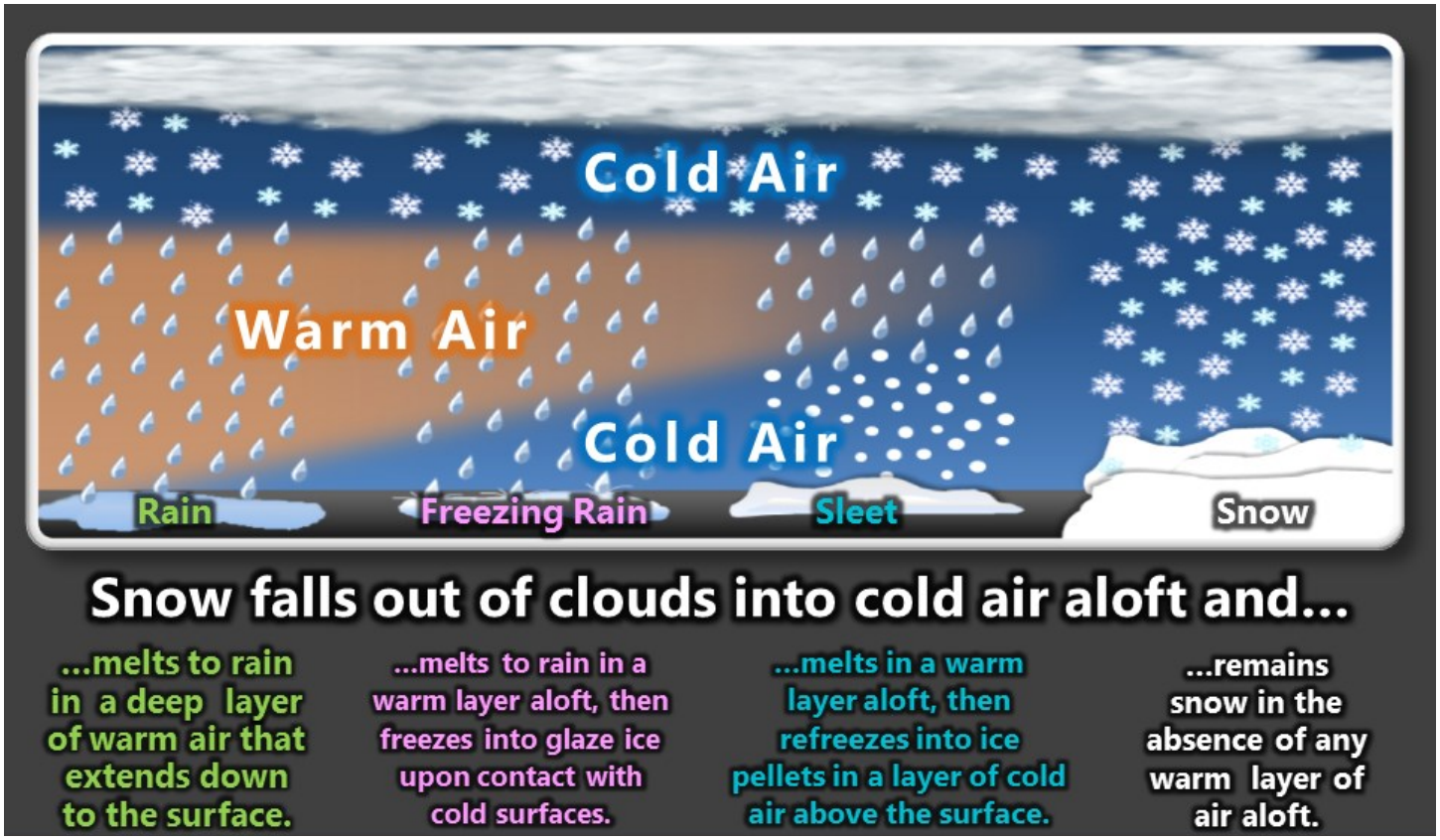


Wavelengths

Xenia Weather Amateur Radio Net Dec 2018
XWARN (W8XRN)

147.1650+ (123.0) (Analog Only)
443.1000+ (123.0) (Analog + System Fusion)

Meetings: 2nd Monday, 7:30PM, Greene Memorial Hospital (1141 N Monroe Dr, Xenia, OH) Herman Menapace Auditorium

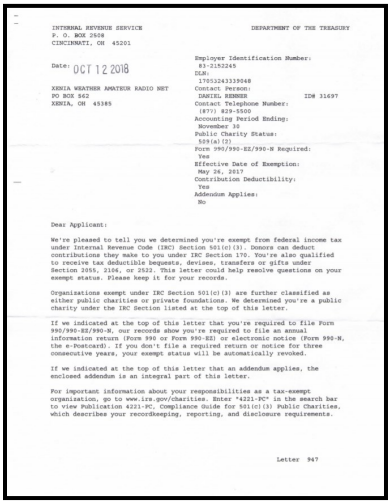
President's Message

Thank you for your votes and for your faith in me to be the next XWARN president. I am also super excited to have Bob Baker returning to the role of Vice President and revitalizing the program section of our meetings. I know he already has the first few months planned out and this is an exciting opportunity to bring new life to our meetings.

