PCARA Update

Volume 23, Issue 5 Peekskill/Cortlandt Amateur Radio Association Inc. May 2022

Field of play

For April we played a version of musical chairs, but with the PCARA Breakfast! We were originally planning to have breakfast at 9:00 a.m. at Downing Park pavilion in Yorktown Heights for the April 9th gathering. Providence had other plans for that morning. With the threat of inclement weather, we moved back to Uncle Giuseppe's Marketplace in Yorktown Heights.

At breakfast there was discussion about PCARA's participation in 2022 ARRL Field Day. Joe WA2MCR has applied to the Lakeland Central School District for permission to use Walter Panas High School once again this year. There is just one little wrinkle — a new multipurpose field is under construction, with the former softball field being turned into a parking lot, so things are a little bit fluid. We might be permitted to use space on the southern side of the school as long as we don't interfere with graduation ceremonies. Stay tuned for updates.

Things are happening, so please mark your calendars with the following important dates:

- Wednesday April 27, 2022: **PCARA V.E. Test Session**, 7:00 p.m. at the Putnam | Northern Westchester BOCES Technical Center at 200 BOCES Drive (off Pines Bridge Road), Room 211, in Yorktown Heights, NY. This is a Laurel VEC session. Please contact Dave KF2BD at daveharper'at'vivaldi.net to register for an exam.
- Sunday May 1, 2022: **Orange County Amateur Radio Club (OCARC) Hamfest**, 8:00 a.m. at the Wallkill Community Center in Middletown, NY. PCARA will be taking a table so bring along anything you wish to sell! For details, please visit the OCARC website at http://ocarcny.org/hamfest/ .
- Saturday May 7, 2022: **PCARA Breakfast**, 9:00 a.m. at the Downing Park Pavilion in Yorktown Heights, NY.
- Saturday May 21, 2022: **PCARA Membership Meeting**, 10:00 a.m. at the Putnam Valley Free Library, 30 Oscawana Lake Road, Putnam Valley, NY.
- Saturday May 21, 2022: **PCARA VE Test Session**, 11:00 a.m. at the Putnam Valley Free Library, 30 Oscawana Lake Road, Putnam Valley, NY. This is an ARRL VEC session. *Continued on page 2* ⇨

At PCARA Breakfast on April 9 Jay NE2Q showed his LDG RT-100 remote antenna tuner and RC-100 controller.

Mid-April view of the new multipurpose field at Walter Panas High School, located alongside the school buildings.

Contents

Please make sure to watch the PCARA website, Google Groups mail list, and the PCARA Facebook page for updates. I hope to see you soon at one of our upcoming events!

- 73 de Greg, KB2CQE

PCARA Board

President:
Greg Appleyard, KB2CQE; kb2cqe 'at' arrl.net
Vice President:
Bob Tarsio, N2CBH; bob 'at' broadcast-devices.com
Secretary:
Lou Cassetta, KD2ITZ; radiocassetta 'at' gmail.com
Treasurer:
David Fredsall KD2EVI; joanndavidss88 'at' verizon.net
Director:
Mike Dvorozniak, W2IG
Vice President Emeritus: Joe Calabrese, WA2MCR.

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.

V.E. Test information

Test sessions

PCARA has scheduled two V.E. Test Sessions during the period covered by this newsletter. The first session — under the auspices of Laurel VEC — takes place at 7:00 p.m. on Wednesday April 27, 2022 at Putnam|Northern Westchester BOCES Tech Center, Room 226, 200 BOCES Drive, Yorktown Heights. Candidates should contact Dave Harper KF2BD on (914) 432-2639 or daveharper'at'vivaldi.net. There is no test fee for Laurel VEC sessions.

The second test session begins at 11:00 a.m. on Saturday May 21 (after the membership meeting) in Putnam Valley Free Library's Community Room, 30 Oscawana Lake Road, Putnam Valley, NY. This test session is being scheduled with ARRL-VEC, so there is a $15.00 test fee for each exam or resit. Candidates should contact Mike Dvorozniak W2IG using w2igg'at'yahoo.com.

A wooden bridge (right) leads to the Putnam Valley Free Library community room.

License application fee

After April 19 2022, candidates who are successful in obtaining a new amateur radio license will be charged the new $35.00 application fee by FCC. The fee only applies to applications for a new license, renewals, rule waivers, or a new vanity call sign. There will be no FCC charge for license upgrades or minor updates such as change of name, mailing address or email. Further details are available at: https://www.arrl.org/fcc-application-fee .

ARRL reported that FCC's ULS batch processing system became unavailable on April 19 — the day when license application fees began. It was back online by April 22.

ARRL Youth Licensing Grant Program

From April 19, 2022, ARRL will cover the one-time $35.00 application fee for new license candidates who are under 18 years old and taking tests administered under the auspices of ARRL VEC. The $35.00 FCC application fee will be reimbursed after ARRL VEC receives the completed reimbursement form and the new license has been issued by the FCC. The reimbursement check will be mailed to the fee payer.

In addition, candidates younger than 18 will pay a reduced exam session fee of $5.00 to ARRL VEC's VE team at the time of the exam. The $5.00 fee is for all candidates under the age of 18 regardless of exam level. Proof of under-18 status will be required at the session.

Further details are available at: http://arrl.org/youth-licensing-grant-program .

Adventures in DXing
- N2KZ

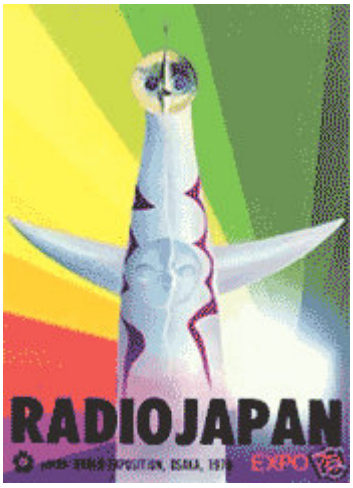
Welcome to Spring. It is time for a clean-up inside and out. Put away those sweaters, woolly hats and throw blankets. It is time to warm up and get out. Just don't turn the radio off!

Let's Dance

I recently witnessed a strange dance on 19 meters. This is a classic shortwave broadcast band going back to the beginning of radio. Back in the days of the dinosaurs when I embraced my first general coverage receiver (year: 1965) 19 meters was on the cusp of being an outlier. It was right in the middle of the top selection band on most modest shortwave desktop sets. This was the mostly quiet range from 11.5 mcs to the very top at 30 mcs. Signals up here were usually sparse and mysterious!

