



PCARA Update



Volume 6, Issue 5

Peekskill / Cortlandt Amateur Radio Association Inc.

May 2005

Special Events

Our request to use Blue Mountain Middle School for PCARA's 5th Anniversary Special Event Station is making good progress and we are just waiting for final approval from the Board of Education. This year we will be commemorating the 100th anniversary of completion of the Croton Dam and we've been assigned the call sign **W2D**. Karl N2KZ is also making progress with permission for a station at the Dam itself. If all goes according to plan, station set-up will commence at 7:30 A.M. on Saturday May 14. For the latest information, come to the May 1 meeting and check the web site.

PCARA has a **second** Special Event Station this year, over the weekend of July 9-10. Following a suggestion from Jim W2JJG, PCARA will have a demonstration station at the 4-H Fair, located at Muscote Farm in Somers. 4-H is an educational program to provide youngsters with a variety of experiences that will help them become skilled and responsible adults — a perfect fit for amateur radio! Our call sign will be **W4H**.

PCARA is sponsoring a Foxhunt on Saturday, June 4. The hunt will begin at the Beach Shopping Center at 3:00 p.m. with foxes being played by Ray, W2CH and Marylyn, KC2NKU. Further details will be provided at the May meeting and on the PCARA web site. After the hunt, we will be getting together at a local restaurant.

Tickets for the PCARA Annual Raffle are still on sale. The prize this year is an IC-2100H 2 meter mobile. Tickets are \$5.00 each, with a limit of 100 tickets to be sold. The winner will be drawn June 26, 2005 at the conclusion of Field Day. Tickets will be on sale at the May and June meetings and at Hamfests such as BARA.

Speaking of Field Day, PCARA has received permission from the Palisades Interstate Park Commission to hold our Field Day activities at Perkins Memorial Point on Bear Mountain. This year Field Day is the weekend of June 25-26. Please join us in practicing our emergency communications skills, while at the same time having fun. To sign up for Field Day, contact Bob, N2CBH.

Bob, N2CBH has been busy improving the PCARA



*The New Croton Dam in southern Cortlandt. On May 14, PCARA will be celebrating the 100th anniversary of the dam's completion with Special Event Station **W2D**. (This photo was taken in February.)*

repeater in Putnam Valley. Try a call on 448.725 MHz, -5.0 MHz, PL 107.2 Hz.

Hope to see each of you at the May 1st meeting at Hudson Valley Hospital Center.

– 73 de Greg, KB2CQE

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FM Stereo with a little help from AM! — N2CBH

It's been a while since I contributed an article to the PCARA newsletter. I thought it was time to get back in the game!

As many of you know, my work these days involves making equipment for the broadcast industry. For many years we have been making equipment that helps FM and TV broadcasters manage their signals at the transmitter sites. Specifically we build equipment that switches and distributes the signal that creates the stereo audio in your receiver. This is called a baseband or composite audio signal, which has all of the components that are required to produce FM and TV stereo. I thought I would spend a little time describing how this system works and a little history on the origins of stereo broadcasting. Stay with me because the technology used is quite similar to ham radio modes that we use.

FM stereo has been around since 1961 when the system now in use was adopted. How did the Federal Communications Commission decide how to transmit stereo? The FCC issued a notice of proposed rulemaking for a standard to be developed. In this case it was stereo broadcasting. They provided some basic specifications that would need to be met but left it up to participating organizations to submit detailed proposals of just how the specifications would be met.

In the case of FM stereo, companies involved in electronic manufacturing submitted proposals for their particular methods. In all, there were eight proposals from companies like Crosby Laboratories, General Electric, EMI, Philco, RCA, and Zenith. Many of these names may be familiar and a few may not. Our esteemed editor is no doubt very familiar with EMI. The EMI Group, formerly Electrical and Musical Industries, is a United Kingdom based electronics colossus. Interestingly, EMI is one of the only companies from this group that is still around. RCA is gone — purchased by GE years ago. Philco is now part of Dutch N.V. Philips and Zenith is a division of Korean LG Electronics



Album cover picture from 1969 shows the Beatles crossing the road to reach EMI's Abbey Road studios.

