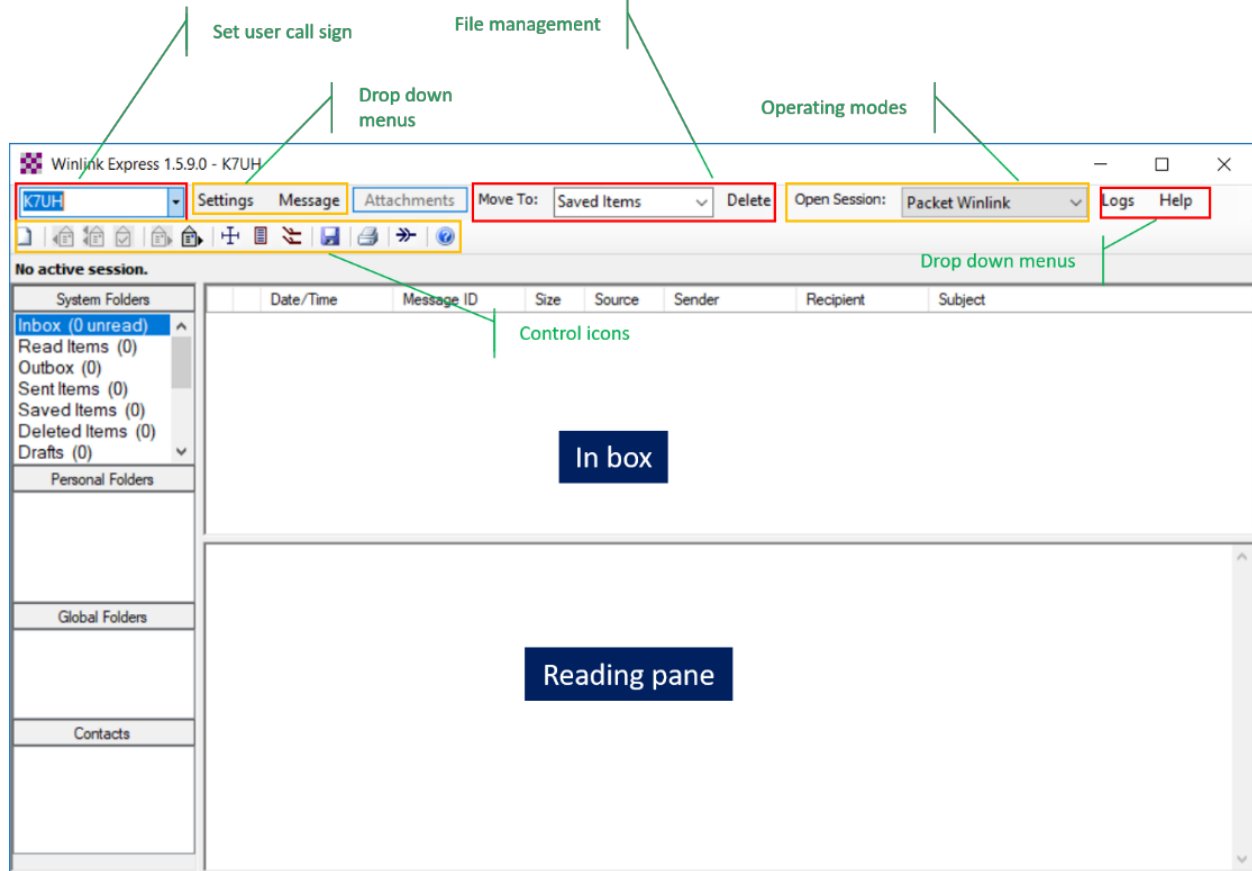


Table 4: Operating modes noted under "OPEN SESSION"

Winlink	P2P	Radio Only	Post Office
Telnet	Telnet	PACTOR	Telnet
Packet	Packet	Winmor	
PACTOR	PACTOR	Telnet	
Robust Packet	Robust Packet		
Winmor	Winmor		
Iridium GO			

## MAINTAINING WINLINK EXPRESS

### Software updates

The Winlink Development Team (a group of volunteers) keeps the Winlink software updated. New versions are available either by automatic download (if the computer is connected to the INTERNET), or by manual installation, using the set up from the Winlink website. If the computer is not left connected to the INTERNET, do so intermittently for updating, or check versions for the latest.

### Winlink gateway lists

## Walla Walla ARES Winlink SOP for the County EOC

Winlink Express contains lists of Winlink stations available for use. Unique lists with the latest information regarding "online" RMS (gateways) can be downloaded from the Winlink servers by selecting **OPEN SESSION** for the desired protocol (currently, packet for the County EOC), and then **CHANNEL SELECTION** in the session window. A third window ("XXXXX Channel Selector") opens; you may then select **UPDATE TABLE VIA INTERNET** or **UPDATE TABLE VIA RADIO**. (NOTE: Updating the table by radio may be time consuming. Plan accordingly).

These lists change routinely; they should be updated on a regular basis. The list for packet gateways may not include those using BPQ or Linux software; and those located more than 160 kilometers from the EOC grid square.

They can also be downloaded from the Winlink website in different formats, via **TOOLS | RMS LIST**. Current lists are stored on the EOC computer under the Documents folder, updated on a regular basis. These may be shared with other stations as necessary by P2P.

### Spam Control and the Whitelist

The "Whitelist" option allows messages to be downloaded to you only if the message was sent from an INTERNET e-mail address on your Whitelist; if the message was sent to you from other WL2K user; or if the sender put a "//WL2K" in the subject line. If a message is rejected, the CMS will automatically send a "Rejection Notice" to the sender of the message. See Q650 of the WL2K FAQ. If the message has a precedence, the "//WL2K" is included. See MESSAGE PRECEDENCE for specifics. See Q670 of the WL2K FAQ.

The K7UH "Whitelist" in Winlink is a list of non-Winlink email addresses or specific domains for incoming messages. If the address or domain is on the Whitelist, the CMS spam filter will allow it to pass. This does not apply for Winlink addresses. New entries are automatically added to the K7UH Whitelist when a message is sent to a non-Winlink address. Other ways edit the Whitelist are:

- Manually add or delete entries to your Whitelist by sending a message to the Winlink server (see A675 in the WL2K FAQ)
- The Whitelist is edited through the K7UH profile under Winlink.org. This requires logging as the primary use, and is limited to the County Emergency Coordinator and designated individuals.

Messages can be blocked from certain sources by using the "REJECT" feature (again, see A675).

The Whitelist should be regularly reviewed, and always before any exercise. Q630 through Q740 in the WL2K FAQ cover the basics of the Whitelist function.

## **HANDLING MESSAGES**

### Making messages as small as possible

## Walla Walla ARES Winlink SOP for the County EOC

A major limit on Winlink is available bandwidth. Unlike typical INTERNET connections, radio frequency bandwidth is limited. You, as the operator, must make the message small as possible. The larger the message, the longer it takes to transmit.

Messages should be kept as short as reasonable without compromising their intent or meaning. The total number of bytes in a message (body and attachments) should be held to less than 10,000 bytes if at all possible. There is a 120K message limit (after compression) for all messages in the Winlink System. A good operating practice is to limit the download time or upload time for a single message to 5 minutes, independent of frequency or protocol, but 10 KB is the practical upper limit.

Table 5 shows recommended maximums. But you should know the speed capabilities of everyone (excluding commercial email addresses) to whom you intend to send a message. This is usually determined by the "maximum Message Size" for each Winlink user, which you won't know up front (this is set by each Winlink station). If you don't know what that size is, find out from a third party, or send a short message to that station, asking about their preferred message size limit, protocol, etc.

