PCARA Update

Volume 22, Issue 4 Peekskill/Cortlandt Amateur Radio Association Inc. April 2021

Together again

PCARA welcomed spring with our first face-to-face membership meeting of the year on March 20, 2021 at the John C. Hart Memorial Library in Shrub Oak, NY, where fifteen attendees braved the chilly temperatures on the front lawn of the library. Items discussed included:

- PCARA's participation in the **Hudson River Relay – Bannerman's Island** Special Event Station sponsored by the Hudson Valley Digital Network (https://hvdn.org/) on June 12, 2021. PCARA would participate from Riverfront Green in Peekskill, NY which would require a rental fee plus refundable deposit paid to the Peekskill Parks and Recreation Department. Further details in Karl N2KZ's column — stay tuned.
- Bob N2CBH brought up the fact that the club has two Motorola UHF DMR repeaters available for use. This triggered a discussion on possible sites where they might be located. This will surely require further research.
- Resumption of PCARA Breakfasts either at Uncle Giuseppe's or Downing Park in Yorktown, NY. Subsequent to the meeting, the next **PCARA Breakfast** has been scheduled for April 3, 2021 at 9:00 a.m. at Downing Park in Yorktown, NY. Mark your calendars!
- Mike W2IG suggested that we should think about additional activities between now and summer, which might include an "on-foot" Foxhunt in a local park rather than mobile. Volunteers wishing to organize the event should contact Malcolm NM9J with any suggestions, plans, and ideas.
- The Monday night Simplex Net continues, investigating various bands and modes. Ideas welcome. The most recent band investigated was 6 meters SSB. The net saw check-ins from Mount Kisco and Brewster, NY!
- Joe WA2MCR is checking with the Lakeland Central School District to see whether we would be able to use the Walter Panas High School grounds for Field Day 2021 activities (June 26-27).

The March 20 meeting took place on the lawn at the John C. Hart Memorial Library in Shrub Oak, NY.

The March meeting was followed by a **PCARA VE Test Session** at 11:00 am which had 3 candidates for testing. The next scheduled **PCARA VE Test Session** is on Saturday April 17, 2021 at 11:00 a.m. at the John C. Hart Memorial Library in Shrub Oak, NY (https://www.yorktownlibrary.org/). Please spread the word. The last few sessions have seen a good turnout, welcoming new Radio Amateurs to the hobby!

The next **PCARA Membership Meeting** will be held on Saturday April 17, 2021 at 9:00 a.m. at the John C. Hart Memorial Library in Shrub Oak, NY. Let's hope that things continue to return to normal. I look forward to seeing each of you there. Until then, stay safe!

- 73 de Greg, KB2CQE

Contents

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Net night

Peekskill/Cortlandt Amateur Radio Association holds a roundtable net on Tuesday evenings at 8:00 p.m. and a directed 'Old Goats' net on Thursday evenings at 8:00 p.m. Both events take place on the 146.67 MHz W2NYW repeater, offset -0.600, PL 156.7 Hz.

Join the roundtable to find out what members have been doing or join the Old Goats with net control Karl N2KZ for news and neighborly information.

March VE Test Session

PCARA's most recent Volunteer Examiner Test Session took place on Saturday March 20th following immediately after the club meeting. Both events were located on the front lawn of the John C. Hart Library in Shrub Oak, NY. The weather began warming from a chilly 35°F at 9:00 a.m. with bright sunshine raising the temperature to 46°F by the official VE start time at 11:00 a.m.

The March 20th V.E. Test Session took place outdoors at the John C. Hart Memorial Library in Shrub Oak.

The Volunteer Examiner team included Team Liaison Mike W2IG, Lou KD2ITZ, Verle W2VJ, Joe W2BCC, Obert KD2HLE, Stan WA2NRV and NM9J.

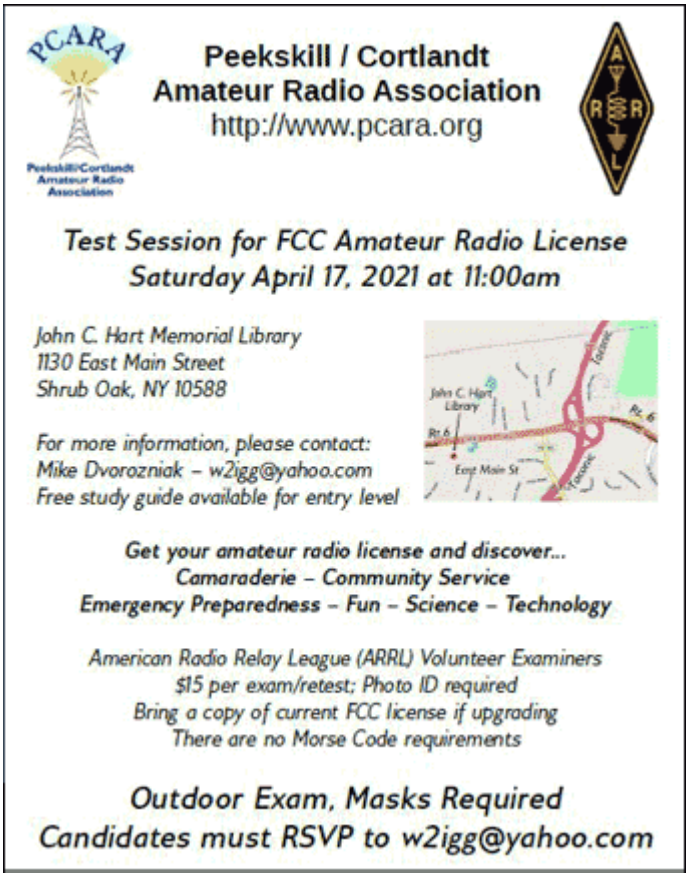
Three candidates arrived to take license examinations, and all three were successful in passing Element 2, the Technician test. Congratulations to Robert Gill of Montrose NY, Donald Schuck (ex-N2VMO) of Jefferson Valley NY and Charles ODonnell of Burnet TX.

Robert and Donald have become members of PCARA – welcome! Thanks to all the Volunteer Examiners who took part in the March 20 Test Session.

Next VE Test Session

PCARA's next VE Test Session has been arranged by Lou KD2ITZ to take place outdoors at the John C. Hart Library on **Saturday April 17th, 2021**, starting at 11:00 a.m. This Test Session follows immediately after the April membership meeting.

All candidates are requested to contact V.E. Team Liaison Michael W2IG before the event using e-mail address w2igg'at'yahoo.com or (914) 488-9196.



Adventures in DXing

- N2KZ

Exciting Anticipation

What a relief! The world is finally emerging from a year-long hibernation. In-person collaboration and creativity is making a fast come-back. People are greeting each other without the aid of a Zoom screen. Every day seems just a little bit better than the last. What has the pandemic taught us and… what will happen next?

Let me tell you about some amazing things to look forward to. **Saturday, June 12th** should be a very interesting day. The Hudson Valley Digital Network is organizing a unique event to remind everyone about the glories of the Hudson River and amateur radio all in one blow! Eight or more amateur radio clubs will be operating at riverside locations all along the shores of the Hudson to attract attention to our magnificent surroundings — and — our great hobby! This will also be the weekend of the ARRL June VHF/UHF Contest so many stations should be on the air. Hopefully they will notice us!