I hope to focus this year on bringing back the substance to our meetings. I would also like to grow our membership, and

(Continued on page 3)

XWARN Tax-Exempt Status



INTERNAL REVENUE SERVICE
P. O. BOX 2508
CINCINNATI, OH 45201

DEPARTMENT OF THE TREASURY

Date: OCT 12 2018

XENIA WEATHER AMATEUR RADIO NET
PO BOX 842
XENIA, OH 45385

Employer Identification Number:
83-2152245
DLN:
17053243339048
Contact Person:
DANIEL REBNER ID# 31697
Contact Telephone Number:
(877) 829-5500
Accounting Period Ending:
November 30
Public Charity Status:
509(a)(2)
Form 990/990-EZ/990-N Required:
Yes
Effective Date of Exemption:
May 26, 2017
Contribution Deductibility:
Yes
Addendum Applies:
No

Dear Applicant:

We're pleased to tell you we determined you're exempt from federal income tax under Internal Revenue Code (IRC) Section 501(c)(3). Donors can deduct contributions they make to you under IRC Section 170. You're also qualified to receive tax deductible bequests, devises, transfers or gifts under Section 2055, 2106, or 2522. This letter could help resolve questions on your exempt status. Please keep it for your records.

Organizations exempt under IRC Section 501(c)(3) are further classified as either public charities or private foundations. We determined you're a public charity under the IRC Section listed at the top of this letter.

If we indicated at the top of this letter that you're required to file Form 990/990-EZ/990-N, our records show you're required to file an annual information return (Form 990 or Form 990-EZ) or electronic notice (Form 990-N, the e-Postcard). If you don't file a required return or notice for three consecutive years, your exempt status will be automatically revoked.

If we indicated at the top of this letter that an addendum applies, the enclosed addendum is an integral part of this letter.

For important information about your responsibilities as a tax-exempt organization, go to www.irs.gov/charities. Enter "4221-PC" in the search bar to view Publication 4221-PC, Compliance Guide for 501(c)(3) Public Charities, which describes your recordkeeping, reporting, and disclosure requirements.

Letter 947

Well, it's official. On Oct 12, 2018, XWARN was recognized as a 501(c)(3) tax-exempt organization by the IRS and is categorized as a public charity under section 509(a)(2). The determination was back-dated to our incorporation as a Domestic Non-Profit Corporation with the State of Ohio on May 17, 2017.

If you haven't heard me say it at the meetings, then you'll notice me and any future Secretary being more religious about record keeping to continue demonstrating the organizations non-profit principles outlined in the Articles of Incorporation.

Club Contacts

- Liz Klinc, KE8FMJ
  President@xwarn.net
- Vice President, Bob Baker, N8ADO
  Vicepresident@xwarn.net
- Secretary, Jason Bowman
  secretary@xwarn.net
- Treasurer, Steve Mackey, N8ILR
  Treasurer@xwarn.net
- Repeater Guru, Jim Simpson, WB8QZZ
  Technical@xwarn.net
- Web Master Josh Long, W8KDL
  webpresence@xwarn.net
- Membership, Phil Verret, KA8ZKR
  membership@xwarn.net
- XWARN Trailer / Public Service,
  Mike Crawford, KC8GLE
  trailer@xwarn.net or
  publicservice@xwarn.net
- Newsletter, Jason Bowman, WG8B
  newsletter@xwarn.net

Minutes: Nov 12, 2018

The normal start of the meeting was delayed to allow the Beavercreek Vault 6936 robotics club to make a pitch for a donation and allow them to leave as it was a school night. The regular meeting began at 1955 with the Pledge of Allegiance.

19 members present.

Motion to accept them October Minutes made by Jim Beller and Richard Weis. Passed unanimously.

Cracker Barrel

Nothing to report

Committee Reports

Membership. No change. 46 members. 37 paid + 9 life members. 4 people have paid for 2019. Need to rebuild honorary member list and list of people who receive the newsletter for free such as city officials.

