



## President's Message

Per the vote taken at last month's meeting, action is being taken to get XWARN recognized as a tax-exempt organization with the IRS. A big thanks is due to Jason Bowman WG8B for tackling this significant project.

We are entering a busy period for ham support of various events. We do this both as a form of public service and to keep our equipment in order and our operating skills sharp. The remaining events for 2017 can be found in the calendar below. Please consider volunteering for several of these events. Note that the ones marked with "\*" are not confirmed but are very likely to be held as listed. Feel free to contact me to enlist or for more information. If I am not the coordinator, I can forward your request to the proper individual.

I have often heard folks state that they are not interested in helping with these events, but that if a real emergency exists give them a call. The truth is that if a real emergency pops up, the first calls will go to those with demonstrated skills. Perhaps you are as skilled as anyone, but how would anyone know without having heard you in action? *[Editor's Note: Supporting these events regularly also helps you to identify problems with your equipment. I was supporting an event last year, and no one had radio comms with one station. Net*

*(Continued on page 2)*

# Wavelengths

Sep 2017

**Xenia Weather Amateur Radio Net**  
**XWARN (W8XRN)**

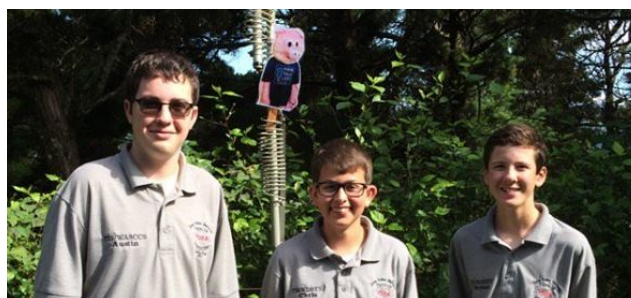
147.1650+ (123.0) (Analog Only)

443.1000+ (123.0) (Analog + System Fusion)

**Meetings:** 2nd Monday, 7:30PM,  
Greene Memorial Hospital ([1141 N Monroe Dr, Xenia, OH](http://www.greenehospital.com))  
Herman Menapace Auditorium

Online Newsletter: <https://sway.com/bzvzvvrTnsPBtGU3>

## Youth DX Adventure



This year's Youth Dx Adventure, which was sponsored in part by a donation made by

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## Club Contacts

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- Vice President, Brett Boggs, NV8I  
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*(Continued from page 1)*

*control did have contact through the "cell phone" net. Turns out they brought two bad batteries for their HT to the event or something like that.]*

It's time to start the nominations process for the November election of club officers. I'm looking for someone to collect a slate of candidates for office. If you would consider taking on this task, drop me a note. Also, if you would consider acting as an officer, let me know.

Bob Baker N8ADO

*Statutory Agent Note: As part of incorporating and seeking tax-exempt status, I politely warned everyone that members must step up to ensure positions are not only filled but filled with capable people willing to do the work. The organization now has real legal obligations and will have even more if we achieve tax-exempt status with the IRS. Now that we are incorporated and are pushing for tax-exempt status, it's time for those who voted "yes" for these things to step up into leadership positions to keep it going.*

Jason WG8B



## Youth DX Adventure

*(Continued from page 1)*

XWARN, was in Costa Rica from Aug 3-8. [Ham Talk Live](https://goo.gl/JpHyFX) (<https://goo.gl/JpHyFX>) recently had an [inter-view](https://goo.gl/Tz25uH) (<https://goo.gl/Tz25uH>) with the [participants](https://goo.gl/SnXwzK) (<https://goo.gl/SnXwzK>), and from the [website](https://goo.gl/qhcdv2) (<https://goo.gl/qhcdv2>):

*"Conditions were bad as everyone knows. However at this site high in the mountains weather prevented operations for almost one entire*

*day. Lightening and radios do not mix! The kids decided among themselves to skip their tourism day and operate. This was the best day of operations and 20M held until late in the night. Total Qs were over 3,100 even with the bad conditions."*

## Calendar of Events

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XWARN now has an [online](https://goo.gl/WkNtTo) (https://goo.gl/WkNtTo) calendar also available in [ICS](https://goo.gl/qMfSPN) (https://goo.gl/qMfSPN) format to use in your favorite calendar application.

