

Flying Pigs QRP Club – BBQ

Bacon Bits Quarterly

Flying Pigs QRP Club International, W8PIG
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FPQRP [membership](#) is open to all licensed QRP operators who reside within 12,007 nautical miles of Cincinnati, Ohio.



Brian Murrey – KB9BVN (FP #-57)

Editor Emeritus

Spring has sprung, the grass has grown, time to move on, this piggy has flown.

Yup, this is the last BBQ for me, your humble but loveable editor, I hope to hand the reins over to a new editor soon. Let me know if you are interested.

We've been a busy bunch of QRPers since last January. Lots of contests and events have already come and gone in this, the new year. Although I won't be at FDIM or Dayton this year, I will certainly be thinking about it. I look forward to operating Field Day with my fellow Flying Pigs in June...which isn't that far away. We will be operating W8PIG from Ceasar Creek State Park near Dayton Ohio...come one, come all!

Special thanks to all of the contributors this month, things were looking pretty slim there for a bit, but I think overall we have another FB edition of the BBQ. Actually, if you have ever submitted an article to the BBQ, OR the old Bacon Bits newsletter, give yourself a pat on the back and a hearty "attapig" right now.

Our club is now showing over 1300 members, we're a QRP powerhouse on the airwaves when we run the RFTB sprints, we're spreading Flying Pig philosophy all over the place, and we're having a heck of a lot of fun.



JANUARY IN VERMILLION BAY LOUISIANA

Joel Dennison – KE1LA

Thair ah was... sittin in my pirogue with my big truck battery and hybrid, home brew, transmitter and receiver. (used 12v tubes and them new transistor thingies) .. ah had mah kite antenna, a semi inverted V, using two kites for seperation, just a listenin to mah radio and fishing for what we in cajun country call Speckled Trout... (sea trout)

They comes in schools with the tide movement and its not unusual to catch two at a time... nice - three to five pounds each... and recently ah learned that mah kite antenna changes swr or causes the receiver noise to increase whan aver a school of spec's come under it. 'bout as reliable as them fish finding gadgets what they got now-a-days...

Anyhow, ah bee heah waiting for a school of fish to come swimming by with the tide... so ah can drift along with em... and have em for supper... Than this CQ come ovah the radio... how sweet it was, ah grabbed mah j38 cw key and commenced to call this guy back.... EA2.... dis be WN5CVM (MY old

Louisiana call sign) novice licence as u can tell. By the N in the licence number... Well, he come back to me and gives me this great signal report and it was while talking with him that ah first noticed the smoke...lil puffs, not alarmin at the time. Guess ah needed meaux wattage or sumthin for them resistors in mah radio...

'bout this time is when ah seen the change in the swr (reflected power on the transmitttr) and knew for sheaux that ah had a big school of fish under my antenna...so ah puts my key down and started fishin... gotta eat u kneaux. I was pullin in a "double" when ah noticed the smoke, then the flames comin from the radio, what was on the front seat of the pirogue... Ah had it sittin on top of some tin so ah wasn't worried 'bout the pirogue catchin fire... than ah noticed that big truck battery , bubblin, like it was gotten kinda warm... As the fish was bitin ah waited a bit before givin the radio situation meaux thought...

Howevers whan that battery gone to hiss in and blowin fluid out them battery caps... it gots my full attention...and ah puts my fishin pole down and quickly summed up the situation... It was at this time that ah decided to flip the pirogue ovah sending me and everything else into the cold January waters of Vermillion Bay. Man , that water was 'bout as cold as a date ah had once, I'll tell u man...

Quick like ah could, ah righted the pirogue and climbed back in... thankful that ah had avoided injury... That's whan it happened, u kneaux. That battery what was now sittin on the bottom of the bay exploded, and sent up a spray of water... and fish!

Ah cuts loose the kite antenna and paddled ovah and started pickin up fish... gotta eat , u kneaux. One of them fish had my fish bait in its mouth, so ah was able to pull on the string and got my fishin pole back. Oh lucky me!

Can U beat that! Thair ah was... sittin in my pirogue... full of fish an only lost the radio, battery and j3 cw key... man ah bees lucky... and bless mah soul, ah saw mah fishin tackle box just a bobbin in the water.... Wondering if this was mah lucky day.. I put a bare hook on mah fishin line and started dragging it across the bottom of the bay, hoping to snag mah radio...

In a little bit ah hooked the radio in that muddied up water and it felt like a big dead crab... when ah brought it to the pirogue, it had the cw key still connected and the battery cable still had the battery lugs connected... guess the rest of that battery was scattered about...

Took a mile or so of paddlin to find mah kite and all ah come up short with was the truck battery...man what a great day of fishin and hammin ... least, by my standards

Y'ALL BE GOOD NOW, U HEAH
72, OO's Joel KE1LA





How I spent FYBO 2006

By Steve Pituch W2MY/5 – FP #1025

I did the FYBO contest and managed to have a photo taken. It was a blustery 47 degrees F here at the start of the contest on Padre Island in Corpus Christi, TX, which is about 70 of a mile from the Gulf. It did manage to get up to 75 degrees in the afternoon which was not as bad as the 93 degrees we had two days earlier. Only got 23 QSOs but that is good for me so I am happy. 15 meters opened up early but closed early also, and then 20 meters was just not the same

as in the morning. I still had a lot of fun. I used my K2 and a NVIS 40 meter dipole barely visible at the top of the photo, and yes, it is very close to some hyper-saline seawater.

Regards,
Steve, W2MY/5, FP 1025



ADVENTURE RADIO – ADD DIRECTIVITY TO YOUR VERTICAL ANTENNA...or I am a PIG for ERP By Rich KR7W FP nr 577

I get up early. Most mornings I drink my coffee while I listen to the 40 meter CW band (7.000 to 7.030 MHz). Every once in a while I make contact with some rare (rare to me, anyway) DX in the Philippines or South Korea. I know that there is a DX station on the band because Harry K7LAZ, a local CW OP about 7 miles north of my QTH is usually on the air at that time and I can see his big signal with the band scope on my radio. I look for the big blip, tune it in, and copy “de K7LAZ K”.