Treasurer's Report. [The Treasurer's report is available to members upon request.] [unknown - bad transcription] and Rich Weis motioned to accept. Motion passed unanimously.

Public Service. This Saturday Mideast Cross Country Invitational at Indian Riffle Park. 1hr long. Breakfast before (optional). 0830 Breakfast. Race at 11.

Trailer. Not a thing new with the trailer.

Repeater. 2m machine working fine. Noise is back on 440Mhz. Noise is intermittent. Need to get spare power supply from Jim Beller. Best contact for access at Beavercreek Fire Dept is Henry Ruminsky. Jim Beller will get the code. Antenna not going up at Clifton Rd until at least the new year.

Website. Josh not here. Did we use a Yahoo group? Yes, but inactive.

Facebook. Continue to add about 1-2 new "Likes" each week.

Newsletter. Need ideas and help. Otherwise the Newsletter will only contain the President's Message and Minutes starting with our 2020 fiscal year.

Mesh. No much motion there. Some shakeup going on in the organization. Bob needs to get caught up before he can say anything meaningful. Bob's impression has migrated away from a self-forming network to a providing services network. We voted to fund a weather camera, no action taken.

Old Business

Elections of Officers for 2019 fiscal year. 17 ballots were cast. Results were President – Liz Klinc; Vice President – Bob Baker; Secretary – Jason Bowman; Treasurer – Steve Mackey.

We are a tax-exempt according to the IRS back dated to May 2017, our date of incorporation as an Ohio Domestic Non-profit.

(Continued on page 3)

(Continued from page 2)

New Business

Christmas party. We've been going to the same place for a while now. Do we want to change? TJ Chumps? Go some place with a buffet because it will take forever to order.

Presentation

The Beavercreek robotics club, Vault 6936, made a presentation seeking a donation. Last month, XWARN voted to donate $250. Videos and pictures will be added to the Facebook page.

Next meeting Dec 10, 2018 at Golden Corral

Motion to adjourn.

Meeting ended 2030.

Jason Bowman

Secretary

(Continued from page 1)

with that, our volunteer quota. Hams help their communities in good times and bad, through community events, disaster response, and various programs. With that in mind, there is one last event this year. The Resolution Run on Monday, December 31 (5K at Beavercreek High School). Contact Bob Baker at n8ado@arrl.net for more details or to volunteer.

This month is our holiday party in lieu of the regular meeting. Please join us at the Golden Corral Restaurant at 2490 Commons Blvd, Beavercreek, OH 45431 December 10th at 6pm.

I look forward to a great year with all of you!

73,

Elizabeth Klinc, KE8FMJ

XWARN Mission

The mission of the Xenia Weather Amateur Radio Net (XWARN) amateur radio club is to conduct weather spotting nets during severe weather and other communication services for the City Of Xenia and all other Greene County communities.

In this capacity, we are set up to provide communication services as required to the Greene County Ohio Public Service Agencies and other local government entities. The communications services provided to the supported agencies may be for emergency purposes or to simply enhance their communications abilities. On an as needed basis XWARN provides similar services to various government entities of our surrounding counties.

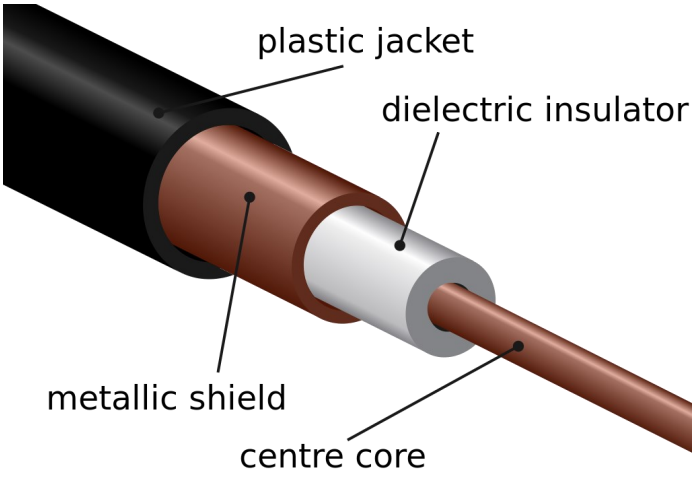
Additionally, XWARN provides communications support to various community organizations in support of marathons, 5K runs, 10K runs, bicycle events, etc. to provide health and safety assistance to the participants and sponsors of said events.

In support of these goals, XWARN operates and maintains amateur radio repeaters and other equipment in Greene County.

