

The GroundWire

Low Band Receive Antennas

When I gave my first talk on using separate receive (RX) antennas years ago, it was very interesting to see the large number of people who had no idea that separate antennas were being used by quite a few stations. The reason for that probably comes from the fact that only a handful of high-end rigs at the time (early 2000's) had separate ports to connect a RX antenna. The compact rigs of the day, which were huge compared to the sub-compact rigs seen on the market today, were doing well to have a spare SO-239 and built in antenna A/B switch and even that was rare. A few years ago QST published an article on building an outboard RX antenna switch that allowed the user the switch an RX antenna automatically on the same port that connected the transmit (TX) antenna. This switching process utilized the rig's PTT relay typically used to key an amplifier. It was at this point that that idea of separate RX antennas became mainstream, so much so that many manufacturers added separate RX ports to accommodate these antennas.

So what's to be gained by using separate RX antennas? The biggest gain is improved signal-to-noise (S/N) ratio which involves how deeply into the noise a signal resides. The best way to improve S/N is by diminishing noise sources and that is typically accomplished using directional antennas. A lot of guys put entirely too much value on the idea of antenna gain, looking for the largest gain figures available in their antenna specifications. The most important values in an antenna specification should be front-to-back (F/B) followed by front-to-side (F/S). You can run an amplifier and/or preamp if you need more gain on TX and RX, respectively. The fact is most RX antennas have negative gain values, some in the -20 to -30 db range, while a good RX antenna has very good F/B (30 db is really good) and at least decent F/S (12-15 db is common). A lot of guys comment that they could never possibly hear a signal that low but in reality, good listening skills and a good pair of headphones dictate that the antenna level only need to exceed the receiver's noise floor. One can test this concept by listening to a receiver without an antenna connected and then hooking up the antenna while listening. If there is an increase in the noise floor, the levels are probably fine. If one feels the need for more signal, a low noise preamp can be employed.

With any system that improves overall performance, there are always drawbacks and there is never, ever a free lunch. For example, I mentioned that improved S/N is accomplished typically using external RX antennas. That sug-