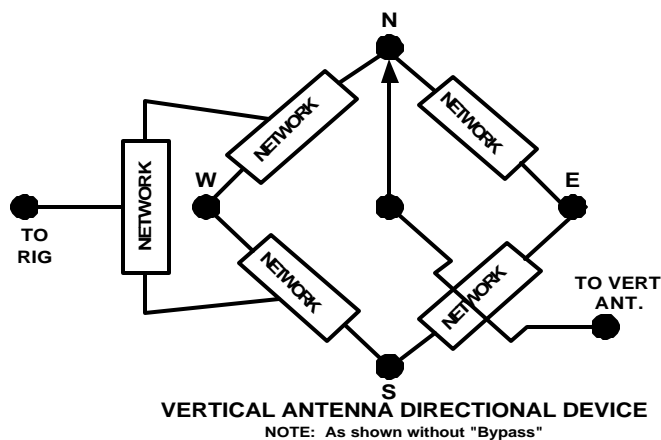
I listen to Harry and copy that he is running 500 watts to a vertical antenna. Harry gets good signal reports, too, like 579 or better. Most of the time... Harry is working DX that I can not hear. I know that vertical antennas have the low angle of radiation that can hear the far away signals bounced off the ionosphere

At the KR7W QTH we do not have much room for antennas... and I want the DX, so I took down the 105 foot inverted-V and put the 33 foot vertical back up. I run 100 watts output and do not get heard well. For me to use 500 watts is out of the question... but I can increase my effective radiated power (ERP) to equal 500 watts or more. What does this have to do with QRP? You might be wondering? Stay tuned.

When I was a kid, just starting in amateur radio, one of the “old guys”, my Elmer, Verle, gave me some Citizen Band magazines that were published in Australia in 1963. The last time I visited my mother in California I found the magazines in the storage in her garage. Anyway, one of the articles I remember reading was about a vertical antenna phasing (**VAP**) device that gave simple single element vertical antenna directivity. Using this gizmo is like having three or four vertical antennas all phased to create a directive pattern to create gain in the desired direction like an AM broadcast station does. (Ask an AM radio station engineer how this works) The Aussie CB article goes on to say that up to 8 dB of gain can be realized in the desired direction.

8 dB ? Let’s do the math: At 3 dB gain, my signal would have an ERP of 200 watts.... 6 dB would be 400 watts ERP, and finally 8 dB equals 635 watts ERP. Yah! More than 500 watts. Now I’ll be heard, for sure.

The schematic of this VAP shows five inductor/networks in a stop sign shaped arrangement, some coupling links, tuning capacitors, a 5 position rotary switch, and the IN and OUT SO-239 connectors. The five positions on the switch are N, S, E, W, and bypass. The bypass position is a handy feature to check signal reports with directivity **IN** vs. directivity **OUT**.



I built the VAP using the tried and true old-timey method of breadboard construction. I wound the network coils using #14 solid copper house wire and 2 inch PVC pipe as the coil forms. The coupling links were made from #14 AWG stranded house wire. Some old thrift store vacuum tube radios provided the four network tuning capacitors.

To test the VAP... I took my QRP equipment down to Owens Beach Park (next to Puget Sound aka salt water). I set up the 16 ft fiberglass crappie pole (with the copper radiator wire) in the sand and used six radials 16 feet long. The antenna was connected to 50 feet of RG8X coax cable (about .6 dB loss). The coax was connected to the breadboard chassis’ VERT ANT of the Vertical Antenna Phaser.

I tuned my FT-817 (5 watts output) up without the VAP on the HF Pack calling frequency of 14.343.5 MHz USB. Then I connected in the VAP in the bypass position. It’s easy to make contact on this frequency because there are lots of HF Pack hams monitoring out in the field or from their home stations hoping to make contact with other HF Packers (see www.hfpack.com).

My SWR was high (2.5 to 1)... but I immediately made contact with a pedestrian mobile ham in Atlanta, GA who was running 20 watts from his backpack radio and fishing pole antenna. I received S-4 to S-5 signal report on my voice peaks with my 5 watts. I switched in the VAP gizmo and selected E on the switch. Now I am being received at S-6 to S-7. Just for funzies... I switch the phaser to the W position. I now am being received at S-2 to S-3. Let’s do the math again: The ARRL handbook claims

that each S unit is equal to approximately 6 dB. Wow! That's more than 6 dB gain in the E direction and an equal loss in the W direction.

I've noticed that HF Packers like this kind of experimenting and some were waiting to take their turn to make contact with me. I heard a ham in San Diego calling me. He was coming in at about S-2 on the 817's S meter when I was switched to the E and W direction. So I switched to the S direction and now I receive him at S-5 to S-6 on his voice peaks. He hears me with the same increase on his S-meter.

Needless to say... I was pretty excited about this gizmo that gave my single element vertical antenna directivity and gain in the desired direction- just like having a three element Yagi and rotator on a tower.

Now all I have to do is figure out how to couple the VAP gizmo with my Icom AH-4 antenna tuner that's connected to my home stations 100 watt rig without causing a high SWR on the feed line between the antenna phaser and the tuner 30 feet away. "Google-ing" comes up with nothing.

Another thing: Back in 1963.... Radios were vacuum tube- and the transmitter's PA used the versatile PI network that would tune just about any kind of wire for an antenna (no stinking 50 ohms needed back then). The original Vertical Antenna Phaser was designed for a radio with PI output. So, I gotta work out the bugs on that issue, too.

A schematic will be forthcoming in a future issue. Also, be sure to look on the www.w7dk.org website, TECHY area, for future developments.

72R5.....de Rich KR7W



The Experimenter

By David White, WN5Y

It is no less true today than in the early days of Amateur Radio that hams have contributed more useful information and inventions to electronic communications than any other group of individuals. Let us review the basics of experimenting so we don't lose our way amongst the unlimited budgets and clout of huge companies trying to dominate the landscape. It is in the practical aspects of innovations and inventions that Amateur Radio has excelled – let's keep our reputation secure.

For those who purchased an early version of the 2006 ARRL Handbook, you also received a reproduction of the 1926 ARRL Handbook, the first edition. Buried deep in the back of the book, an article, "The Experimenter," inspired the author to update the older classic.

With the high cost of commercial equipment, homebrew is the only way to enter ham radio on a strict budget. Homebrewed equipment has many advantages, one of which is that it quickly leads one to become an experimenter.

Immediately starting out as an experimenter is not the usual path. One does tinkering, then experimenting, and then advanced experimenting leads to inventions.

Let's look at these steps: tinkering, experimenting, inventing. Knowing the steps and what is involved with each step can help the Amateur Radio operator improve his radio's performance and develop new skills.