See Q170 in the WL2K FAQ for guidelines, or "Best Practices" below, and "Message Limitations" under "Composing a Message" in Winlink Express help contents.

### Best practices

- The maximum size of a message you send may be determined by one of the following:
  - Recommended file size for 2 meters is 10KB.
  - The maximum size you are comfortable sending (this could exceed the recommended maximum).
  - The maximum size that can be received by those to whom you send.
  - The level of use of the frequencies you/they are using.

Table 5: Recommended file size limit

Operating mode	Compressed Size (bytes)	Operating mode	Compressed Size (bytes)
Packet (1200) direct	10000	PACTOR 1	1300
Packet (1200), 1 Node	8000	PACTOR 2	5000
Packet (9600) direct	20000	PACTOR 3	40000
WINMOR 500	2000	PACTOR 4 (not legal in US)	80000
WINMOR 1600	6000		

(Assumes 5-minute transmission under ideal operating conditions)

- If the message is CC'd to many recipients, consider breaking up your cc list into several groups, depending on their maximum message size, and tailoring the message for each group.

## Walla Walla ARES Winlink SOP for the County EOC

- Know what frequency or frequencies the message may be sent on (e.g., VHF or HF).
- Original files compress well in Winlink. But it may be necessary to convert large files to text format, or spreadsheets to CSV.
- Graphic and Portable Data Format (PDF) files. See "Appendix D: Handling Attachments" for details.
  - Consider message size; 10 to 20 KB is the recommended size for typical messages. Critical messages should be limited to about 90 KB. Larger messages should be broken down into multiple messages.
  - The EOC scanner may be used to convert hardcopy text into digital form, instead of transcribing. It can also convert hardcopy photos, maps, and sketches into graphic files.
  - The recommended graphic file format is JPEG in color. You may resize graphic files in ATTACH.
  - Sizing PDF files must be accomplished by the author.

### Message Precedence

The term "precedence" means the order in which messages transmitted, or in receiving and relayed, or provided to the served agency. Message precedence is an indicator of the sequence messages are processed by the radio operator. The background is covered under Q690 of the WL2K FAQ. Use of this system is optional, but is available for use when directed by EOC staff. The Winlink system, as applied to the Walla Walla EOC, is under Table 6.

Table 6: Precedence definitions

Precedence	Designator	Definition
Flash (Z)	//WL2K Z/	Handle in the order received and ahead of all messages. If feasible, interrupt any traffic of lesser precedence.
Immediate (O)	//WL2K O/	Handle as fast as possible, ahead of all other messages except those with FLASH precedence.
Priority (P)	//WL2K P/	Reserved for messages which require expeditious action, sent ahead of ROUTINE messages.
Routine (R)	//WL2K R/ Or //WL2K	Routine communications that require rapid transmission but not preferential handling. Handle last, or not at all, when busy with higher-precedence traffic. This is default, and what the CMS assumes, if nothing else is used (see Q670).

The precedence indicator is added to the beginning of the subject line of the message, whether from Internet email or within the Winlink system. Messages from outside of Winlink must have "//WL2K", or they will be rejected.

The CMS servers route messages to and from users connecting through RMS gateways and Telnet connections in the order of priority applied to each batch. Higher priority messages are transferred before lower priority or Routine messages. This is NOT available for messages sent outside the Winlink system.

Set Winlink Express to make a sound if a message of a given priority arrives. Under "**SETTINGS**", select "**MESSAGE NOTIFICATION AND FORWARDING**". In the dialog box, under "New Message Notification Sound", choose the message precedence, notification sound, and repeating the sound.

Best practice is that the radio operator should not set the precedence. Operators transmit and receive message traffic as part of their duties, and should avoid composing the message. Message composition falls to the message originator within the EOC, as does setting precedence. The operator certainly can advise the originator as to which precedence may be best suited for a given message. If no precedence is given, the operator should assume ROUTINE.

### Composing a Message

(This is also covered in the Winlink Express help function, "Operations | Composing a Message".)

Select **MESSAGE | NEW MESSAGE**, or click the "New Message" icon on the tool bar. When the "Enter a new message" window (Figure 2) displays, do the following:

- Select template (if any)
- Select "Send As" option (see "Select message routing ("SEND AS")")
- If needed, check "Request Read Receipt".
- Address the message (see "Address the message ("To:" and "CC:")")
- Enter subject
- Add attachments (see "Add Attachments ("Attach:")"). Identify the attachments in the body of the message.
- Enter text. List all attachments, and include delivery instructions if the message will be forwarded by other people.
- Post to Outbox, ready for transmission.

NOTE: While composing a message, you can't access the Winlink Express window. If you need to, click "SAVE IN DRAFTS", exit back to Winlink Express, and take care of your business. You can re-open the draft message, and proceed from where you stopped.

### USE A TEMPLATE ("SELECT TEMPLATE")

A message template can be used to provide information for a message by clicking "Select Template" on the screen where you enter the text for a message you're composing. A template is a form that pops up in your browser. You fill out the form, submit it, and the message is populated with the form, ready for sending by Winlink.

The EOC staff should specify which form to use, if one is required. The "General EOC Message" form does NOT have a template. This is strictly for internal use by the Walla Walla EOC staff. If you are given such a form to send, transcribe the message to ICS213 for transmission.

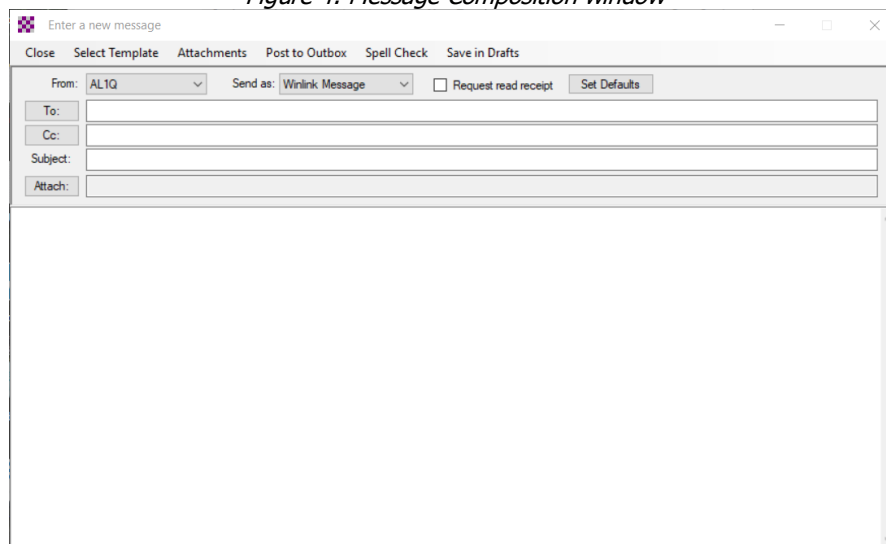
The forms typically used are:

- ICS 213: General message form
- ICS 213RR: Resource Request Form

This is how to use a template for a message:

- Open a new message.
- To load a template, click SELECT TEMPLATE to bring the Template Manager window (See Figure 4).

*Figure 4: Message Composition window*



- Expand the "STANDARD TEMPLATES" menu by clicking on the "+", and then do the same for the next set.
  - The radiogram is under "ARRL\_FORMS" → "ARRL\_RADIOGRAM\_INITIAL.TXT"
  - All ICS forms are under "ICS\_USA\_FORMS"

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- Select the template by double clicking on the template manager; this will bring the form up in the browser, ready to fill out.
- Complete the form (see Figure 5). Some fields may be “pre-populated” from earlier submissions. Click on the field, and hit the DOWN ARROW key to see what is available.
- Some fields MUST be completed; if you click Submit without filling them, you will be prompted to complete those fields (see the red boxes in Figure 5).
- Click “SUBMIT” when ready. You will be prompted to click OK in yet another window.
- At this point the message is populated with the form information, ready for sending (see Figure 7). The text is in the message body, and the form template is attached as an Extensible Markup Language (XML) file.
- You can now address the message, and send as normal.