The 19 meter band was in the top frequency range of vintage SW broadcast receivers — when dials had a warm glow and frequencies were marked in ***mcs****.*

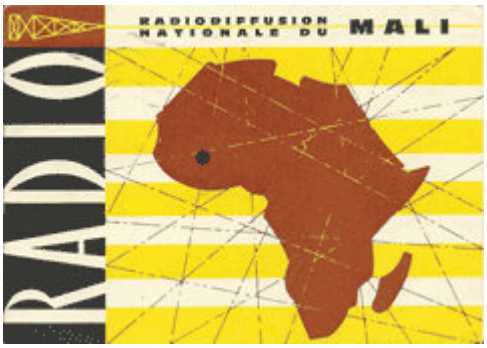
There were no megawatt relay stations back then. All broadcasts were direct from the countries they represented. You would look to 19 meters as a place to hear the most distant stations especially at night: the 50 kilowatt power houses from Radio Australia, Radio Peking and Radio Japan.



Your ears would experience the mileage they traveled. The double-hop skip gave those incoming signals a signature fast warble that could not be mistaken. Listen to 19 meters in the daytime and all you would hear were the time signals from WWV at 15 mcs and the BBC holding court on 15.070 mcs. Maybe Radio Kuwait might be logged with rock music in the late afternoons. At night, multi-hop miracles could happen. You just had to listen very carefully.

Fast forward 57 years and things have changed. The majority of international shortwave broadcasters have ceased operations and even demolished their massive antenna installations. A few remaining stations relentlessly send out 24 hour a day religious preaching. The main players are now varied and few. The BBC World Service still has a presence if you know where to look for it. Cuba, China and Romania all continue in English. With Radio Australia silenced and dismantled, Radio New Zealand is now all alone in servicing the Pacific Ocean islands and Pacific Rim.

Some stations are not what they seem. Today's high powered shortwave relays in unusual places bring the signals closer to end-users with receivers at home. Don't be fooled! The program origination points are often far, far away from the transmitters you are listening to. Some examples: The once familiar HCJB (Heralding Christ Jesus' Blessings) formerly from Quito, Ecuador now only broadcasts from Germany and Australia as part of the Reach Beyond ministry. Radio Peking has become China Radio International and has built a facility in Bamako, Mali, West Africa to extend their range. It shares the 100 kilowatt facility with the local Malian government who operate it as Radio Mali. Inexpensive satellite or Internet studio-to-transmitter links make these interlinks easy to arrange and inexpensive to use.



Dueling Broadcasts

Herein lies yet another story! Due to very recent events, the BBC World Service rose to the occasion and added news broadcasts beamed toward Russia and Ukraine radiating from the Woofferton transmitting facility located west of Birmingham in central England beginning March 2, 2022. Although their huge signal is skewed to the east, the 300 kilowatt BBC signal, elevated by enormous curtain array antennas, sends a considerable secondary and unintentional signal 'off the back of their beam' towards the American northeast. Each morning, from 9:00 to 11:00 a.m. Eastern time here in New York, you could once again hear the BBC news just like years and years ago on 19 meters but this time on 15735 kHz. When war destroys all modern methods of news conveyance, shortwave HF broadcasting effectively gets the message through with or without the Internet even in the year 2022!

In the days that followed, the BBC moved their transmit frequency just a wee bit lower to 15730 kHz and eventually scooted up to 15740 kHz. All was well until one day in April another strong broadcast went on the air right next door on 15745 kHz from 9:00 a.m. to

10:00 a.m. rendering reasonable reception of the BBC impossible. Where did the signal come from? China Radio International was the culprit! Their beam was aiming towards the same target area as the BBC: Ukraine and Russia. Coincidence?

The BBC scaled back their broadcast to just 10:00 a.m. to 11:00 a.m. Eastern time and now they co-exist with CRI in peace. Will there be further moves? Stay tuned! In the meantime, take an amazing tour of Woofferton courtesy of the British DX Club: http://bdxc.org.uk/woofferton.pdf (pdf file).

Members of the British DX Club visit Babcocks' Woofferton Transmitting Station in Herefordshire, England. Woofferton carries shortwave broadcasts from BBC World Service and a variety of other stations.

These events taught me some thought provoking lessons. By watching this story unfold I learned a lot about propagation in this region of HF. Friends in Scotland suggested my best shot to reach them on 20 meters would be between 10 a.m. and noon Eastern time. This proved true. Reception of the BBC 19 meter broadcasts usually lift up almost on cue at 10:30 a.m. every day. Could this effect be a useful clue towards capturing new DX and regularly reaching my friends in 'the old country?' Maybe so!

Time for Dinner!

I have an interesting strategy when attempting to work distant and exotic places around the world. Always remember this logical question: When are hams likely to be sitting down to their rigs and getting on the air? Probably within an hour or two of dinnertime. Weekday peak periods for ham operation anywhere in the world would be from 5 p.m. to maybe 9 p.m. local time at the target area. Want to work Sydney, Australia? Try between 3 a.m. and 7 a.m. American Eastern time. I can tell you that 40 meters is a good place to look for VKs arriving from long trips over the Pacific Ocean as dawn breaks here in New York!

How about reaching Ukraine? Dinnertime hours in Kyiv would equate to our 10 a.m. to 2 p.m. What time is the BBC on the air to Ukraine? 10 a.m. Eastern time! Bingo! The BBC also offers a late night broadcast to Ukraine on 11680 kHz from 3 p.m. to 5 p.m. Eastern which is 10 p.m. to midnight in Kyiv.

Don't hurt your head trying to convert time all over the world! Use this convenient and useful tool: https://www.worldtimebuddy.com . If you are looking for the latest schedule from the BBC search "BBC global short wave frequencies" for an up-to-the-minute listing of current times and frequencies. (Each new schedule has a new URL hence the necessity of needing to search.)

Using shortwave broadcasts as a propagation indicator is not limited to the 19 and 20 meter bands. International broadcasters usually follow their published schedule every day with very predictable transmissions of a long duration. Monitor transmissions from stations close to your DX targets and discover what bands are most efficient during the day when attempting to hear signals from that area. Build a log of your findings to determine a pattern, then get on the air during the times when the shortwave broadcasts peak and search for potential DX catches. 40 meters is particularly suited for this strategy. Shortwave and amateur transmissions are well mingled together in the range just above 7 MHz especially at night.