- Sep 4. Mon very early. Holiday at Home 5K & Parade Kettering safety and logistics. DARA is final unit in the parade, come ride along... [N2TUJ]
- Sep 9. Sat (assignment time varies with location). Market to Market Relay Relay footrace from Cinci to Dayton. Big event, safety and logistics, track runners [N8ADO]
- Sep 16. Sat All day. Air Force Marathon. Full and half marathon. HUGE event, need everyone able to sign up via AFM website. [KF4KWW]
- Sep 17. Sun 7–5 Bike MS: Dayton Eastwood Metro Park (+Xenia + Corwin & routes between & SAGS) Big bike event [N8ADO]
- Sep 23. Sat 8–11. Zero Prostate Cancer Run/Walk Kettering (Dixie/Dorothy area) 5k run/walk [N8ADO]
- Oct 1. Sun 9–3 Little Miami Triathlon. Ft Ancient State Park area. 18 mile bike course, need lots of help [N8ADO]
- \*Oct 8. Sun 8–3 River Corridor Classic Half Marathon. Riverscape Metro Park Start & along rivers. Big event, needs many eyes [N8ADO]
- Oct 21 Sat 8–3. Dayton District Cross Country Meet. Cedarville Univ XC course. Big meet. Need 10–12 volunteers. Lunch provided [N8ADO]
- Nov 18 Sat 9–11. Mid East Cross Country Regionals. Indian Riffle Park, Kettering. Easy event, need 12–15 volunteers [N8ADO]
- \*Dec 9 Sat. Reindeer Run.
- Dec 31 Sat 1900-2100 (7-9PM). Resolution Run. Beavercreek HS, Dayton-Xenia at Fudge. 5k, VE test session, potluck snacks before. We provide comms and light the course with our headlights—we are never short of volunteers for this one, but don't miss out! [N8ADO]

### 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.

## **Minutes from August 14, 2017**

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President Bob Baker opened the meeting with the Pledge of Allegiance

### **Cracker Barrel**

- Phil Verret has some handouts for the 5013C
- Bob Baker has a few 12v batteries for sale

The Minutes from last month has a name spelling correction. It was Wynn that needed the help with his antenna. Also the DARA picnic was published with the wrong date. Should be August 20th. Dick Bray/Jim Simpson moved to accept with the noted corrections.

**Treasure report:** Jason Bowman/Ken Cornett moved to accept the Treasure's report as read.

### **Committee Reports**

- Public Service. There will not be any support for the Abi Khan this year. Market to Market is still on the calendar for the second weekend in September. And the Air Force Marathon is coming up.
- Trailer. A request was made to purchase mesh equipment for the trailer. Jim Simpson/Ken Cornett moved to spend \$300 for said equipment. Motion passed.
- Repeater. Jim Simpson reports Bret is close to having main repeater finished.
- Membership: Phil Verret reports 58 members.
- Newsletter. Jason always is looking for news or articles to include in newsletter.

**Old Business:** none

### **New Business**

- Ballots were passed out to vote on the change to the bylaws and to seek 501 C3 approval including authorization to pay the \$800 fees. Both items passed unanimously.
- Phil wants to investigate getting a "Square" to use for t-shirt sales. [Secretary's Note: Jason, the Statutory Agent, received an advertisement for Square and suggested we look into establishing an account so that people at Hamvention could use a credit card to pay for T-shirt sales.]
- Ken Cornett has 2 big antennas in his garage that he would like removed - apparently he was just storing them for us.
- Meeting Presentation: Postponed to next month due to length of balloting.

General Notes: Next month's meeting will be September 11 and we will take a few moments to remember the tragedy.

Motion to adjourn. Ed Collins moved to adjourn to Frisches.

Submitted by Karen Baker, Recorder

Approved by Jason Bowman, Secretary (Acting)



## New Governing Documents

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At the August meeting, the club approved changes to our governing documents. The most visible change was to separate the existing Bylaws into [Articles of Incorporation](https://goo.gl/eAjHrL) (<https://goo.gl/eAjHrL>), [Code of Regulations](https://goo.gl/wZSn3v) (<https://goo.gl/wZSn3v>), and an [Operations Manual](https://goo.gl/kVCKHS) (<https://goo.gl/kVCKHS>). There were some substantive updates as well - elimination of absentee ballots and giving the Officers and Executive Council more flexibility in running the corporation without necessarily having to take a membership vote. By and large, you won't notice these changes. The intent was to keep the nature of the club intact while meeting requirements of the State of Ohio and IRS without imposing undo burden on the Statutory Agent and Treasurer. The Constitution Committee that produced these documents believe we have met these objectives.