Hudson Valley Digital Network | www.hvdn.org

Listen for 1 x 1 special event call signs – like N2N – individual to each station. See how many you can work! Each installation will have a HF and VHF/UHF presence, so there will be many chances to fill your logbook. A very special QSL certificate will be offered noting each and every station you manage to work that afternoon.

The centerpiece of this event will be The Hudson Valley Digital Network's station on Bannerman's Island. Along with using an unusual call sign, it will be the first-ever illumination of a quite rare location for Islands On The Air (IOTA) collectors — a catch never before available. All stations will be encouraged to try NVIS (Near Vertical Incidence Skywave) antennas to maximize our close range HF signal strength up and down the Hudson River shores.

Pollepel Island, better-known as Bannerman's Island, is located on the Hudson River between Cold Spring and Beacon.

Subject to approval, PCARA will be assembling and operating a station at Riverfront Green Park in Peekskill. We should be on the air between 1:00 p.m. and 5:00 p.m. that afternoon — Saturday, June 12th. Look for our club banner and antennas at the gazebo and say 'hello!' Compliant and correct social distancing will be followed.

Riverfront Green, Peekskill

Other clubs participating will include Kingston's Overlook Mountain Amateur Radio Club, The Orange County Amateur Radio Club, The QSY Society, The Mount Beacon Amateur Radio Club, The United States Military Academy at West Point and Rockland's Crystal Radio Club. It should be quite a party!

Visit http://www.hudsonriverradiorelay.com for progress and details as the event nears. [Site still under construction in late March - *Ed.*] For an introduction to the Islands On The Air project, please see: https://www.iota-world.org/ . Mark your calendars for June 12th and visit us in person or on-the-air!

2021 ARRL Field Day

Two weeks later on **June 26th** and **June 27th**, the annual ARRL Field Day event will be held using a hybrid approach of club and club member stations as we did last year in response to the COVID-19 pandemic. One major change of note: Class D and E (Home-based) stations will be limited this year to 150 watts PEP to achieve closer parity with true in-field operations. For full details, please see: https://contests.arrl.org/ContestRules/Field-Day-Rules.pdf. (PDF file).

I asked our regular PCARA Field Day mainstay, Malcolm NM9J, his thoughts about our strategy for this year: "The Field Day situation is not certain at the moment. There was some discussion at the PCARA monthly membership meeting on Saturday March 20th. Much will depend on Lakeland Central School District and Walter Panas High School. There are Spring sports activities scheduled at Walter Panas for May-June, so the grounds may be open… Joe WA2MCR will be contacting the School District to find out their position."

PCARA had admirable success last year (2020) using a coordinated combination of individual member stations to complete our Field Day entry. If all else fails, and we cannot gather together with safety compliance, we may revert back to our all-independent member station strategy again. Stay tuned to our weekly Tuesday and Thursday night over-the-air nets (PCARA 2m repeater – 146.67 MHz – at 8:00pm) or our club websites at http://www.pcara.org and https://www.facebook.com/pcarahamradio to discover the latest information regarding our Field Day plans. Think about how you would like to participate on Field Day weekend and start planning now! It's only 12 weeks away!

Hello Scotland

Another quite exciting event will occur the weekend of **December 11** and **12,** 2021. Two groups of amateurs are working to re-create a magical moment in time that happened 100 years ago.

Back in February 1921, a test was organized to challenge British experimenters to hear the signals of American amateurs on 200 meters (1500 kc/s.) Unfortunately, only very weak signals could be heard and station call signs could not be discerned. An account in *QST* read: *"We have tested most of the circuits used by the Britishers and find them one and all decidedly inferior to our standard American regenerative circuit... We would bet our new Spring hat that if a good U.S. amateur with such a set and an Armstrong Super could be sent to England, reception of U.S. amateurs would straightaway become commonplace."*

In November 1921, an expert DXer named Paul Godley was sent to Scotland with some of the finest receiving gear known to man to see if he really could receive never-before-heard amateur signals from North America. A special transmitting station was built for this important trial in Greenwich, Connecticut using the call sign **1BCG** to provide a powerful signal to leap across the pond and hopefully make the connection. Miracles happened. Paul heard the signals of 1BCG!

Paul F. Godley, 2XE.

Fast forward 100 years and enthusiastic amateurs will try to make magic again. To recreate the magic of 1921, a new amateur station is being planned to be constructed in Greenwich to once again send signals eastward to Scotland. A group of Scottish DXers will build a similar station to hopefully become a fine correspondent on those sacred days in December.

I am honored to announce that I will participate in Greenwich and also act as a liaison between the sites. I am a proud and active member of the Wigtownshire Amateur Radio Club based in Stranraer, Southwestern Scotland just south of the historic town of Ardrossan where the original 1921 signals were snagged. I will join my two groups of friends together as we attempt to once again make history!

The first shortwave signals from the USA were heard in 1921 at Ardrossan in SW Scotland.

The story of the first Trans-Atlantic trial makes thrilling and fascinating reading. After a few unsuccessful attempts to establish contact, six members of the Radio Club of America built a magnificent state-of-the-art station in Greenwich at the home of member Minton Cronkhite, 1BCG. Many weeks of work and developmental trials were spent before they were ready to go. The operating wavelength would be approximately 230 meters (1304 kc/s.) At the time, this was considered a very high frequency indeed!

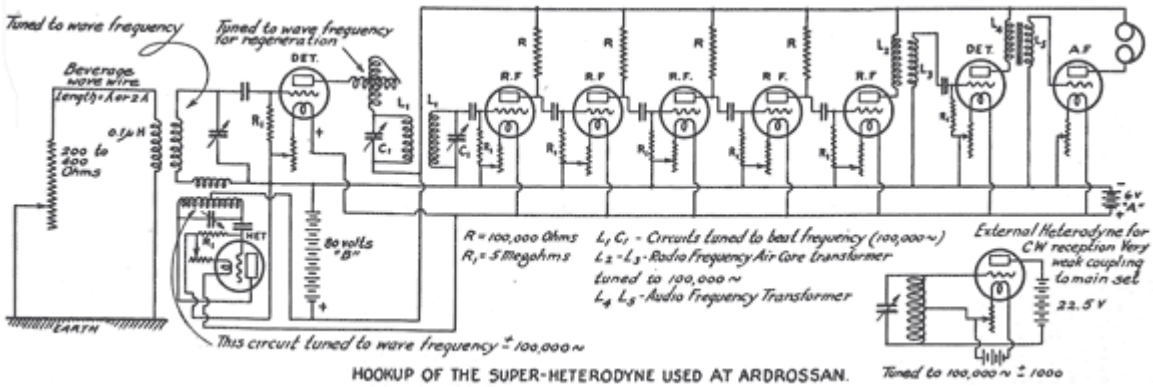
In 1921, most domestic radio broadcasting was done on the very original standard frequency of 360 meters (833 kc/s.) In 1922, a second frequency was added for entertainment programming: 400 meters (748 kc/s.) At the same time, 360 meters became dedicated for mostly talk: news, sports and information. Late in 1922, yet a third frequency was added – 422 meters (710 kc/s) originally populated locally by WBZ, Springfield, Massachusetts before Boston became WBZ's official city of residency.

The world above 200 meters (1500 kc/s) was considered untenable and not practical. Only amateurs had experimented with transmitting above this frequency. Daily commercial radio traffic was being exchanged between 1000 meters and 600 meters (300 and 500 kc/s.) Operating at 160 meters (1874 kc/s) and above was almost considered a form of encryption! Most common receivers could not reach this far.