Coaxial Cable and Connectors

Back in October, someone posted an article on our Facebook page about the origins of the BNC connector. Jim Simpson noticed it and sent a note to me and the DARA newsletter article saying what a wonderful article and that we should put it in the newsletters. What a wonderful idea since I was the one who posted the article on Facebook! But an article solely on the BNC connector might be kind of boring. So I decided to expand the discussion to other connectors. And what's a connector without a transmission line? So I decided to include some information on coaxial cable, too.

There are various types of transmission lines. Most hams are probably most familiar with coaxial cable a.k.a. coax and secondarily ladder line or twin lead. These two different kinds of transmission lines have very different properties, which greatly impact their applications.



Coax was invented in 1880 by Oliver Heaviside. Coax gets its name from the coaxial design. "Axial" means along an axis or line, and "co" means two or more things along that axis. For coax, these "things" are circular cross section conductors separated by a dielectric material.

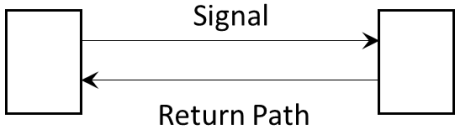
Coax has two distinguishing features from twin lead or ladder line. First, the electromagnetic field is theoretically contained between the two conductors with zero field outside of the coax. Second, coax is an unbalanced transmission line whereas twin lead is balanced.

Most hams involved with HF radio are probably familiar with these terms at least in the sense of needing a balun (balanced-unbalanced) for certain types of transmission line and antenna setups.

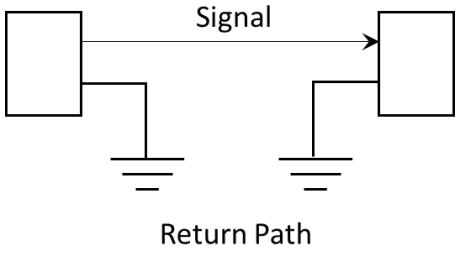
From Wikipedia,

In telecommunications and professional audio, a balanced line or balanced signal pair is a transmission line consisting of two conductors of the same type, each of which have equal impedances along their lengths and equal impedances to ground and to other circuits. The chief advantage of the balanced line format is good rejection of external noise when fed to a differential amplifier. Common forms of balanced line are twin-lead, used for radio frequency signals and twisted pair, used for lower frequencies. They are to be contrasted to unbalanced lines, such as coaxial cable, which is designed to have its return conductor connected to ground, or circuits whose return conductor actually is ground.

Balanced Line



Unbalanced Line



At the end of the day, coax is generally more practical. It can be run over much longer distances than twin lead, and it can be run next to other objects, including metal, and with bends and contortions without largely impacting the performance of the transmission line. Twin lead's advantage is superior noise rejection.

Coax has many properties that need to be considered, some mechanical and some electrical. First the mechanical aspects.

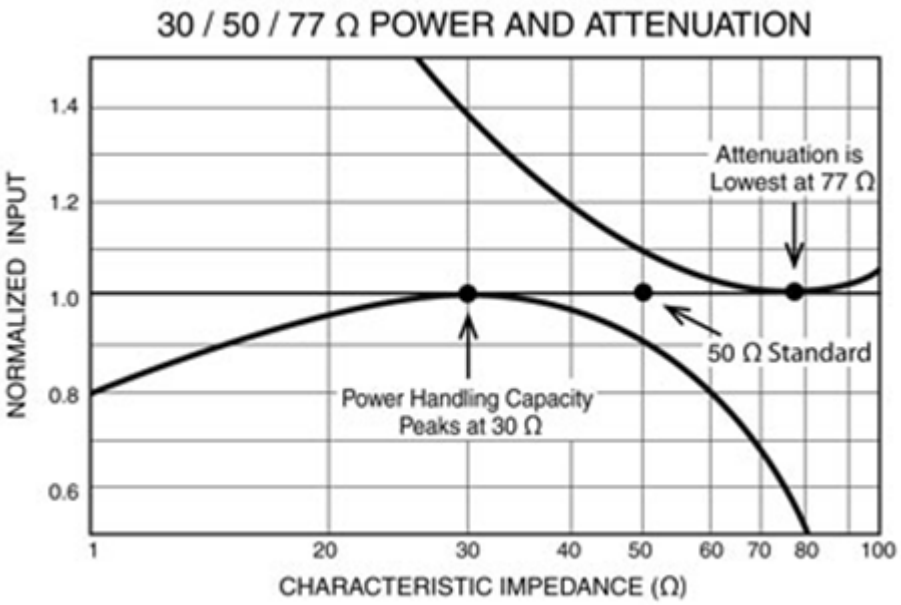
Although primarily an electrical consideration, diameter can be important mechanically because smaller wires are more