Another way to maximize your chances toward success is by using remote SDRs as your ears. Pick a SDR near your target area and see if you can receive *your* signal from afar. For example, if you want to verify your signals are reaching France, go to the Kiwi SDR map and tap on a French SDR link, enter your frequency in kilohertz and select the proper mode. Send your signal and listen. There will be a slight time lag between you and the SDR. You will know immediately if you are getting through. If you are lucky, you will hear your signal echo back to you from across the many miles. When successful, all you then have to do is find another ham on the air to correspond to! Especially useful is the Kiwi SDR map available at: http://rx.linkfanel.net . Good luck with your hunts!

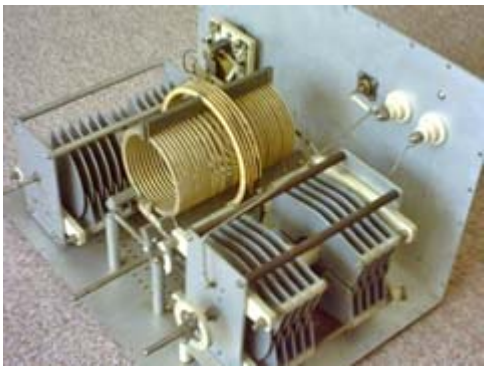
Map shows Kiwi network of SDR receivers in Europe. Click on a flag pin for details and a link to the SDR site itself.

More Adventures

"I discovered a lot of things that *didn't* work!" You will find this quote in the biographies of all great innovators and inventors. Indeed, it is a common thread with everyone who has experimented and learned from their trials. I am no exception!

I wanted to know all about end-fed antennas. I also now know more about my equipment. The more you do, the more you know!

Back in the days of sturdy analog tube rigs filled with heavy metal chassis and parts, the antenna matching devices they fed were downright defiant. You could use a mechanical tuner with beautiful big inductor coils and massive metal tuning capacitors and bring nearly anything to resonance. Their range of compensation was nearly infinite.



View inside a Johnson Kilowatt Matchbox tuner for balanced lines. Note the size of the matching components.

Today's solid-state rigs, fitted with very convenient and concise built-in antenna matching systems, have a limited range. You have to make a good attempt to play ball with your transceiver for it to welcome you for consideration. In my case, you need to present at most a 3 to 1 standing wave ratio for acceptance.

Antenna Impedance	50 Ohms, unbalanced
	16.7 - 150 Ohms, unbalanced (Tuner ON, 1.8 - 29.7
	25 - 100 Ohms, unbalanced (Tuner ON, 50 MHz A

Published specification of Yaesu FTdx-1200 transceiver shows SWR with tuner on must be kept below 3:1 (HF).

Outside that range, the tuning circuitry will just give you a brief click and excuse itself from any attempt to match. Silently, it will tell you "I'm sorry. You'll have to do better than that!"

This can be a problem especially if you try using a 1 to 1 RF choke directly after the signal leaves the rig. Any poor transference of energy will be rejected as a dead short. To adapt the medium to high impedance of single wires, I also tried using 9:1 and 49:1 UnUns to match to a variety of different length wires. The results were unusable.

My best attempt was incorporating a good long length of coaxial cable from the UnUns to the transceiver. I did 'get in the ballpark' with these trials. By adding long lengths of coaxial cable to reach from UnUn to transceiver, I created near-equal length counterpoises to the driven 'hot' wire vertical element emulating the design of a vertical dipole. Obviously, I still have more to learn — but these were good lessons towards eventual success.

Karl did not have success with end-fed antennas until a counterpoise was added.

I also became familiar with the personality of vertical antennas in an amateur environment. Horizontal antennas can be easily placed high and away — free and clear of man-made noise sources and away from obstructions created by nearby objects. Always try to launch your antenna to at least a half-wavelength above ground for best results and 'take-off.'

When using a vertical, it is best to find a method of supporting the driven element as perpendicular to the ground as possible along with having a multiple stab counterpoise of equal length spaced gracefully and evenly around the hot element. When you slope and bend the active hot radiator you introduce all sorts of aberrations. Blocking the vertical with dense buildings or trees really discourages good results. Think to yourself how your reception declines when you travel between or near obstacles in your car listening with a vertical. It's no different when the antenna is right next to your home!

More than anything, I noticed that reception from verticals was entirely different than what I had come to expect and rely on. When you play games with matching and positioning, your sky hook's ability to snag signals declines too. During my trials with vertical designs, I never got to a point where my 'ears' were satisfied with the results.

I need to heed my good friend Malcolm's advice: If you want to continue to experiment with antenna designs with a passion, go buy yourself a good antenna analyzer! Truer words were never spoken! Without one, it is like trying to build a detailed and sophisticated home without a tape measure, level and a straight edge. Don't do it! Did you ever try to tune a piano without having ears? Yes, it is that frustrating! Use an analyzer. Otherwise it will take you a million years to find the right wire length and impedance match!

RigExpert AA-230 antenna analyzer.

Granted, my standards are high.

My recently fallen 20 meter horizontal dipole had picked up the weakest signals through all my QRP QSOs. I was able to track the meek QRP CW signals from several very high altitude balloon flights released from Iowa. There were no bounds! When you operate with milliwatts, you can't afford to casually throw away strength. Simplicity reigns. No compromises. Your antenna needs to be as efficient as possible!

I am about to replace my fallen dipoles — one by one — until I build my antenna farm back to its former strength. I remain a believer: high and away is always a good strategy! There are always exceptions. Read about my NVIS triumphs on 60 meters in the January and May 2020 editions of *PCARA Update*. If you don't believe in my gospel, that's OK. Whatever works for you — but please share your experiences with us. There is always more to compare and learn!

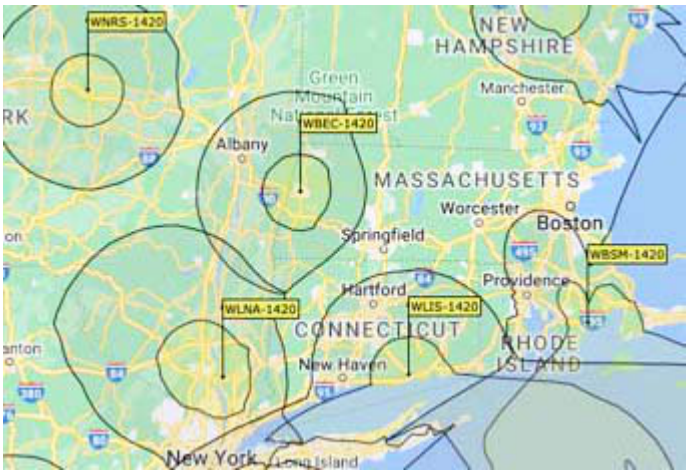
Karl's rebuilt wire dipole for 20 meters.

