

# Evergreen Intertie

## Operating Instructions and Codes

### July, 2007

The Evergreen Intertie is an interconnected group of amateur radio repeaters located in the Northwestern United States. FM repeaters operating in the VHF and UHF bands are interconnected (linked) by full duplex UHF radios. The network is open to all licensed amateurs, and access codes are available.

### Technical Introduction

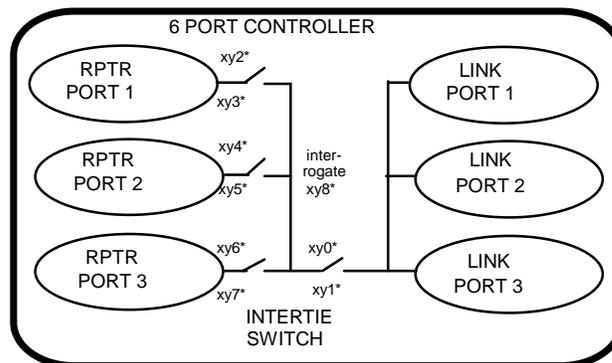
The Evergreen Intertie is a repeater linking system with a mixture of various connections and equipment types. In general, repeaters which make up the system can be operated independently or they can be switched onto common communication trunks or party lines. A repeater that is switched onto a trunk line can communicate with any other repeater that also happens to be connected to the same trunk. There are a number of different and independent trunk lines that make up the Evergreen Intertie. Normally these trunk lines are separated by "*Intertie*" switches which allow repeaters on one trunk to communicate without interfering with a simultaneous conversation among repeaters on another trunk. If the Intertie switch were closed i.e. switched to the "*on*" position then all listeners on both trunks could participate in a single conversation. The more trunk lines that are tied together the more potential listeners there might be, but still only one person can talk or transmit at a time per trunk or per group of intertied trunks. To establish the various repeater link connections users of the system must send commands to an Intertie controller commanding it to add or drop repeaters from the Intertie, turn on or off Intertie switches or to interrogate the current switch positions for a specific Intertie link controller.

In order for a repeater to participate on the Evergreen Intertie, it must have a link port available on its own repeater controller. Through this port, audio and keying signals are made available for interfacing with an Evergreen Intertie controller. The E.I. controller is a computerized switchboard that monitors and controls the routing of audio and keying signals for the repeaters or link radios that might be attached to any one of its six ports.

Three repeater ports have user switches for connecting or isolating repeaters on the Intertie. A typical configuration uses the Intertie switch to isolate the three link ports from the three repeater ports as is done for the Longview/Kalama repeaters but this is not always the case. Hardware configurations allow any combination of three ports on each side of an Intertie switch. Major components of the controller include a DTMF touch-tone decoder, an EPROM state machine for interpreting commands, an audio mix and switch card for mixing receiver and transmitter audio signals, and a microprocessor that monitors activity on all six ports and routes audio and keying signals appropriately. The microprocessor also performs identification and switch confirmation using morse code.

A system of mostly 4 digit command codes has been developed to control each of the 4 user switches on an individual Intertie controller. The first digit (x) is a *region* code. The number 8 is used in Washington and temporarily at Salem, Oregon. The number 2 is used in the balance of Oregon. The second digit (y) in the command is a *site* specific code within each region. Seattle uses the number 6. Number 5 is used in Spokane. The third number commands a specific switch either *on* or *off*. *On*, refers to the switch being thrown to the closed position. The numbers 0 and 1 toggle *on* and *off* the intertie switch. Numbers 2 and 3 toggle *on* and *off* the first repeater port and so on. The fourth digit is a \* used in all cases to identify the end of a command. The command 864\* for example would be used to turn *on* the K7NWS 220 MHz repeater since it is connected to the second repeater port of the Seattle (West Tiger MT) controller (86 region and site). If the command was received correctly, the controller will respond with a morse code (~20 wpm) confirmation of the switch change. Confirmation includes the callsign associated with the controller followed by the letter "N" or "F" depending on whether the *on* or *off* code was sent. In our example above, the confirmation: "K7NWS N" would be given. If a switch is already in the *on* state and you send the *on* code, no confirmation will be given. The same applies for already *off* switches commanded *off* again.