Stars Aligned

During 1921 and 1922, a whole new world opened for radio communication fueled by recent advances in receiver and tube design. What amateurs were about to discover changed the world forevermore. Radio technology was rapidly maturing and amateur radio experiments led the way!

One pivotal person during this advancement was Edwin Howard Armstrong, the inventor of the super-re-



HOOKUP OF THE SUPER-HETERODYNE USED AT ARDROSSAN.

Superheterodyne receiver used for Transatlantic Test by Paul Godley 2XE at Ardrossan, Scotland. Intermediate Frequency (IF) was 100 kHz. Local oscillator is at lower left, BFO at lower right.

generative receiver design. This was a major breakthrough for radio receiver sensitivity and reliability. Mr. Armstrong was a one-man miracle worker always creating the very latest answers to every request the world of radio could bring.

Just in time for the 1BCG – Scotland test, Mr. Armstrong's latest innovation took radio design to yet another new level — the super-heterodyne receiver. Featuring simply superb sensitivity, selectivity and filtering, "super-hets" remain a standard design even to this day. Just a few years later, in 1928, Mr. Armstrong would begin development of yet another miracle – the advent of FM radio.

When DXer Paul Godley boarded ship bound for Scotland, he indeed had an Armstrong 'Paragon' superhet receiver along with him. Upon arrival in Ardrossan, Paul strung out a long wire Beverage antenna on bearing to Greenwich, Connecticut. Almost immediately, magic occurred! Before the antenna was physically connected, the super-het receiver was already picking up station 'FL' in Paris.

Connecting the antenna directly to the rig proved problematic. The signals the long wire delivered swamped the receiver's front end! It immediately became obvious that the Beverage antenna needed to be inductively coupled to the receiver.

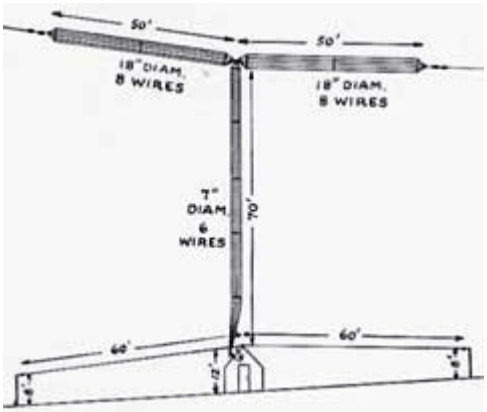
More than 30 American CW stations were heard during the tests along with nine more stations running spark. Needless to say, the powerful signal of 1BCG on 230 meters (1303 kc/s) was clearly heard, with many messages received, and a new world of operating on HF had begun.

Many, many stations around the world also heard 1BCG's 990 watt signal on 230 meters (1303 kc/s.) The signals from Greenwich were copied in nearly every state in the U.S.A, in Scotland, England, Holland, Puerto Rico and British Columbia.

Checking operator D.E. Pearson of Marconi Corporation witnessed the reception and was greatly impressed with the results: "Strong! Reliable! Thrilling!" With super-heterodyne receivers and newly improved transmitter tubes and techniques, amateur radio was set for an enormous surge of activity in the coming years. Indeed, HF had been discovered and experienced. The exciting possibilities were endless. So many stations took to the air!

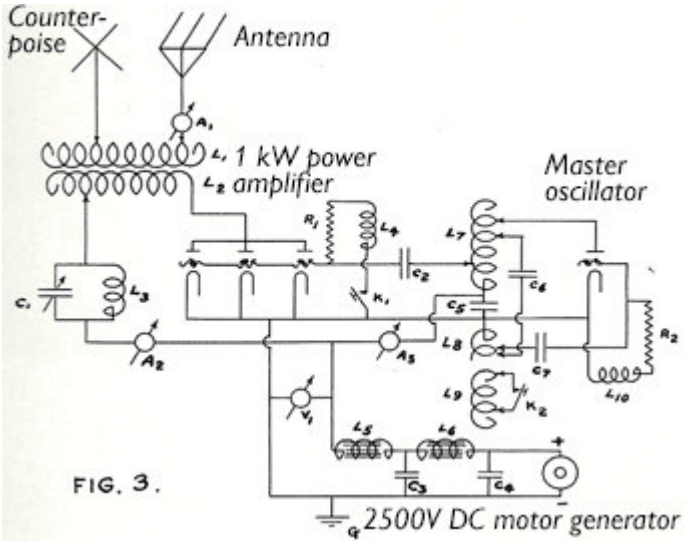
Bob, N2CBH, lent us this amazing connection between Paul Godley and WLNA Peekskill: *"The author of the QST article, Mr. Paul Godley, ran a broadcast consulting business for many years and the Godley Company was the FCC consultant of record for WLNA when I started working there in 1979. They designed the array and filed the license application for the original project. Shortly after that Paul Godley Jr. sold the business to Sherman-Beverage. They were promptly fired when it occurred to us that these guys didn't know what they were doing. The project was finished by Mr. Raymond Rohrer another character but he* DID *know what he was doing. Godley filed for the original WLNA license in 1947 to be licensed in 1948. They also filed for the original WLNA FM now WHUD construction permit ten years later in 1958. They also filed for the power upgrade for the "New" WHUD construction permit in 1972. All of that documentation still existed in a file drawer when I worked there. So there is a link albeit a weak one to good old WLNA and these early transatlantic experimental transmissions!"*

Bob also offered fascinating insight into the 1BCG installation in Greenwich, as well: *"It shows how much these guys learned in a very short period of time. This is basically a top loaded vertical with a conventional ground system referred to as the counterpoise. If you look at the dimensions of the system it was most likely around 50 ohms at 160 meters. The little transmitter they built is also very modern for that era. I imagine it pulled a bit when the oscillator was keyed because that oscillator tube along with the three parallel final tubes were all*



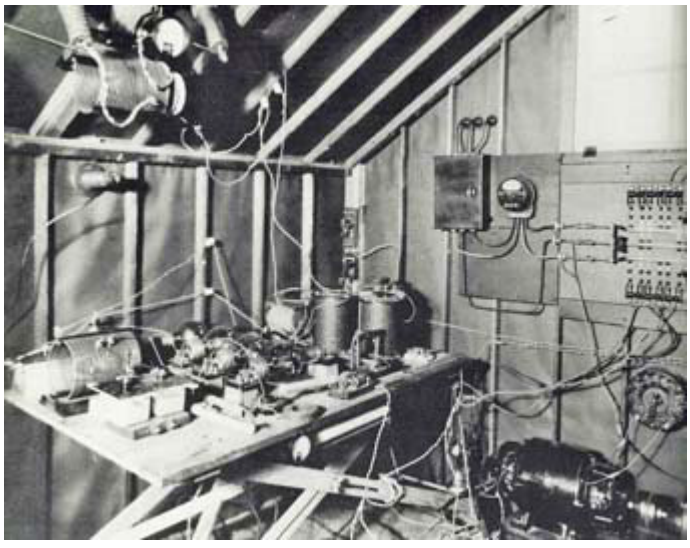
Antenna for Transatlantic Test station 1BCG, Greenwich was suspended between two masts — 108 ft and 75 ft high. Station hut is below the counterpoise.

running from the same power supply which was perhaps a motor/generator but who knows they may have had some active off the line voltage power supply for this. In the beginning they made antennas like this thinking that the radiating element was only the horizontal portion. They quickly realized that the vertical section thought to be a wire transmission line is actually radiating most of the signal. This is a really modern design of the coupling network too. They transformed down from the high plate impedance of the three finals down to the 40 ohms or so with that transformer in the schematic".