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Minutes of General Meeting

**Merry
Christmas
and
Happy
New Year**

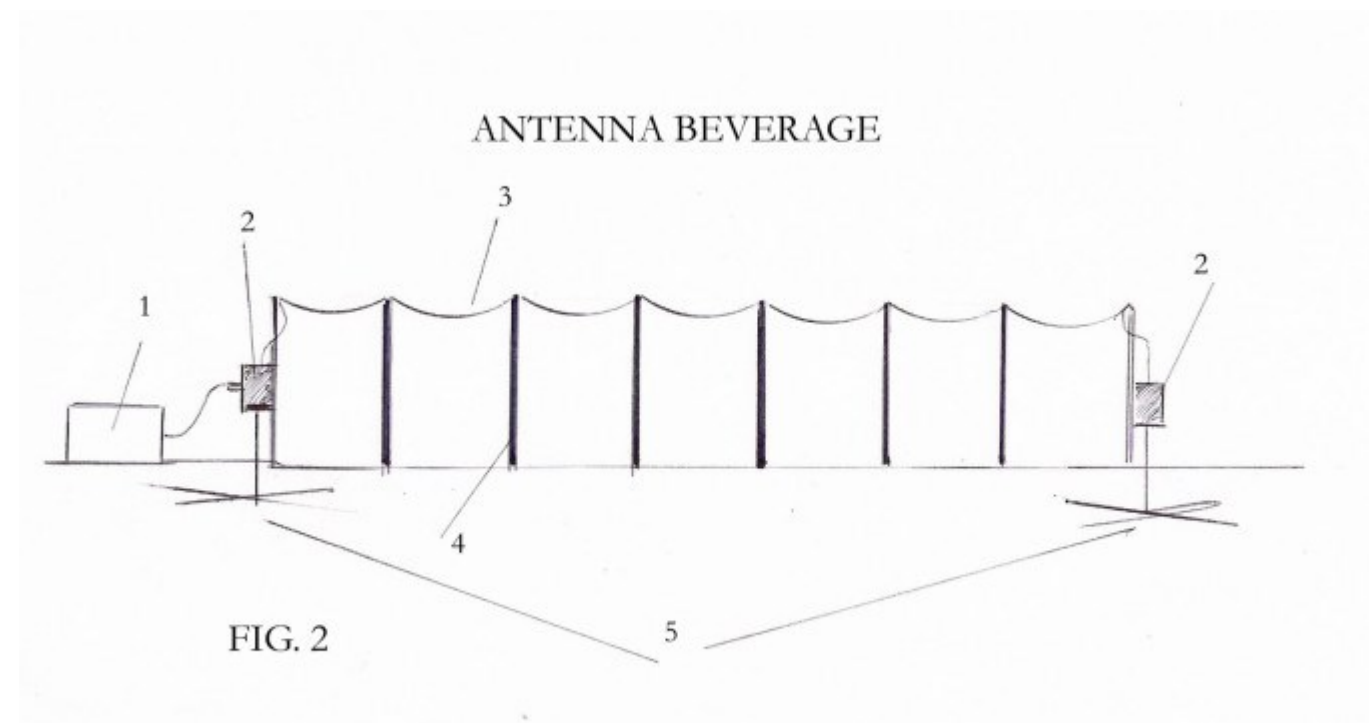


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gests that these RX antennas exhibit a pattern which is used to null an offending signal. In the presence of a TX antenna, typically a vertical on the low bands, the RX antenna pattern can become skewed, in some cases losing all of its directivity. This is often characterized by an overall increase in noise and a lack of directivity when listening to known signals. I first experienced this problem using [K9AY loops](#) on 160-meters in the presence of my short, base loaded vertical. I was stubborn and it took my inability to hear the 3B9RF DXpedition before I fixed the problem by simply detuning the TX antenna while receiving. This concept of detuning can be daunting to a lot of people and RF switching, particularly at high power, is not for the faint of heart. A simple relay *at the TX antenna feed point* can switch in a network that resonates the antenna out of band. In some cases, depending on the physical length of the TX antenna, simply opening up the feed point or shorting it to ground can be all that is necessary. Relay control is accomplished using the rig's PTT relay or a breakout box that is driven by the PTT relay. The relay should be scaled depending on the amount of power applied to the antenna, SWR, and voltages that are present on the TX antenna. My very first attempt at detuning resulted in a relay that was too small and I welded the relay contacts shut. Yes, it looked like an arc welder. I learned my lesson and began using the [Gigavac G2-HAM vacuum relay](#), which is listed on the Gigavac ham discount program. No more problems and I started hearing well for the first time. I have observed in a few instances that some individuals try to cut corners by doing the detuning from inside the shack in order to avoid running control cables. More often than not this approach fails. For those who say that this approach works, its either denial or dumb luck due to some other aspect of their installation. Detune at the base of the TX antenna!

The need to detune the TX antenna can be minimized by giving a wide berth between TX and RX antennas. [W8JI](#) goes into a very extensive discussion of this concept on his website so I will forego the details. For most of us, we are limited to small chunks of property and detuning the TX antenna is the only option.