Note that there are two means of sending a templated form through Winlink:

- The combination of text and XML.
  - This is intended for another Winlink user, and requires Winlink Express to work properly. When the message is viewed in Winlink Express (see Figure 8), you see both the plain text in the message body, and the attachment as a paper clip icon.
  - If the icon is yellow, the attachment has not been viewed. If it’s blue, it has been. Clicking ONCE on the icon brings the form up in the default browser (see Figure 9).
  - if this message goes to a non-Winlink user (either directly or by forwarding), they can’t bring up the browser form, but they CAN read the message body for the information. They should understand the referenced form, to avoid confusion.
- Saved from the browser, and attached to the message.
  - This is simply the form viewed in the browser (see Figure 9), saved as an HTML file, and either attached to a message, or transferred to EOC staff electronically, or as hard copy. Click on the PRINT button to export to PDF, or print to hardcopy. You can view the form in either the inbox, read items, or outbox.
  - Alternatively, under Internet Explorer, click “FILE | SAVE AS...”, select “WEBPAGE, COMPLETE (\*.HTM, \*.HTML)”, and save to the desired location and file name for further distribution. This results in a much smaller file than in PDF, and better to use for forwarding on Winlink.

### ADDRESS THE MESSAGE (“TO:” AND “CC:”)

Do either of the following:



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- Type in the email addresses and/or callsigns (if WL2K addresses).
- Select the "To:" or "CC:" box. This will bring up the "Select Destinations" window; select and add individual addresses or Groups. When finished, select "Complete".
- If the message is to be CC'd to many recipients, consider breaking up the message into several groups, depending on their maximum message size, and tailoring the message for each group.

### SELECT MESSAGE ROUTING ("SEND AS")

You must specify how you are sending the message through SEND AS. Your options are described in "HOW DOES WINLINK WORK?". Your order of use for sending traffic is under Table 1; use the first available option, unless noted otherwise.

### ATTACH FILES ("ATTACHMENTS")

This operates somewhat similar to other e-mail applications. However, a separate window pops up when you click on "ATTACHMENTS", as seen in Figure 10. Remember that sending e-mail by radio will be slower if the messages are large. Messages should be kept to a minimum size. As a rule, attachments over 10KB to 20KB should be sent only for urgent messages, or sent by other means. Further information about preparing and sizing attachments may be found in "APPENDIX D: HANDLING ATTACHMENTS".

"Attachment" controls work as follows:

- Close: closes the window.
- Add: Add an attachment; this brings up a standard Explorer window.
- Edit / Resize-Image: Basic image editor for resizing or rotating the selected image, suitable for transmission on Winlink (see "OPERATION | EDITING, CROPPING AND RESIZING IMAGES" in the Winlink HELP function).
- Open/View: Opens the selected image in the default viewer.
- Delete: Removes the selected image as an attachment.
- Save to: Saves the selected image to a new location.

### PREPARE MESSAGE

Enter the subject, and note the precedence as defined in WL2K FAQ A690 (//WL2K Z/, //WL2K O/, //WL2K P/, or //WL2K R/).

Enter message by typing or cutting and pasting in the message body.

### SAVE MESSAGE

Select either "Post to Outbox" or "Save in Drafts Folder"

Double click on the message. Verify that the "Group" (if used) expanded to include the addresses in the Group.

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All messages in the "Outbox" folder (and only that folder) will be sent during your next communications "Session". After a message is Sent it is moved to the "Sent Items" folder.

Messages in the "Drafts" folder may be opened later for further editing, and then sending.

### Opening and reading

For Winlink Express, opening and reading e-mails is similar to normal e-mail. There are some features that are different:

#### ACKNOWLEDGE MESSAGE

Use the ACKNOWLEDGE control to send a message acknowledgement. Clicking on ACKNOWLEDGE posts a response to the sender in the outbox. No further action is needed, except for sending and logging the message.

#### OPENING AND SAVING ATTACHMENTS

There are two ways to open and view attachments:

- From the box pane. Click on the paperclip icon.
- From the message window. Click on VIEW ATTACHMENTS, and the Attachments window (see Figure 10) pops up. The only difference here is that you can't add or delete attachments.

### Answering a message

This works much the same as normal e-mail, by clicking on REPLY or REPLY TO ALL. The difference is that you have to be aware of the operating mode, especially for P2P. If you REPLY TO ALL, and change it to P2P, you need to connect to each recipient separately. A Winlink or Radio-only message needs only one connection.

### Sending and Receiving Messages

#### BASICS

Unlike many e-mail programs, Winlink is not connected to the INTERNET, and the default setting does not automatically check for your e-mail. Manual connects are required to send and receive messages. Winlink may be set to automatically poll gateways, but this feature is not enabled for the EOC station (see FAQ 11680).

The basic process for sending and receiving messages is:

- Open Winlink, and turn on the radio and TNC.
- Set the frequency, based on the destination (by gateway or P2P modes).
- VHF is the only band used for the County EOC, so select either "PACKET WINLINK" or "PACKET P2P", and then click on OPEN SESSION.

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- For "PACKET WINLINK", the "PACKET WINLINK SESSION" window appears. For "PACKET P2P", the "PACKET PEER-TO-PEER SESSION (K7UH)" window appears. These are nearly identical in appearance and function. The TNC will be initialized at this time.
- Look for "\*\*\*\* READY" in the status window.
- Select "CONNECTION TYPE". This is generally by script, but direct is possible for AL1Q-10. Do not use digipeater mode.
- If using direct, enter the destination call sign and SSID (if any).
- If using script, select the appropriate script.
- Click on START. The connection proceeds automatically until the common mail server ends the session, or the RF link is lost. Use STOP or ABORT to disconnect before the end of the session.
- All mail in the outbox is sent first, followed by downloading of received traffic. If you do not want a particular message (or messages), save it to the Drafts folder.
- Packet sessions can and will fail:
  - The most common problem is a "Link Error" (see Appendix A). You may need to review the messages before downloading the others. See "Review Message List Before Downloading" for instructions.
  - The session may "hang" for an extended period. This may be due to a lost connection at the gateway, or a lost RF link. STOP the session, and try again in a few minutes.
  - You may have to reconnect several times. Be patient.

### PRIORITIZE OUTGOING MESSAGES.

If you have more than a single message to send, consider their priority before posting to the outbox. Messages are sent in the order that they were posted. If problems happen during the Connection, all of a sending group of 5 may be deemed by Winlink to "not be Sent", even though some of the five have already left your radio. Prioritize outgoing messages by:

1. Use the "Save as Draft" option instead of posting to the outbox.
2. Determine whether or not it would be better to group messages by size (several small messages in one Session, followed by single large message in another Session), or by content (as designated by the EOC staff). If there are no priorities to consider, move to the next step.
3. Open messages saved as a draft, and the "Post to Outbox" in the order that you want them to be sent. Post only those you want to go out during your next Connection, and save the rest for later.

### REVIEW MESSAGE LIST BEFORE DOWNLOADING.

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A particular message may be giving you problems; it may be too large for a quick download, or you may be getting a "Link Error". Or you may have a large number of high priority message to be sent, and you might have a boatload of "low priority" messages to receive.