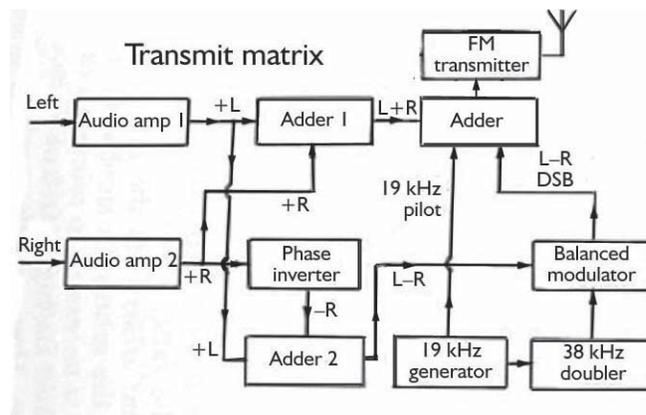
(Lucky Goldstar). All but one of these companies was a large firm — Murray Crosby was sort of a lone inventor with many patents to his credit.

Each company submitted a proposal. Some companies submitted more than one. Each proposed system was different enough to be given consideration of its own but there were many similarities. The final system adopted was actually a marriage of two systems. Combined techniques of the GE and Zenith proposals were used to complete the final system.

I will describe how this system works and touch back on some of the other systems for a bit more history. FM radio started as a monaural service back in the 1940s. With the advent of stereo records in the 1950s there was quite a bit of interest in adding a second channel to the new high fidelity medium of FM radio. The FM stereo system starts by taking the left and right channels of a stereo pair and performing what is called a matrix operation on them. This is simply taking the sum of the two channels to create an $L+R$ signal. This is the monaural signal that listeners were already familiar with. A second operation was performed by subtracting the right channel from the left channel in another circuit. This produces an output anytime there is a difference in the program content between left and right channels. Monaural audio produces no $L-R$ as long as the channels are level balanced.

Next, the $L+R$ signal is fed directly to an adder circuit to be combined with other components which I am about to describe. This monaural signal provides backward compatibility to anyone owning a monaural receiver. The difference signal is then fed to a double sideband suppressed carrier modulator along with a 38 kHz carrier. The signal produced consists of amplitude modulated upper and lower sidebands above and below the 38 kHz suppressed carrier.

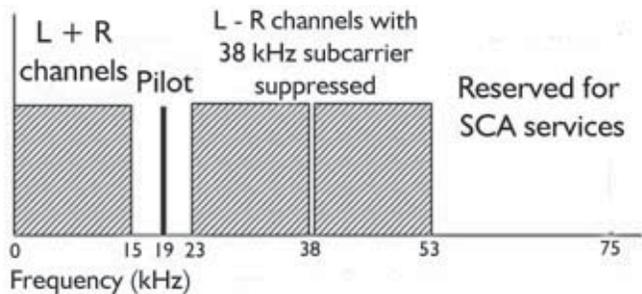
There is one more thing that needs to be added to the composite signal before it can be broadcast. A pilot tone is added which is precisely one half of the 38 kHz carrier used to generate the DSB signal. This 19 kHz pilot tone serves a dual purpose. First it's the signal that



Block diagram of stereo FM transmitter.

tells your receiver to illuminate the “stereo” light, indicating a stereo broadcast. Its second and more important role is to synchronize demodulation of the incoming 38 kHz DSB signal.

At the broadcast location, all three signals $L+R$, 19 kHz pilot and $L-R$ modulated 38 kHz DSB are combined to form a composite signal, which is then fed to the wide band input of an FM broadcast transmitter. The process of reception of this signal is really just the reverse, requiring detection and de-matrixing of the multiplex signal.



Frequency spectrum of composite stereo multiplex signal.