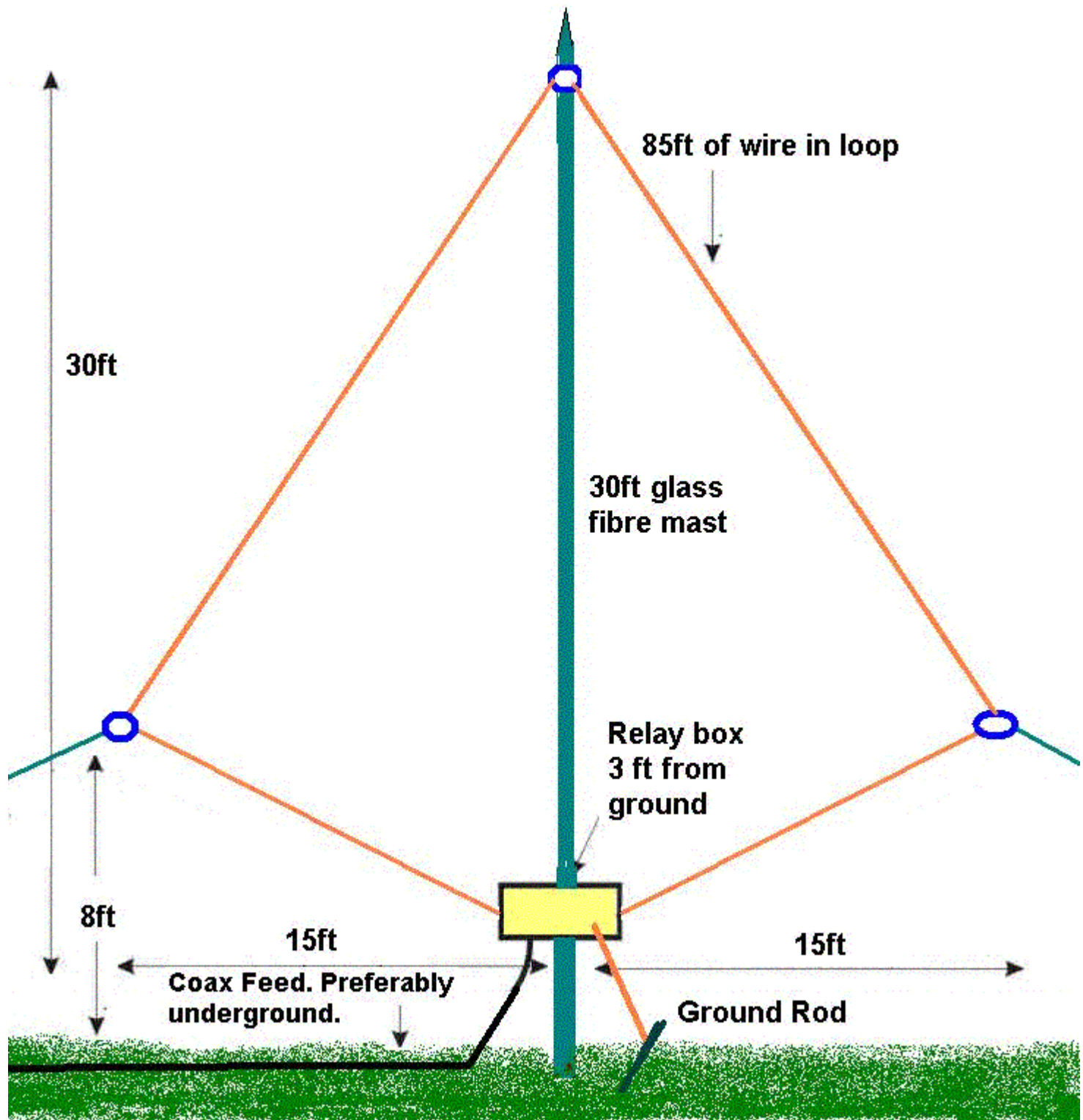
While some RX antennas might benefit from good ground conditions, like the ground-dependent K9AY loop, other antennas rely on poor ground conditions to achieve the necessary wave tilt to become sensitive to vertically-polarized signals. Most notable is the beverage antenna. The beverage antenna in its simplest form is just a straight, long wire, horizontally oriented and spaced several feet above the ground into the direction of interest. Typically the far end of the beverage is terminated through a resistor to a good ground rod and in some cases, more than one. The resistor value is determined experimentally and is dependent on the environmental conditions. Signals arriving from the far end of the antenna tend to have their wave front slowed due to lossy dielectric under the length of the antenna. This slowing results in a tilting of the wave which explains how a horizontal wire can be sensitive to a vertical-incidence wave. As the tilted wave front moves down the length of the antenna wire, the signal adds in-phase, resulting in a building voltage which is coupled to the receiver through an impedance matching transformer, typically a 9:1 transformation. Signal arriving from the feed point end of the antenna add similarly but are shunted to ground through the terminating resistor at the far end of the antenna. The result can be a very nice F/B, depending on the length of the antenna and care in termination as well as a tightening of the pattern which is analogous to a narrowing of the beam width. While beverages that are multiple wavelengths in physical length are often desired, portions of wavelengths can be useful, although the pattern tends to become more omnidirectional as the wire gets shorter. All of these factors contribute to S/N. As in the previous section where the importance of detuning the TX antenna was emphasized, locating a beverage over a radial field for a TX vertical, detuned or otherwise, can have devastating effects on the wave tilt and subsequently the sensitivity and pattern. It is recommended that interested readers carefully study W8JI's website in addition to the ON4UN low band DX book, which are both considered important references for the low band operator.