I thank everyone for their patience and understanding in this endeavor.

Jason, WG8B (ARS) // WQZF899 (GMRS)



*Editor's Note: In the August 2017 newsletter, I discussed some radio science experiments related to the solar eclipse that occurred on August 21. Also, since the last newsletter, Hurricane Harvey hit the Houston area as a Category 4 hurricane and has dumped rain of biblical proportions on the area. Due to a funeral I had to attend in Pittsburgh, I was unable to do any research on whether any of the data from the eclipse science experiments was available yet and how amateur radio is supporting relief efforts in Texas. First reports indicate that most of the communications network, including cell towers and 911, largely survived the hurricane greatly reducing the need for traditional amateur radio participation. Hopefully I can have some updates on these two topics for October's newsletter, but I have some quick notes about Hurricane Harvey at the end.*

## Beyond Amateur Radio

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*Tera TR-505 radio type  
-accepted for Part 95  
MURS/GMRS use*

*Editor's Note: Due to the length of discussion on our proposed governing documents at the August meeting, this [presentation](https://goo.gl/GgSC3h) (https://goo.gl/GgSC3h) was pushed to the September meeting.*

Are you frustrated that more hams don't support public service events because you never have enough support for an event? Are you frustrated with the inability to use encryption on amateur radio frequencies? Are you frustrated that amateur radio technology is lagging behind radios available to the general public? Does your CERT team have a mix of people with and without amateur radio licenses making it difficult to provide intra-team comms?

Having been in amateur radio only a few years now, I am surprised how many amateur radio operators get stuck in the trap of an Amateur Radio Service-only solution to providing radio communications to events and served agencies. At the end of the day, they are just looking for communication support and really don't care how its provided. Yes, ARS has a lot going for it - lots of power, spectrum, and modes and so many repeaters you could walk from repeater antenna to repeater antenna without getting wet in case of a flood. But ARS also has its issues - no encryption, the need to pass tests, and weird rules governing which modes can be used and types of payloads that can be passed. We can't even agree on a digital voice standard, which is preventing digital interoperability and adoption of modern capabilities (Not that digital voice is a panacea. Analog FM still has its benefits as does AM).

Outside of ARS, the FCC provides for other radio services that can give us additional capabilities without many of the restriction of ARS. Under Part 95, there is Family Radio Service (FRS), General Mobile Radio Service (GMRS), Multi-Use Radio Service (MURS), and CB Radio Service (a.k.a "Citizens Band"). The FCC finally published the [update to Part 95](https://goo.gl/Xj8TsH) (https://goo.gl/Xj8TsH) to the federal register on Aug 30, and the changes will take effect on Sep 28. There is also Part 90 a.k.a. the "business band".

Like ARS, each has its positives and negatives. FRS is simplex, does not require a license, but now allows 2W. But FRS is UHF and MURS, also simplex-only and license-free, is 2W at VHF with better propagation and allows for encryption. GMRS allows for repeaters and high power (50W) but no digital voice or encryption and requires a license. Single Side Band (SSB) on CBRS is the worlds best kept secret, but not many people have CB radios and there is a stigma attached to this service. Part 90 allows almost anything but requires relatively expensive licenses and frequency coordination. And then there is the relative free-for-all on the ISM bands.

Going back to the original point, these other radio services, which are either license-by-rule a.k.a. "no license required" or have relatively inexpensive license requirements without needing a test, allow

people not holding an amateur radio license to participate in providing radio support. Furthermore, these services provide capabilities not found in ARS. For amateur radio organizations that provide communications services to events and served agencies, I believe it is time to get out from the ARS-only mindset and expend our horizons. License-by-rule radio services are probably the easiest way to get people interested in radio, and many of the consumer radios that people use every day are more closely associated with Part 95 and whatever is on the ISM bands. So they are more relatable to the average person than amateur radio. In any case, given the positives and negatives of each radio service, taking a layered approach to communications can only be a good thing.