In addition to four *on/off* type switches the controller also offers an *interrogate* feature. This command always uses the number 8 as the third digit in the command sequence. The command does not change the current state of the controller, however it generates a response that indicates the *on* or *off* position of all four switches. Issuing the interrogate



command for Seattle by sending 868\* might initiate the following response: "K7NWS FNFF". The first F of the FNFF indicates that the first switch, the intertie switch is in the *off* state. The next letter N indicates that the first repeater switch, in this case the 145.33 repeater switch is in the *on* position. The third and fourth F's indicate that the 220 MHz K7NWS repeater connected to the 2nd repeater port and the UHF repeater connected to the 3rd repeater port are both switched to the *off* position. Each successive F or N in the interrogation response is produced at a higher audio pitch making it easier to distinguish the four switch positions.

The DTMF touch-tone decoder scans receiver inputs from all six ports listening for valid touch tones. Once a valid touchtone is received at any one of the 6 ports, the scanner pauses on that port so that the tone decoder can listen for additional tones. Since the scanner requires approximately 300 milliseconds to scan all six of the controller ports, the first tone of a command must be held long enough (1 to 2 seconds) to make sure that the tone decoder acquires the tone. After the first tone, additional tones can be sent in quick succession.

In most situations, a two meter repeater is connected to repeater port 1. The repeater, its controller, and the Intertie controller are physically located next to each other at the repeater site. A repeater connected to the 2nd repeater port may or may not be located physically at the same site even though its drop switch is. This is the case for the Ocean Shores, WA repeater. It is physically located on the Washington coast, however the intertie controller is located in Olympia at Capitol Peak. The controller's microprocessor knows to identify the repeater drop switch response using the Ocean Shores repeater call sign, W7ZA. Interrogation responses use the home repeaters callsign, or in this case K7CAH. Audio and keying signals are transferred between the two sites via full duplex UHF link radios that are transparent to the user. Once you've remembered the region and site codes and you know which ports the particular repeaters are connected to, its easy to remember the entire set of command sequences for a particular site. Examine the schematic representations of the Evergreen Intertie in Figures 1, 2, and 3 for a complete list of repeaters and codes.

## Courtesy Tones

When listening to your favorite Intertie repeater it would be nice to know if the person that's talking is using the same repeater you're listening to or if that person is using a different repeater somewhere else on the Intertie. Courtesy tones indicate switch status and link activity. Depending on the sophistication of the repeater controller, a number of different courtesy tone signals might be heard. Repeaters in the system that use BEARS designed repeater controllers generate a short low pitched beep to indicate link activity. Consult your local repeater control operator for courtesy tone information in your area.

## Getting on the Air

The system is an exercise in fun, education, and experimentation. A radio with a touch tone generator keypad is required to operate the Intertie switches and repeater drop switches. Proper identification is important. When you wish to operate a system switch, first give the callsign of the repeater you are controlling, then your callsign. Next announce the control function you are about to operate and then send the tones all in one transmission. For example; "K7NWS this is W7XYZ bringing 2-meters on line <TONES>." Some groups have implemented a voice detector/recorder that will not decode tones unless a voice ID precedes the tones. A control operator may interpret a series of unidentified touch tones as harmful interference so please identify before entering tones.

By agreement with local repeater groups, a standard system configuration has evolved whereby certain repeaters are normally switched on or off the Intertie. These switch positions are indicated in the Intertie architecture diagrams of Figures 1 thru 3 and should be returned to their normal position when you're done using the system.

