



# PCARA Update



Volume 8, Issue 2

Peekskill / Cortlandt Amateur Radio Association Inc.

February 2007

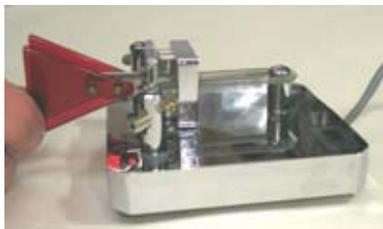
## Code war end

On February 23, 2007 an epoch in Ham Radio will come to a close. To become licensed by the FCC, candidates will no longer be required to demonstrate a proficiency in receiving Morse Code. Over time, the Morse requirements became less, and have now disappeared in response to international agreements and requirements. There are copious arguments for and against keeping some form of Morse Code requirement for licensing. I couldn't begin to do justice to them all in the very limited space I have in this newsletter.



ARRL code tape.

Just because Morse Code is no longer required in order to become licensed, doesn't mean that you can't learn it, or have to stop using it! CW is, and will remain a viable and important part of amateur radio. Now, let us not forget to welcome our new General and Extra class amateurs both on and off the air!



CW will remain an important part of amateur radio.

On several occasions there has been some discussion of having a club "field trip" of sorts to an amateur radio equipment dealership within a few hours drive of our area. I would really like to see something like this happen. If we get really serious, I would like to get a large group to make a pilgrimage to Dayton. This could be really fun! Let's talk.

I look forward to seeing each of you at the February 4<sup>th</sup> meeting, at 3:00 PM at Hudson Valley Hospital Center.

- 73 de Greg, KB2CQE

## Net night

Don't forget that the PCARA weekly net now takes place on **Wednesday** evenings at 8:00 p.m. You can call in to the net on the 2 meter repeater, 146.67 MHz, offset -0.6 MHz, 156.7Hz CTCSS.

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## PCARA Officers

President:

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Secretary/Treasurer: *open.*

# Adventures in DXing

- N2KZ

## Inspired Resolutions

New goals fill the New Year in the world of N2KZ. Inspired by Joe, WA2MCR and Ray, W2CH, I have begun my quest for another holy grail: The DXCC award. One hundred countries verified may someday be mine! I have already managed to satisfy two lesser goals: Fists' Century Club award (working 100 different Fists members,) and the ARRL's Worked All States award with a CW endorsement. The ARRL's DXCC award requires you to verify contact with 100 countries. With 47 countries already verified, I need only 53 more to reach for DXCC gold!

This challenge is not slight. All of my signals emit from quite modest equipment. My finest and most powerful rig is my trusty Heathkit HW-16 rated at 90 watts provided by horizontal sweep tube technology borrowed from the days of pre-solid state television. A 1959 vintage Heathkit DX-20 has now joined my collection as a new source of QRO power also fitted with another horizontal sweep tube boasting 50 watts input. My Radio Shack HTX-100 is capable of 25 watts as a monobander on 10 Meters. Besides this troika, all my gear is rated in single-digit wattage or milli-wattage! With only simple wire antennas up in the nearby trees, it's not exactly a mighty high-tech. shack, but, boy! is it a lot of fun! Nothing beats the smell of old dried dust being warmed by tube filaments.



*The N2KZ shack includes (left to right) Heath HG-10B VFO alongside Heath HW-16 CW transceiver; on top is Heath DX-20 CW transmitter. To the right, down on the desk is the Collins-designed R-390 receiver, with Heath HW-7 CW QRP transceiver sitting on top.*

I'm amazed how potent my DX-20's signal is! Distant stations continually respond to its hefty clout. To ease operation of my new DX-20, I designed and built a custom transmit-receive switch based upon a 4PDT relay. When the relay is relaxed and off, my

receiving antenna connects to my R-390 military surplus behemoth and the sending key is disconnected from the DX-20. Flip the front-panel switch on and the receiving antenna is disconnected, the R-390's antenna input is terminated by a resistor, and my straight key becomes active. Either the receiver or the transmitter is active, but never both at once! I simply can't send (and blow up my receiver) when the switch is off. It's a lot more fun when you don't have to physically jump up and switch the antenna every time you send! A fancy illuminated bat toggle switch made a sweet final touch for the project. Now, I'm really ready to go for the DXCC!



*Transmit-receive switch handles antenna switching and keyer control for Karl's separate transmitter and receiver setup.*

Speaking of 20, my DX-20 operates on 20 Meters. Suddenly, for the first time ever, I will soon be able to transmit a signal with double-digit wattage on the most popular DX band. Step one: I need to get a crystal that will oscillate in the 20 Meter CW band! The ARRL International DX CW contest convenes the weekend of February 17 and 18, so watch out! N2KZ will be loose toting heavy duty quartz-driven thermionic signals! Why would I want to use "real" equipment when I can party with old friends from Benton Harbor, Michigan? Look to Brian, AF4K, as the answer to all your crystal needs. Visit <http://s88932719.onlinehome.us/crystals.htm> to see his current stock of quartz. He has become a definitive source of natural oscillation offering an enormous collection of frequencies and holder types. Get a piece of the rock from Brian!

Hearty congratulations to Joe, WA2MCR for reaching 200 countries for another milestone DXCC endorsement; and Ray, W2CH for almost reaching his first 100 countries to earn his DXCC certificate for the first time. Ray has only one more country to verify! Bravo! Hopefully, I'll be next!