Beverages come in a number of forms. At KB5NJD / WG2XIQ, beverages have been used on 80 and 160-meters in the past, both in the air and on the ground (commonly known as BOG's, or "beverage on ground"). In fact, beverage antennas are responsible in the completion of 160-meter DXCC. In recent years, however, trees that supported and concealed beverage antennas 8-10 feet above the ground were damaged by ice storms and in most cases had to be removed. While many have reported good performance with BOG's, relatively good ground conditions at this location tend to result in a significant loss of sensitivity and directivity. BOG users often find that due to the proximity to the ground, the dielectric effect allows the short wire to "look" much longer than it really is which is more or less a function of a decreased surge impedance, typically around 200 ohms for an average wire sitting on the ground. Running beverages down the sides of the street along the curb has been done by many and may be considered again here. Its easy enough to roll the wires up using a spool mounted on a drill motor. Of course, very low frequencies dictate very long wires in order to achieve a useful pattern so this concept bares more experimentation.

For low band amateur radio activities, the K9AY loop has historically been the most reliable, compact work-horse at KB5NJD. Sadly, that was not the case on 630-meters. Even making modifications to the termination resistance in order to improve the null depth in addition to changing the transformer material from type-43 to type-77, the performance seen on the ham bands was never achieved on 630-meters. Its difficult to achieve a good pattern with such small spacing on such a low frequency. Jay, W1VD, published an improvement to the K9AY loop on his [website](#) which includes increased element length, spacing and a variable termination resistance. Results from those using this design have been very positive and I believe that this approach is what Jay uses on a regular basis to hear Europeans. The takeaway message here should be that the K9AY loop is a good choice for MF and LF reception if realistic physical size is considered and scaled accordingly. The very nature of the design has made it quite scalable.

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Most recently at KB5NJD / WG2XIQ, the [VE7SL multiturn resonant loop](#) has been employed with very good results. This loop replaced the K9AY loops in the summer of 2014 and while this station has histori-

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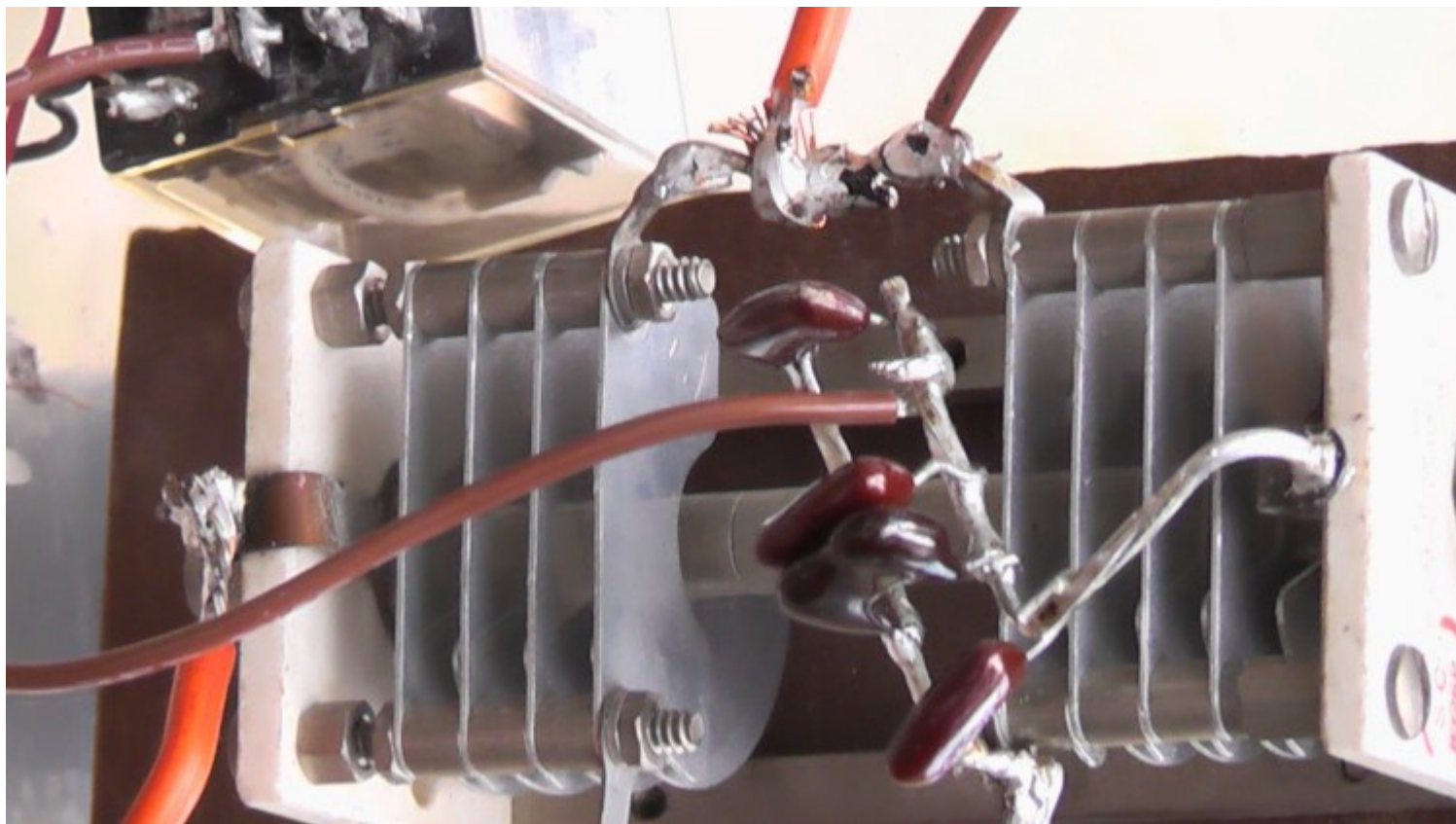
cally demanded a switchable cardioid pattern from the receive arrays, the performance of this antenna has been very good during late summer tests.