Try Top Band (or go below!)

Other approaches were considered and may still be tried: Employing loop antennas or a full sized dipole or an inverted-L for 160 meters. So many options! So little time! Unfortunately, I have to think of aesthetics and practicality. A little part of me would jump for glee for having a 540 foot loop for 160 meters but... having wires hanging over a swimming pool or being dodged while I ride my tractor would not be fun at all! Several 3,000 foot Beverage antennas for medium wave DXing would be fun, but simply not practical. Not in this lifetime? Don't give up too fast, Karl!

Quite recently, The Medium Wave Circle (U.K. based DX club) has established a SDR in northwestern Scotland that brings these dreams to life. You haven't lived until you have spent some time with this installation. The SDR is not limited to just AM broadcast radio reception. It also is a 160 meter dream come true! It is a nifty Kiwi SDR connected to an automatically switching group of Beverage antennas aimed at various DX destinations around the world. The location is equally remarkable amidst the rolling hills near seaside in a nook called Clashmore. Man-made electrical noise be gone! I have DX catches to make! Read all about it at: https://mwcircle.org/memorial_kiwisdr/ .

Speaking of The Medium Wave Circle, they now offer a magnificent collection of broadcast station pattern maps covering North America. For approximately $4.40 via PayPal you can enjoy 280 maps covering each and every AM radio frequency during daylight, critical hours and nighttime. It also features a real-time three level greyline map for your convenience. A great tool for your logbook and curiosity! https://mwcircle.org/north-american-mw-coverage-maps/ .



Part of the day/night coverage maps for 1420 kHz.

We all have our moments and disappointments. One very early recent morning I just happened to be tuned to 960 kHz AM. Strange... a station was booming in just loaded with commercials and announcements about everything Vermont. Why is this exciting? Vermont is a very rare state for any medium wave DXer. My balloon was popped with their top of the hour ID. In a low-key voice sneaking in under the programming clutter I clearly heard: *"WEAV Plattsburgh."* Yes, 960 AM 'The Game' with an all-sports format covers most all of northern Vermont helped by two FM simulcasts ...but the license says 'New York!' Boo! By the way, your only hope for Vermont can be found on 620 kHz: Newstalk 620 WVMT from Burlington. Try for them nightly at greyline dusk.

So, let me get back to my ambitious projects. So much to try! So much to build and launch! I need a 40 meter gain antenna aimed 45 degrees from north aimed at Scotland. I need to finally put a CW signal on the air at 1815 kHz on 160 meters. I need some dry and warmer days without endless blustery winds. I need to stay off my roof! I need an antenna analyzer! And why is *QST* now on newsprint paper? Life goes on. Wish me luck! 73s and dit dit from N2KZ 'The Old Goat.'

.

Club callings

PCARA breakfasts bring members together, along with all their electronic gadgetry. Our members come from a variety of backgrounds, trades and professions. That thought took me back to the first radio club I joined and the people I met there.

My first visit to a radio club took place in the 1960s while I was still at grammar school in northwest England. A fellow student who was related to Harold, G3LWK suggested a visit to Ainsdale Radio Club. Their meetings took place only a half mile from my home — so the next Wednesday evening I hopped on my bicycle and rode over to the location of Gerry G8QG in Clifton Road, Southport.

REGION 1

Ainsdale (ARS).—December 8, 22, January 5, 8 p.m., Clifton Road, Southport.

Allerton (SRHS).—Thursdays, 8 p.m., 3rd Allerton Scout Group Headquarters, Church

Forthcoming Events from 'RSGB Bulletin" for December 1965.

There I found a mix of people, ranging from "old-timers" with G2 call signs, more recent licensees with G3 calls and a few unlicensed people of roughly my own age. After a few visits, club secretary Norman G2CUZ made sure I had access to training material and pointed me in the direction of the City & Guilds' Radio Amateurs' Examination (RAE) in May, followed by the GPO Morse Test.

One of the sodium lamps installed around Southport by G8QG's lighting department.

I began finding out the background of radio club members. Many had served in World War II, often with a Signals connection. G8QG had been licensed before WWII while employed as a chemist at Southport Gas Works, and was now in charge of the County Borough's Lighting Department. His employees — in radio-controlled vehicles — had been busy installing yellow sodium lights around town, replacing the old incandescent lamps.

A variety of trades and professions were represented in Ainsdale Radio Club — but I noticed two trends in club members and other radio amateurs I met around town. They either worked for **Post Office Telephones** — the communications branch of the GPO — or they were involved in the **Radio and Television** trade.

Back to the sixties

The General Post Office of mid-1960's Britain was a government department with many responsibilities. It had a monopoly on the delivery of mail and parcels. It supplied all telegraph and telephone services, with some radio communication as well. And it was responsible for regulation and licensing of radio spectrum.

This was a time before cable TV, microprocessors, pocket calculators and cell phones. Urgent messages were sent by GPO telegram and delivered by telegram messenger on a red BSA Bantam motorcycle. Telephone service was expensive and not everyone could afford a land-line connection. All equipment connected to the phone line had to be supplied by the Post Office, starting with the humble desk telephone with its carbon microphone, moving coil earpiece and rotary dial that pulsed the line voltage as it returned to the rest position.

Urgent messages were delivered by Post Office telegram boys.

1960s Post Office Telephone 706R in duo-tone grey.

Within the boundaries of Southport telephone lines were kept underground. Outside town overhead lines appeared, supported on telegraph poles. The Post Office was a world expert in planting poles, stringing twisted-pair lines and keeping outdoor plant working during periods of bad weather. Old telegraph poles were sought after by radio amateurs for holding up wire antennas. In locations like Southport with utilities delivered below ground the Post Office would pull multi-pair cables through their own cable ducts using plastic rope.

Telephone lines were all underground in Southport, but outside town the lines were suspended from wooden telegraph poles.