Remember that I said this article would tie ham radio in somewhere? Well, the stereo demodulation circuit in your stereo receiver is really just like your SSB receiver. The composite signal is detected by an FM discriminator circuit just like in your two meter rig. The $L+R$ monaural signal is filtered and sent to one port of the de-matrix circuit. The incoming 19 kHz pilot is doubled and used as the BFO signal for the 38 kHz demodulator circuit. Unlike the BFO in your SSB rig which free runs, the incoming pilot signal when doubled is exactly in phase with the suppressed 38 kHz DSB carrier, providing synchronous detection of the 38 kHz DSB signal. By use of synchronous detection the “Donald Duck” effect familiar to us all with SSB reception is eliminated. A small amount of this is OK for speech but listening to music this way can make one ill!

Once the $L-R$ signal is demodulated it can now be fed to the other port of the de-matrix circuit. This de-matrix circuit is identical to the one used to create the signal at the transmitter. Taking the sum and difference of the “sum” and “difference” signals provides the reverse operation of the original whereby the original left and right information is output to the amplifiers in your stereo system. The algebra for this is quite simple:

$L + R$, $L - R$ are the two signals generated at the transmitter. Adding them and subtracting them:

$$(L+R) + (L-R) = 2L$$

$$(L+R) - (L-R) = 2R$$

The “2” is a constant multiplier, which does not affect the recovered signals.



FM-stereo signal of local broadcaster WHUD is radiated from circularly polarized antennas at the top of this tower, using a power level of 50 kW ERP.

The other systems that were proposed to the FCC were similar to the one described above. All used matrix circuits. They differed mainly on how to handle the difference channel. One system used conventional double sideband full carrier AM for its sub carrier. Crosby’s approach used an FM subcarrier, which as it turns out will outperform the system that was finally adopted.

Why would the FCC have chosen a system that was inferior to another? The answer lies in the fact that for some time before FM stereo was adopted, the FCC had adopted rules for subcarriers used to distribute programming of a non-broadcast nature via FM radio. Use of the Crosby system would have meant that these subcarriers would have to cease operation, due to the fact that the FM subcarrier for the difference information would have occupied the entire base band spectrum used by the subcarriers.

Subcarriers actually became a lucrative business for FM stations of the 1950s as many FM stations didn’t do that well against the more listened-to AM band. They would lease their subcarriers for a fee to a third party. Often, this was the only revenue an FM station would derive. Broadcasters were not about to throw away a viable business for this stereo stuff! The GE/Zenith system used less bandwidth, which allowed subcarriers or SCAs (Subsidiary Communications Authority) as they are known in the industry to continue. Some had to be moved up in frequency to accommodate the wider stereo subcarrier.

The penalty of using the GE/Zenith system over the Crosby system was the addition of noise to the system. The AM system used for FM stereo is prone to additional noise as the FM carrier strength is reduced.

The penalty is 23 dB over monaural FM! You can compare this for yourself at home. If your receiver has a mono position, tune in a station from a great distance and place the receiver in mono. Then, switch to stereo during a quiet passage in the programming. You will notice a great deal of noise that is added when you switch to stereo. This is masked somewhat by modern audio processing techniques that broadcasters use but it will always be there.

Dolby® FM
Making Radio Sound Better™

There were a few systems proposed to reduce this noise. In the 1970s Dolby Laboratories developed what they called “Dolby FM”. It was a system very similar to the noise reduction systems that they had developed for tape recorder use. The idea was to compress signals being fed to the transmitter upon broadcast and then to decompress or expand the signal at the other end. This would boost the signal level over the noise and at the receiver the expander would put the audio back where it belonged and suppress the noise below apparent listening levels. This system was not backward compatible to existing FM stereo receivers so it was a gentle system and therefore marginally effective.