A rotator allows the antenna's azimuth to be changed and even with the bidirectional response, performance has been really great. The loop itself is a parallel resonant circuit at a very high Q and uses an isolated feed

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which is accomplished with a single turn pick-up loop about 6 inches from the main loop turns. a 30 pF variable cap is used in parallel with about 250 pF silver mica padder caps and is adjusted with my MFJ antenna analyzer until the value of X is equal to zero, which occurs around 475 kHz. A [W1VD preamp](#), based on the original design by W7IUV, utilizes a 2n5109 and offers very little noise insertion. Having built a number of poor-performing, noisy preamps, this preamp is very quiet. At zero level input (no antenna attached), there is no discernible difference in output level when the preamp is coupled to the receiver. This means the internal noise is very low. In fact, the noise figure specification is 2.5 db.



Because the loop is located in the near field of the transmit antenna, I used a 12-v relay to short across the resonating capacitor when I am transmitting. Doing so accomplishes two things: First, it prevents the high-Q loop from developing dangerous, damaging voltages which could not only destroy the capacitors but could also back feed the protection relay in the shack and ultimately damage the receiver. Secondly, a high-Q resonant circuit in the near field of the antenna would serve to sap power away from the antenna that should otherwise be radiated to distant locations. This problem is often seen in the broadcast service when resonant or near-resonant structures are erected in the vicinity of a transmitter site. The result is skewed pattern in directional arrays and a decrease in field strength overall. This problem is often corrected by “skirting” and detuning the structure, resulting in it disappearing electrically.

The most impressive system that I am aware of is the [630-meter 8-circle array](#) at NO3M / WG2XJM located in western PA. Eric’s system encompasses 30 acres and is often reported to perform better than his long, phased beverage arrays that are also used on 630-meters. Still other space-conscious options that work well include the [W7IUV rotatable flag](#), which is related to the family of terminated loops, much like the K9AY

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loop, while offering a significant improvement in performance and the EWE antenna which has been very well optimized by Mike, WA3TTS in west central PA.