The Tinkerer

Most people enter the experimenter's path by tinkering, especially by working on their antennas. The antenna is the easiest part of a ham radio setup to modify, and the information available is almost limitless. [1]

A Tinkerer is one who wants something to be better in his station. A new antenna similar to the one being used is supposed to work better, a slight mod in the transmitter is supposed to increase power or lower IMD (InterModulation Distortion), or a new mixer in the receiver to help bring in the DX inspires the first step.

A Tinkerer looks into the future. When building his projects, he will order extra parts, scour hamfests for related parts, and develop a system for storing all his newly found parts. The author worked at a beer store and found that beer flats worked very well to store parts. Others use plastic or metal drawer bins, cubby holes, or shelves to store parts. Always think about how your system will work as you accumulate larger quantities and adjust it accordingly. [2]

A discovery process for the Tinkerer is finding his favorite suppliers, both locally and mail order. When visiting a local store, don't go in just to pick up one part. Look around, check prices, and make mental notes of what might be needed in the future.

Collect catalogs of mail order distributors. Look for references in email reflectors and from friends for the best prices, friendly sales people, and lead time on delivery. There is quite a difference in how mail order companies handle their customers. Good mail order companies try to get orders out same-day, charge reasonable postage, and are readily available to answer questions.

The most important thing is to develop a network of friends who also build. Having a project-in-process to talk about draws others of like mind who love to talk about their projects and share similar experiences. It is a fast way to make friends in ham clubs and at hamfests. Other builders can keep you interested in building and provide motivation on challenging projects.

Other than basic Tinkerer equipment and facilities (a DVM/VOM, some clip test leads, soldering iron, a general coverage receiver, and a kitchen table for a few hours of the day) consider building some homebrew test equipment between other projects. Several suggestions are a signal generator, SWR meter, digital frequency counter, antenna analyzer, power supply, and an RF level indicator. [3]

The spirit of Hiram Percy Maxim (HPM) is around to help Tinkerers. A change made to a Tinkerer's equipment always improves the perceived performance of the station. Even though it may turn out that not every change is an improvement, the inspiration and pride of a homebrew station continue to grow.

When your soldering skills and parts knowledge have grown to the point where you have no problem slamming projects together, then it's time to take the next step: adding a notepad and a pen to the table. Formalizing your tinkering brings you to the next step – "Experimenter."

The Experimenter

As stated in the original article in the 1926 Handbook, you are not an experimenter until you write down what you do. The basic steps are writing down the references and schematics of the current experiment, making notes about circuit changes, and documenting the data and the results.

As you become more comfortable with the pen and paper, try to evolve to more formality by writing an introduction stating the problem or experiment, the summary of work of others, conclusions that can be made, and summaries of the work. [4]

This formality will greatly improve the accuracy of your experiments. No longer will you need HPM's spirit to help you. The outline of your experiment, the carefully defined results and comparisons will really tell what is an improvement or a disaster.

Finally, you must write an article to share what you have done with the amateur radio community. Experimenters should get credit for what they have done. The best way is to get it into writing and to a publisher.

A full article is not necessary. Examples are the Flying Pigs' BBQ (No Rules!), Idea Exchange in QRP Quarterly, and Hints and Kinks in QST. Even a letter to the editor can be a short summary of something that has been discovered.

Beyond the important step of getting it in writing comes advancement in your test equipment: an oscilloscope and/or a spectrum analyzer (SA). These two instruments take the electrons from a reading on a meter to a visual representation -- a huge step in analyzing signal characteristics. Also, pictures from an oscilloscope or SA in articles raise the level of confidence in your work.

Oscilloscopes can be found in hamfests at very reasonable prices. A 50 MHz scope, considered obsolete nowadays, works very well for HF work and can be purchased at bargain basement prices. The author was surprised at how quickly circuits can be diagnosed with an oscilloscope, cutting considerable time getting projects in working order. [5]

A spectrum analyzer puts you on an equal basis with the best of experimenters. The importance of a spectrum analyzer can be seen by the number of kits available to the Radio Amateur, undercutting the outrageously high price of commercial spectrum analyzers. [6]

An oscilloscope is very useful in building a spectrum analyzer. The signal levels and purity are very important in building a useful spectrum analyzer. Having confidence that a spectrum analyzer is working properly helps in analyzing difficult projects.

Another way to do useful experimenting is by using a working piece of equipment. An RF/audio level indicator or sound card computer program can be used to make measurements of changes in the equipment. [7] Crystal filter testing, stage gain measurements, and receiver dynamic range measurements can be done with inexpensive equipment.

Be sure to follow the rule of one change at a time to make sure you get relevant and useful results. It is very tempting to try to save time by making more than one change. Simultaneous changes usually don't improve performance and you have to go backward to find out why they didn't work.

Start out with a set of measurements so changes can be compared with your baseline measurements. Write an outline of what you want to do and follow it to the letter. Don't get lost in new inspirations as the equipment shows useful modifications. Write down new ideas and incorporate them in an organized manner.

After a lot of experimenting, ideas will begin to emerge such as “I wonder if I can get this to work?” or “Maybe this combination will work better” or “I wonder if I can simplify this and make it work better?”

Now you are ready for the next step – inventing.

The Inventor

Inventing comes in two different flavors: discovering something completely new and putting old things together in new ways. Both paths are entered upon through working on current or past experiments. An idea comes to mind during a dream, walking down a path in a park, or while daydreaming at work. Short naps are great for relieving frustrations while working on projects and can help in finding new solutions for problems found in the relentless hours of getting a project working.

It is well known to college and graduate math students that difficult equations can be solved during a nap or a good sleep at night. The author has found it also works for solving problems on projects.

Peggy Aycinena, from EDA Weekly, wrote, “...ideas are born out of a creative, supportive, tranquil environment where minds can roam unfettered, free of worry and fear. An environment where there are long periods of silence, where individuals can explore solution spaces during the daylight hours, as well as at 3 AM, and where researchers can share their solutions with other like-minded researchers, whether they arise out of the same scientific or engineering discipline or not.”[8]

An example of trying to discover something new: While working on the problems of third IPs (Intercept Points) in mixers, the author had the idea of inventing a mixer that automatically cancels the third IP. The idea was inspired by the fact that single balanced amplifiers help reduce the 2nd harmonic which is a part of the third IP. Reducing the 2nd harmonic should reduce the signal level of the third IP.