If so, select SETTINGS | REVIEW MESSAGE LIST BEFORE DOWNLOADING. Checking this option enables the review feature. When you connect to a CMS with Winlink Express, a screen will appear for you to make a choice of which messages to download, "Delete before downloading", or "Hold for Later Downloading". Make your choice and proceed.

### HF RADIO OPERATIONS

This is not available from the County EOC at this time.

### HF RADIO RELAY

If there are no VHF gateways available, message traffic will be sent to another station on P2P for relay by HF radio outside the county. The County EC will advise you of the station, call sign, and connection protocols.

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Figure 5: Template Manager

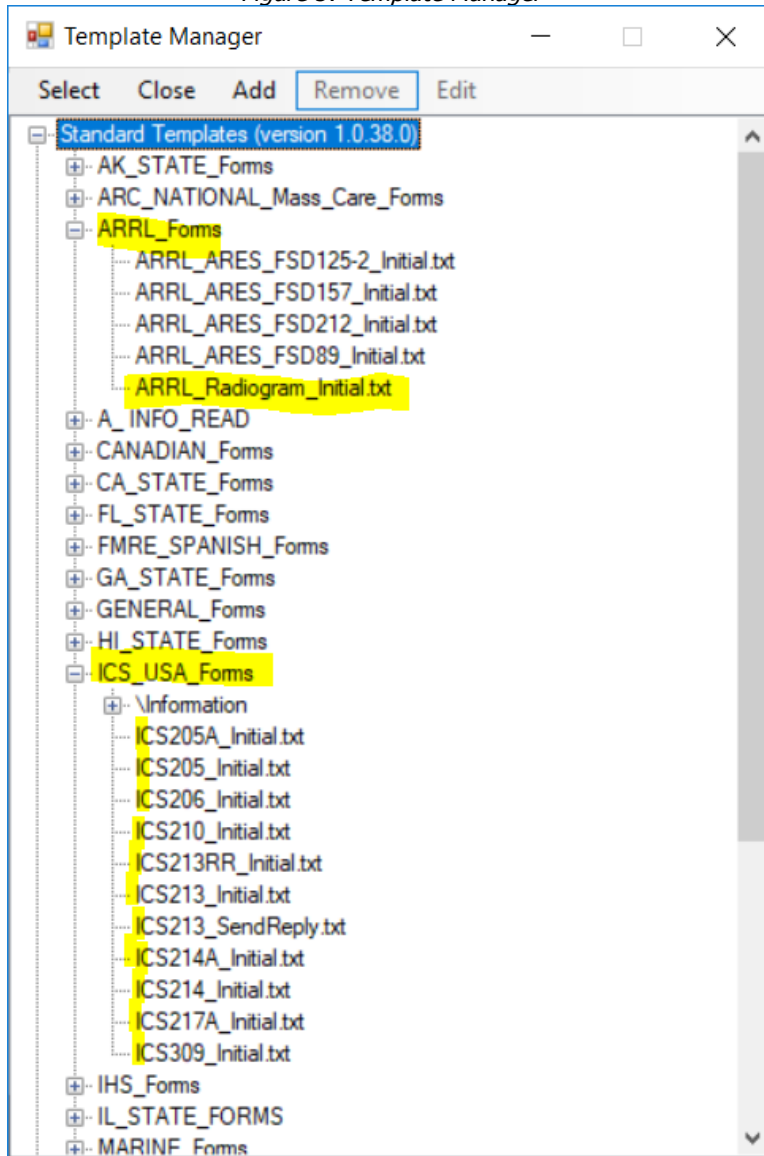
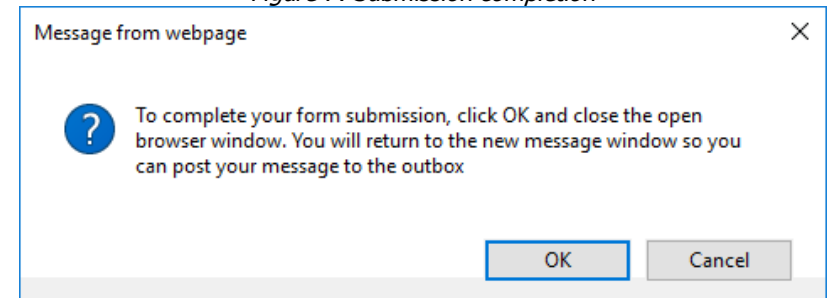


Figure 6: HTML Form after template selection

The HTML form displays the following fields and content:

- Track #: AL1Q-5
- ICS 213 GENERAL MESSAGE Ver 18 [Form Info](#)
- 1. Incident Name: Winlink template example
- 2. To (Name/Position): N7ACW
- 3. From (Name/Position): AL1Q
- 4. Subject: Demonstrating how a form is completed
- 5./6. Date/Time: [Redacted]
- 7. Message: This is an example of a completed ICS 213, ready for transmission by Winlink. This is a required field. You may enter as much information (in plain text format) as desired; it will scroll as needed. There is no formatting, but you can copy&paste into this field from other documents.
- 8. Approved By: [Redacted] Position/Title: [Redacted]
- Buttons: Submit, Reset Form

Figure 7: Submission completion



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Figure 8: Template completed, ready for transmission

Enter a new message

Close Select Template Attachments Post to Outbox Spell Check Save in Drafts

From: AL1Q Send as: Winlink Message ☐ Request read receipt Set Defaults

To:

Cc:

Subject: ICS213-Winlink template example-Track# AL1Q-5

Attach: RMS\_Express\_Form\_ICS213\_Initial\_Viewer.xml;

1. INCIDENT NAME: Winlink template example  
2. TO: N7ACW  
3. FROM: AL1Q  
4. SUBJECT: Demonstrating how a form is completed  
5./6. DATE/TIME: 2017-12-25 13:35:12  
7. MESSAGE:

This is an example of a completed ICS 213, ready for transmission by Winlink. This is a small window, but you may enter as much information (in plain text format) as desired; it will scroll as needed.

There is no formatting, but you can copy&paste into this field from other documents.

-----

8. APPROVED BY: AL1Q  
POSITION & TITLE: Assistant EC, Walla Walla ARES

[If not using Winlink Express, you may ignore the attached .xml file]

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Figure 9: Templated message viewed in Winlink Express

The screenshot shows the Winlink Express 1.5.10.0 - AL1Q interface. The top menu bar includes AL1Q, Settings, Message, Attachments, Move To: Saved Items, Delete, Open Session: Pactor Winlink, Logs, and Help. Below the menu is a toolbar with various icons. The left sidebar shows a folder tree with System Folders (Inbox (0 unread), Read Items (235), Outbox (1), Sent Items (66), Saved Items (1), Deleted Items (2), Drafts (0)), Personal Folders, Global Folders, and Contacts (AL1Q, AL1Q@ARRL.NET, K7BDT, K7BFL-TEXT, K7BFL-WINLINK, K7BIO, K7DSR, K7GTC, K7LL, K7LL@ARRL.NET, K7TEG, KA7HAK, KB7HDX, KB7POT). The main window displays a message with the following details:

Date/Time	Message ID	Size	Source	Sender	Recipient	Subject
2017/12/25 22:00	7F7E148QA2EV	1163	AL1Q	AL1Q	N7ACW	//WL2K ICS213-Winlink template example-Track#

Message ID: 7F7E148QA2EV  
Date: 2017/12/25 22:00  
From: AL1Q  
To: N7ACW  
Source: AL1Q  
Subject: //WL2K ICS213-Winlink template example-Track# AL1Q-5

1. INCIDENT NAME: Winlink template example
2. TO: N7ACW
3. FROM: AL1Q
4. SUBJECT: Demonstrating how a form is completed
- 5./6. DATE/TIME: 2017-12-25 13:35:12
7. MESSAGE:

This is an example of a completed ICS 213, ready for transmission by Winlink. This is a small window, but you may enter as much information (in plain text format) as desired; it will scroll as needed.