While so much has been said about the use of directivity to improve S/N, it is important to mention that one should periodically listen with the transmit antenna because there is certainly benefit when the noise level is low. Because of generally poor performance with the K9AY loops in the winter on 2013/2014, the TX vertical was used almost exclusively during that time frame at WG2XIQ. When the band is quiet, which is often the case from mid- November into early January when the weather is generally stable here in North Texas, the noise floor on 630-meters can sound like 10 or 15 meters. These conditions are perfect for listening with the omnidirectional vertical. This arrangement is also useful living in the central US as it is very easy to be listening in the wrong direction when a signal may be arriving from another. Be aware of propagation and be an active participant in the operation of your station and you won't miss much.

Copied with permission from:

By [John Langridge](#) September 3, 2014 – Posted in: [630 Meters](#)

MEMBER FACTOID

Most of you probably don't know that our youngest club member, besides being a great radio operator, having made contact with the ISS at Field Day, is also an actor. I didn't know that about N5BRH until the XYL & I went to the D.L. Hopkins Senior Center last Saturday to see CenterStage Production "Play Your Cards Right, Ebenezer! (Or, You'll Soon Be Singin' A Christmas Carol). There he was listed in the program and was part of the cast. He did an outstanding job of acting. For those of you that don't know, N5BRH is Bennet Harris.

Photo below is Bennet (3rd from left) taken during the play Thursday night.



Submitted by Jerry Keltner (KB6OJE)

Upcoming Activities



December 2nd
December 16th

Board Meeting
Club Meeting

Christmas Party

December 25th

***Groundwire* submissions due**

Club Breakfast *every* Saturday 7:00AM @ Acapulco's in DeSoto
Monday Night Nets every Monday @ 8:00PM (147.060 MHz / + /110.9)



Here is what is coming this month ...

December *Christmas Party with food and fun*
Ham Of The Year Award (HOTY)

Elmer Directory



APRS	Jerry (KB6OJD)	Floyd (KC5QBC)	Mike (K5MMH)	
Antennas	John (KB5NJD)	Mike (K5MMH)	Paul (KD5IVP)	
CAD Circuit Board Design		Mike (K5MMH)		
Contesting	Jerry (KB6OJE)	John (KB5NJD)		
CW	Mike (K5MMH)	John (KB5NJD)	Russ (KX5G)	Paul (KD5IVP)
DF'ing	John (KB5NJD)	Rick (KJ5UY)		
DX	John (KB5NJD)	Mike (K5MMH)		
JPole Construction	Barry (K5BSM)	James (KF5RBN)		
Kit Building & Soldering		Mike (K5MMH)	Paul (KD5IVP)	
Net Operations	Russ (KX5G)			
Portable Operation	Gene (N5PKZ)			
PSK31	Jerry (KB6OJE)			
QSL'ing	Mike (K5MMH)			
Radio Bargains	Barry (K5BSM)			
Satellites	Bob (KA4JSQ)			
Traffic Handling	Russ (KX5G)			
WSPR	John (KB5NJD)			

The above club members have volunteered to help you get started or answer questions to help you enjoy these areas of our radio hobby. If you wish to volunteer your expertise, contact Bill (N5TXN) to get on the list.

Financial Report ... October, 2014



October-14	Income	Expense	Balance	Petty Cash
General Fund				
Beginning Balance 11/1/2014			\$956.02	
INCOME/EXPENSE				
Dues Income-2014	\$62.75			
ARRL Renewal Income-2014	\$78.00			
T-shirt/hat income	\$ 226.34			
ATT rebate	\$ 10.97			
Transfer From Matl. Property				
Transfer Petty Cash income				
TOTAL INCOME	\$378.06			
EXPENSES				
Transfer to Special Events				
Purchase of new checks		\$ 22.34		
PO Box Renewal		\$ 80.00		
TOTAL EXPENSES		\$102.34		
TOTAL INCOME/EXPENSE	\$378.06	\$102.34		
Ending Balance			\$1,231.74	
Special Events Fund				
Beginning Balance 11/1/2014			\$0.00	
INCOME/EXPENSE				
Trans from General Fund				
TOTAL INCOME	\$0.00			
EXPENSES				
TOTAL EXPENSES		\$0.00		
TOTAL INCOME/EXPENSE	\$0.00	\$0.00		
Ending Balance			\$0.00	
Material Property Fund				
Beginning Balance 11/1/2014			\$569.33	
INCOME/EXPENSE				
Dues Income-2014	\$62.75			
Exxon Donation	\$ 500.00			
Transfer from General Fund				
TOTAL INCOME	\$562.75			
EXPENSES				
AT&T				
HOTY Award		\$60.45		
Mercer Consumer Insurance		\$ 320.00		
Transfer to General Fund				
TOTAL EXPENSES		\$380.45		
TOTAL INCOME/EXPENSE	\$562.75	\$380.45		
Ending Balance			\$751.63	
OCTOBER Balance	\$940.81	\$482.79	\$1,983.37	