Each switch command requires a sequence of four tones, where the first of which must be held for a half second followed by the other tones in quick succession. You should then drop your carrier and listen for a system ID that will confirm a successful switch operation. A call sign followed by an "N" (switched *on*) or "F" (switched *off*) means you successfully operated that switch. If multiple switch settings are required, enter another command sequence for the next switch after confirmation of a successful previous switch operation. If you are not successful try again or interrogate the switch position. You will get a confirmation only if you throw a switch from *on* to *off*, or *off* to *on*. If you get a warble "raspberry" tone this means that a control operator has disabled the local 2-meter connection to the intertie for some reason. Also, each switch can be locked by a control operator to prevent further changes. If you have frequent problems operating the system switches you should have your tone deviation level checked for  $\pm 2.5$  KHz maximum deviation.

In general if you bring up a link to listen in or to call someone you should take it back down when you're through. If you find a link left on, inquire first if someone is using it to listen before you decide to drop it. When bringing a repeater onto the system announce your intentions before doing so and listen for any objections.

Switches must be turned on or off in logical order. For example, a connection of the 145.33 BEARS repeater to the 145.47 Capitol Peak repeater normally requires 800\* then 820\*. The fact that a link is established is indicated by the Intertie controllers issuing morse ID's: K7NWS N, and K7CAH N.

Another more complex example is the connection of the 145.33 repeater in Seattle to the 442.825 Kalama repeater. In three separate transmissions, send 862\* then 800\* and then 830\*. The system will ID after each successful switch operation. Switches should be turned off in reverse order so that one does not become isolated from a distant switch and leave it on.

## Repeater Traffic Priorities

*Emergency Traffic* - Protection of the immediate loss of life, bodily injury or imminent damage to property.

*Priority Traffic* - Urgent matters if not handled in a timely manner may become an Emergency in nature or other traffic that falls below Emergency Traffic but above routine traffic.

*System Testing and Maintenance* - The repeater is maintained by volunteers who have regular jobs just like you. Sometimes maintenance must take place at a time that may inconvenience operators. Remember this is amateur radio not a public utility.

*Public Service and Scheduled Nets* - These operations are time driven and need to take place during the scheduled time of the event or the scheduled net time.

*General Use* - Last but not necessarily least.

## General Rules of Operation

*Control Operators* - Control Operators are amateur operators designated by the owner/operator of the repeater to control its operation. This includes FCC Rule enforcement and rules established by the owner/operator. Let control operators handle interference problems and repeater rule enforcement. Control operators do have the authority and responsibility to alter the rules of operation to meet temporary requirements.

### *Interference*

*Do Not* acknowledge transmissions from unlicensed stations causing interference.

*Do Not* discuss interference on the radio. Discussing interference only encourages those whose desire is to cause problems to others.

*Do Not* discuss problems of the intertie on other repeaters. We don't want their problems on our repeater so we should not take our problems to their repeater.

### *Daily Operations*

Follow all applicable FCC Rules. Be a courteous operator. Lead others by example. Treat others as you would want to be treated. Listen to see if there is an ongoing QSO before making a call. ***Identify yourself with your callsign at the beginning of your transmission and then as required by the FCC.*** Until a station identifies itself, control operators will consider the station an unlicensed station. Be proud of your call, use it.

Use your callsign to enter an ongoing QSO or if you need to make a contact and are unable to wait until the QSO is complete. Don't break into an ongoing QSO unless you *really* need to or have something to add. Interrupting is no more polite on the air than it is in person.

"Break" indicates emergency or priority traffic. Relinquish the frequency immediately. Failure to comply may lead to you losing your repeater privileges.

Wait until you hear the courtesy tone before transmitting. This allows the repeater timer to reset and not cut you off in the middle of a transmission.

Keep QSO's short. Due to the large number of users, it is necessary to have this system operate on the short contact, not ragchew, type operation. QSO's should not last longer than 10 minutes.

Don't tie up the intertie with a local QSO. Take the repeater off the link or move to another repeater or just move to a simplex frequency.