Schematic of the 1kW CW transmitter at 1BCG for 1921 Transatlantic Test. RCA UV-204 triode in master oscillator drives three UV-204s in parallel in power amplifier.

"They fed the wire directly from the transformer. Coax would be around the corner from Bell Labs but not widely for RF use until after WWII! So the idea of 50 or so ohms being the optimal impedance for transmission line wasn't even considered I bet. Is there a plan to duplicate the transmitter for this? It wouldn't be that hard to do. A 6CA7 driving a triple set of 807's would do the trick! Oh yeah, an OA2 regulator for the 6CA7."

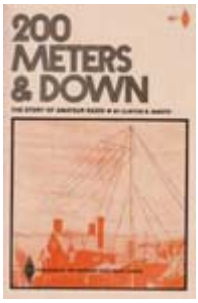


Transmitting equipment in the hut at 1BCG, Greenwich. Antenna coupling transformer is visible top left, four tubes lie horizontal on table and motor generator is bottom right.

Original crew at 1BCG Greenwich. L to R: John Grinan NJ2PZ, Ernest Amy 2VK, Edwin H. Armstrong, George E. Burghard 2SS, Walker Inman 2BGM (seated) and Minton Cronkhite 1BCG.

Here is an invitation to re-live all of the great adventure and thrills that ensued in 1921… The 1BCG test is very well documented! Start your journey at the site of Clark Burghard, N1BCG: http://www.internetwork.com/radio/n1bcg/. Here you will find many stories, links and descriptions of the original 1BCG station and all of the subsequent tributes. Make a point to look at the PowerPoint presentation listed under 'Resources' at the bottom of his home page!

ARRL members can search the *QST* archive (http://www.arrl.org/arrl-periodicals-archive-search) for two articles in the February 1922 edition: "*Official Report on the Second Transatlantic Tests*" and "*Station 1BCG*." The moment-by-moment descriptions from Scotland brings those nights back to life. It is a terrific read!



The ARRL also offers a comprehensive history of the early days of amateur radio in Clinton B. DeSoto's classic "*200 Meters & Down*." This highly recommended book carefully chronicles the discovery of many aspects of amateur radio we now take for granted. Read all about the first days of radio and how it developed into a complex working system. I found even more documentation searching the Web. Reading these accounts is great fun. Take a look! I look forward to once again getting our signals across the pond from Greenwich to Ardrossan.

Please add Tuesday and Thursday nights to your agenda! Join us at 8:00 pm on the PCARA repeater for our weekly chat fests: 146.67 MHz -600 offset and please use a 156.7 PL. Until next month, happy trails de N2KZ "The Old Goat."

Being heard at a WSPR

– N2MUZ

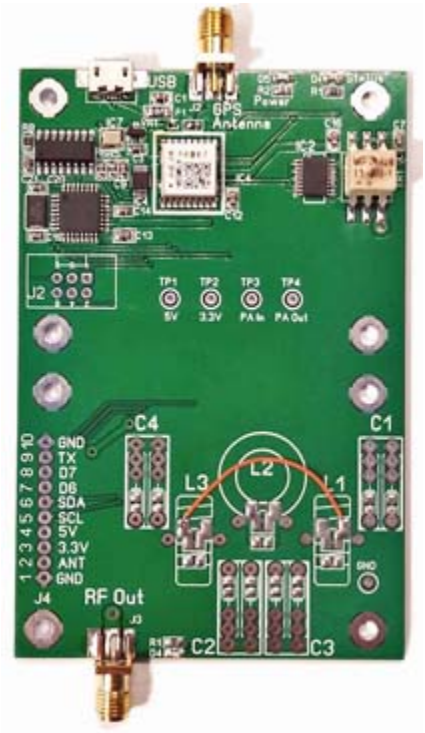
I've long been a hold-out against digital modes, feeling that computers and radios should never meet. Computers consume me during my day job and were not something that I wanted to tinker with in my off-hours.

But then when propagation was at an ebb, I tried FT8 at 5-25 watts on my Icom IC-7300 with PC attached running WSJT-X and was amazed where I could be heard. Hmm, alright, this is kind of interesting!

It was also a good way to see how my antennas were performing, checking PSKReporter (https://www.pskreporter.info/) every hour or so to see where I was being heard, even if no one was coming back to my CQ. Tinkering with and comparing antennas was my thing, so the digital mode is very interesting from that perspective.

Though I still wasn't crazy that FT8 required my HF rig and PC, getting them to play nicely together, then me overseeing them as they operated.

So, one evening while looking around for amateur radio-related YouTube videos, I came across a review of a completely integrated product made by **ZachTek** called the **LP1**, which got great reviews and was very reasonably priced at $69.00. See https://www.zachtek.com/



ZachTek LP1 standalone WSPR transmitter with built-in GPS.

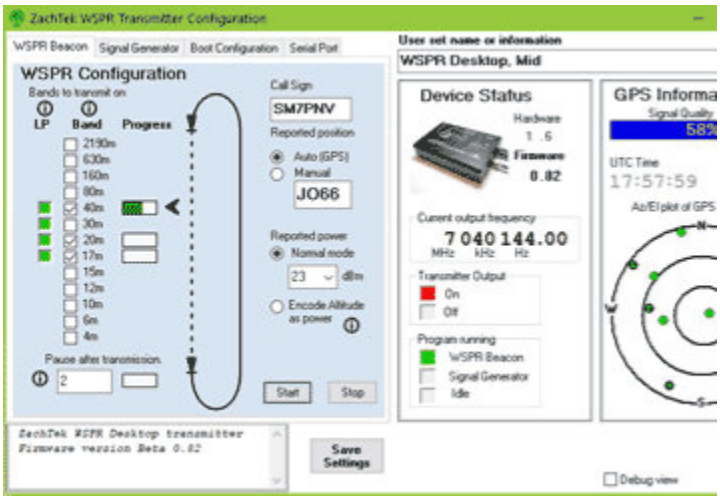
The LP1 is a programmable standalone beacon for **WSPR** frequencies that can operate between 2190 meters and 4 meters. The entire unit is smaller than an index card, contains a GPS receiver, Arduino processor, 300mW multiband transmitter, all powered by a cell phone charger. I was intrigued so ordered one.

Well, it worked right out of the box! I programmed it with my PC via USB connection and was on the air shortly. Just type in your call sign, the GPS fills out your grid, and you're on the air.

Then once programmed, you can disconnect the PC and power the LP1 with a cell phone charger, while it continues to transmit, looping between programmed frequencies. No operator intervention required. Very cool!

What's a WSPR?