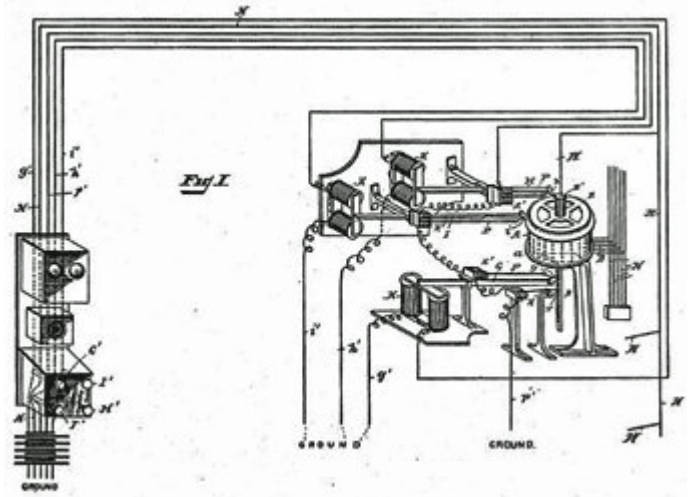
In the Telephone Exchange (Central Office) electromechanical switching still reigned supreme. The first exchanges had been based on human operators — mostly female — who connected calls by pushing a jack plug into the appropriate socket on a large panel. This

"Number please?" A British telephone exchange of 1960 with female operators still connecting calls by plugging a cord into the outgoing circuit and ringing the recipient's bell by pressing a key.

method was upended in the late 1880s by **Almon B. Strowger** who discovered that calls to his funeral business in Kansas City MO were being redirected to a competitor — whose wife just happened to be one of those telephone operators.

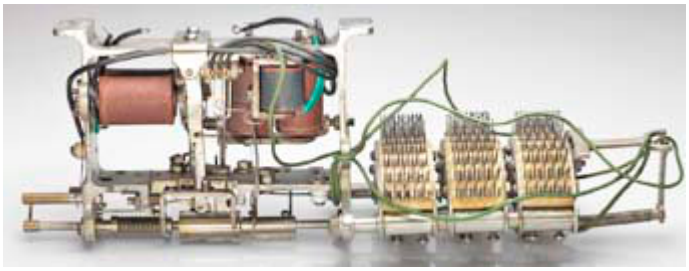
Strowger devised an automatic telephone exchange where calls from one subscriber to another could be set up without operator intervention. The caller would indicate digits of the desired number by tapping three separate telegraph keys a number of times, sending electrical pulses down separate wires to the exchange. For example, to connect to number 315, the caller would tap the first key three times, the second key once, and the third key five times.

In the automatic exchange, these pulses were converted into vertical motion using an electromagnetic stepper switch to select one digit, then rotated in the horizontal plane to select another digit using a stepped rotary switch. (Patent application filed 1889, granted as U.S. Patent 447918 in 1891.)



A.B. Strowger's U.S. Patent 447,918 of 1891 showed telephone equipment at left with telegraph keys G', H' and I' activating electromagnets in the Exchange to move a contact vertically then horizontally around a cylinder.

The need for telegraph keys and their separate wires was removed after Strowger's company devised the **rotary dial** telephone in 1891-96. Following successful deployment of Strowger automatic exchanges in the USA, they were tested in Britain in the early part of the 20th century. In 1925 the GPO had decided that Strowger should be the standard system for Britain and placed orders for exchanges in larger cities and towns — including Southport.



Strowger step-by-step two-motion exchange selector, 1898.

By the 1960s, the main Telephone Exchange for Southport had moved to Hawesside Street, near Chapel Street train station. The technology was still based on Strowger's relays and rotary selectors, though greatly developed to cope with thousands of subscribers, busy numbers, billing, branch exchanges and 'subscriber trunk dialing' to reach distant exchanges. Post Office engineers were skilled in troubleshooting, adjusting and cleaning contacts to keep the ingenious Strowger mechanisms in good working order.

Southport Telephone Exchange on Hawesside Street.

Nearby exchanges were linked by two-wire circuits while distant exchanges were connected by trunks carrying more signals. Trunk circuits between busy exchanges employed coaxial cables with repeaters, capable of carrying hundreds or even thousands of analog voice signals, each one on its own (HF) single-sideband radio-frequency.

With demand for telephones increasing, there was sometimes insufficient capacity in the multi-pair cables running down the street. The solution was a shared-service "party-line" where you might pick up the hand-

set and find that a neighbor was already having a conversation on your pair!

All this technology in the Exchanges, under the street, on telegraph poles and in subscribers' homes needed a small army of qualified personnel to install and maintain the system. Who better than telephone engineers to take up a practical hobby like amateur radio, combining radio communication with electrical and electronic knowledge?

Post Office Telephones' Morris 1000 van with ladder rack.

Trendy TV

In mid 1960s Britain, **television** reached more households than the telephone. There were just three television networks broadcasting — BBC1 Television and Independent Television (ITV) on 405 lines VHF plus newcomer BBC2 on 625 lines UHF. Color would not arrive until the summer of 1967 when BBC2 carried Wimbledon tennis using the PAL (phase alternating line) system.

Radio Rentals 17" TV set in walnut veneer..

Television receivers first became popular in the 1950s, employing vacuum tubes — or **valves** in British English. A 1950s television set looked like a piece of furniture, with a 17 inch or 19 inch cathode ray tube mounted in a polished wooden cabinet above a metal chassis containing the essential circuitry. TV sets of the 1950s and 1960s were not particularly reliable. Those vacuum tubes — and the cathode ray tube itself — would slowly lose emission from their indirectly heated cathodes and would eventually need to be replaced. Failure of tubes and components could result in sudden loss of picture. This was a job for the **TV engineer** who would be dispatched in a van equipped with spare parts and a rack full of replacement vacuum tubes.

Live metal chassis inside a dusty Radio Rentals TV set from the 1950s.

Television Service van.

High voltages required by those tubes along with the heat they generated contributed to poor reliability. This became more noticeable as 1960s dual-standard TV receivers incorporated more miniature all-glass tubes, with sockets soldered directly to a phenolic printed circuit board. At the same time, cabinet depth was shrinking as shorter cathode ray tubes were introduced.

Television sets were sufficiently unreliable that the local TV engineer became a frequent visitor to most homes, especially when there was more than one TV set. If a problem could not be fixed in the home, the set was taken back to the workshop where there was more space and test equipment available. As well as troubleshooting receivers, TV engineers might have to solve problems of over-the-air reception, fixing antennas mounted high on a building, along with their coaxial cable and connectors.