There is no formatting, but you can copy&paste into this field from other documents.

-----

8. APPROVED BY: AL1Q  
POSITION & TITLE: Assistant EC, Walla Walla ARES

[If not using Winlink Express, you may ignore the attached .xml file]

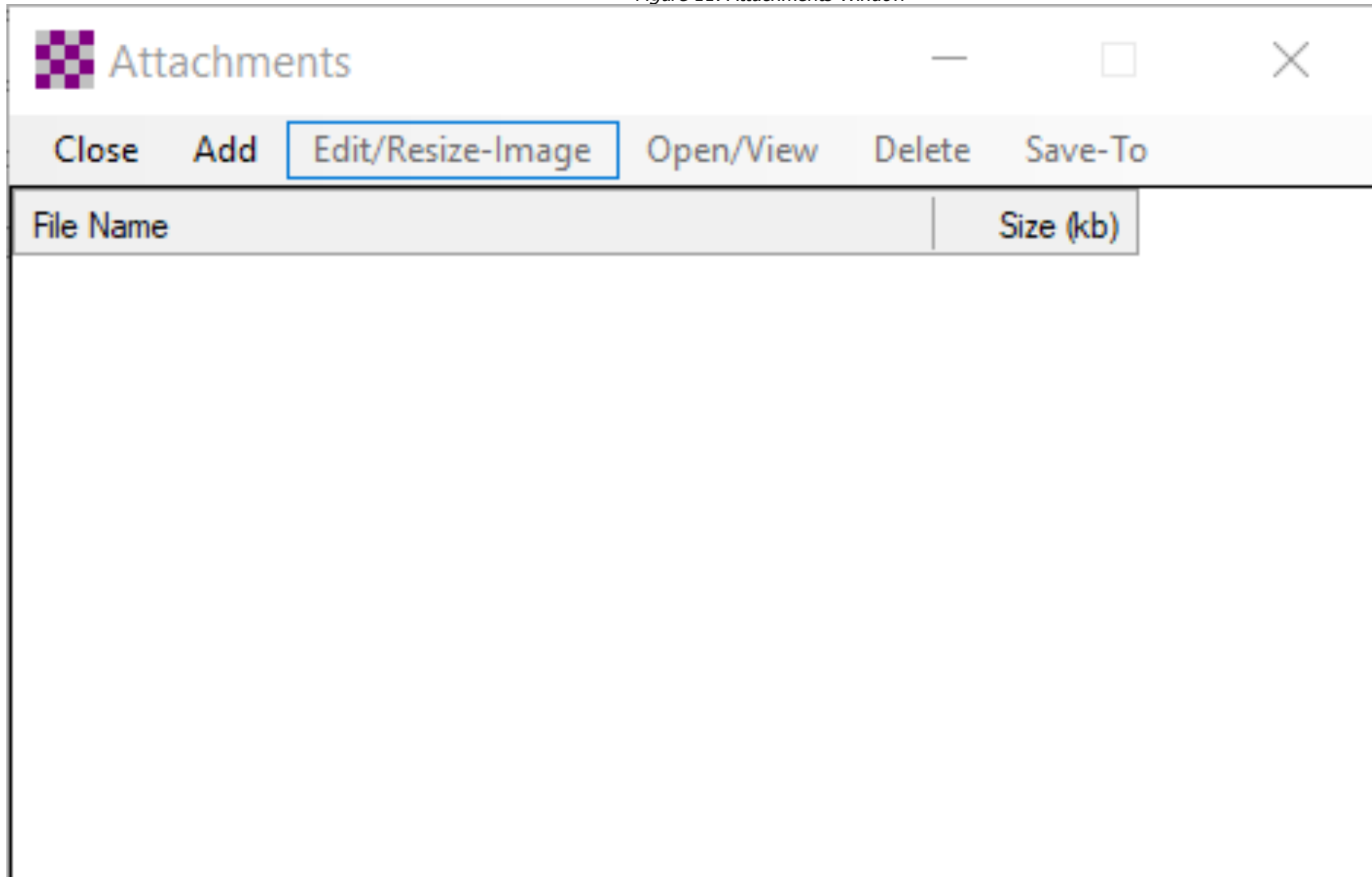
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Figure 10: Templated message viewed in browser

Track #	AL1Q-5	ICS 213 GENERAL MESSAGE		Ver 18
1. Incident Name Winlink template example				
2. To (Name/Position) N7ACW				
3. From (Name/Position) AL1Q				
4. Subject Demonstrating how a form is completed		5./ 6. Date/Time 2017-12-25 13:35:12		
<b>7. Message</b>  This is an example of a completed ICS 213, ready for transmission by Winlink. This is a small window, but you may enter as much information (in plain text format) as desired; it will scroll as needed.  There is no formatting, but you can copy&paste into this field from other documents.				
8. Approved By AL1Q		Position/Title Assistant EC, Walla Walla ARES		
<a href="#">Print</a>				



Figure 11: Attachments Window





## APPENDIX A: TROUBLESHOOTING

### \*\* Link Error

Description: During an message exchange in any protocol, you may see a "\*\*\* **Link Error**" warning in the session window. The session will disconnect abruptly ("\*\*\* Disconnecting due to timeout"). You may not have downloaded all the messages, and will have to re-connect to complete the session.

Explanation: The "Link error" warning is followed by a brief explanation include, but are not limited to, the following:

- \*\*\* Link Error - Received data stream not correct format
- \*\*\* Link Error - Unable to decompress received binary compressed message

This is followed by by *"\*\*\* Disconnecting due to timeout"*, and the session ends, even if there are messages yet to be downloaded.

The "Link Error" cause is not certain, but the message content and/or format appears to have been corrupted. This may be from:

- A computer "glitch"
- The file may have been damaged during RF transmission (such as by packet collisions), in spite of the error correction routines.
- Deviation on the TNC might be too high.
- It might be RF feedback (a/k/a RF interference). Listen to the session on another radio and see if you can hear what sounds like 60Hz hum. That's actually RF.

Whatever the cause, Winlink Express is unable to process the message, and terminates the session abruptly. The operator then has to re-start the session.

A "Link Error" is not related to Winlink or the Central Mail Server (CMS). The Winlink Development Team has made this very clear. Nor is this topic discussed in any Winlink documentation as of the date of this SOP being published. However, "Link Errors" do exist, and must be addressed by the operator.

Work arounds:

- Note the number of the problem message; this will be the line immediately above the "Link Error" warning with the word "Receiving ". For example:
  - 2018/01/23 01:38:59 1.5.10.0 PAC \*\*\* Receiving 30182\_K7BFL
    - The message number is **30182\_K7BFL**
  - 2018/01/20 17:04:03 1.5.10.0 PAC \*\*\* Receiving 28YZ38TO0YC3
    - The message number is **28YZ38TO0YC3**
- Identify the sender and subject. Winlink sends a list of the messages at the start of the session. Look for the message number, as follows:

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- 2018/01/20 17:00:12 1.5.10.0 PAC ;PM: AL1Q **28YZ38TO0YC3** 2487  
KI7QFV@winlink.org Re://WL2K KI7QFV QSL for HOW club - MAC winlink  
over RF - it can be done
- Record these separately.
- For gateways:
  - Check "Settings | Review message list before downloading"
  - Restart the gateway session, and try again.
  - Pay attention to the screen.
  - During the session, a screen will appear for you to make a choice about the "problem" message: "Delete before downloading" or "Hold for Later Downloading".
  - Recommend selecting "Hold for later downloading".
  - Download the other messages.
  - Restart the gateway session, and try again for the problem message. It may take a couple tries.
  - If that isn't working, select "Delete before downloading", and then send a message to the sender, with the subject, and request resending the traffic.
- For P2P sessions: Coordinate with the sender for them to move the subject message out of their Outbox, or to recompose the message, and try again.
- Check the deviation on the TNC.
- Confirm there is (or is not) RF interference.