(Continued on page 5)

Coaxial Cable and Connectors

(Continued from page 4)

easily damaged in handling and even *in situ*. The materials with which coax is made affect its maximum operating temperature (and SWR stability), chemical resistance, UV resistance, water resistance (primarily a concern for the dielectric), and abrasion characteristics (think direct-burial cable). Coax is also distinguished by whether the core is solid or stranded. If the coax is to be placed in an environment where vibration can occur — think vehicles, airplanes, boats, or even wind — solid core coax will fail relatively rapidly. In those cases, stranded core coax is used. Stranded core coax with high temperature and chemical resistance (RG178, RG393, and RG400) is the only approved coax for certificated aircraft installations, for example.



Coax properties affecting electrical performance include the diameter (RF loss per unit length), coating of the core and coating of the shield, the number and types of shield layers, material used for the dielectric, and the relative geometries of the core, dielectric, and shield, which determine its characteristics impedance.

Probably the most dominant factors in coax RF performance are its diameter and length. Smaller diameter coax has a much higher impedance per unit length than larger diameter coax. Long runs can make even large diameter coax look lossy, while short runs demonstrate similar absolute losses regardless of diameter, which, allows us to use short pieces of RG400 for jumper cables in repeater setups without issue, for example. For a given run, diameter is the dominant parameter affecting performance.

Believe or not, you can actually find some coax using bare copper. The reason to not use bare copper is that it corrodes very easily, and copper corrosion products generally have a much higher impedance than corrosion products of tinned copper, which generally have a much higher impedance than corrosion products of silvered copper. Most coax out there uses tinned copper, especially for the braid, which generally has higher susceptibility to the elements than the core. For maximum corrosion resistance and to provide for higher cut-off frequencies (think skin effect), silvered braid and core are used (RG178, RG393, RG400).

Coax is also specified by the number and type of shields as well as the shield coverage. RG58, for example, uses a single braided shield with relatively low coverage, explaining why it isn't used in aircraft with modern avionics. Double shields provide much higher coverage, sometimes 100%, and find use in applications where signal performance (noise rejection) is critical such as in repeater jumper cables and aircraft avionics. But some double shielded coax designs use a foil inner layer and a braided outer shield. Word has it that foils don't perform as well as braids at lower frequencies, and the surest way to generate intermod/duplex noise in a repeater is to use double shielded coax with a foil inner layer and a braided outer layer, for example LMR400. For repeater jumper cables, the repeater builder website has a good article (http://bit.ly/2BKoxTX) recommending RG400 (or its larger sibling RG393) due to its silvered conductors, double braided shields, and high temperature capabilities (most likely for SWR stability in a repeater cabinet/closet).

I won't go into how coax is designed to achieve certain impedances, but I will point out (http://bit.ly/2KLNl0z) that 75Ohm coax is generally where signal attenuation losses are lowest, 30Ohm is where power losses are lowest, and 50Ohm, being a compromise between the two, is what most radio application use. There is another short article (http://bit.ly/2QxshQE) on the issue. Basically, if you don't need to transmit, you are

(Continued on page 6)

Coaxial Cable and Connectors

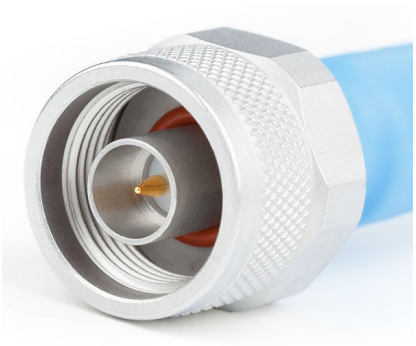
Size Class	Loss (db) /100ft		Single Shield		Double Shield	
	146 MHz	445 Mhz	Solid	Stranded	Solid	Stranded
1/16" 3/32"	10.2	18		RG174 RG178 Belden 8216	RG316 LMR100	
3/16"	5.3	9.5		RG58 LMR-195 Belden 8219	RG142 RG223 LMR200	RG400
1/4"	3	5.3 - 8.2			RG8X LMR240 Belden RF240	LMR240UF
3/8"	2.5	4.5		RG8, RG213	LMR400 Belden 9913	RG214 RG393 LMR400UF
1/2"	1	1.7			LMR600	LMR600UF

probably using 75Ohm cable (think cable and satellite TV). Hobbyists interested in ADS-B in application will also use 75Ohm coax to minimize signal losses and then provide a simple matching circuit when connecting to a 50Ohm receiver such as an RTL-SDR dongle.