Refrain from using "CB Lingo". We are Amateur Radio Operators and should be proud that we have earned the privilege to transmit on amateur bands. Amateurs have created their own lingo; 73, 88, handle (yes handle is ham lingo),

and others. Listen to some mature hams (not necessarily the ones you hear talking all the time) and emulate them. Mature hams should offer to be an "elmer" (another ham term) to new hams. Direct them down the path to good operatorship.

## Reporting Accidents & Emergencies to Authorities by Autopatch

To report any incident to authorities, the first thing you should say is: "Are you aware of (type of incident) at (location)?" Then unkey your mic and let the emergency dispatcher have control of the conversation. Don't waste time by giving a long explanation of your callsign. Let them ask the questions. The dispatcher will want to know certain information, such as: Type of emergency, if any injuries, type of and number of vehicles involved and whether any lanes are blocked. The outside (extreme right lane) is considered lane 1. On drunk, reckless or excessive speed cases, do your best to get the license plate, make, model, year and color of offending vehicle. The dispatcher may ask for a telephone number. Tell them you are on a one-way radio patch and can't be called back but give your home number instead. You may be needed as a witness.

## KBARA/Seattle Connection Times

KBARA and Seattle are connected continuously unless equipment failure or interference dictates otherwise.

## Nets

There are several nets each week on the local repeaters. There are also a few that are Intertie wide. If you want to participate in one of these nets you are welcome to bring your local repeater on to join in but you should either stay to bring your local repeater down at the end of the net or make sure someone will bring it down for you. Following is a list of some of the known nets and times.

Astronomy Net  
Sunday 2200 hours  
Originates Portland

YL Net  
Monday 2000 hours  
Originates Seattle

Youth Net  
Tuesday 2000 hours  
Originates Seattle

7am NW Regional/Intl Net  
Weekdays 0700 hours  
Originates KBARA

Wednesday Evening Net  
Wednesday 1900 hours  
On KBARA only

Bozo Net  
Saturday 0700 hours  
Originates KBARA

Weather Net  
Weekdays 0545/1645 hours  
Originates Seattle

Intertie Information &  
Technical Net  
Wednesday 2000 hours  
Originates Seattle  
Entire Intertie is on

Swap & Shop Net  
Saturday 0900  
Originates Portland

NW Elmer Net  
Monday 1900 hours  
Originates KBARA

Computer & Packet Net  
Thursday 2000 hours  
Originates Seattle

Roadrunners Net  
Sunday 0730 hours  
Originates KBARA

## **Intertie Support**

We are supplying this information to you at no charge and it is the goal of member repeaters to make the system available to all without requiring a membership fee. There are substantial costs to the Evergreen Intertie and each operator to maintain the system and to expand its usefulness. Please bear this in mind as you enjoy the system. Contributions are welcome and we are deeply grateful to those who are able to contribute to the support of the system. If you contribute to the Evergreen Intertie please make contribution payable to EVERGREEN INTERTIE. You might consider one or more of the following Intertie members if you wish to participate as a supporter of the system:

Evergreen Intertie  
Jack Williams  
PO Box 603  
So. Cle Elum, WA 98943-0603

W.O.R.C., Inc.  
P.O. Box 2259  
Beaverton, OR 97075

B.E.A.R.S./Boeing Recreation  
Mail Stop 8L-35  
P.O. Box 3707  
Seattle, WA 98124

Puget Sound RTTY Rptr Group (WA7HTJ)  
7821 NE 205<sup>th</sup>  
Kenmore, WA 98028

Salem Repeater Assn.  
P.O. Box 17803  
Salem, OR 97305

Capitol Peak Repeater Corp.  
c/o Rick Taylor K7CAH  
613 N. 5th  
Tumwater, WA 98502

Naneum Ridge Repeater  
c/o Kerry J. Griffith KB7TYR  
P.O. Box 41  
Dryden, WA 98821

Kalama  
c/o Dave Amos  
5318 NE NE 101<sup>st</sup> Circle  
Vancouver, WA 98686

KBARA  
PO Box 30801  
Spokane, WA 99223-3013

If you need help in operating the system call for a control operator or Jack Williams (WA7HNNH). Copies of this handout can be obtained by going to [www.evergreenintertie.com](http://www.evergreenintertie.com) and filling out the contact request or joining the Evergreen Intertie on Yahoo Groups.