WSPR – or **W**eak **S**ignal **P**ropagation **R**eporter — is one of the protocols included within Joe Taylor K1JT's WSJT-X software suite. See: https://www.physics.princeton.edu/pulsar/k1jt/index.html. WSPR is designed to test propagation paths using low power FSK transmissions that encode each station's **call sign**, 4-digit Maidenhead **grid locator** and **output power** in dBm (decibels referenced to 1 milliwatt). Receiving stations can send their reception reports to Internet site http://wsprnet.org where the data is analyzed and mapped. Popular frequencies for WSPR transmission include: 3.5941, 7.0401, 10.1402, 14.0971, 18.1061, 21.0961, 24.9261 and 28.1261 MHz. WSPR transmissions last 110.6 seconds and begin one second into an even UTC minute: i.e. at hh:00:01, hh:02:01. This needs the local clock to be set accurately to within ±1 second of UTC. A GPS receiver can provide accurate clock and location settings. *-Ed.*

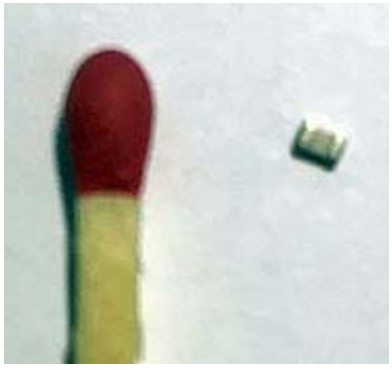


Sample ZachTek WSPR transmitter configuration screen.

Though I could hear and decode my WSPR transmissions at my QTH using WSJT-X, no one else was hearing me?

Hmm. Turns out my fat-fingered installation of a low pass filter SMD component created a short, so the signal wasn't making it all the way to the antenna.

Mike N2HTT kindly stopped by with his oscilloscope and identified how far



Surface mount capacitor, part of the LP1's low pass filter, shown against a match-head. [N2MUZ pic].

the RF was making it through the circuit, which along with advice from Zachtek enabled me to zero in on the problem. Once the short was resolved, I ventured onto WSPR for the first time, and was amazed at how well 300mW can propagate!

The N2MUZ ZachTek LP1 with low-pass filter components installed upper right. [N2MUZ pic.]

The LP1 is a very well-engineered, nicely packaged and effective little "rig". The map below shows results from 4 hours of operating on 20 meters into a Cushcraft R5 vertical.

WSPRnet map shows reception of 14 MHz, 300 milliwatt WSPR transmissions from N2MUZ.

And Harry SM7PNV, who owns Zachtek and hand-builds the products, provides an exceptional level of customer support, responsive to all inquiries. I asked him several questions, and he was always prompt with answers and assistance.

I look forward to taking this 2 oz pocket-size LP1 hiking with me this summer, putting up an antenna in the trees (the LP1 doesn't care about poor SWR), then using my cell phone battery bank as power source, let the LP1 do the work of churning out N2MUZ signals for a few minutes, so I can then take a look at the WSPRnet map (https://wsprnet.org) to see how well the antenna is performing. I can hardly wait!

- Todd N2MUZ

How's my audio?

An Op-Ed by NE2Q

There is obviously a large group of SSB operators that are obsessed with how their audio sounds. I'm sure you've heard the guys with $1,000s spent on audio-shaping equipment.

How about the nets where they are incessantly comparing audio, recording each other and playing back, endlessly comparing their settings on various audio-shaping boxes.?

Many of these stations have very stilted and unnatural sounding signals, from hyper-boosted bass to explosive audio presence.

Apache Labs ANAN-7000DLE Mk II Silver 100W HF - 6 meter SDR transceiver.

I hear many ANAN and FLEX users with artificially enhanced and digitally created bass, making them sound like they are humming while talking through a kazoo. They think they sound great!

Clarity of transmission should be paramount.

- Jay NE2Q.

FlexRadio FLEX-6600M HF - 6 meter 100 W SDR transceiver.

The perfect portable antenna? – K2WPM

A linked dipole with jumpers and more

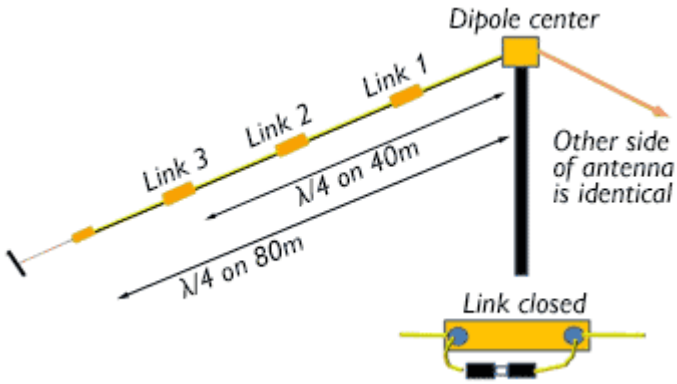
Those of us who operate portable spend many hours studying the question: what is the perfect portable antenna for HF? Your author has built and used a myriad of antennas in his quest for this holy grail of ham radio. The latest attempt is a **linked dipole** — but not your father's linked dipole.

- A linked dipole with an additional segment for 80 meter CW.
- A linked dipole that resonates on 20 meters, 40 meters and 75 as well as 80 meters.
- An antenna that can be used as an inverted-V, or as a horizontal dipole.

I think I'm in love.

The linked dipole antenna

The linked dipole is not a new antenna, and is widely discussed in ham circles. SOTABeams™ sells a commercial QRP model. See: https://www.sotabeams.co.uk/linked-dipoles/ .



Linked dipole for four different HF bands in inverted-V configuration. Links are closed or opened to change bands. [After SOTABeams]

The standard concept is simple. Build a dipole antenna with segments of wire inserted — or not inserted — to operate on multiple bands. To simplify set-up, I put each set of elements into labeled baggies. Everything fits nicely into a single shopping bag — except the Big Shot antenna launcher.

80 m elements for linked dipole stored in baggie.[K2WPM pics]

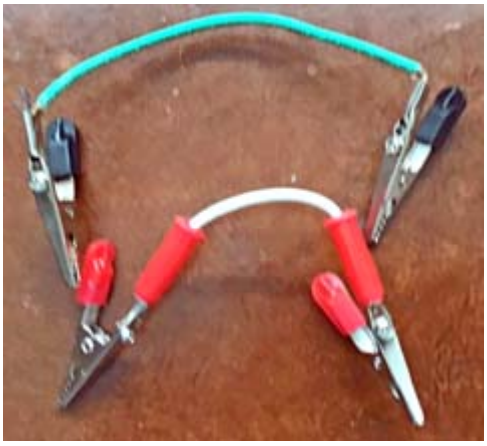
Coaxial cable, wire elements in baggies, cord and analyzer all fit into a shopping bag. Poles below are part of the Notch Big Shot antenna launcher. [K2WPM pic.]
*[Sling shots are legal in NY State provided they do **not** have a wrist brace. Check local regulations and use with caution. -Ed.]*

The center insulator is connected first to the wire segments for the highest frequency band. In my case I operate on 20, 40 and 75/80 meters. Therefore, I start by constructing a 20 meter dipole.

The 20 meter wire segments both end in an insulator, and the 40 meter segments are then added to each side of the dipole, but insulated from it. If one wants to operate 20 meters, leave the insulator as is. If one wants to operate on 40 meters, just connect the two segments of wire on each side.

Two different plastic insulators with wire segments terminated in alligator clips for use in a linked dipole. The insulator at left is from SOTABeams.

I use a pair of alligator clips and a short length of wire as a jumper. This way, a single antenna can be used to cover two bands. If cut carefully, the antenna's VSWR will be very low on each band, and the antenna quite efficient.