Now onto connectors.

The basic function of a connector is to provide a means of mechanically and electrical fastening one transmission line to another while maintaining the shielding and impedance.

Perhaps the most ubiquitous connector in amateur radio is the "UHF" connectors known as SO-239 (female) and PL-59 (male). These connectors were invented in the 1930s and essentially form a shielded banana plug-socket connection. The UHF connector has a non-constant impedance, especially above 100MHz, across the connection primarily caused by the SO-239 jack. Back in the day, frequencies were generally limited to upper HF or lower VHF as they are defined today. So it wasn't until recently that this has become a problem. Impedance mismatches cause high SWR and can cause damage to the front end of the radio. More modern SO-239 connectors have greatly reduced this effect by using a special dielectric. While the UHF connector remains popular in amateur radio and CB communities, other connectors have emerged to better support today's higher frequencies and provide form factors and other characteristics better suited to today's diverse range of applications.

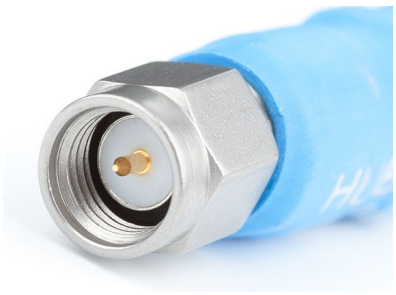


Enter the Type N connector developed in the 1940s. Of similar size to the UHF connector, Type N connectors were originally capable of handling 1GHz but now easily support up to 11GHz. Type N connectors are

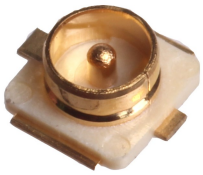
also generally waterproof whereas UHF connectors are not. For what it's worth, while most of my radios have a factory-installed UHF connector, none of my hand-made coax cables do. I either make them with Type N for larger cables or SMA or BNC for smaller cables. I then use adapters to connect to my radios.

The BNC connector (http://bit.ly/2U8nuV9) is what got this article started. Whereas the UHF and Type N connectors are threaded and require many turns to connect and disconnect, the "Bayonet Neill–Concelman" connector is a quarter-turn connector making it quick-disconnect. Being a smaller connector, BNC connectors aren't rated for the kinds of power that UHF and Type N connectors are . That and their quick-disconnect feature makes the BNC connector fairly ubiquitous with test equipment (BNC connectors are often rated for 2000+ mating cycles as opposed to the normal 500), equipment in tight spaces (avionics), and lower power (generally 50W or less) applications where the SMA connector is also widely used.. The BNC connector uses the same center pin design as the Type N connector.

The "Threaded Neill-Concelman" or TNC connector retains the center geometry of the BNC connector but replaces the outer bayonet shell with a threaded shell. I'm not certain where TNC connectors are generally used, but I am aware of one gentleman looking for one a MCM Electronics before they were bought out. The Wikipedia article on the TNC connector stated that WiFi router manufacturers once used the TNC connector for antenna attachment because it was not a ubiquitous connector and relatively safe from consumer modification allowing for gain antennas (and busting FCC regulations). However, the TNC connector became fairly common by the early 2000's, and the FCC gave up. My current Wifi router actually uses reverse polarity SMA connectors, another anti-hacking idea the FCC gave up on. My main interest in the TNC connector is that it is a smaller form factor than the Type N connectors I currently use, and there may be some advantages to using smaller connectors on small go-boxes for space savings on exterior panels.



The second-to-last connector we'll talk about here is the SMA connector. The "Subminiature version A" connector was developed in the 1960s for applications up to 18GHz. Special types of Type N connectors will now support up to 18GHz as well. SMA connectors generally find application in 1+GHz signal applications such as GPS, astronomy, and WiFi routers. Because of the their small form factor, they are also used frequently as the antenna connector on handheld radios. They are also generally found on the smaller coax diameters because it is sometimes difficult and ungainly to attach a UHF or Type N connector to RG-174, for example.



The last series of connectors we will talk about here are the Micro-Miniature Coaxial Connector (MMCX) and Ultra Miniature Coax Connector (UMCC) developed in the 1990s. These connectors are very small form factor connectors suitable for attaching small signal lines to circuit boards in tight spaces, for example. One of their distinguishing characteristics is a snap-lock design that allows the connector to freely pivot without disconnecting thereby providing natural strain relief. If you've ever put together an Elecraft radio kit, the small black coax lines on the inside are terminated with UMCC connectors.