**THANKS AND ENJOY THE SYSTEM!**

# WASHINGTON

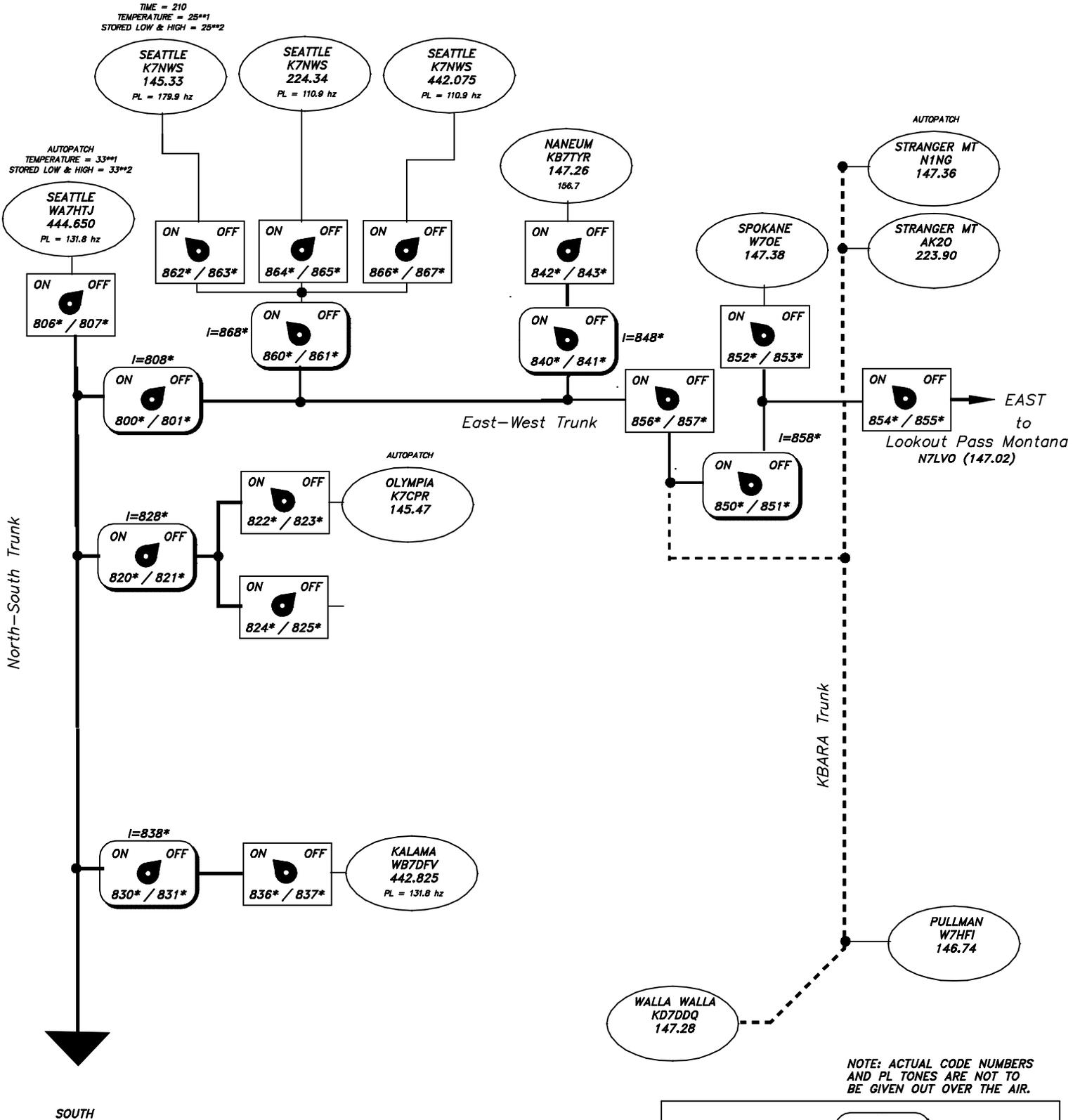


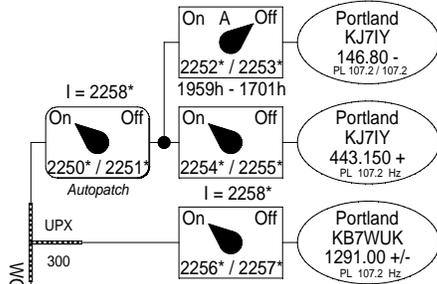
Figure 1

North

# Oregon

# Western Oregon Radio Club

## Portland

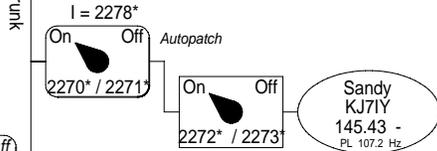


Time (UTC) = 40

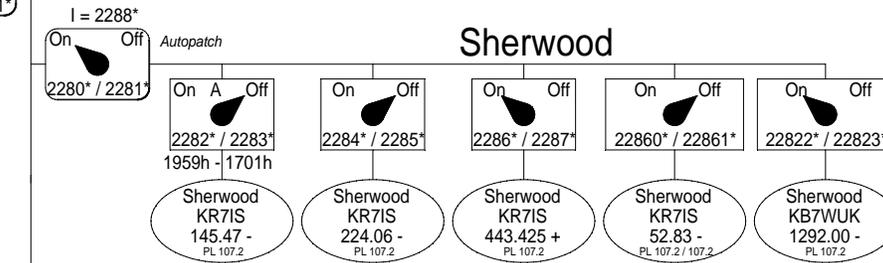
The WORC 2m repeaters are automatically connected to the WORC Trunk at 1801h PDT each day, and disconnected at 1859h PST, for the National Traffic and Training Net.

70cm Repeater are all linked locally at all times.

## Sandy



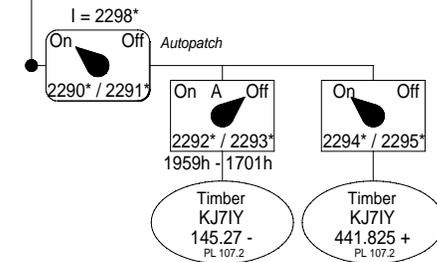
## Sherwood



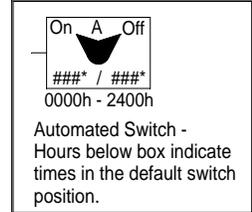
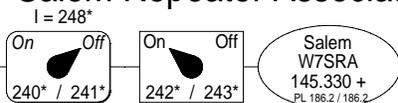
IRLP Node # 3881

Echolink Node # 82962

## Timber



## Salem Repeater Association



Connection to the North-South trunk is available to any user on the WORC UHF repeaters always. Connect the trunk switch at Portland and the appropriate additional switches in the other city.

Connecting from the other repeaters will require connecting those repeaters to the WORC trunk before connecting the Portland trunk switch, except during the 2 hour NTTN window.

South to ORLG

Note: PL Tones outside of Portland and Actual control code numbers are not to be given out over the air.