Jason, WG8B (ARS) // WQZF899 (GMRS)

## **Building a Portable GMRS Repeater**

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A couple of years ago, I became involved with Community Emergency Response Team or CERT. I started with Beavercreek CERT but most of my CERT hours have been spent with German Twp CERT on the SW side of Dayton doing woodland search exercises with the Ohio Military Reserve.

I've participated in two of these exercises, and both times we had comms issues. German Twp CERT shows up with Motorola FRS/GMRS bubble pack radios, and the Ohio Military Reserve shows up with Baofeng radios set to FRS/GMRS frequencies. While the Baofeng radios usually don't have an issue because they output 5W, the Motorola radios are only outputting 1-2W. And remember, FRS/GMRS is UHF at 462MHz, and we were in the woods. UHF and woods don't go well together. And, by the way, both groups were likely us-

ing their radios illegally.

So I began to think of how to resolve the persistent comm issues at these exercises. That story is much bigger and goes beyond the scope of this article. For now, I'll just add that using MURS (VHF at 150MHz) handheld radios might actually solve most of the problems without needing a repeater. For now, I'd just like to briefly describe a portable GMRS repeater that I am starting to tinker with. This repeater, by the way, would also be illegal to use on GMRS. More later.

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## GMRS Repeater (continued)

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GMRS is the only Part 95 service that allows repeaters and a relatively large amount of power (up to 50W). The downside is that GMRS is on the UHF band, so woodland propagation can be an issue. GMRS also requires a license (but no test) to the tune of \$65 and only covers close family not other kinds of groups. While you used to be able to get an organizational GMRS license, you can't now. If you really want that, the FCC will tell you to get on Part 90.

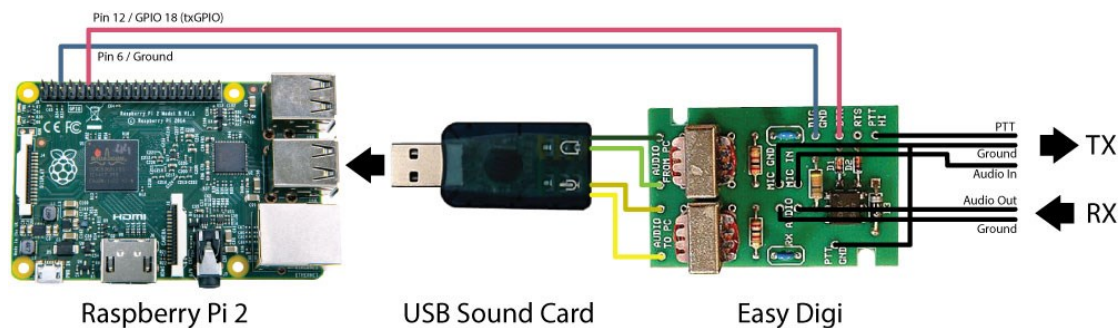
It turns out that some CERT teams do use GMRS and have dedicated GMRS repeaters. But I decided to look into what it would take to build a portable GMRS repeater given the the type of terrain some CERT teams operate in, especially German Twp. But please note that, while a homemade repeater is perfectly legal under the Amateur Radio Service, all GMRS equipment, including repeaters, need to be type-accepted by the FCC for Part 95 GMRS operations. While I can't go into too many details here, and I'd like to do a briefing on this at some time to the club, let me briefly describe my approach to putting a portable GMRS repeater together.

A basic repeater consists of three main components - receiver, transmitter, and a circuit that connects the two, which in many cases is a full blown repeater controller. Many practical repeaters will have other components such as a duplexer, which allows the transmitter and receiver to use the same antenna.

Because the receiver only needs to receive (duh), you really don't need a mobile radio. But mobile radios do generally have better sensitivity and selectivity than handheld radios. The reason to use a handheld radio is NOT price - the quality ones are just as expensive or more expensive than a similarly capable mobile radio. The best reasons to use a handheld radio are much lower size, weight, and power if that's what you're worried about - and I am because this is supposed to be portable!

But the first problem with using a handheld radio is the lack of a Carrier Operated Switch (COS) circuit, which tells the repeater controller to turn the transmitter on. So if you use a handheld radio as

*(Continued on page 10)*



Basic hardware setup for the "Open Repeater" repeater controller



## Hurricane Harvey

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We've already started receiving reports of amateur radio participation in relief efforts in the aftermath of Hurricane Harvey. Unfortunately, this effort is ongoing and I only have scant information at this point. Expect a more complete update for October's Newsletter.