The las bit of discussion on connectors is perhaps the most controversial, and that is whether to solder or crimp. My strong preference, coming from an aviation background, is to crimp. In any environment where vibration will be present,

Coaxial Cables and Connectors

(Continued from page 7)

solder joint will fail. It's not a question of if rather when. Contrary to popular belief, proper crimp tools need not be expensive. You can pick up a decent coax strip tool for under $30, and a decent set of crimpers are maybe double that. Of course, if you do a lot of crimping, then spending more will result in better and more repeatable crimps. Coax strip and crimp tools are also designed to repeatable. The same can't be said for soldering, where there can be a fine line between getting enough solder into the connector and melting the dielectric. My own preference is to crimp, especially for larger coax. But, for some reason, one of my crimp dies will not reliably crimp pins onto RG-174-size center conductors. So I solder those since I'm far enough away from the dielectric.

goTenna Mesh Pro & Mother of All Nodes

About a year ago, I made mention of some small consumer radio units I was playing with, specifically the Beartooth and goTenna mesh products. I don't have an update on any of my experiments because I just haven't had time to do any more experimenting. But there is something newish on the goTenna front, and I wanted to point out an interesting project page on the goTenna website for hacking a goTenna mesh unit to make it into a super node.

What prompted all of this is that I started getting advertisements from goTenna about their relatively new goTenna Pro units. Unlike their normal consumer grade radio units, which kind of look like a large USB stick, output about 1W, and use the 900MHz ISM band (the first gen goTenna units were not mesh and used the 150MHz MURS band), the Pro units are Part 90 devices capable of 5W of power, have a form factor similar to a handheld radio, and have a the ability to attach an external antenna. The advertised frequency range is 145-174 MHz and 445-480MHz. The Pro units also have an price of $1000 per pair!

The Pro units have been heavily marketed alongside an application called ATAK, which stands for Android Tactical Assault Kit. This is actually a military product that I am familiar with, but the non-military version without the military plugins is called TAK, which I think stands for Tactical Awareness Kit. Although non-military, it is not generally available as a consumer application. You have to be a registered business or public safety organization to obtain the software and a license.

Basically, the tablet (or phone) connects to the goTenna Pro (or consumer) device via the native Bluetooth connection. TAK/ATAK is comparable to any of the APRS software applications but on steroids, and the goTenna units provide the RF link much like APRS modes on our amateur radios do. This isn't to denigrate APRS. APRS software and APRS modes certainly have the ability to pass a wider range of information than just position and weather, but APRS certainly isn't used that way.

I've been meaning to experiment with goTenna and software applications beyond the consumer app they provide (goTenna provides an SDK for both the consumer and Pro versions), but I've been way too busy with other projects at home and at work. But the idea I had was to develop a tactical emcomm app that is more freely distributable than TAK. It would even handle APRS feeds.

Another project that has been on a side burner for over a year now is the goTenna Mother of All Nodes (MOAN). There is this ham and experimenter in the Seattle area who was an early goTenna mesh adopter like myself, but he wanted to tear into the unit and put a proper 900MHz antenna on it to increase the range.

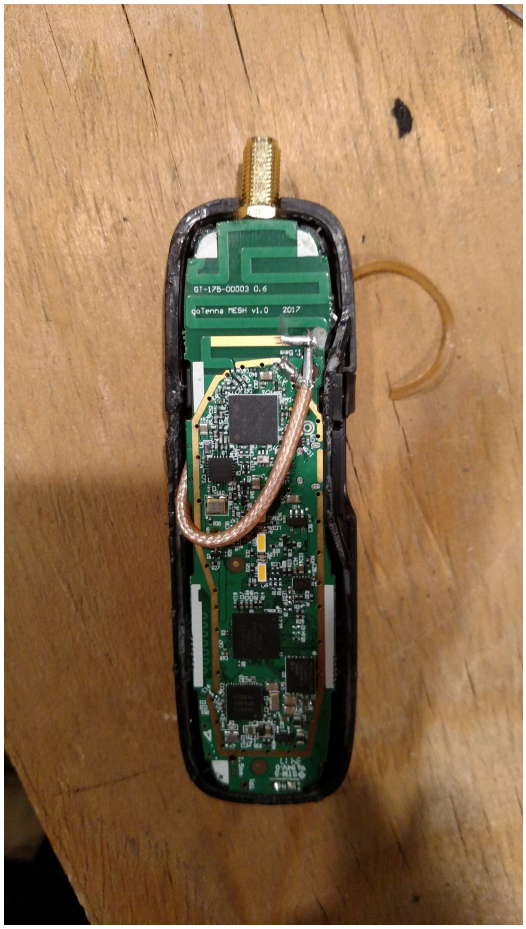
This thread (http://bit.ly/2E91hkK), although largely inactive at this point, describes the motivation and hardware modifications required to do this. It turns out goTenna has made "improvements" to the device that complicate the modification process on newer mesh units. But it's very interesting

reading. They discuss how to bypass a tuning capacitor for the original antenna, scraping away the original antenna traces, and then someone discovered a pad for an MMCX connector on the board and found documentation on the radio chip that showed how to switch output between antenna traces. If you don't care about goTenna, it's still a very cool electronics project.