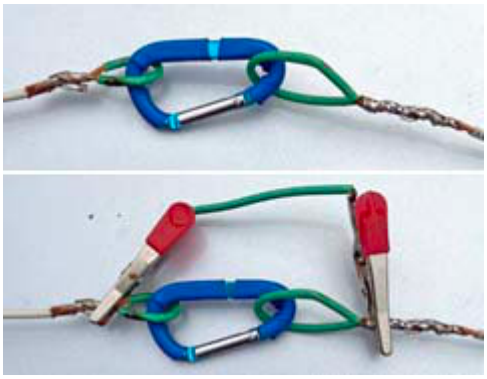
Alligator clip and short wire jumpers.

Alongside is a picture of how I terminated each wire segment and the insulator that I used — a plastic carabiner.

Original termination of each wire segment by snapping wire loop into a carabiner.

During editing of this article NM9J noted that one of the carabiners used by the author appeared to be aluminum, and therefore likely conductive. The carabiner is supposed to serve as an insulator.

Testing carabiners with a multimeter, and scratching off the paint, the author confirmed the carabiners were in fact conductive and therefore should not be used as they are. (It's surprising that I had used this antenna for months without experiencing SWR aberrations). I modified the carabiners by insulating them with shrink wrap tubing. I also modified the wire segment ends to change them from bare wire loops to insulated wire loops. (See pictures alongside.) I also ordered plastic carabiners.



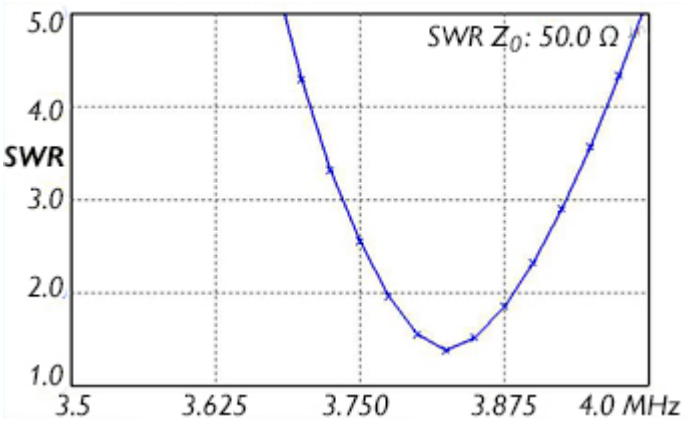
Carabiners insulated with shrink-wrap tubing. At top, insulated wire loops are snapped into an insulated carabiner. Below, wire segments are linked using a wire jumper with alligator clips. [K2WPM pics.]

But what about the 75/80 meter band?

One can cut a dipole easily to cover the entirety of the 20 meter phone and CW bands; similarly for 40 meters. But anyone who has ever constructed an antenna for 75 / 80 meters knows it's not possible to cut a wire antenna to length that will have an SWR less than 3:1 across the entire range of 3.5 to 4.0 MHz. Indeed, we generally refer to the lower-frequency CW section as being 80 meters, and the upper-frequency phone section as being 75 meters — acknowledging the two segments are much like two separate bands.

I have never seen a linked dipole address this quandary; usually the response is simply to cut the 75/80 meter segment for the desired frequency, i.e. CW or phone. But read on — my innovation addresses that problem.

The next wire segment will be cut for 75 meters. This segment fastens to the insulator at the end of the 40 meter wire segment. When connected to the 40 meter segment with a jumper, the antenna will be resonant in the 75 meter phone band.



Limited bandwidth of an 80 meter wire dipole. A horizontal dipole cut for a frequency of 3.800 MHz has a bandwidth of 195 kHz for SWR < 3.0:1. [Prediction by MMANA-GAL software.]

My innovation is the addition of *another* five foot segment — after and insulated from the 75 meter segment — designed to make the antenna resonant in the 80 meter CW band. Once again, when one wants to operate 75 meter phone, the last segment remains unconnected; to go to the CW segment, simply attach another jumper.

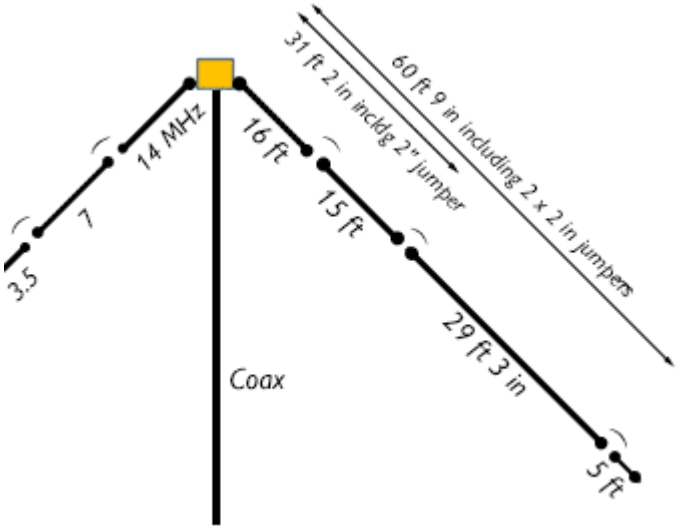


Diagram of one side of the linked inverted-V dipole as constructed by K2WPM. 5 ft segment at right is connected to extend the 75 meter / 3.85 MHz dipole for use in the 80 meter / 3.550 MHz CW section of the band. [Note – dimensions shown may require adjustment depending on wire gauge, wire insulation, height etc.]

Rapid changes in the field

Sounds complex and difficult. How can this be the perfect field antenna? In practice — several POTA activations — it takes about five minutes to lower an inverted-V antenna, insert jumpers to go to another band and re-raise the antenna.

Computed and measured lengths

The table below presents my calculations for a wire antenna on 20, 40, 75 and 80 meters, phone and CW segments. Calculated lengths are from standard formulas, using *468/f* for the horizontal dipole length, reduced by 5% for the 90° inverted-V configuration.

"Actual" lengths are after trimming and using an antenna analyzer to minimize SWR. The inverted-V is 35 feet at apex with 90 degree center angle, and the ends are about 10 feet above ground — a typical portable set up.

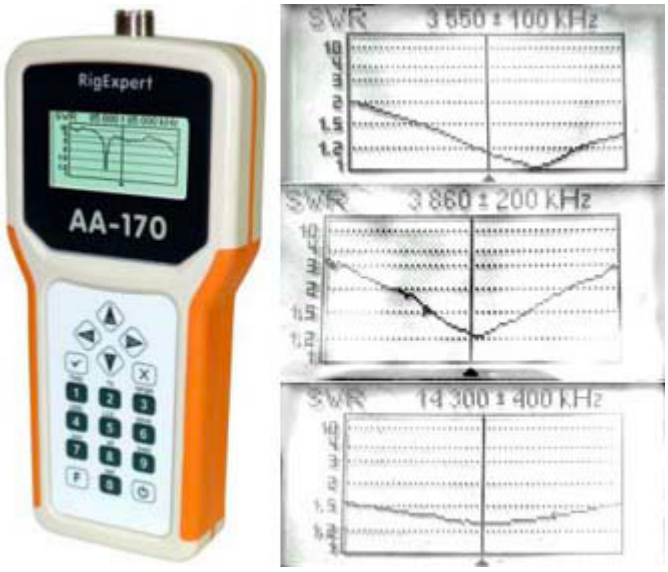
Freq MHz	Inverted-V calc'd length	Actual dipole length	B/W SWR
3.550 CW	127.8 ft	132' 6"	>200 kHz under 2.0:1
3.850 SSB	117.9 ft	121' 6"	3.6 - 4.0 MHz under 3.0:1
7.025 CW	64.6 ft	N/A	
7.250 SSB	62.6 ft	62' 4".	entire band under 2.0:1
14.050 CW	32.3 ft	N/A	
14.300 SSB	32.7 ft	32'	entire band under 1.5:1

Individual segment lengths

20 meters	16 feet
40 meters	15 feet
75 meters	29 feet 3 inches
80 meters	5 feet

Antenna analyzer results.