Then an article was discovered on the Internet that implemented a transistor amplifier that canceled the third IP in its output. The idea now is to work with that circuit to see if the same effect will work in a mixer. [9]

The invention of new things is more alive today than ever. WB8RCR's PIC 160 series goes a long way toward demystifying PIC programming for the inventor. [10] Creativity in using PICs is wide open to anyone who takes the time to learn 35 instructions. The amazing PIC projects that have already been developed will surely be followed by more innovative applications.

Receiver designers have barely touched the use of Optical Communications, and there are certainly a lot of ways optical devices can be implemented. The scrounging of NASA and DOD dumpsters, always a ham radio pastime, has led to a lot of innovations in ham radio. And by all means we encourage hams working in software companies to release “student/collegiate/ham” versions that will not limit the tight-budgeted ham radio inventor. [11]

With all our friends in the high-tech environment and the creativity abundant in ham radio, the potential for new inventions is the best ever!

An example of putting old circuits together in new ways is the Electroluminescent Receiver Kit. [12] A superhet receiver is so complicated to build because of all the different circuits that have to be built. The first stage in the thinking was to build a superhet that used the same amplifier all the way through the design.

The first experiments used the 2N5109 post-mixer amplifier of the Progressive Communications Receiver and MMICs (Monolithic Microwave Integrated Circuits), but they added complexity instead of simplifying the receiver. Then Jim Tanner of Tanner Electronics handed over a number of dual-gate MOSFETs. The simplicity and versatility of the MOSFET amplifier/mixer/AGC amp achieved the goal of a universal circuit throughout the receiver.

Further experimenting showed that an LED could diagnose the MOSFET circuit. The idea was expanded to using the same circuit throughout the receiver to be self-diagnosed without the need for expensive test equipment.

A new receiver was invented by putting together old time-proven circuits in a design that was easy to diagnose and used the same basic amplifier/mixer/AGC circuit throughout the entire receiver. The basic idea/invention was successful after a long period of experimenting!

Finding new ways to put together existing circuits can be done by anyone in Amateur Radio. It is no less creative to recombine and simplify than it is to discover something completely new and has the advantage that what you build will not step on someone's patents. Publishers perceive the usefulness of simplifying the old and appreciate articles about this type of inventing.

Conclusion

There are many other experimenters like you out there. The purpose of this article is to bring you together, to suggest things that need doing, to help you solve your problems, and to encourage you to share the results with the Amateur Radio community.

Sharing with the Amateur Radio community is most important. Writing an article is the best way, but if writing is not your way, communicate with others in a club or email reflector and inspire others to experiment. And at every opportunity, encourage and help others to tinker, experiment, and invent.

Your most important duty as a Tinkerer, Experimenter, or Inventor is to share.

Acknowledgements

First of all, I would like to thank all of those who already share their work. The following list of references would be blank without them.

Most importantly, I would like to thank Kathleen McQuilling, KI6AIE, for her suggestions in formulating this article and her excellent editing.

References

[1] Antenna analysis software: http://www.dxzone.com/catalog/Software/Antenna_analysis/
Very complete list of antenna software programs

[2] An excellent post by AL7FS on QRP-L on "Junk Box Suggestions,"
<http://www.kkn.net/archives/html/QRP-L/2002-07/msg01355.html>

Good junk box suppliers: <http://www.kitsandparts.com>
<http://www.vakits.com>
<http://www.danssmallpartsandkits.net>

QRP-L posts on workshop and parts stock:

K7QO: <http://www.kkn.net/archives/html/QRP-L/2001-02/msg02564.html>

KD5NWA: <http://www.kkn.net/archives/html/QRP-L/2005-11/msg00734.html>

W3FPR: <http://www.kkn.net/archives/html/QRP-L/2005-04/msg00968.html>

K3TKS: www.kkn.net/archives/html/QRP-L/2002-01/msg00332.html

Where to get NE602's: <http://www.kkn.net/archives/html/QRP-L/2001-03/msg00149.html>

[3] Phil, K6LS, has put up a great webpage for builders. Includes test equipment, manufacturers, dealers, manual sources, stuff you can build, and more: <http://www.qsl.net/k6ls/test.html>

VE7BPO Homebuilder Site: <http://www.qrp.pops.net/workshop.htm> for more workshop information.

Simple test equipment to build: <http://www.alphalink.com.au/~parkerp/noapr97.htm>

Electronics Workshop: <http://www.davehylands.com/Wood-Working/Electronics-Workbench>

LC Meter and Frequency Counters from AADE: <http://www.aade.com>

Check out these posts on QRP-L for test equipment information:

AI2Q: <http://www.kkn.net/archives/html/QRP-L/2001-12/msg00372.html>

WA6ERB: <http://www.kkn.net/archives/html/QRP-L/1994-02/msg00111.html>

AA5TA: <http://www.kkn.net/archives/html/QRP-L/1998-01/msg00482.html>

G4WIF: <http://www.kkn.net/archives/html/QRP-L/2001-12/msg00103.html>

[4] Writing Simple Reports: <http://umassk12.net/~kberti/reports.html>

Writing Lab Reports and Scientific Papers:

<http://www.mhhe.com/biosci/genbio/maderinquiry/writing.html>

Notes on Scientific Writing: <http://science.widener.edu/svb/essay/writing.pdf>

[5] Oscilloscope tutorial site:

Paul Hardin's Site (NA5N): <http://www.aoc.nrao.edu/~pharden/hobby/Scope1.pdf>

<http://www.aoc.nrao.edu/~pharden/hobby/Scope2.pdf>

[6] Some of the kits available:

Poorman's Spectrum Analyzer: <http://www.science-workshop.com>

Scotty's Spectrum Analyzer: <http://www.zianet.com/erg>

Yahoo group: <http://groups.yahoo.com/group/spectrumanalyzer>

W7ZOI/K7TAU SA: <http://www.bright.net/~kanga/kanga/>

Hans Summers SA: <http://www.hanssummers.com/electronics/equipment/spectrumanalyser/index.htm>

[7] Test equipment using computer software and soundcards:

Links to soundcard programs: <http://members.fortunecity.com/xelbef/soundcard.htm>

http://www.qrparci.org/component/option,com_weblinks/catid,26/Itemid,22

<http://www.packetradio.com/freeware.htm>

Software Spectrum Analyzers: <http://www.bitscope.com>

<http://kl7r.ham-radio.ch/poormansspec.htm>

Also see Chris Trask's reference page, Intermodulation References:

<http://home.earthlink.net/~christrask/intrmod.html>

[8] “Regional Advantage: Part 1- Pitting California's U.C. Berkeley against Belgium's IMEC”, EDA Weekly, March 20 - 24, 2006.

http://www10.edacafe.com/nbc/articles/view_weekly.php?articleid=255073

[9] On Robust Suppression of Third-Order Intermodulation Terms in Small-Signal Bipolar Amplifiers, by Gleb V. Klimovitch

<http://whitepapers.zdnet.co.uk/0,39025945,60020844p-39000477q,00.htm>

[10] AmQRP Club, <http://www.amqrp.org/elmer160/lessons/index.html>
Elmer 160 Series, by John McDonough, WB8RCR

[11] Thanks to Ulrich Rohde, KA2WEU and Dave Newkirk, W9VES for the student/ham version of Ansoft Designer SV, from Ansoft Corporation, an HF simulation program:

<http://www.ansoft.com/ansoftdesignersv>.