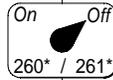
# Oregon Repeater Linking Group

## Oregon, Portland to Roseburg to Bend

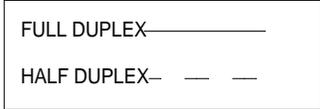
To WORC Portland

North - South Trunk

### Mid Oregon Trunk Sw.

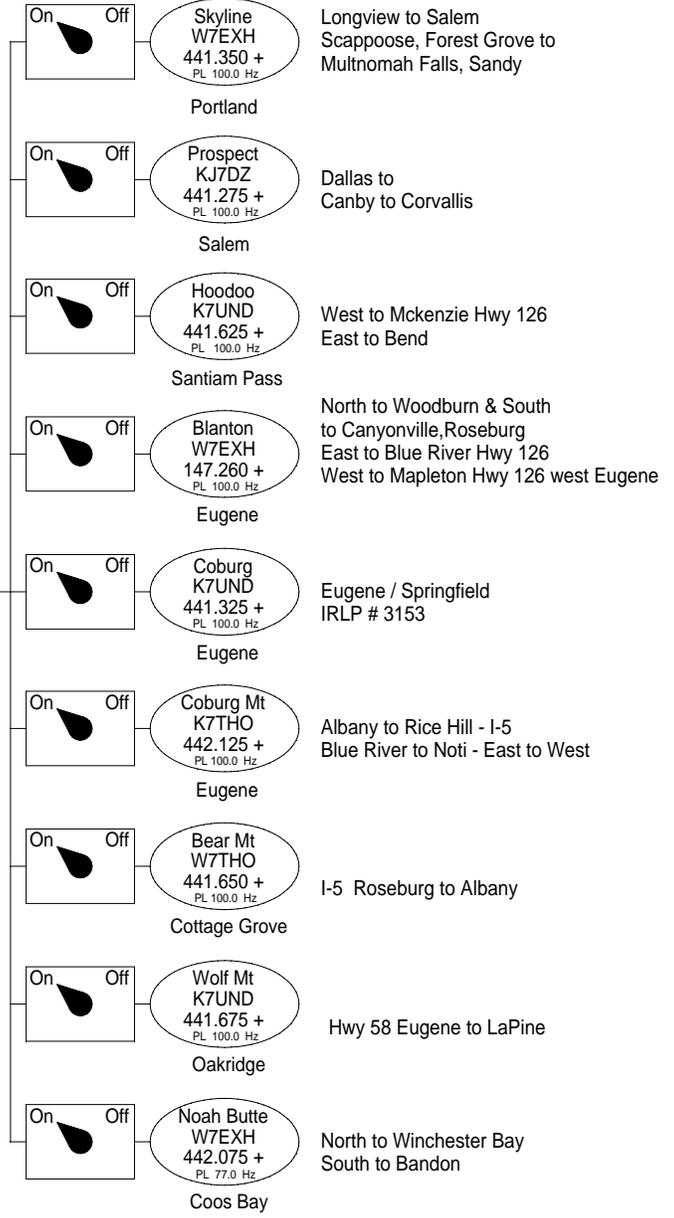


Revision C 07-08-07



Link ON / OFF switches show normal operating configuration

North - South Trunk



South to RVL A

Evergreen Intertie Yahoo Groups  
 for Instruction updates  
<http://groups.yahoo.com/group/evergreenintertie/>