### Error check failed on receiving B2 message

Description: You might see this message during download:

- Error check failed on receiving B2 message. [Received data stream not a correct format]

The error translates to a corrupt data stream, similar to a link error. Refer to the above for details.

### Understanding Winlink session log on

\*\*\*[**Example Session**]\*\*\*

[WL2K-2.7.8.2-B2FWIHJM\$]

PQ: 76481232

Wien CMS via VE1YZ

FW: KD4B

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[RMS Express-1.2.13.0-B2FHM\$]  
PR: 92530534  
VE1YZ DE KD4B (FM06SA)  
FF  
FC EM 7YIYBZX79JV3 148 145 0  
F> 68  
FS Y  
\*\*\* Receiving 7YIYBZX79JV3  
\*\*\* 7YIYBZX79JV3 - 161/155 bytes received  
FF  
FQ

### \*\*\*[Explanation by KN6KB]\*\*\*

The PQ; 76481232 is the challenge phrase for secure login. It is generated by the CMS using a standardized hash algorithm that creates a challenge number (76481232 in this case) based on:

- 1) The password for the connected call sign
- 2) A Secret phrase known by the CMS.
- 3) A large random number (so the challenge changes with every connection of the call sign)

The PR; 92530434 is the response generated by the client program which is based on:

- 1) A secret phrase
- 2) The password known by the Client program (must match the one known by the CMS)
- 3) The challenge phrase above

The CMS uses an algorithm to verify that the password (as known by the client) is exactly the same as the one known by the CMS. If it matches the connection proceeds otherwise the CMS immediately disconnects with a failed secure login fault.

The advantage of this system is the password itself is never sent over the air or telnet connection and the challenge phrase and matching response are different (because of the random number) on each connection even from the same station. This has been in use about 10 years and proven to be very secure. It is used by both RMS Express and AirMail. Because the PQ and PR are followed by a ":" they are considered by the FBB protocol used as comments not forwarding commands.

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The 7YIYBZX79JV3 148 145 0 are simply the message number (7YIYBZX79JV3), actual size (148), and compressed size (145) of the message in bytes. For a very short message as your example these are nearly the same. For a larger text message (> 2 K bytes) you will see a typical 2:1 compression. Some other messages with attached files may be more or less compression depending on the ?entropy? of the files. Those numbers are used by the receiving protocol to know when to un-compress the received message when a block of messages are chained for forwarding as permitted by the B2F protocol. The algorithm and code for capturing and un-compressing can be challenging but once debugged is reliable although once in a great while a message will decompress OK and still fail an overall CRC check. In such rare cases there is no recovery possible and the link must be dropped.

For obvious reasons we keep the details of the secure login algorithm well guarded. When you get to a point where your client needs to verify the secure login (it is optional for users and is ignored if secure login is not enabled by the user in his Winlink profile) we can get you the details of the algorithm.

There is also a secure login for servers to the CMS. It works on a similar principal but has a different algorithm. This is now required for ALL servers and insures no one can operate a "rogue" server without proper information and authorization in the WL2K master database. You normally won't see this in the client program unless the server fails the secure login which will force a disconnect.

- FF means you have no more messages to Upload to the CMS
- FQ means that the CMS has no more messages to Download to you

## **APPENDIX B: SENDING TEXT MESSAGES TO MOBILE PHONES**

### Introduction

Using a mobile phone to send and receive text messages is an excellent Emergency Communications (EMCOMM) technique. This is NOT regular email, but a short message addressed to a mobile phone. The sender can use an e-mail account, or another mobile phone. Text messages take much less bandwidth than audio or video connections, and are more likely to get through if there is any bandwidth available. Further, you can exchange text messages between a Winlink station and a mobile phone, an important option if commercial communications are down or unreliable.

You have two options for text messages, both of which support sending and receiving data messages using mobile phones:

- Short Message Service (SMS) is limited to sending and receiving messages of up to 160 characters.
- Multimedia Messaging Service (MMS) extends the core SMS capability to allow sending photographs, video, text messages over 160 characters, and other data. There is no standard limit in size of MMS messages and instead constraints are set by the carrier and phone manufacturer.

All smart phones, and most older mobile phones, can send and receive text messages. SMS is generally common to all mobile phones, but MMS may not be available in older models. Using SMS for EMCOMM is the better approach. Hence, **this is written for text messaging between Winlink and SMS**, but it can be used by other email clients to SMS or MMS. You should think of it as another tool in your EMCOMM tool kit, for you, your family, and your fellow hams.

### Instructions

1. Create a new email on Winlink as you would normally. Instead of entering the callsign or email address in the recipient box, insert the 10 digit phone number of the mobile phone you're trying to reach. Some carriers might require the use of 11 digits (see Table B-1); this document uses 10 digits for simplicity.

2. Once entered, tack on the appropriate "@domain" behind it by:

a. Either asking your intended recipient who their provider is, or look up the carrier of a phone number at [www.freecarrierlookup.com](http://www.freecarrierlookup.com) (note that you are limited to 30 free searches in a 30 day period). Ideally, you have done this ahead of time, and have it stored in your contact list. If not, do your best.

b. Find the SMS text messaging domain as shown in Table B-1 at the end of this document, and add it to the 10 digit phone number. This is the "@domain".

c. The complete address looks like this: TenDigitPhoneNumber@domain

3. Compose your email.

a. Brevity and clarity are good practices for EMCOMM. Keep the message short and

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to the point. Remember that you are limited to 160 characters for SMS!

b. All words in your subject line will become the first words that show up in the text message.

c. Attachments are not accepted by SMS, so don't add any (maybe later, when things are calmer).

d. Once you are finished composing the message, send it through the desired Winlink gateway.

4. Your text message to the recipient needs to get through their spam filter. Send multiple messages to make sure this works.

5. Their text message (reply) back to you needs to get through your Spam Filter [WL2K] "Whitelist".

a. Sometimes the "From" domain gets changed from the one you sent To. Send multiple messages to make sure this works.

b. You might consider including in your Whitelist the domains of the major cell service providers (such as txt.att.net, mms.att.net, vtext.com, vzwpx.com. See Winlink FAQ Q675).

6. Once you get your Whitelist "smart", a mobile phone user can successfully initiate a Text message to your Winlink email address.

### Recommended practices:

1. Store TenDigitPhoneNumber@domain in your mobile phone for each person to which you might ever want to send a text message during an emergency.

2. Offer friends and family your Winlink address for emergency messaging, and have them store that address in their mobile phone.

3. A List of cellular provider domain's ("@domain") should be kept on your Winlink laptop. Version 1.6.1 of the National Interoperability Field Operations Guide (NIFOG), available as PDF or as a pocket-sized hardcopy, has such a list (reproduced at the end of this document). Pages 80 and 81 list both SMS and MMS addresses for all US carrier (Table B-1 below was extracted from version 1.6.1, and could be outdated in the future). The PDF is found at <https://www.dhs.gov/publication/fog-documents>. Be sure to check for updates!

4. Keep in mind that individual entries in your Winlink Whitelist will disappear if they are not used during a rolling 400 day period. Run periodic tests for key recipients.