See QST, “Simulating Circuits and Systems with Serenade SV,” by David Newkirk, W9VES, Jan 2001 for help.

Thanks to Richard Lehman, KE4RFY, and Jay Craswell, W0VNE, for Circad, a PCB program for which they give a special price to hams. Contact Jay for information. Excellent, fast, can do schematics with the Demo version. <http://www.holophase.com>

I don't know if hams were involved in the following two links, but they are very useful for ham radio projects:

LTSpice/SwitcherCAD III, <http://www.linear.com/company/software.jsp>

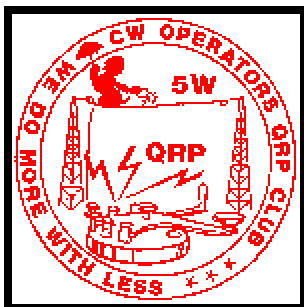
See QEX, “PSpice for the Masses,” Jan/Feb, 2006 for help.

CadStar Express Free PCB program, 300 pins, 50 components,

<http://www.cadstarworld.com/>

Search for PCB programs on <http://www.kkn.net/archives/html/QRP-L> for more suggestions.

[12] <http://www.pan-tex.net/usr/r/receivers> or <http://www.qsl.net/wn5y>



The Great Crystal Swap – A resource for Homebrewers!

When the web was in it's infancy, there used to be a great site called “The Great XTAL Swap Page”, run by Steve, G7NAY. Anyone could list crystals they had surplus to their needs, and peruse the stock of others – a brilliant idea! Obviously, the bigger the junk box, the more likelihood that somebody somewhere has something close to what you need. Unfortunately, that web page has long since hit the bit bucket. The CW QRP Operators Club has elected to carry on this great e-tradition with this web site, even retaining the

original title in tribute to G7NAY.

How it works:

Everyone, everywhere is encouraged to catalogue their spare crystals, and forward a list in the format shown below to VK4TJ for inclusion. In the “Source” column, put your call sign, or some other means of contacting you. It is suggested that you NOT spell your e-mail address out in full, as the spam miners will find it in an instant, and fill your inbox with trash. Better to simply include your call, and

the resolve to keep your details current with QRZ.COM, where e-mail information is embedded in a graphic, beyond the capabilities of most address harvesters.

If someone is interested in a crystal that you have, they will e-mail you, and you can negotiate a swap, donation, or outright sale. You may charge whatever you think is fair, but be realistic – oddball out-of-band crystals are hardly worth the price of the postage, and you will be competing directly with the CW Operators QRP Club, who charge precisely.....nothing! Yep, that is right. In onesy-twoesy type quantities, our crystals are free to members, even overseas. If you aren't already a member, this service, combined with our quarterly journal "Lo-Key" and the "Bit's 'n Kits" parts store, add up to a value proposition you shouldn't even try to resist.

Hoarders: examine your conscience. If you have had parts tucked away for a project for more than 6 months, with no discernable progress towards completion, you're a hoarder. The object of this service is to get more folks building more fresh, original projects that will hopefully grace the pages of Lo-Key magazine, not to enhance your static parts stash. CW Ops QRP reserve the right to refuse service to anyone, member or not, who appears to be abusing this service. Let's face it folks, you know this is a very generous service we offer, from a club with pretty limited resources. You'd like for us to be around for your next crystal request, too, right?

Please collate your crystals into ascending order of FUNDAMENTAL frequency. Everyone knows that overtone crystals can be made to happily resonate on their fundamental frequency, which, unhappily, is seldom a strict third, fifth or seventh of the marked channel frequency. Chances are, if your crystal has a marked frequency of over 20 MHz, it is an overtone. It is suggested that you use a simple Pierce test oscillator and a receiver or frequency counter to find out what you've got. We aren't going to get all anal about series or parallel resonance or particular values of load capacitance, as any good ham worth his salt knows how to get a bit of travel out of a crystal.

In addition to crystals, we're happy to list your crystal filters, clock oscillators and ceramic resonators. As there are no standards for holder designations for these products, be creative with your description.

Don't know your **holder designations**? The more common ones are listed below:

Holder Type	Pin Spacing (in.)	Pin Diameter (in.)	Height (in.)	Width (in.)	Thickness (in.)	Comments
HC-6/U	0.486	0.050	0.78	0.76	0.35	
HC-13/U	0.486	0.050	1.50	0.76	0.35	LIKE HC-6/U ON STEROIDS
HC-18/U	0.192	WIRE	0.53	0.40	0.15	WIRE LEADS
HC-25/U	0.192	0.040	0.53	0.40	0.15	PINS
HC-33/U	0.486	WIRE	0.78	0.76	0.35	HC-6/U WITH WIRE LEADS
FT-243	0.500	0.093	1.10	0.90	0.40	USUALLY BAKELITE

A more comprehensive, illustrated list of holders can be found at:

http://s88932719.onlinehome.us/crystal_holders.htm

Please keep us advised of any crystals you manage to find good homes for, so that we may remove them from the list, and, while you are thinking of it, jump over to www.qrz.com and ensure that your contact details are current. Of course when you become a member of CW Ops QRP Club, make sure we know how to get a hold of you as well.

Happy rock-swapping! 72 de VK4TJ – John



Electroluminescent Receiver Kit **By David White, WN5Y**

Is your operating table boring? Surely not, at least not to other hams. But what about visitors? How about putting the “biggest city in the world” on your table. “What the h*ll is that?!” will be the first thing everyone will say entering your shack. Beaming with pride you will say, “That’s a receiver called Tokyo at Night.”