I was familiar with the day-to-day life of a TV engineer — one of my friends from the radio club was employed in turn by a TV rental company, then by the TV repair section of a department store. Later on he established his own TV business. He showed me how to converge a color TV's shadow mask CRT so all three electron guns were aligned correctly. Another friend was employed by BBC Television at their Manchester studios. Both found a natural fit in a hobby that combined technical knowledge with long-distance communications.

Pye color television from the early 1970s had hybrid circuitry with three PCL84 tubes for color difference outputs. (TV sweep tubes like the PL509 and 6HF5 were used in amateur radio HF amplifiers.)

Where did they all go?

If you look around a modern radio club, you will not find many telephone engineers or TV repair technicians. How did this happen? I think it can be summarized in a few words and acronyms… **semiconductors**, **LSI**, **VLSI**, **SMD**, **LCD**, **cable** and **fiber optics**.

Less mechanical telephony

In the early 1980s, I joined Bury Radio Society on a visit to Rochdale Telephone Exchange, conducted by Laurence, G4KLT. The Rochdale exchange had a mix-

Strowger equipment still in use at a British Telecom exchange in 1995. Lead acid battery at bottom left.

ture of old and new equipment that typified the evolution of telephone engineering. A large area was still occupied by old-style Strowger equipment. This was the most interesting part of the tour as it allowed visitors to see exactly what happens when a telephone call was initiated by lifting the handset. A uniselector found a free line to the first selector then dial pulses were acted on sequentially by the two-motion stepping switches, setting up a path through the exchange. At the end of the call, as the handset was returned to the cradle the path was cleared.

The development after Strowger was "Crossbar", in which switching was accomplished using a matrix of horizontal and vertical bars activated by electromagnets. Where a horizontal and vertical bar crossed, contacts were connected and would be wired on to the next matrix. Control of the crossbar electromagnets was achieved by separate "common control" circuitry rather than the simple step-by-step Strowger method.

Crossbar switch has horizontal and vertical bars activated by electromagnets.

The matrix of horizontal and vertical bars of crossbar was replaced by an array of reed relays under electronic control in Post Office TXE2 and TXE4 Exchange switches. Reed relays were enclosed in glass and did not need the constant maintenance of electrical contacts open to the air. With each

Reed relay was placed inside a wire coil. Contacts of magnetic material are encapsulated in glass to avoid contamination.

of these developments, the equipment was growing faster and more reliable.

The next step for the GPO was a major leap forward. As microprocessors became readily available, Post Office Telecommunications (which became British Telecom in 1981) developed a digital switching system named "System X" that was eventually implemented throughout Great Britain for handling voice and various other signals.

A System X digital exchange was made up of three parts. A subscriber **concentrator** terminates the customers' phone lines, carries out analog-to-digital conversion using pulse code modulation to produce a 64 kbps digital format, then, using time-division access, concentrates thirty voice calls down to a 2 Mbps digital stream that was fed into the **group switch**. The group switch connects time slots of the thirty 64 kbps channels. Each re-constituted 2 Mbps line would then lead either to other exchanges or to other subscriber concentrators. The third part of the digital exchange is a central control computer or **processor**.

System X microprocessors (1979).

These developments removed electromagnetic switching from the telephone exchange, making it a lot quieter and more reliable. The equipment was smaller and did not require as much floor space. There was less mechanical work for the telephone engineers inside the exchange, though maintenance was still required on the outside analog plant. In 1982 the rules on equipment which could be connected to BT's network were relaxed, allowing subscribers to connect their own "green dot" approved telephones and answering machines. By 1985 British Telecom was beginning to roll out ISDN service, extending the digital connection from a System X exchange all the way out to customer premises.

In more recent years, there has been a trend away from hard-wired telephones to cellular service — while much copper cabling has been replaced by fiber optics. Fiber optic connections are very reliable and have far more bandwidth than the old twisted pair. So — those telephone engineers of the 1980s are mostly retired, with plenty of time to spend on amateur radio.

For a visual introduction to telephone exchange technology, take a look at the following videos:

The Step-By-Step Switch, AT&T Archive 1951:
https://youtu.be/xZePwin92cI

The Telephone Exchange, 1982 British Telecom Schools Film: https://youtu.be/owAjCeHRgMA

"Telephone Exchange", Origins of Electronic Switching Technology 1982: https://youtu.be/wI3z_gGXNwU

British Telecom System X promotional video 1983: https://youtu.be/I4DJoAk22-0

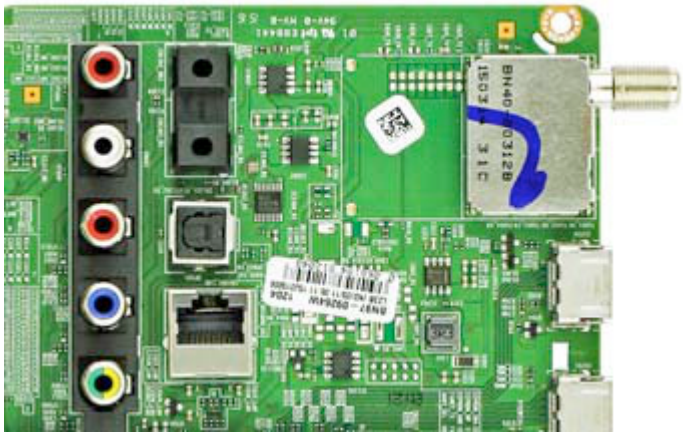
The Making of Information Age: Enfield Telephone Exchange: https://youtu.be/GVDGuCjog_0

TV tail off

There is a parallel story of technology catching up with the lives of TV service engineers. As color television became popular in Britain during the 1970s, unreliable vacuum tubes were being replaced by semiconductors. The last color television that I purchased in the UK in 1981 was all solid state — apart from the cathode ray tube. Dual standard VHF/UHF 405/625 line sets were being replaced by UHF-only 625 line color TVs with integrated circuits in many of their stages. A frequency synthesizer IC allowed specific TV channels to be selected, rather than manual tuning of a drifty, free-running local oscillator.

NEC UHF-only "IC/Transistor" color TV from 1981 was all solid state apart from the CRT.

A major change came about when surface mount devices (SMDs) replaced through-hole wire-ended components. Those surface mount devices were bad news for hobbyists but very good news for mass production of reliable, inexpensive electronics. During manufacture, SMDs could be placed automatically on the surface of the circuit board by a pick-and-place robot, then connected to solder pads by reflow soldering. Component density was much higher, devices could be installed on both sides of the board, fewer holes had to be drilled and production was much faster.