However, the general theme for relief operations is that local and state governments, the federal government, and the communications infrastructure were much better prepared this time around compared to Katrina. The Wall Street Journal has a nice [summary](https://goo.gl/xN1eDt) of these points. This article is paywalled, so if you cannot access it, you can find it [archived](https://goo.gl/LjgfZz).

In terms of what this means for amateur radio, if this level of preparedness keeps up, amateur radio should expect its roll to shift. This has already happened in relief operations for Hurricane Harvey and will continue to occur as [FirstNet](https://goo.gl/zZBZTG) gets built out.

The Wall Street Journal also has a short [video](https://goo.gl/HMv7cb) on why Harvey was so powerful. Harvey moved fast enough to not exhaust its supply of warm water while moving slow enough to dump large amounts of rain over one area. Furthermore, the upper level shear necessary to break up hurricanes and push the remnants away were virtually non-existent. Finally, Houston sits on clay, which is really bad for drainage.

The National Weather Service also published non-operational [visible](https://goo.gl/qfPR9S) images from the new [GOES-16](https://goo.gl/fFKMnL) satellite just before Harvey made landfall. There is also a [combined image](https://goo.gl/mQ1egJ) from its Advanced Baseline Imager, which has two (2) visible channels, four (4) near-infrared channels, and ten (10) infrared channels.

Jason, WG8B (ARS) // WQZF899 (GMRS)



(Continued from page 8)

the receiver, you need to provide COS functionality if not an actual COS circuit.

There are various repeater controllers out there that will run on a RPi. Bret is using one for the XWARN repeaters. I'm using or intend to use a different one from the [Open Repeater Project](https://goo.gl/x674cb) (<https://goo.gl/x674cb>). I believe this particular controller is derived from an older Echolink project. If you peruse the Open Repeater Project website, you'll see that the other required hardware is still a bit of a hack. Although not strictly necessary, optoisolators on the COS and PTT circuits will prevent nuisance opening of the repeater. Audio isolation transformers will prevent hum and ground loops on the audio circuits. And the RPi still needs a USB sound card (\$8 from Amazon. Woohoo!) I'm only just getting around to putting all of this together.



*Kenwood TM-481 with massive heat sinks to meet MIL-STD-810. This radio was never sold in North America, so you have to get lucky to find someone in the US selling it or order from China.*

On the transmitter side, instead of using a hacked (extended transmit mod) amateur radio, I found a Kenwood TM-481 (400-480MHz). This is similar to the TM-281s (144-148MHz), which are spec'd to MIL-STD-810 for ruggedness. They don't even have a cooling fan option instead to make the radio one large heat sink. But the 481 was never sold in North America, so you'll have to get it from China through eBay. I happened to find a seller on eBay in Columbus, OH, of all places.

While it is simple to create a split repeater using the cross-band feature of amateur radios to avoid needing a duplexer, you really need a duplexer for GMRS or find a way to separate the transmitter and receiver (about 400ft horizontal or 15ft vertical) and connect them with a wired line for audio. A typical duplexer for a fixed repeater is a set of cans, which are tuned cavities. While smaller than their VHF equivalents, UHF cans are still large and not very portable. Instead you can opt for a notch duplexer for portable operations since they are much smaller but only if you're not in a co-site environment, i.e. in an area where there are other transmitters nearby. While the cans pass energy on the receive frequency, notch duplexers block energy on the transmit frequency. So notch duplexers are basically useless when there are other transmitters near-