A more effective solution was proposed by CBS Laboratories in the 1980s. CBS developed a system called FMX which actually added a second 38 kHz sub carrier that was in quadrature with the normal sub carrier. This was really a novel approach because it was completely backward compatible with existing FM receivers, at least on paper. What they did was to apply a re-entrant compression curve to the quadrature subcarrier that reduced the noise in an FMX equipped receiver by 23 dB. This effectively eliminated the noise problem. There was an added benefit in that it could reduce multipath effects as well. Multipath is the picket fence type noise that we experience on FM broadcasts and even our two meter repeater. FMX had a couple of problems. First, you needed an FMX equipped radio to benefit from it. Second, the additional subcarrier wasn't always transparent to existing FM radios. Third, the additional sub carrier also created multipath-like effects that it was supposed to eliminate. Neither Dolby nor CBS had any luck with this and eventually both firms pulled their systems from the market.

Today, broadcasters are beginning to use a digital modulation system to eventually replace AM and FM broadcasts. Next time I will talk about these new systems.

- Bob, N2CBH

Footnote: Seventy years after Edwin H. Armstrong demonstrated wide-band FM in public, there will be a commemorative broadcast from the historic Armstrong tower at Alpine, NJ. Transmissions on June 11-12 will be on Armstrong's original 42.8 MHz frequency, thanks to an STA from the FCC, using experimental call sign WA2XMN. (Press release)

In-flew-Enza

*“I had a little bird, it's name was Enza,
I opened the window, and in-flew-Enza.”*
(Children's chant from 1918 Spanish flu pandemic.)

On April 12 2005, news stories described how a potentially deadly flu virus was accidentally distributed from the U.S.A. to 3,800 laboratories worldwide. The College of American Pathologists had sent out kits to help labs do proficiency testing, but the supplier accidentally included samples of the deadly H2N2 virus, responsible for the Asian flu pandemic of 1957. The World Health Organization called on laboratories to destroy the samples as a precaution against another outbreak of the same disease. People born after 1968, when the strain was last included in vaccines, would have had no immunity whatsoever against the H2N2 strain of influenza.

I suspect that the majority of PCARA members **were** born *before* 1968, so with apologies to those readers born later, this set me thinking about what the consequences might be if all our youngsters suddenly disappeared – leaving only baby boomers and senior citizens to inherit the earth!

The first thing we might notice would be a sudden lack of students to fill the classrooms and clog the roads during term time. As an immediate consequence, all educators would have an awful lot of time on their hands. Teachers would have to wait several years before the next batch of youngsters turned up for school. Radio clubs seeking ‘new blood’ would have to stop looking to the teens and twenties traditionally drawn into the hobby and start recruiting from the middle-aged OMs and old timers.

The next thing we would miss is explaining items of bygone technology to today's youngsters – topics like electron tubes, tape recorders, and telegrams. Just think of the items we were familiar with in the 60s and 70s that have all but disappeared today... from LP records, slide rules, AM transmitters, flashcubes, cine cameras, contact breakers and carburetors — to carbon paper, carbon microphones, black and white television and moon landings. Those were the days when “cable” meant a cablegram and “Hertz” meant ouch.

With all the youngsters out of the way, I would predict a resurgence in fondly remembered, if dated techniques. Dig out your 35mm SLR camera, your manual typewriter and your fountain pen. Perhaps the art of letter writing will make a comeback.

While old-style techniques are being revived, I would predict hard times for the cell phone industry. Today's youngsters cannot be parted from their wireless devices and feel cut-off without them. Boomers and beyond remember happier times when you could walk

around all day without being tethered to a cell-phone. No more interruptions from XYL or works-QTH. Out of site, out of mind.

In the world of amateur radio, I see a big future for receivers *without* solid state front-ends. I remember setting up multi-op multi-band special event stations where all the equipment was classic hollow state — and there was no need to worry about intermodulation, cross-modulation, phase noise or any other kind of interaction between all the different operating positions. At one point, we accidentally connected the transmitter output to the receiver input without causing any damage at all. Tubes rock!



A complicated kit from Benton Harbor...

gratification prefer to buy brand new radios and use them immediately. More senior hams remember the joys of home construction, whether it was a project you designed yourself or a complicated kit from Benton Harbor. You might be involved in days of careful assembly, culminating in the grand finale of switching on, taking cover (from exploding electrolytics), then checking to see if your creation actually worked according to the specifications.