2014 Board Members

President

Bill Ellis (N5TXN)

Vice-President

Jerry Keltner (KB6OJE)

Treasurer

Barry Fulfer (KF5JPE)

Secretary

Pat Roberson (KB5YPP)

Directors

Rick Ellis (KJ5UY)

Material Property Chairman

James Jackson (KF5RBN)

Membership Chairman

Harold Wheat (K5HDW)

Program Chairman

Committee Positions

Repeater Trustee

Johnny Roberson (KJ5LB)

Repeater Committee Chair

Bill Ellis (N5TXN)

Newsletter Editor

Bill Ellis (N5TXN)

MN²

Monday Night Net

Net Time 8:00PM

147.060(+) Primary

444.500(+) Alternate

Financial Report ... November, 2014



November-14	Income	Expense	Balance	Petty Cash
General Fund				
Beginning Balance 11/1/2014			\$1,231.74	
INCOME/EXPENSE				
Dues Income-2014				
ARRL Renewal Income-2014				
Transfer From Matl. Property				
Transfer Petty Cash income				
TOTAL INCOME	\$0.00			
EXPENSES				
Transfer to Special Events				
TOTAL EXPENSES		\$0.00		
TOTAL INCOME/EXPENSE	\$0.00	\$0.00		
Ending Balance			\$1,231.74	
Special Events Fund				
Beginning Balance 11/1/2014			\$0.00	
INCOME/EXPENSE				
Trans from General Fund				
TOTAL INCOME	\$0.00			
EXPENSES				
TOTAL EXPENSES		\$0.00		
TOTAL INCOME/EXPENSE	\$0.00	\$0.00		
Ending Balance			\$0.00	
Material Property Fund				
Beginning Balance 11/1/2014			\$751.63	
INCOME/EXPENSE				
Dues Income-2014	\$0.00			
Transfer from General Fund				
TOTAL INCOME	\$0.00			
EXPENSES				
AT&T				
Transfer to General Fund				
TOTAL EXPENSES		\$0.00		
TOTAL INCOME/EXPENSE	\$0.00	\$0.00		
Ending Balance			\$751.63	
NOVEMBER Balance	\$0.00	\$0.00	\$1,983.37	

Minutes of Board Meeting ... November 4, 2014



The meeting was called to order by Jerry (KB6OJE) at 6:35 PM.
Invocation was given by Harold (K5HDW).

Executive Board members present :

Officers

Bill Ellis (N5TXN) - absent
Jerry Keltner (KB6OJE)
Pat Roberson (KB5YPP)
Barry Fulfer (KF5JPE)

Guests: Johnny (KJ5LB), Scott (KE5NLK).

Directors

Rick Ellis (KJ5UY) - absent
Harold Wheat (K5HDW)
James Jackson (KF5RBN)

Minutes: Motion by Barry (KF5JPE) with 2nd by Harold (K5HDW), approved as printed in the Groundwire.

Treasurer's Report: An error was discovered in the amount of \$500.00 total. Barry will go back to April and review all activity. The error seems to be in the TShirt and hat money. The balance as of 4 November is \$1,984.03.
Motion by Pat (KB5YPP) with 2nd by James (KF5RBN), approved as given verbally at the meeting.

COMMITTEE REPORTS

Repeater: Johnny (KJ5LB) has the transistors to repair the 440. Currently the 440 is running 45 watts and users are able to talk to Denton.

VE Session: Susan Miday passed the Tech test at the October session. Her call sign is KG5ENZ.

EOC: The Tri-Cities EOC radios have been re-programmed.

Membership: Nothing to report.

Net: Russ (KX5G) had good participation on the 22nd of September, Pat (KB5YPP) had 14 check-ins on the 29th of September.

Web: It is up and running.