The graphs shown below were obtained using the RigExpert AA-170 0.1-170 MHz antenna analyzer.



Graphs for K2WPM's inverted-V linked dipole antenna. Top, SWR is less than 2.0:1 across 200 kHz on 80 meters; middle, less than 3.0:1 for a 400 kHz bandwidth on 75 meters. Below, less than 1.5:1 over the whole 20 meter band.

Results during 2021 Virginia QSO Party

After my primary antenna — a 111 foot doublet fed with ladder line — suffered a catastrophic ladder line break, I pulled out the trusty linked dipole. In the span of a few hours, I made over 250 contacts on Sunday March 21, mostly 75 meter phone, with dozens saying "loudest signal on the band", "booming S9 plus 20" and similar unsolicited reports. 100 watts on battery power and a wire antenna hung from tree limbs gave a pretty good accounting. I think I'll keep this antenna.

- 73 de David K2WPM

PCARA hats

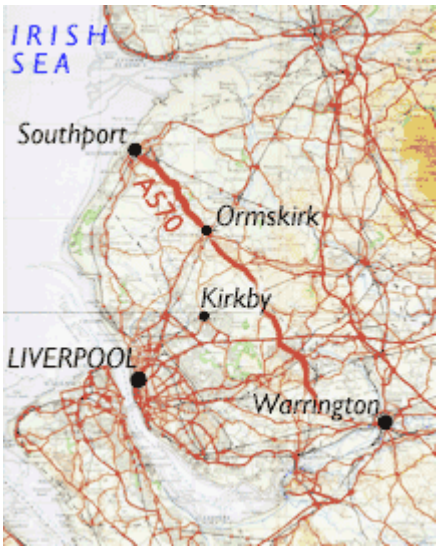
First orders for PCARA baseball caps were collected at the March 20th membership meeting. The cap style is "Otto" with an adjustable hook-and-loop band at the back. Cap colors available are Black, Navy Blue, Royal Blue, Forest Green and Red. The cap has the PCARA tower logo embroidered on the front, club name plus U.S. Flag on opposite sides and — optionally — your embroidered call sign on the back.

Our first order was placed with Peekskill supplier RescueStuff on March 23rd and caps should be available shortly. If you are interested in a hat for yourself, additional orders will be taken at upcoming PCARA meetings.

Seventies sideband

Back to Southport

Let's take a trip back to the early 1970s when I was still living in Southport in northwest England. For a while I had been commuting to a manufacturing site in Warrington. Then, after a change of employer, I was commuting to a different location on Kirkby Industrial Estate, in the outer suburbs of Liverpool. For both journeys, the route began down the A570 road between Southport and Ormskirk.



I had been commuting to Warrington in a Hillman Imp, a small rear-engined Chrysler vehicle which was equipped with various transceivers. Just before the move to Kirkby, I upgraded from the Imp to a Volkswagen Beetle 1200 which also had a rear-engine, now air-cooled. The Beetle was equipped with 4 meter AM, 2 meter FM and 2 meter SSB. The collection of antennas made the vehicle look more like a porcupine than a beetle, with whips mounted everywhere.

Rear-engined Hillman Imp.

VW Beetle 1200 had antennas for (left) 4 meter AM, 2 meter FM (roof center) and 2 meter SSB (right).

Two meter SSB

A typical mobile installation of the early 1970s would be crystal-controlled on the 145.00 MHz calling channel with 5 watts AM output from a QQV03/10 vacuum tube. Repeaters would not arrive in the northwest until 1976, so range was limited. Meanwhile, fixed station VHF DXing was being revolutionized by adoption of **single sideband** in place of amplitude modulation.

Time to transvert

The usual arrangement for fixed station VHF operation on SSB employed a commercial HF transceiver connected to an external **transverter**, or transmitting converter. For example, a low-level SSB signal from the HF transceiver on 29.410 MHz mixed with a steady carrier on 116.000 MHz would produce output on the sum frequency, 145.410 MHz, the (then) SSB center frequency. Reception used the reverse process.

Adoption of SSB in place of crystal-controlled AM had several advantages. In addition to the 9dB+ improvement in signal-to-noise ratio for SSB versus AM, the ability to net exactly on to a calling station's frequency led to much faster QSOs than in the days of crystal-controlled AM.

I built several transverters for use with my HF equipment. They were based on vacuum tube technology with a QQV06/40A (5894) in the 100 watt PEP output stage. While fine for home station use, they were hardly practical for mobile operation.

Liner lift-off

In 1973, a new SSB transceiver arrived from Japan. *RadCom* advertisements from amateur dealer Lowe Electronics showed the "Nihon Dengyo Co. Ltd. SSB 144 MHz Mobile Transceiver Liner 2". This solid-state transceiver produced 10 watts PEP SSB output

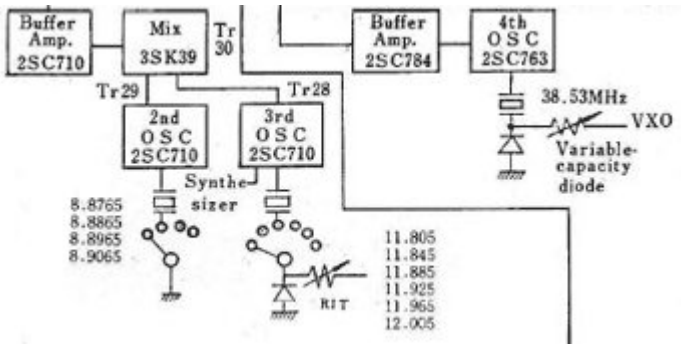
over a frequency range of 240 kHz. The UK version covered 145.25 – 145.49 MHz, in order to include the 145.41 'calling channel'. The International Amateur Radio Union Region 1 Band Plan subsequently moved the 2 meter SSB calling frequency to 144.200 MHz, and this could be accommodated on the Liner 2 with a crystal change and a new Perspex frequency dial.

Belcom Liner 2 144 MHz SSB transceiver. Push buttons at left for Power, NB *and* Test. *Channel selector center. Controls at right for* VXO, Volume, RIT, and Squelch.

On the North American side of the Atlantic, the same radio was known as the KLM "Echo II". Technology had not advanced far enough to include a digital frequency synthesizer within the small case. Instead, frequency control was achieved with a crystal-mixing synthesizer.

Simple synthesizer

The switched crystal-synthesizer consisted of a second oscillator with a choice of four crystals in the 8.8 – 8.9 MHz range spaced 10 kHz apart and a third oscillator with a choice of six crystals in the 11.8-12.0 MHz range spaced 40 kHz apart. Turning the 24-way rotary channel switch selected in turn one of four crystals for the 8 MHz oscillator and one of six crystals for the 11 MHz oscillator. The sum frequency produced by the mixer ran from 20.7015 to 20.9315 MHz, a range of 230 kHz in 10 kHz steps.