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Table B-1: Text Messaging Addressing (from the NIFOG, version 1.6.1)

Selected US & Canadian Cellular Text Messaging Carriers (Cellular Provider Domains)	
<i>"number" is the 10-digit mobile telephone number, unless 11-digit-number is specified</i>	
Alltel	SMS: number@sms.alltelwireless.com MMS: number@mms.alltelwireless.com
AT&T	SMS: number@txt.att.net MMS: number@mms.att.net
Bell Canada	SMS & MMS: number@txt.bell.ca
Boost Mobile	SMS: number@sms.myboostmobile.com MMS: number@myboostmobile.com
C Spire Wireless	SMS & MMS: number@cspire.com
Cricket Wireless	SMS: number@sms.mycricket.com MMS: number@mms.mycricket.com
Metro PCS	SMS & MMS: number@mymetropcs.com or number@metropcs.sms.us
Qwest	SMS & MMS: number@qwestmp.com
SouthernLinc Wireless	SMS: number@page.southernlinc.com MMS: number@mms.southernlinc.com
Sprint	SMS & MMS: number@messaging.sprintpcs.com
T-Mobile	SMS & MMS: 10-digit-number@tmomail.net
Telus Communications	SMS & MMS: number@msg.telus.com
TracFone	SMS & MMS: number@mmst5.tracfone.com
U.S. Cellular	SMS: number@email.uscc.net MMS: number@mms.uscc.net
Verizon	SMS: number@vtext.com MMS: number@vzwpx.com
Virgin Mobile	SMS: number@vmobl.com MMS: number@vmpix.com
Alaska	
Alaska Communications	SMS: number@txt.acsalaska.net MMS: 11-digit-number@mms.ak.net
General Communications Inc. (GCI)	SMS: number@mobile.gci.net MMS: number@mms.gci.net
Puerto Rico	
Centennial Wireless	number@cwemail.com
Claro	number@vtext.com
TracFone	number@mmst5.tracfone.com

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Table B-1: Text Messaging Addressing (from the NIFOG, version 1.6.1)

Selected US & Canadian Cellular Text Messaging Carriers (Cellular Provider Domains)	
<i>"number" is the 10-digit mobile telephone number, unless 11-digit-number is specified</i>	
U.S. Virgin Islands	
Centennial Wireless	number@cwemail.com
TracFone	number@mmst5.tracfone.com
Worldwide	
Iridium	SMS: number@msg.iridium.com

## **APPENDIX C: EWA/NID PACKET NODE NETWORK**

### Inland Pacific Northwest Packet Network

There is an extensive packet network in the area, with multiple mountain top nodes, gateways, and bulletin boards. This is a simple infrastructure that supports packet communications beyond line-of-sight. Like voice repeaters, a node relays packet traffic between distant points. And similar to a linked voice repeater network, several nodes can be linked together for two stations to exchange e-mail traffic.

For example, a station in Walla Walla can use a Winlink gateway in Ellensburg to send and receive e-mail. Or a station in Yakima can do a P2P connection with a station near Spokane.

Figure C-1 shows part of the network. While diagram says "Spokane Area", it in fact covers most of the inland Pacific Northwest (primarily eastern Washington (EWA) and northern Idaho (NID)).

### Packet network basics

Basic radio communication involves two operators operating their radio stations to exchange messages, in what is known as "peer to peer operations". The operator has to know the physical destination and understand propagation in order to get the message through. It matters not if you are operating on packet, CW on HF radio, or a voice repeater. EMCOMM pre-planning is required, in that frequencies and operation modes must be agreed to.

Modern technology can take away that guesswork, by building and maintaining infrastructure. Cellphones are a prime example of this; you can literally call anyone anywhere in the world they have a signal, and computers do most of the work.

The system in EWA and NID uses a network protocol known as NET/ROM. A network protocol allows two computer systems to communicate with each other. The basic protocol for packet is AX.25, which NET/ROM is derived. The network consists of a series of radios and terminal node controllers (TNC), located on mountain tops, and using selected frequencies.

The radio/TNC combination (called a *packet node*) uses a custom EPROM chip in TAPR type TNCs (TNC-2 or similar), or the Timewave PK-96. That chip sets up the packet node as an independent relay which communicates with similar nodes. A common firmware in this area is X1J theNet, but there are others which are compatible.

The various packet nodes exchange signal reports, and build a list of nodes they can connect to. This list is the *routing table*, a directory of available nodes for any one packet node. This permits offering an automatic routing feature for simpler operations.

It's important to understand that a NET/ROM packet node is not a digipeater. A digipeater is the original networking scheme for AX.25, and performs a similar service, but works very differently.

A digipeater is a station capable of digitally repeating AX.25 frames as per the AX.25 protocol specification. Generally, this refers to an unattended, wide-coverage digital repeater, often located on a hilltop. The AX.25 protocol was originally designed for point-to-point (non digipeated) connections. It was subsequently extended to accommodate to allow up to eight digipeaters or "hops". However, AX.25 is effectively unusable for digipeat paths exceeding two or three "hops", as such digipeaters do not provide full error control. Further, digipeaters repeat the entire message, including the callsigns of the previous "hops". That adds to the "overhead" of an message.

For an AX.25 packet to traverse a multi-hop path, it must not fall victim to a collision or other error during any of the hops; otherwise, it must be retransmitted by the originating station and start its journey all over again. This is inefficient for regional use, as frequencies become clogged with repeated traffic over distances, and transmission time increases. The Automatic Packet relay System (APRS) protocol uses digipeaters, but has strict protocols to keep the channel open.

Packet nodes work much differently, and supports extended "hops" with a shorter transmission time. It is still subject to collision or other errors, but is more suitable for regional communications, even at 1200 or 9600 baud.

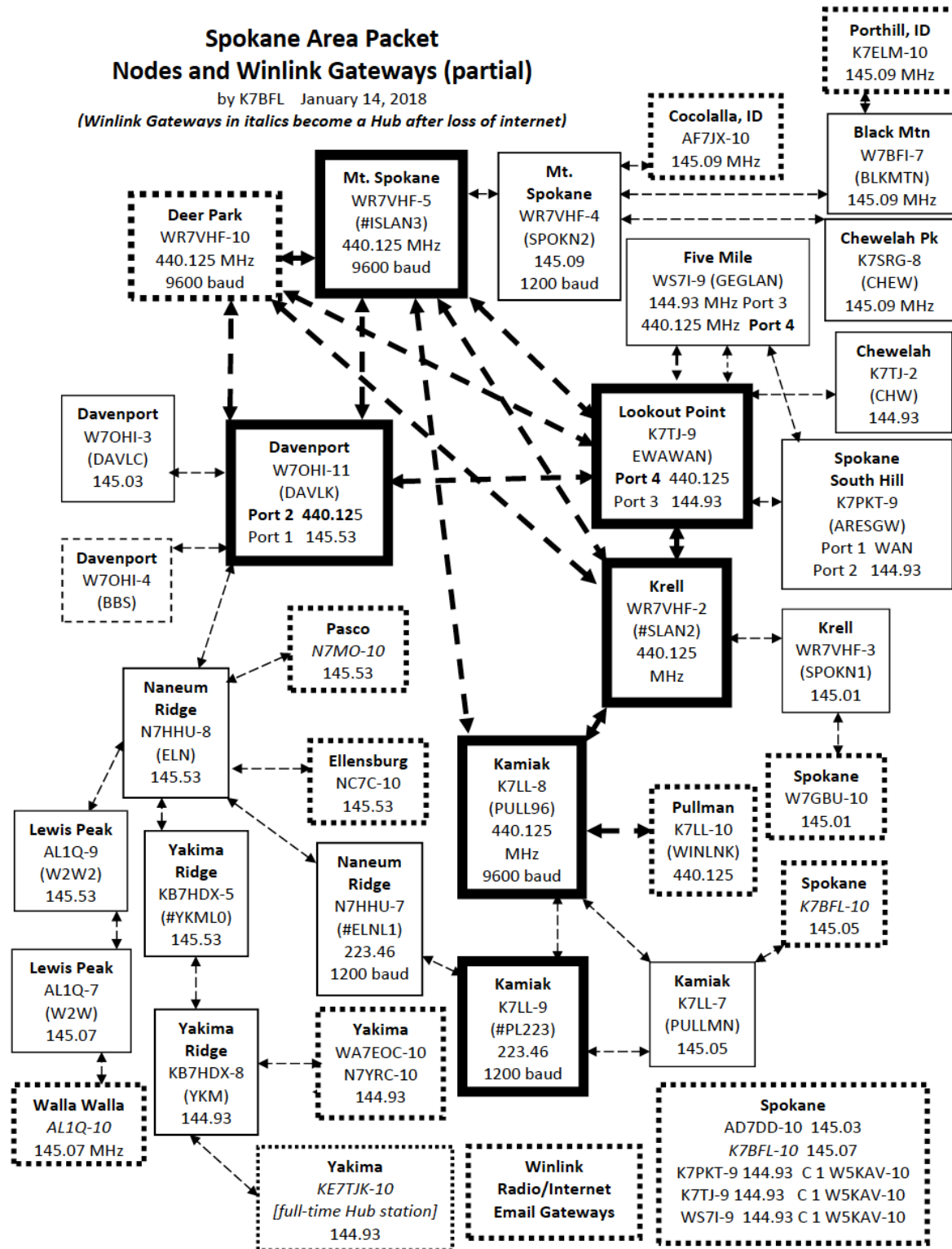
Multiple band and frequency operations are feasible as well with packe nodes. Co-located TNCs are physically linked using a bridge, a hard wired connection that permits those TNCs to network without an RF link. Figure C-1 shows the various frequencies in use throughout the region.