Your home-brew equipment might include a grid dip oscillator with a real grid, an oscilloscope with a genuine cathode ray tube and an antenna tuner with an RF ammeter so you can remember the joys of tuning for “maximum smoke”.

I predict a bright future for contesting, slightly modified for the new demographics. All contests would have a compulsory sleep period overnight, with an optional nap in the late afternoon. There would be a special bonus for operators rejecting electronic aids — no Internet spotting, no memory keyer, no electronic logging and no Packet Cluster. All entries would be handwritten and submitted by good old snail mail.

The Japanese transceiver manufacturers would find part of their market drying up. Demand would die out for transceivers with tiny buttons, diminutive displays and 27 functions on a single control. A new “revival” line of transceivers would have full-size control knobs, large digits and a rotary band-change switch that feels like you are turning over a propeller engine — clunk-clunk-clunk! The special “Pro” version would emit the odor of hot dust burning off PA tubes

when the key was held down too long.

But enough of this day-dreaming. By April 21, the World Health Organization reported that laboratories in 18 countries had destroyed or secured the proficiency panels containing H2N2 virus — and destruction of the remainder would be completed shortly. *Welcome back youngsters!* It’s up to you to lead the way with your enthusiasm, endless energy, and ever-ready willingness to try new techniques. We couldn’t make it without you!



Demand would die out for transceivers with tiny buttons...

- 73 de NM9J

PCARA Annual Raffle

Tickets now on sale!

1st Prize:

Icom-2100H - 2 meter mobile transceiver



55 watt transmit,
large tuning dial,
rugged aluminum chassis.

Perfect for beginning Techs and great for all Hams

Tickets are \$5.00 donation each. Limit of 100 tickets sold.

Proceeds to help offset our liability insurance premiums and keep our dues low.

**Drawing to be held June 26, 2005
at Field Day 2005**

Zooming around

Would you like to waste an hour or two cruising around Peekskill and Cortlandt, without leaving your computer? Take a look at the latest version of Google's amazing "Google Maps" web site at <http://maps.google.com>. You can locate places in North America by address, by zip code, or by double-clicking a map location to center it, then using the pan and zoom controls displayed on the map. The maps can also be dragged with the mouse. The response is amazingly fast — the maps redraw very quickly as you pan and zoom. Keyboard shortcuts are also available... arrow keys or <PgUp> <PgDn> to pan, then use "+" and "-" keys to zoom in and out.

Google Maps can give you directions. For example, type in "Cortlandt Manor, NY to LaGrangeville, NY" to see how to get to the Beacon Hamfest.

But the latest addition to Google Maps is even more fun – high-resolution aerial images are now available... simply locate the area of interest on the Google Maps window, then click on "satellite" in the top right corner. The same area is then shown in a high-resolution photograph, with sufficient detail to see your home and trees in the yard!

The images are provided by digital map maker Keyhole Corporation, which was bought by Google in October 2004. The images, from satellites and airplanes, can also be panned and zoomed just like the maps. You can toggle backward and forward from "satellite"

view to "map" view to help identify streets and maintain your orientation.

Not all places have the high-resolution images available, but Peekskill and the Town of



Cortlandt Town Center from above.

Cortlandt certainly do. Some places worth checking out include Hudson Valley Hospital Center, Beach Shopping Center, Cortlandt Town Centre, Cortlandt Town Hall in Heady Street, Bear Mountain Bridge, and New Croton Dam. The dam is just within the high resolution image area. (Readers across the border in Yorktown are currently out of luck!)

Interested in landmarks from other parts of the country? Pay a visit to <http://www.shreddies.org/gmaps/>.

Repeater news

The latest edition of the Repeater Directory is available from ARRL. Price has increased from \$9.95 to \$10.95.