Groundwire: It has been sent out to the membership. All submissions for the Groundwire need to be in **MS Word** format and sent to Bill (N5TXN) by the 25th of the month.

OLD BUSINESS

1. Program Chairman, Harold (K5HDW), requesting program ideas and participants in Speaker Exchange with Ellis Co ARC. It was suggested that programs be limited to 20-30 minutes.
2. The General classes presented by Ben (K5NEB) for 8, 15 & 22 Nov. are CANCELLED.
3. Fox Hunt scheduled for 8 Nov. is CANCELLED. Rick (KJ5UY) has to work. A suggestion was made to go to 2 meter for Fox Hunts since more people have 2 meter capability.

NEW BUSINESS

1. The Christmas Party/Dinner is scheduled for the 16th at the regular meeting time. It was suggested that the Board get information from different sources to have the dinner catered this year, if we did not want to do a pot-luck dinner.
2. The Nominating Committee has been selected: Barry(KF5JPE), Gene (N5PKZ), Wayne (KE4SGS), and Scott (KE5NLK).
3. The Ham of the Year nominations are due by the November general meeting. Contact Jerry (KB6OJE) with your nomination.
4. Scott (KE5NLK) brought the APRS box from Mike (K5MMH). The box was given to Jerry (KB6OJE).
5. The program for the November meeting will be by Steve (KF5RYI) on HF Foot Portable Communications.

ADJOURN: Motion by Barry (KF5JPE) with second by Harold (K5HDW) at 7:38 PM.

General Membership Meeting ... November 18, 2014



The meeting was called to order by Bill (N5TXN) at 6:30 PM.

Invocation was given by Barry (KF5JPE).

Executive Board members present:

Officers

Bill Ellis (N5TXN)

Jerry Keltner (KB6OJE)

Pat Roberson (KB5YPP)

Barry Fulfer (KF5JPE)

Directors

Rick Ellis (KJ5UY)

Harold Wheat (K5HDW)

James Jackson (KF5RBN)

Guests: Three guests were present to take tests after the program: Phil Vincell, Juan Rodriguez (KA1RTR), Dwight Brown.

Minutes: Motion was made by Paul (KD5IVP) to approve the minutes as printed in the Groundwire. All approved.

Treasure Report: Barry (KF5JPE) gave the following report: There are some errors in the bookkeeping that he is trying to find and correct. Nov. beginning balance: \$1525.35, deposit of \$838.47, withdrawal \$482.79. The balance as of today is \$1984.30.

Motion by Wayne (KE4SGS) with 2nd by Paul (KD5IVP) to accept the report.

COMMITTEE REPORTS

Repeater: Nothing new to report.

EOC: The Tri-Cities emergency use radios that Johnny (KJ5LB) and Paul (KD5IVP) have as EOC Radio Officers have been re-programmed.

Membership: Nothing new to report.

Net: Wayne (KE4SGS) had 13 who checked in on the 17th.

Web: The web site needs some updating.

Groundwire: Thanks to Steve Parks (KF5RYI) for his articles. Articles are needed from any and all who have something they would be willing to share with the club. All Groundwire articles need to be in MS Word format and sent to Bill (N5TXN) by the 25th of the month.

OLD BUSINESS

Field Day 2014: The results are in and we were 4th in Class 3A Commercial with 5,832 points. If we were 3A not using commercial power we would have been in 30th place. John (KB5NJD) commented on how the club has progressed over the years.

NEW BUSINESS

1. The Christmas Party/Dinner will be at the December General meeting on the 16th at 6:30 p.m. Ham and beef brisket, coffee, water and ice will be provided. Everyone is asked to bring side dishes, deserts, and any drinks they want. Each person who wants to participate in the White Elephant gift exchange needs to bring something that they would like to pass along to someone else.
2. The HF Fox Hunt will be the 2nd Saturday, 13 December. Rick (KJ5UY) will be hiding the "Fox".
3. Dues are now due for 2015! SWDCARC dues are \$25.00 for full membership. Dues paid to ARRL are \$39.00 and the club gets a 'kick-back' depending upon if the member is new or renewing.

ADJOURN (to Program, followed by VE Session): Motion by Bill (N5TXN) at 6:48 PM.

Program: HF Foot Portable Communications, by Steve (KF5RYI).