The “Tokyo at Night” name comes from the light of 21 LEDs on the boards. The purpose of the LEDs is very practical, while infrared switching with IREDS provides a unique approach to isolating conflicting receiver circuits.

The 21 LED lighted Electroluminescent Receiver can sort out a CW pileup on 20M, or 40, and tunes 30 and 17 too. So it's better than a hoary Hammurlund or a near forgotten National. But it does light up the shack like the old timers. And also like the old timer, the ELR owner can fix their rig. They built it and they know which light tests which circuit.

If you want to learn receiver theory or are an experienced builder with an experimenter’s tendency, the Electroluminescent Receiver can be both enlightening and a challenge. This article will explain the reason for the LEDs, how one can learn by building the kit, and an example of one experimenter’s modifications.

Receiver Description

The receiver is a dual dual-conversion, dual dual-image superhet receiver that covers the 40, 30, 20 and 17 meter bands. Two IF’s are dual imaged using a relay switched Tesla VFO [1]. The IF frequencies are 4 MHz and 3.547 MHz. Using a second mixer and oscillator with the filter crystals allows conversion to a 455 kHz second IF strip.

VFO frequencies are 14 MHz, added and subtracted with the 4.000 MHz IF yields the 30 and 17 meter bands; 10.545 MHz subtracted from the 3.547 MHz IF yields 40 meters, and 10.455 MHz added to the 3.547 MHz IF yields 20 meters.

Tokyo at Night

The practicality of the LEDs is diagnosis and indicator functions. The LEDs make the receiver almost 100% self-testing and the indicators let you know what band functions are selected throughout the receiver.

Low-noise dual gate MOSFETs [2] are used in all of the amplifiers and mixers, except in the product detector and audio board. All the drain/source current of the MOSFETs flows through an LED.

Mistakes in the MOSFET circuit show in the brightness of the LED. The LEDs provide a simple, but very useful, built-in oscilloscope. No expensive test equipment is needed to find dead circuits.

Normal current through the LED is 5 mA, which yields a bright LED. If the LED is very bright, dim, or off, looking for missed solder joints, wrong value resistors or a missing part will fix the circuit. To test the MOSFET, the output transformer is pulled while the circuit is powered. The LED should go

off, if not, a bad MOSFET or a short across the transformer soldering pads is the problem. All the amplifiers and mixers are self-diagnosed with this procedure.



The mixer LEDs are visual indicators of oscillator energy. Gate 2 of the mixer MOSFETs is at .05 volt, which turns off the device. When oscillator injection is present (raising the Gate 2 voltage), the LEDs turn on providing a test for oscillator operation and an injection level indicator.

LEDs are used at the bandpass and crystal filters, VFO, and crystal oscillator to show which filter, VFO frequency, or crystal is selected. Super-bright LEDs can be used in these locations to increase the visual impact of the receiver.

The LEDs of two AGC controlled amplifiers flash with the level of the received signal providing a built in S-

Meter. The AGC circuit controls the drain/source current through the Gate 2 bias voltage which is visually reproduced in the LEDs.

With the LEDs, the state of the entire receiver can be monitored with one glance and it provides a beautiful display pleasing to the eyes.

Infrared Switching

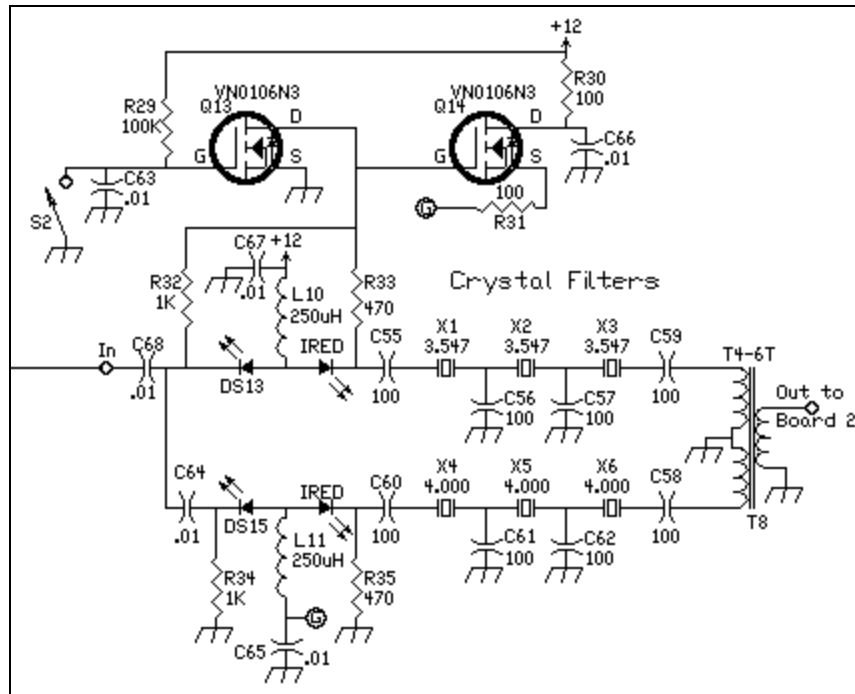
The major innovation of this receiver is the use of Infrared devices to control the switching of the receiver. The advantage of IR switching is the elimination of wires across sections of the receiver.

The circuits are simple on-off controls using high-impedance MESFETs (IRFU220). The gate resistor on the MESFETs set the sensitivity of the photoreceivers. (Schematic1) A 1 meg resistor is used for the photodiodes and a 47K is used for the phototransistors. Higher resistor values increase sensitivity.

The crystal filter is the control center for the IR switching. One IR emitter, a high power IRED [3] at the 4.000 MHz Crystal Filter, switches the Crystal Oscillator with the Crystal Filters so that the output of the Second Mixer is always 455 kHz. A Phototransistor at the Crystal Oscillator, incorporated inside a MESFET switching circuit, receives the IR energy and switches the frequency of the oscillator.