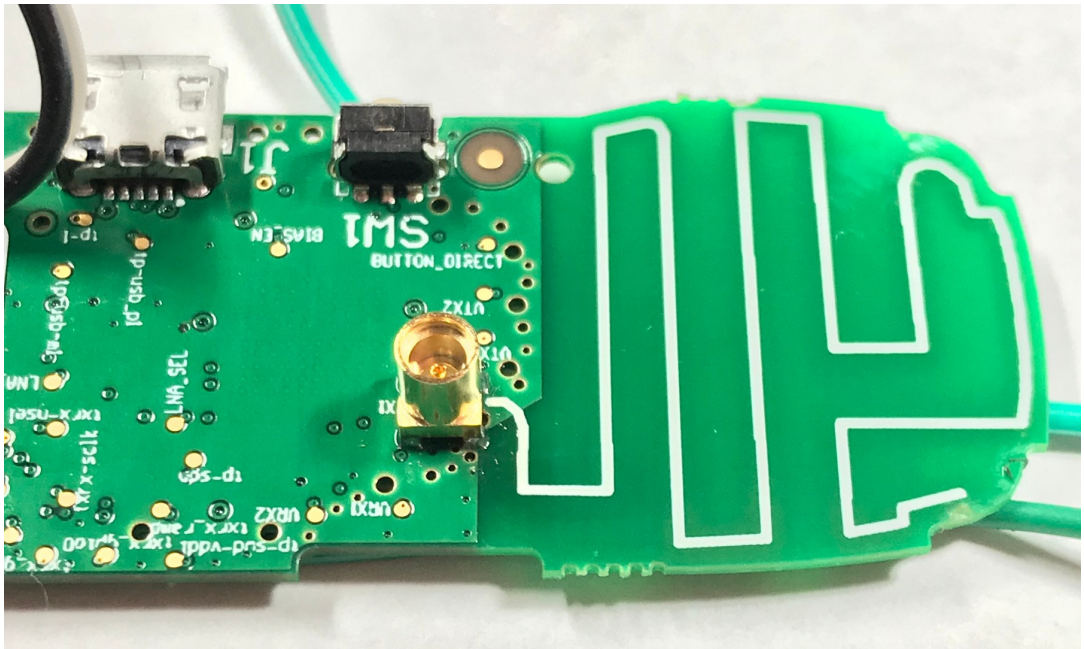
So what about the range of a goTenna MOAN? Well, the original mesh units have a single-hop range of maybe a handful of miles in more open and less cluttered environments and maybe a half mile or less in urban environments. Reports are that the original MOAN modification achieved just over 10nm and subsequent improvements (includes increased elevation of the unit) have pushed that to maybe 30nm. Not bad for a consumer grade device operating on 1W sharing situational awareness (and text messaging) data.

If interested in learning more, the progenitor of this particular MOAN project maintains a Facebook page (http://bit.ly/2Ruw3aM) for building out a goTenna mesh network in the Seattle area.

Finally, if you want to know what someone else really thinks about goTenna, you have to read this (http://bit.ly/2PeIENB). Very strong pro and con opinions of these devices and company as well as some 3rd party applications being developed.



External antenna using the OEM antenna traces



Aftermarket installation of an MMCX connector. This approach requires you to tell the radio chip via two logic gates.to use the other antenna trace.

Club Call: W8XRN

XWARN
P.O. Box 562
Xenia, Ohio 45385

Email: info@xwarn.net
Website: XWARN.NET

«FNAME» «LNAME» - «CALL»
«ADDRESS»
«CITY», «STATE» «ZIP»

Wavelengths

Wavelengths is published monthly by the Xenia Weather Amateur Radio Net. Our meetings are currently held on the 2nd Monday of each month at **7:30 pm** at the Greene Memorial Hospital Auditorium. You can find additional information about our organization at www.xwarn.net . We welcome new and experienced Amateur operators and those interest in becoming an Amateur operator to attend our meetings.