Part of the main circuit board from a Samsung 55 inch LCD color TV shows over 100 surface mount devices. Component density increased and reliability improved with the change from wire-ended devices to SMD.

While SMD improved reliability, repair of circuit boards with SMD components became more difficult — requiring good eyesight and specialist tools. With the cost of electronic equipment falling, it became less attractive to repair a faulty TV or monitor compared with purchase of a brand new model. This was bad news for the TV repair engineer.

Meanwhile, distribution of TV signals was changing. Cable TV offered improved reception, then — for a while — satellite reception became popular as it offered more channels. Satellite dishes disappeared as digital cable took over, offering even more channels. The demand for antennas mounted high on the roof diminished and visits from the TV engineer were replaced by the cable TV installer, equipped with his ladder and signal level meter.

Arrival of cable TV has reduced the need for roof-mounted antennas.

Coaxial cable requires bidirectional amplifiers mounted at intervals along the length of cable to offset losses. For aerial installations, cable loss increases with temperature, so the amplifier gain has to compensate for these variations.

Coaxial cable line extender hangs below a newer fiber optic cable.

Just like the phone company, the cable TV industry has been changing over from coaxial to fiber optic connections in order to improve reliability and provide greater bandwidth. Perhaps the old-style cable guy will be putting his feet up soon, along with the phone company's Strowger experts.

The last hollow state component to disappear from television was the cathode ray tube. When flat panel TVs came along with their liquid crystal displays, picture quality improved, EHT supplies were eliminated, reliability was raised and the TV repairman from the 20th century decided that enough was enough. It was time to clear out the tube caddy, drop the degaussing coil and take a turn on twenty meters!

- NM9J

Taking the ham out of radio? – "CC"

Are we going too far with applying modern technology to our hobby? Here are a few thoughts — feel free to disagree.

CW Contests

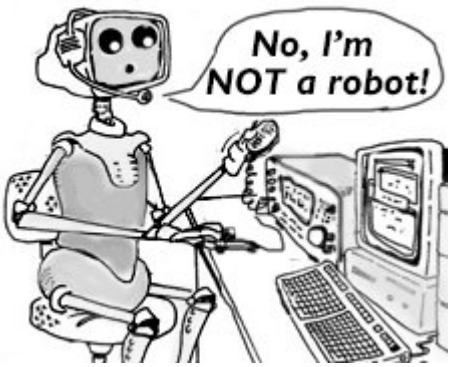
I used to enjoy giving away points in CW contests, whenever they might be. But most CW events — apart from Straight Key Night — leave me cold these days. Stations are using software to send a standardized report — for example 5NN. And many stations have the speed control set at 30 wpm, 35 wpm or even higher. If you call at a lower speed, don't be surprised if the unsympathetic operator will not slow down to match your speed.

I suspect that contest stations are treating CW as just another digital mode, with no need to transmit or receive themselves. They don't even have a paddle or straight key connected. All messages are pre-programmed onto function keys.

It's quite an achievement to automate a contest station to this degree. But is it *friendly*? Is it *amateur* radio?

Phone contests

Plenty of contest stations have a CQ message programmed into a voice keyer. This is fair enough… on a quiet band you might be calling CQ for long periods without a reply and the voice becomes strained. But some stations have *all* their messages programmed into memories, just like the CW contester. Do we really want to go that far? Are you talking to a human at the far end, or is this another example of a **Turing Test**, where you have to guess who or what is behind the curtain?



(I have no problem with the spirit of contesting… contests are an excellent way to advance the radio art. Just as motor sport improves the safety and performance of vehicles we drive every day, contesting has honed efficiency and generated demand for high performance transceivers.)

FT8

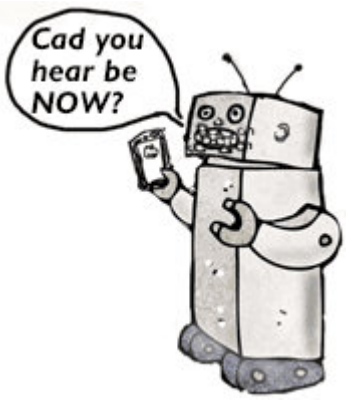
The digital mode FT8 is a significant technical achievement. It has attracted a good deal of activity by radio amateurs who can contact distant stations on HF and VHF using moderate stations and antennas. I have tried the mode but find it curiously unsatisfying. Perhaps this is because of the limited amount of information that can be transmitted… call sign, grid square and — for a few contests, a standard contest exchange. Another factor limiting enjoyment might be the complete lack of human interaction. Some stations have programmed their stations to make FT8 contacts without an operator present. Calling Professor Turing…

Keyboard modes like RTTY and PSK-31 allow more human interaction, especially when you see the operator at the far end back-spacing over his or her mistakes.

• • • • • • • •

Digital voice

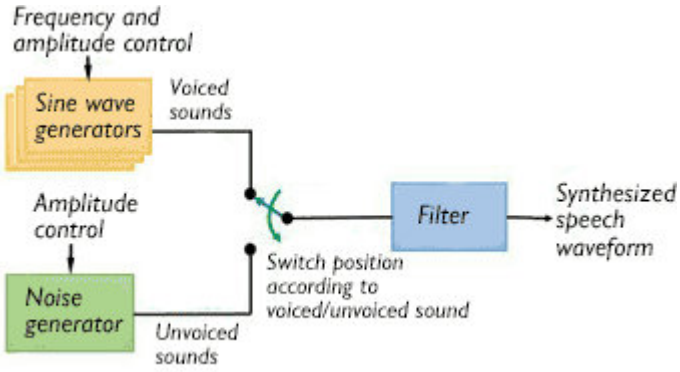
I have been monitoring digital voice modes for a while including Yaesu System Fusion, P25 and DMR. All these modes have a common thread — proprietary "IMBE™" and "AMBE®" vocoder technology supplied by DVSI, Digital Voice Systems Inc. Their software processes the human voice into a digital bitstream that can fit within radio bandwidths equivalent to 12.5 or 6.25 kHz. When signal strength is good, audio quality can be fair, but as mobile flutter drags a signal down into the noise, the quality becomes more and more robotic, as though the operator has a mouth full of cotton wool.



An audio signal with 3 kHz bandwidth digitized using pulse-code modulation (PCM) at an 8 kHz sampling rate with 8 bit resolution requires an uncompressed bit rate of 64 kbps. This is the type of encoding employed on static digital phone networks. There are various ways to compress this signal — for example GSM cell phones use 'linear predictive coding' to reduce the bit rate to 7 - 13 kbps — and it still sounds quite good.