A listing of IRLP nodes is included, so PCARA now has *four* entries in the directory, as follows:

MID HUDSON

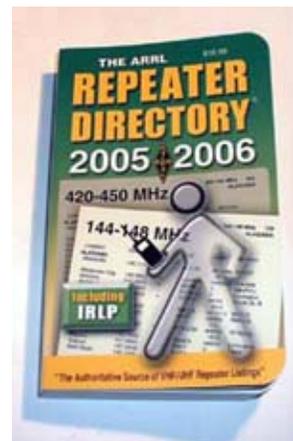
Lake Peekskill 146.6700 - W2NYW o(CA)es 156.7 PCARA
Lake Peekskill 449.9250 - N2CBH oes 179.9 PCARA
Putnam Valley 448.7250 - N2CBH oes 107.2 PCARA

IRLP Nodes

4214 Cortlandt Manor NY USA 449.925 -5 179.9

The Directory still shows the wrong callsign on Greg's 449.925 machine — it should of course be KB2CQE.

Putnam Valley machine: PCARA's UHF repeater located in Putnam Valley was given a spring cleaning by Bob, N2CBH on April 7. The old antenna has been replaced and the repeater is now operating more efficiently. Try a call on 448.725 MHz - 5.0 MHz, PL 107.2 Hz and see what signal report you receive via N2CBH/R.



Dam Special Event

On Saturday May 14, PCARA will be celebrating the hundredth anniversary of completion of the Croton

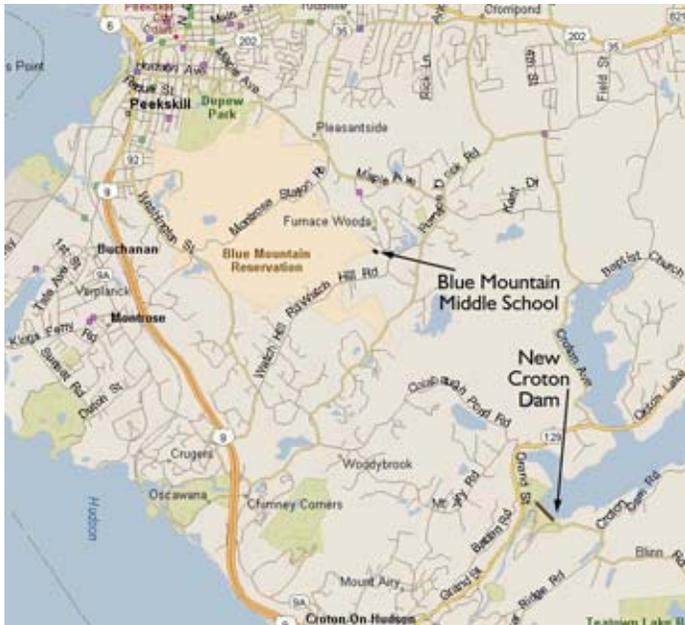


Bridge and spillway at the New Croton Dam.

Dam and the 5th anniversary of PCARA. Here is the Special Event Station announcement as it appears on page 97 of the May edition of QST.

Cortlandt Manor, NY: Peekskill Cortlandt Amateur Radio Association, W2D. 1400Z-2100Z **May 14.** 100th Anniversary of completion of Croton Dam. 28.450 21.350 14.250 7.250. Certificate. PCARA, PO Box 146, Crompond, NY 10517. www.pcara.org.

Special event operations using the call **W2D** will be taking place at Blue Mountain Middle School, and possibly from the area of the dam itself. Blue Mountain Middle School is located on Furnace Woods Road, ¾ mile southeast of Maple Avenue. Croton Dam Plaza is located on Route 129, two miles northeast of Route 9/9A.



Special Event Station locations.

For a potted history of the New Croton Dam, see the March issue of *PCARA Update*, page 7. For a full history see the linked page on the Village of Croton on Hudson web site.

Construction of the original Croton Dam began in 1837 near Arcady Road in Yorktown. The 50 foot high earthen dam was breached when a January snowstorm was followed by heavy rain – sounds familiar? The rebuilt rock-filled timber crib dam, with granite face, was completed in 1842. In its day, the brick-lined Old Croton water supply fed the reservoirs at Central Park and Bryant Park. Parts of the Old Croton aqueduct are still in use today.