### References

- [https://www.tapr.org/pr\\_intro.html](https://www.tapr.org/pr_intro.html)
- [https://www.tapr.org/pr\\_intro.html#NetSchemes](https://www.tapr.org/pr_intro.html#NetSchemes)
- "Two Packet Radio Books In One Cover":
  - A Primer for the Packet Radio BEGINNER
  - A HANDBOOK for the ADVANCED Packet Radio System Node Operator

# Walla Walla ARES Winlink SOP for the County EOC

Figure C-1: Inland Pacific Northwest Packet Network



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## **APPENDIX D: HANDLING ATTACHMENTS**

### General

The key points on handling Winlink attachments are:

- Attachments sent through a CMS have a maximum size of 120,000 bytes. This limit can be lowered under "SETTINGS | UPDATE USER OPTIONS", but not raised. This does not apply to P2P messages, but you must consider transmission time and frequency sharing.
- Consider message size; 10 to 20 KB is the recommended size for typical messages. Critical messages should be limited to about 90 KB. Larger messages should be broken down into multiple messages.
- Know how to resize images. The recommended graphic file format is JPEG in color, with 24 bit depth. The Winlink HELP function has good instructions under "Operation | Editing, Cropping and Resizing Images".
- Template forms can be saved as HTML for transmission to non-Winlink addresses (see "SAVE TEMPLATES AS HMTL"). This may not reduce file size, but non-Winlink users can view the message as a form in a web browser.
- Sizing PDF files must be accomplished by the author.
- The EOC scanner may be used to convert hardcopy text into digital form, instead of transcribing. It can also convert hardcopy photos, maps, and sketches into graphic files.

### Common office formats

Any binary file can be sent using Winlink, providing size limitations are considered. Binary files include those created by commercial office software. Plain text, without graphics or formatting, is strongly recommended.

Most word processors can save as text ("\*.txt") or rich text files ("\*.rtf"). Spreadsheets may be saved as "\*.csv". These formats use a protocol which conveys the same information in smaller files.

Any plain text editor may be used to create attachments.

### Portable Data Format (PDF) Files

PDF files are commonly used for saving documents and publications in a standard format that can be viewed on multiple platforms. Generally, PDF files are created from existing documents instead of from scratch. This may be from an office software package, or from a scanner.

Operators may be given a PDF file for transmission. If the file is too large, the author will have to resize it, either using the original application, or break the file into multiple smaller files to send by several messages. Alternatively, the PDF file could be converted in a graphical file, and resized.

All of these options depend on the software and applications available to the EOC staff. If none of these are feasible, alternate means, aside from Amateur Radio, will have to be used to send the message.

### Graphical files

Graphical files are technically called raster files in computer graphics. A raster file is a dot matrix data structure, representing a generally rectangular grid of pixels, or points of color, viewable via a monitor, paper, or other display medium. Raster images are stored in image files with varying formats.

The size of graphical files depends on the resolution (number of pixels) and the color depth (bits per pixel). A low end scanner or camera produces an image of 640 x 480 pixels, with a bit depth of 24. The size of that one file is  $(640 * 480 * 24) \div 8 = 921,600 \text{ bytes}^2$ , or nearly 1 megabyte.

Hence, graphical file sizes *absolutely must be reviewed before transmission on Winlink.* A typical photograph may be 1 to 5 megabytes in size. A scanned in image could be of a comparable size. A single attachment could take hours to send, far too long for EMCOMM needs.

Graphical files can be resized in the "Attach" dialog box, but this may eliminate details and/or clarity in the attachment by doing so. The operator must understand the nature of the image files being sent. The intent is to convey information to a distant party, but to send it by WinLink means resizing it to fit the available bandwidth. The operator must be aware of the intent of the message, and have the author review the image after resizing, but before sending.

Any file format may be sent, but the recommended graphic file format is JPEG in color, with 24 bit depth. These are generally photographs, but may include maps and sketches. Graphical files may be an alternate means of sending a PDF file.

### Save Templates as HMTL

Create a form message using the Winlink TEMPLATE feature, and as per normal procedures.

After clicking SUBMIT, post the message temporarily to the Outbox, and then re-open it, and bring the template up in a browser. Save that template as HTML through FILE | SAVE AS in your browser, rename the file appropriately. Attach that HTML was attached to a NEW message, and the old one discarded.

This format can't be revised later. The primary reason for it is for recipients who may not be familiar with ICS forms, and may feel more comfortable by seeing a form, rather than raw text.

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<sup>2</sup> For computer storage, 1 byte = 8 bits.



## APPENDIX E: WALLA WALLA COUNTY ICS FORMS 205 AND 217

Table E-1: Other Winlink Gateways

Gateway	Script(s)	Comments
NC7C-10, Ellensburg	"NC7C-10 v W2W" or "NC7C-10 v W2W2"	See Table 2 for frequencies
K7LL-10, Pullman	"K7LL-10 v W2W" or "K7LL-10 v W2W2"	See Table 2 for frequencies
K7BFL-10, Spokane	"K7BFL-10 v W2W" or "K7BFL-10 v W2W2"	See Table 2 for frequencies
N7MO-10, Pasco	"N7MO-10 v W2W" or "N7MO-10 v W2W2"	See Table 2 for frequencies
N7YRC-10, Yakima	"N7YRC-10 v W2W" or "N7YRC-10 v W2W2"	Located at the Yakima Red Cross. See Table 2 for frequencies
KE7TJK-10, Yakima	"KE7TJK-10 v W2W" or "KE7TJK-10 v W2W2"	Permanent hub, no INTERNET connection. Use as a post office for the Yakima area. See Table 2 for frequencies

The current ICS 205 for Walla Walla EOC, and ICS 217 for Walla Walla ARES, are attached.