As an illustration of how the process might work, imagine the design of an artificial larynx and mouth. We'll use a set of audio signal generators capable of producing a sine wave along with harmonics. They will simulate the formants that make up vowel sounds. We'll add a white noise generator with variable amplitude and filtering for the short fricative sounds like "S"

and "T". You can control frequency and amplitude of the fundamental sine wave, turning harmonics on and off as desired, with their own phases and amplitudes. You will have similar control of the white noise source. Operating this artificial voice from a distance might require lots of wires and potentiometers — or you could encode the information into a digital bit stream.



Decoder section of a voice encoder-decoder. [After Electronics Coach.]

The device described is the second half of a multiband voice encoder/decoder. The encoder part would examine the human speech waveform at regular intervals (like 10-40ms), extract the fundamental frequency, measure amplitude of the fundamental and of each harmonic, with similar measurements for the bursts of white noise. This data could then be encoded into a digital bit stream with a rate as low as 3 kbps.

But what happens if the bit stream is interrupted — for example when a mobile signal disappears into the noise for a few milliseconds? The encoder system can add extra bits for forward error correction so the original pattern can still be reconstructed even with a few bits mangled. But if the signal is lost for too long, forward error correction is insufficient. At this point, the decoder might fill in the gap by repeating a previous frame or frames. Now we start to hear strange extended sounds that never came from a human mouth. This is beyond robotic… it sounds like somebody trod on the parrot.

"This... is an ex-parrot!"

If you would like another illustration, consider that wonderful invention the **Star Trek Transporter**. By stepping onto the Transporter Pad, a person's atoms and molecules are converted into an energy pattern then "beamed" to another location, where the pattern is reconverted into the human being. (But is it the same human being? That's a question for philosophers.)

Perhaps you can see a parallel with digital voice, where a human voice is taken apart, beamed to another location, then put back together again.

Unfortunately, the world of Star Trek suffered from regular Transporter malfunctions. In the original series episode "The Enemy Within", Captain Kirk is converted into two people — one an evil twin. In "Mirror, Mirror" members of the Enterprise crew are beamed into a brutal mirror universe.

Perhaps this helps to explain how a digital voice signal sounds more and more alien-like as the station gets further away?

We deserve better

Radio amateurs have always been interested in "stretching the rubber band" whether on CW, SSB or FM. They like to know how far away their transmissions are being heard and are expert at pulling weak signals out of the noise. I think we need an improved digital voice mode that sounds more like a human being, especially at the limits of coverage.

Let's put the "ham" back into radio by making our hobby more **H**uman **A**nd **M**indful.

– the "Crusty Curmudgeon"

New York QSO Party

By this time of year the newsletter should have published results from the 2021 New York QSO Party, held in October 2021. However, results are not available yet. Here is the explanation from the NYQP web site (http://nyqp.org/wordpress):

"2021 NYQP results will be delayed. Due to an issue outside of our control, we are in the process of rebuilding the scoring engine. We are making strides in restoring 5 years of hard work, but progress is slow. Check back for further updates as we progress."

"Thanks for your patience."

Facebook page

Due to circumstances beyond his control, Karl N2KZ has been forced to restart the PCARA Facebook page. The new page made its appearance on April 7, 2022; the old page was scheduled for withdrawal by April 23.

If you have the old link saved (https://www.facebook.com/pcarahamradio) please change it to the new URL: **https://www.facebook.com/pcararadio** .You can then re-like and re-friend the new Facebook page.

Peekskill / Cortlandt Amateur Radio Association

Mail: PCARA, PO Box 146, Crompond, NY 10517
E-Mail: mail 'at' pcara.org
Web site: http://www.pcara.org
PCARA on Facebook: https://www.facebook.com/pcararadio
***PCARA Update* Editor:** Malcolm Pritchard, NM9J
E-mail: NM9J 'at' arrl.net
Newsletter contributions are always very welcome!
Archive: http://nm9j.com/pcara/newslett.htm

PCARA Information

PCARA is a **Non-Profit Community Service Organization**. PCARA meetings take place every month (apart from July/August break). See http://www.pcara.org for current details.

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 may be required.
Sat May 7: PCARA Breakfast, 9:00 a.m., Downing Park Pavilion, Rt 202, Yorktown.
Sat May 21: PCARA Membership meeting, 10:00 a.m., Putnam Valley Library, 30 Oscawana Lake Rd, Putnam Valley NY.
Sat May 21: PCARA V.E. Test Session, 11:00 a.m., Putnam Valley Library, 30 Oscawana Lake Rd, Putnam Valley NY, see below.

Hamfests

Check with organizers before leaving.
Sun May 1: Orange County ARC Hamfest, Wallkill Comm. Cntr, 7 Wes Warren Dr., Middletown NY. 8:00 a.m. **Club Table.**
Sat May 7: Splitrock ARA Tailgate Hamfest, Roxbury Snr Center, 72 Eyland Ave, Succasunna, NJ, 8:00 a.m.
Sat May 21: Southern Berkshire ARC Hamfest, Goshen CT Fairgrounds, 116 Old Middle St., Goshen, CT. 8:00 a.m.

VE Test Sessions

Check with the contact before leaving.
April 27: PCARA, BOCES Tech Ctr., 200 Boces Dr., Yorktown Heights NY. Laurel VEC. Must contact daveharper'at'vivaldi.net (914) 432-2639
May 7, 14, 15, 21, 28: NYC-Westchester ARC, 43 Hart Ave, Yonkers NY. 12:00 noon. Must contact VE: k2ltm 'at'aol.com.
May 12: WECA, Westchester Cnty Fire Trg Center, 4 Dana Rd Rm 3, Valhalla NY. Must contact: wa2nrv'at'weca.org (914) 831-3258.
May 20: Orange Cnty ARC, Munger Cottage, 183 Main St, Cornwall NY. 6:00 p.m. Must contact w2bcc'at'arrl.net (845) 534-3146,
May 21: PCARA, Putnam Valley Free Library, 30 Oscawana Lake Rd., Putnam Valley NY. 11:00 a.m. ARRL VEC. Must contact Mike W2IG, w2igg'at'yahoo.com.

Peekskill / Cortlandt Amateur Radio Association Inc.
PO Box 146
Crompond, NY 10517