The **New Croton Dam** replaced the Old Croton Dam. Work on the new dam began in 1892 at the Quaker Bridge site in the Town of Cortlandt, 4 miles

downstream from the previous dam. The old dam now lies submerged in the waters of the Croton Reservoir, under Old Croton Dam Bridge, east of the Taconic State Parkway.

The new dam is the second largest hand-hewn masonry structure in the world after the Great Pyramid in Egypt. It rises almost 200 feet above the valley and is faced with Peekskill granite. Most of the labor was provided by Irish and Italian immigrants. By 1890/91 water was flowing from the Croton system to Central Park Reservoir, though the dam itself was not completed until 1905-1907.

The Croton reservoir system supplies New York City, parts of the Bronx and Westchester County with 300 million gallons of water per day. Nowadays the Croton Reservoir is supplemented with water from the Catskill and Delaware River systems.

Mt Beacon Hamfest

PCARA attended the Mt Beacon Hamfest on Sunday April 10 at Tymor Park, LaGrangeville NY. The day was fine and sunny throughout and a good number of members came by the club table.

PCARA raffle tickets were on sale as well as various items of equipment, large and small from members and from the club's collection of donated items. This activity should all help top up the coffers.

PCARA's next club table is likely to be at the Bergen Amateur Radio Association Spring Hamfest on Saturday May 28.



Ray W2CH, Jim W2JJG and Joe WA2MCR at the PCARA club table during Mt Beacon ARC hamfest.

(Note the PCARA hats and sweatshirts. If you are interested in ordering items of PCARA clothing, contact Jim, W2JJG.)

Peekskill / Cortlandt Amateur Radio Association

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Newsletter contributions are always very welcome!

Archive: <http://home.computer.net/~pcara/newslett.htm>

PCARA Information

PCARA is a **Non-Profit Community Service Organization**. PCARA meetings take place the first Sunday of each month at 3:00 p.m. in Dining Room B of the Hudson Valley Hospital Center, Route 202, Cortlandt Manor, NY 10567. Drive round behind the main hospital building and enter from the rear (look for the oxygen tanks). 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

(IRLP node: **4214**)

N2CBH: 448.725MHz -5.0, PL 107.2Hz

PCARA Calendar

Sun May 1: May meeting, HVHC, 3:00 p.m.

Sat May 14: Special Event Station W2D.

Sat June 4: PCARA Foxhunt.

June 25-26: Field Day

July 9-10: Special Event Station W4H, Muscoot Fm.

Hamfests

Sat May 28: Bergen ARA Annual Spring Hamfest, Westwood Regional HS, 701 Ridgewood Rd, Washington Twnship, NJ. 8:00 a.m. **Club table.**

Sun Jun 5: Hall of Science ARC Hamfest, Flushing Meadows Corona Park, Queens NY. 9:00 a.m.

Sun Jun 12: LIMARC Hamfair, Briarcliffe College 1055 Stewart Avenue, Bethpage NY. 9:00 a.m.

Sat Jun 18: Raritan Valley RC Hamfest, Piscataway HS, Hoes Ln & Behmer Rd, Piscataway, NJ. 7:00 a.m.

VE Test Sessions

May 1: Yonkers ARC, Yonkers PD, 1st Precinct, E Grassy Sprain Rd, 8:30 a.m. Contact D. Calabrese, 914 667-0587.

May 9: Split Rock ARA, Hopatcong HS, Hopatcong NJ. 7:00 p.m. Contact Sid Markowitz, 973 724-2378.

May 16: Columbia Univ ARC, Watson Labs, 612 W 115th St. New York, 6:30 p.m. Contact Alan Crosswell, 212 854-3754.

May 28: Bergen ARA, Westwood Reg HS, 701 Ridgewood Rd., Washington Twnshp NJ. 8:00 a.m. Contact Donald Younger 201 265-6583.



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