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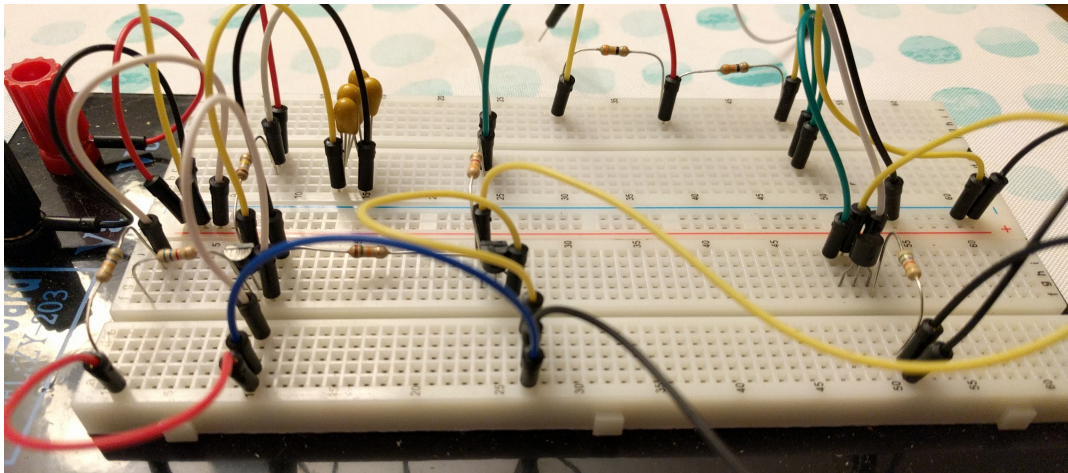
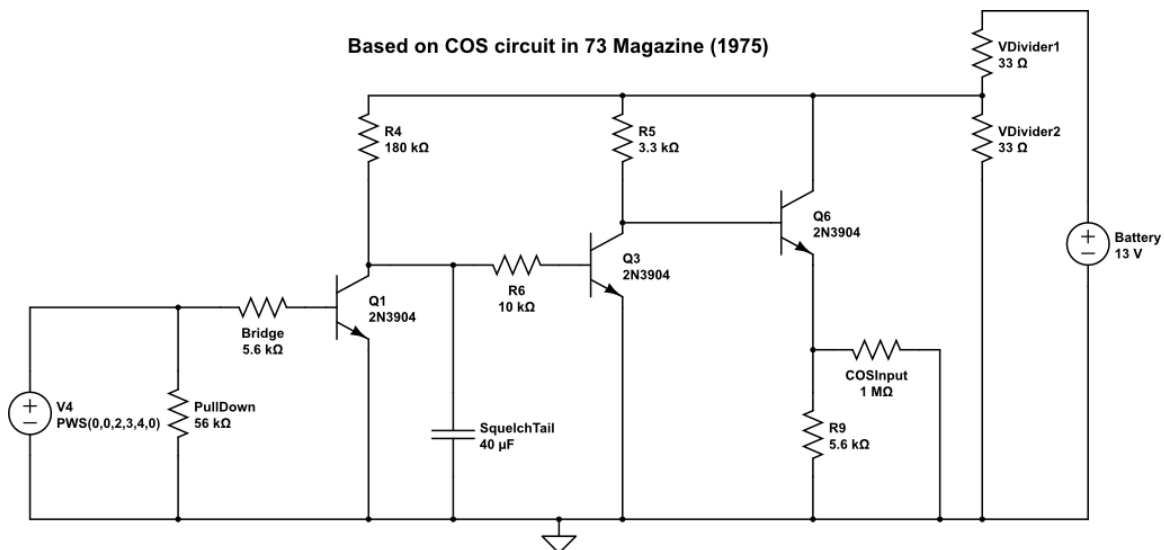
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by than can overwhelm the front end of the receiver. The band-pass cans protect the receiver absolutely. For portable woodland operations, this probably isn't an issue.

Finally, I really haven't thought much about the case to hold all of this or the power supply. It will be similar to the ruggedized radio I showed the club earlier in the year but using a larger case. I really haven't decided on a use case yet or done any testing to determine the needed battery size. Ideally, I'd like the battery in the case. But I suspect for all-day repeater operations, you'd want at least a 50A-hr battery. While a lead acid battery in that size would be too big for a portable case, a LiFe battery in that size may be able to fit but would be very, very expensive. We'll see.

Jason, WG8B (ARS) // WQZF899 (GMRS)

Carrier Operating Switch circuit modified from one found in [73 Magazine, June 1975](https://goo.gl/Yw5cMo) (<https://goo.gl/Yw5cMo>)



Club Call: W8XRN

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«CITY», «STATE» «ZIP»

## **Wavelengths**

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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](http://www.xwarn.net). We welcome new and experienced Amateur operators and those interest in becoming an Amateur operator to attend our meetings.