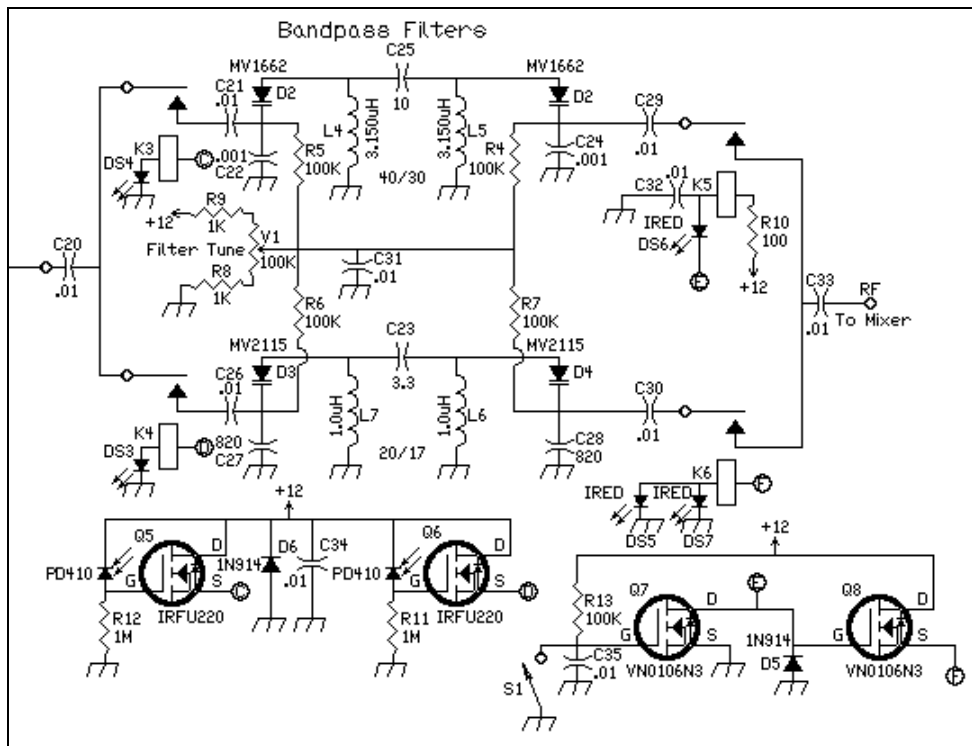
A second IRED at the 3.547 MHz filter controls the VFO frequencies. When the 3.547 MHz filter is on, the IRED turns on a Phototransistor that switches the 10.545 VFO relay for reception of 40 Meters.

The Phototransistor also powers the 10.455 VFO relay, which is switched on by a Photodiode that is activated when the 20 Bandpass filter is selected. An IRED at the bottom of the 20/17 Meter Bandpass filter turns on when the Bandpass switch selects the 20/17 filter. This action turns on the receiver for 20 Meter reception.



Another set of Photodiodes/IREDs is at the input and output of the Bandpass filters. An IRED located at the output of the filter is turned on by a switching circuit. The Photodiode at the input turns on a MESFET that activates the input relay and the indicating LED. The photo devices provide excellent isolation between the input and output of the filters.

The switching circuits at the Bandpass and Crystal filters need only one wire. When ungrounded, the 40/30 Meter Bandpass and 30/17 Crystal filters are on. When grounded, the 20/17 Meter Bandpass and the 20/40 meter Crystal filters are on. Two SPST switches switch the combinations to the four bands of the receiver.



Detailed Documentation

A “Circuit Details” chapter is included with the step-by-step instructions providing schematics and circuit descriptions for every module of the receiver. Over 30 references and 70 pages of circuit details explain the interworking of the receiver. Below is a summary of some of the classic articles that formed the receiver.

The first vision of this receiver came when working on the 9 MHz IF of the Progressive Communications Receiver [4]. Hayward and Lawson used an LED to raise the effective ground of the MOSFET amplifiers to eliminate a negative voltage for AGC. After building a dozen LED MOSFET amplifiers, it was discovered the LED did an excellent job of diagnosing the circuit for mistakes.

The RF amplifier, VFO, bandpass and crystal filters, and audio amplifiers are modern circuits from the late 1980s to the 21st century. Wes Hayward’s (W7ZOI) “Designing and Building Simple Crystal Filters” article in QST [5] was used for the crystal filters. An article in QEX, written by William Sabin (W0IYH) [6], was the basis for the bandpass filters. Both designs aimed for simplicity and economy with high performance.

The pre-audio amplifier was taken from an excellent web page by Mike Martell (N1HFX) [7], a comprehensive study of audio amplifiers using transistors, FETs, and op amps. The VFO is Mark L. Meyer’s (WUOL) design from QEX [1], “Meet the Vackar: The Simple, Stable VFO You’ve Been Looking For”, the best comprehensive article on the Vackar VFO since Jim Fisk’s ‘70s articles in Ham Radio Magazine.

For maximum comprehension in understanding the receiver, read the Circuit Details of each circuit before building it on the printed circuit boards (PCB).

The references are updated as new articles are published that will help in updating or modifying the receiver for improved performance.

Building Aids

The main focus of the design of the PCBs was to make the building process as easy as possible with a well-defined layout that made it easy to follow the flow of the signals through the receiver. Features to help the building/learning process were large boards, easy soldering, a topside silkscreen and a very easy-to-mount VFO capacitor.

The receiver consists of two large 21.6 by 21.6 cm printed circuit boards. The PCBs are single sided with traces 1.3 cm wide. All the soldering pads were enlarged for easy soldering while trying to keep potential soldering bridges to a minimum.

The solder mask was eliminated so solder has plenty of room to flow properly and leaves ground plane for modifications and experimentation. Each board is three sections that clearly define the modules of the receiver.

The topside of the board includes a silkscreen for easy location of parts. Important instructions are silkscreened on the board, so a hurried builder does not miss important points. All the circuits are labeled along with in/out locations so modifications are easy.

The main tuning capacitor is soldered on the bottom side of Board 1, underneath the VFO, for a very sturdy and stable mounting. With four polystyrene capacitors for compensation and solid mounting for the tuning capacitor, the VFO is very stable.

The “block” style layout facilitates learning and makes experimentation easy if the builder finds improved circuits that may enhance the receiver.

Experienced Builders – Add DDS VFO

All the receiver blocks have in/out labels that provide easy modifications for improvements and experiments. This feature was taken advantage of by Duncan Watson in a VFO modification.

Duncan Watson (a New Zealand SWL) did the first adaptation of a DDS VFO with the ELR. His receiver was originally built with several FET VFOs [8] to cover all the SWL bands from 3 MHz to 20 MHz.

Then he ordered the DDS VFO from Mini-kits [9] and mated it to the ELR. The output of the DDS VFO was about +8 dBm, which is just enough to light the first mixer LEDs.