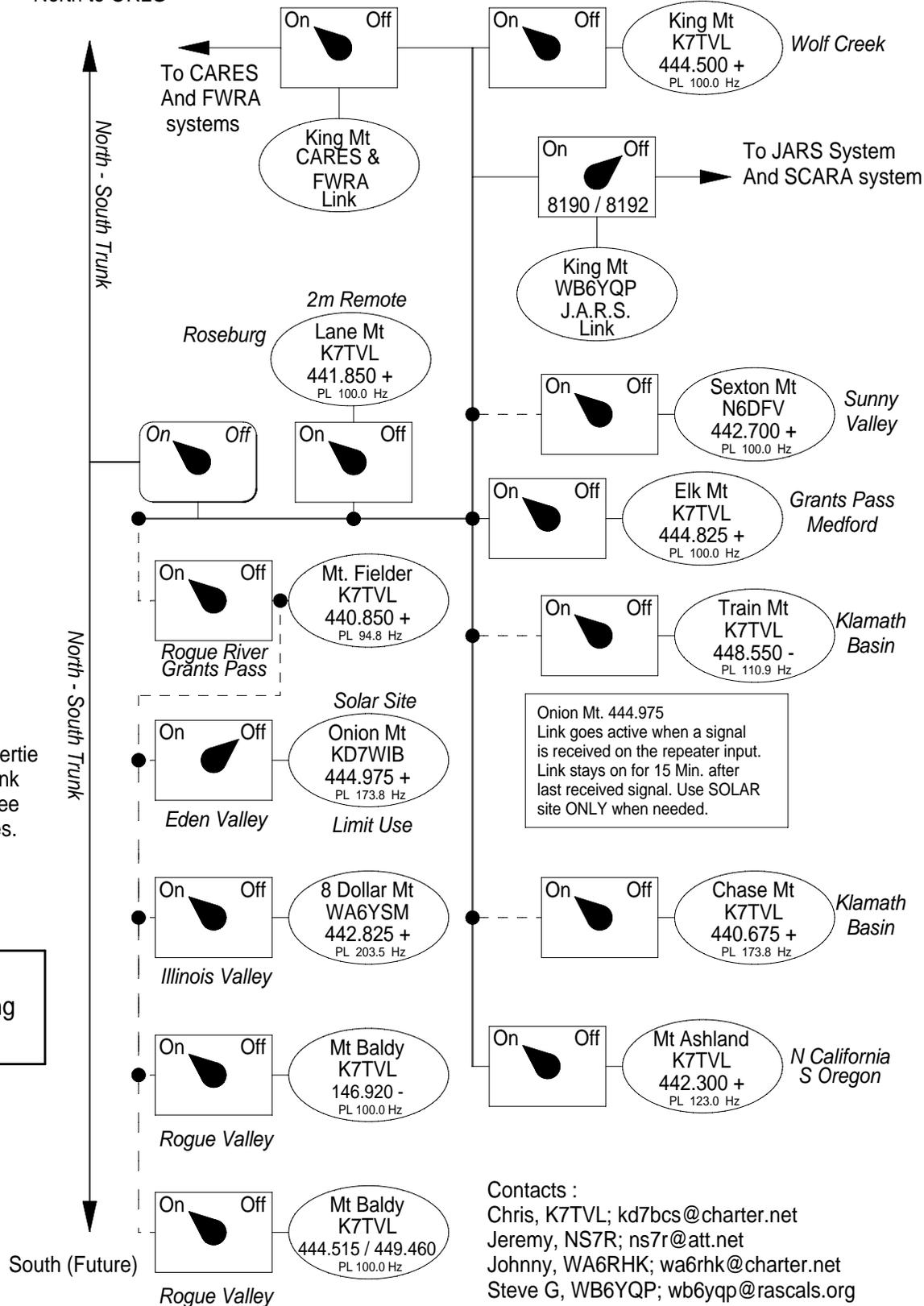
ORLG  
<http://www.org.org>

Evergreen Intertie  
[www.evergreenintertie.com](http://www.evergreenintertie.com)

# Southern Oregon & Northern California

## Rogue Valley Linking Association

North to ORLG



System Overview  
[www.radiolinks.org](http://www.radiolinks.org)

To connect to Evergreen Intertie System, the Mid Oregon Trunk Switch must be turned on. See ORLG sheet for control codes.

Rev. C Date 09-10-05

Link On / Off Switches Show Normal Operating Configuration

FULL DUPLEX ———  
 HALF DUPLEX - - - - -

Contacts :  
 Chris, K7TVL; kd7bcs@charter.net  
 Jeremy, NS7R; ns7r@att.net  
 Johnny, WA6RHK; wa6rhk@charter.net  
 Steve G, WB6YQP; wb6yqp@rascals.org