Detail from Liner 2 block diagram showing the switched crystal synthesizer (2nd, 3rd OSC) and 4th crystal oscillator.

The SSB signal was generated at a carrier frequency of 7.7985 MHz using a 7.800 MHz crystal filter to select upper sideband. The resulting SSB signal was then mixed with output from the crystal-synthesizer to produce a signal in the range: 28.50 – 28.73 MHz. This was passed to a second mixer, where it was added to the fourth local oscillator frequency of 115.6 MHz, producing a sum product of 144.100 – 144.330 MHz.

The transceiver had rotary "VXO" and "RIT" controls that could swing the crystal oscillators through a small range with varicap diodes. VXO (variable crystal oscillator) allowed continuous tuning between the synthesized 10 kHz steps and RIT provided receiver offset of several kHz to compensate for drifting signals.

On receive, the frequency conversion process was reversed, with incoming 144 MHz signals mixed down to a first intermediate frequency in the 28 MHz band, then to a second IF of 7.8 MHz.

Installation

When I acquired my own Liner 2, the first problem was to provide a suitable mobile antenna. I had a 2 meter antenna on an NMO mount on the roof above the Beetle's rear-view mirror — but this was already in use for the existing 2 meter FM radio. There was a ¼ wave Pye whip for the 4 meter band on the left of the windshield. That only left the telescopic antenna on the right side that was being used by the broadcast receiver.

I had acquired a Pye filter unit that could share a broadcast antenna between the car radio and a VHF transceiver. It was a combination low pass – high pass filter that I adapted for the 2 meter band. This allowed use of the telescopic antenna for 2 meter SSB as well as for simultaneous reception on the car radio. The Belcom Liner 2 was mounted on the floor, near the four-speed gear shifter — or gear lever in UK English.

Belcom Liner 2 (arrowed) was installed near the Beetle's gear shifter alongside a Pye Westminster for 4 meter AM. Icom IC-22A is mounted above.

Performance

The Liner 2 demonstrated the same improvement in VHF performance as my home station transverters. Signal to noise ratio was much better than for AM, and co-channel operation meant that calling CQ and receiv-

ing a reply was much snappier than with the old crystal-controlled approach of long CQ calls and tuning-high-to-low.

The West Lancashire Coastal Plain meant there were few hills in the way of VHF signals, and range was quite good. It was worth waiting for a **high spot** along the route before putting out a CQ call… if signals deteriorated, single sideband would still be readable, much further down into the noise than with AM or FM.

Highs and lows

On the way to work in my VW Beetle, one high spot was along the A570 road between Southport and Ormskirk. Shortly after crossing the Leeds-Liverpool Canal and just past the Red Lion Pub was the Municipal Water Works where water was pumped from underground and treated before being piped to the surrounding area.

Scarisbrick Water Works (arrowed) was at the top of a 100 ft hill on the A570 road between Southport and Ormskirk.

In the summer of 1959, during construction of Scarisbrick Waterworks at Mill Brow an 18-year old **John Lennon** was employed as a laborer. He worked there just long enough to afford his first electric guitar.


The Municipal Water Works in Scarisbrick at the top of Mill Brow is associated with a famous musician. It is now known as the United Utilities Water Treatment Plant.

By all accounts, John Lennon did not enjoy his period of heavy manual labor during an unusually warm summer, preparing the ground for Scarisbrick's new pumping station. See: https://beatlesliverpoollocations.blogspot.com/2018/03/

"Was she told when she was young that pain would lead to pleasure?
Did she understand it when they said
That a man must break his back to earn his day of leisure?
Will she still believe it when he's dead?"

["Girl" – Track 9, Rubber Soul, The Beatles, 1965.]

Hindsight

Within a few years, amateur VHF and UHF mobile operation would undergo a transformation. Inexpensive multi-channel FM radios became available from Japan, with digital synthesizers taking over from crystal control. Then hilltop repeaters arrived, promising improved coverage for mobiles, with S-9 signals at points high and low.


1970s multi-channel mobile transceivers that helped drive the change to FM. Top – crystal controlled Icom IC-22A; below synthesized Kenwood/Trio TR-7500.

The days of 2 meter mobile SSB faded away and the Belcom Liner 2 fell out of favor. Some people tried to improve its power output for fixed station use, but the crystal synthesizer design became notorious for producing spurious signals — unless very carefully aligned with a spectrum analyzer.

There are lessons worth remembering today. If you have a modern multi-mode HF/VHF/UHF transceiver, bear in mind that SSB still reaches further than AM and FM. If the repeater fails, and nobody comes back on FM simplex, try putting out a *CQ* on one of the SSB calling channels, 50.125, 144.200 or 432.100 MHz. Somebody might still be listening!

The Liner 2's Japanese manufacturer, Nihon Dengyo, is still busy nowadays supplying antennas for 5G cell-phone base stations, broadcast filters and antenna combiners.

- NM9J

Peekskill / Cortlandt Amateur Radio Association

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Archive: http://nm9j.com/pcara/newslett.htm

PCARA Information

PCARA is a **Non-Profit Community Service Organization**. PCARA meetings take place each month (apart from holidays, July/August break and pandemics). Talk-in is available on the 146.67 repeater.

PCARA Repeaters

W2NYW: 146.67 MHz -0.6, PL 156.7Hz
KB2CQE: 449.925MHz -5.0, PL 179.9Hz
N2CBH: 448.725MHz -5.0, PL 107.2Hz

PCARA Calendar

Masks and Social Distancing are required.
Sat April 3: PCARA Breakfast, 9:00 a.m., Downing Park Pavilion, Rt 202, Yorktown.
Sat April 17: PCARA Membership meeting, 9:00 a.m., John C. Hart Memorial Library, 1130 E Main St., Shrub Oak, NY. Outdoors, bring your own chair.
Sat April 17: PCARA V.E. Test Session, 11:00 a.m., John C. Hart Memorial Library, Shrub Oak. Outdoors, see below.

Hamfests

Many Spring Hamfests have been canceled. Check with organizers before leaving.
Sat May 15: Splitrock ARA - N Jersey Tailgate Hamfest, Roxbury Sr Cntr, 72 Eyland Ave, Succasunna, NJ. 8:00 a.m.
Sat May 22: Southern Berkshire ARC Hamfest, Goshen CT Fairgrounds, 116 Old Middle St. (Rt 63), Goshen, CT.

VE Test Sessions

Check with the contact before leaving.
Apr 3, 10, 17, 24: Westchester ARC, 19 Hunts Bridge Rd, Yonkers NY. 12:00 noon. Must contact VE, (914) 237-5589.
Apr 3, 10, 17, 24: NYC-Westchester ARC, 43 Hart Ave, Yonkers NY. 12:00 noon. Must contact VE (646) 225-8600.
Apr 11: Yonkers ARC, Yonkers OEM, 789 Saw Mill River Rd, Yonkers NY. 11:30 a.m. Pre-reg. Walt, kd2d'at'arrl.net.
Apr 17: PCARA, John C. Hart Memorial Library, 1130 E Main St., Shrub Oak NY. 11:00 a.m. Contact Michael W2IG w2igg'at'yahoo.com, (914) 488-9196. **Call ahead**.

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