Duncan noted that the results were pretty good. “It is amazing to have continuous coverage with accurate readout (I just set the DDS for coverage from 9.5 to 39 MHz, I’m using a 9 MHz IF and filter in the Electroluminescent, and an offset frequency of –9 MHz for the digital readout). Rock solid stability. Tuning down to 1 Hz – I set it to 100Hz step to tune up and down the bands. Listened to SSB on 3.6 MHz, listened to MW on 981 kHz, tuned up to 17.69 MHz. All fine.... There are a few spurious as I tune across the band, no doubt due to the DDS.” [10]

Duncan set up a web page [11] that shows his completed boxed unit and a schematic with his modification using a THS3202 current-feedback Op Amp for additional output. He suggests using the THS3202 as a buffer amplifier for driving diode ring mixers (50 ohm, +17 dBm) with very few components.



Duncan’s case is very clean, neat design and provides a good design for others to use with the ELR or other homebrew projects.

Other DDS VFOs in the US are available from the AMQRP club (AA0ZZ IQ-VFO Kit) [12], Ham-Pic member projects (AD9850 + PIC16C84) [13], Far Circuits (DDS VFO QEX July 97) [14], NorCal FCC-2 [15], and the Analog Devices Pic “N” Mix Digital Injection System [16]

Other countries also have DDS kits: Italy - AD9951 DDS [17], India - DDS VFO 3.1 by VU3CNS [18], Slovakia - DDS Unit with AD9850/1 by OM3CPH [19], and France – DDS HF Generator [20].

Conclusion

The LEDs have important circuit contributions, but after the receiver is working, also contribute to an exciting visual experience. Because of the visual aspects, children find the radio irresistible

The kit works well in home schooling and science fairs [20], providing an opportunity to introduce ham radio and teach electronics. An Elmer is necessary to help children build the kit. The Elmer can train kids in proper soldering techniques and safety in building electronic projects, providing a starting point for continued interest in electronics and ham radio.

It is time to put a kit together that you can see, easily place parts on, and have the freedom to modify and improve without major hassles. This receiver should never be static. A builder should be able to move from learner, to experimenter, to inventor very easily.

References

[1] The name for the VFO, "Tesla Oscillator", comes from the April 1999 issue of QRP Quarterly, Chris Trask, N7ZWY, "LC Oscillators - A Brief History". The more common name for the VFO is the Vackar VFO. The VFO is an adaptation of the circuit from the July 1997 issue of QEX, "Meet the Vackar: The Simple, Stable VFO You've Been Looking For", by Mark L. Meyer, WU0L.

[2] MPF131, depletion mode dual-gate MOS Field-Effect transistors designed for VHF amplifier and mixer applications.

[3] Individual IREDs are part number LED1067, Page 11 in the BG Micro catalog. T-1 3/4", 1.3V, 1A peak, 100mA continuous, 940nm, 16 degree viewing angle. Web site address: <http://www.bgmicro.com>

[4] Wes Hayward, W7ZOI, and John Lawson, K5IRK, "A Progressive Communications Receiver," QST, November 1981, Page 11.

[5] "Designing and Building Simple Crystal Filters", by Wes Hayward, W7ZOI, July 1987, QST, Page 24

[6] September/October 2000 issue of QEX, "Narrow Band-Pass Filters for HF", by William Sabin. NBPF.ZIP at <http://www.arrl.org/qex-files> has all the information on the filters.

[7] Mike Martell's, N1HFX, web site: <http://www.rason.org/Projects/bipolamp/bipolamp.htm>
The kit pre-audio amplifier was designed from the information here.

[8] Duncan Watson's modifications for SWL reception of the ELR are located at <http://www.pantex.net/usr/r/receivers/dwswl.htm>

[9] Direct Digital Synthesizer Experimenters Kit, at <http://www.minikits.com.au/kits4#eme85>

[10] Email correspondence.

[11] Web site address for Duncan Watson's build of the DDS Experimenter's Kit is <http://www.inthelight.co.nz/electronics/dds.htm>

[12] <http://www.amqrp.org/kits/iqvfo/>

[13] <http://www.njqrp.org/mbrproj/9850dds.html>

[14] <http://www.farcircuits.net/vfo2.htm>

[15] <http://www.norcalqrp.org/fcc2.htm>

[16] http://www.analog.com/UploadedFiles/Application_Notes/60158993555034710870863939AN557.pdf

[17] Italy: <http://www.cqdx.it/i0cg/add9951.html>

[18] India: <http://www.hamradioindia.org/circuits/dds.php>

[19] Slovakia: <http://www.qsl.net/om3cph/om3cph.html>

[20] France: <http://perso.wanadoo.fr/f6itv/p2065001.htm>

[20] QRP Quarterly, Journal of the QRP Amateur Radio Club International, Fall 2003, "The Electroluminescent Receiver Kit – A Year Later", by David White, WN5Y, page 21.

The Electroluminescent Receiver Kit web site is <http://www.pan-tex.net/usr/r/receivers> or <http://www.qsl.net/wn5y>



This little piggie was sent in my Jim Sheldon W0EB, look for Jim and this little guy at FDIM in just over 30 days!

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OUR MISSION:

- 1: Have Fun.
- 2: No rules.
- 3: Have a group of Friendly Hams who enjoy Amateur Radio, and sharing their skills with their fellow Hams.

CLUB EMAIL POLICY:

These are not rules, just common sense.

Club email is not moderated, as we are not a stuffy group. You can send off topic messages about most subjects, but please keep it clean and in good taste. We do like good-natured ribbing and joking with each other, but we will not tolerate flaming other members or spamming the group. We will remove offenders who abuse our open policy. The word eBay is allowed.

CLUB WEB PAGE:

The club web page is our forum for sharing projects, and information about us. You are encouraged to submit your ideas and projects to be added to the web page.

<http://www.fpqrp.com>

OUR MONTHLY CONTEST – RUN FOR THE BACON SPRINT:

This event is held on the 3rd Sunday Night (EDT) of the month. For full details on how to participate, see the website address of: <http://www.fpqrp.com/fpqrprun.html>

PROBLEM REPORTING:

If you are having problems with email, the web pages, or a fellow club member, please report this to either:

Diz, W8DIZ at w8diz@cinci.rr.com
Jim, W0EB at W0EB@cox.net
Rick, WB6JBM at ripowell@mpna.com
Dan, N8IE at n8ie@who.rr.com