Mike, N2EAB, has also been a good influence. After a conversation at the PCARA holiday dinner in December about Mike's homebrew projects, I dusted off my Heathkit active antenna preamplifier and

preselector for use with my Realistic DX-160 receiver residing in my bathroom. You don't think I could begin my days without hearing CW, do you? The active antenna really brings up very weak and tentative signals out of the murk of the noise floor. Poor solar conditions demand amateurs to use as much operating moxie as possible!

Read my eHam review of my DX-20 at <http://www.eham.net/reviews/detail/3358>. Even better, find some inspiration of your own! Join us every Wednesday night at 8pm for the PCARA Old Goat's Net on our two-meter repeater (146.67 MHz, -600 kHz offset with a 156.7 PL.) You won't have to leave home to join the fun! Listen in! You'll become instantly inspired!

### Winning Strategy

You don't need to be a Briton to find the Holy Grail. All you need is a good strategy. I follow the gray line! It is a well-known enhancement of radio propagation seen during dawn or dusk. Looking to work an exotic location? Watch a grey line map and listen carefully when your target area experiences dawn or dusk. Call CQ even if the band seems dead. It often provides miraculous results. Don't overlook yourself! When *you* are in the grey line, you are someone else's DX!

I gained a grand appreciation of this effect while serving as a Fists code buddy to my friend Gil, KG4VCG. We would meet every dawn to practice code on 40 meters. The gray line served us well. His dawn and my dawn were nearly concurrent making my HW-16's 90 watts seem powerful to him. Gil was using an Elecraft K2 QRP kit and a Carolina Windom to respond to me. His mighty 15 watts registered solid signals



Map showing areas of the earth in daylight and in darkness. Grey line is the band that separates the two.



*"What... is your name?"  
 "King Arthur of the Britons"  
 "What... is your quest?"  
 "I seek the Holy Grail!"*

nearly every day as if they were delivered by the Gulf Stream. Gil became endeared with his newfound Morse skills and changed his call sign

to NN4CW. These were grand times, indeed!

Two places to find gray line maps are: <http://nist.time.gov/timezone.cgi?Eastern/d/-5/java> (The National Bureau of Standards online time-of-day page), and <http://dx.qsl.net/propagation/greyline.html>. Don't waste time! Surf the line!

My wish-list includes two continents not yet visited by my signals: The Middle East and Africa. Maybe, someday, my best catches of Antarctica on 15 meters and New Zealand on CW from my car will seem trivial. CQ AFRICA  
 CQ AFRICA DE N2KZ...



One of Karl's best catches on 10 meter CW.

### A Small Wonder

At long last, I have completed the final touches on my Small Wonder Labs Hi-Mite 20. This is the last of a series of kits offered by QRP guru Dave, K1SWL. It is a slightly modified version of his very popular Rock-Mite transceiver available for 80, 40, 30 and 20 meters. The Hi-Mites were offered for 20, 17, 15, 12 and 10 meters hence the name. Complete assembly of the tiny Hi-Mite PC board took about ten hours of careful soldering. Since this kit did not include a chassis and some of the parts required for final assembly, the project dragged on for some time!

I knew I would have only one chance to house this rig, so I gave it a lot of thought! Parts placement can be a bear. I think of it like a chess game. If you mount the pot or the BNC connector there, will it leave enough clearance to slip the PC board into the housing? No matter what I did, I found that I could not get all the parts into my small project box with room to spare. The PC board had to go in before the control pots are mounted. I also added the optional audio gain pot, so I had to rearrange my initial design for three knobs



Inside Karl's Hi-Mite 20 QRP transceiver.

instead of two. It was worth the effort. The project came out very nicely.

The Hi-Mite 20 features a 250 milliwatt transmitter and a direct conversion receiver for 14.060 MHz with the ability to slightly vary the transmit frequency.



Hi-Mite 20 meter transceiver in case with three knobs.

Unlike the Rock-Mite series, it also came with an RIT control. Dave's design also provides a nifty, self-contained keyer capable of speeds up to 40 wpm! It all works fine,

except that the direct conversion receiver has a wonderful tendency to be swamped by megawatt shortwave broadcasts much like my Heathkit HW-7. The Morse note it transmits is sweet and musical. It all fits into a featherweight box that fits in the palm of your hand. The greatest rewards are the QSOs you'll make with a Hi-Mite. I always delight in reporting "PWR HERE IS 250 MILLIWATTS TO DIPOLE UP 30 FT!"

### Learn Not To Burn

Another excellent New Year's resolution is to always play it safe with your equipment. Good grounds are always important. Isolation transformers for your AC/DC rigs with hot chassis will save your life. It's also a great idea to have a working fire extinguisher in your shack. Switching power supplies, vintage gear and lightning are all sources of smoky nightmares that might visit you one day. It could be the best few bucks that you ever invest in your shack. Make sure you are prepared! Play it safe! Get a fire extinguisher and know how to use it!



### Take Me Seriously!

February 17, 2009 is not so far in the distant future. This is the big day when old-fashioned analog TV broadcasting is supposed to cease for eternity, leaving us to exclusively rely on the new world of digital transmission. With only two years to go, most consumers have no knowledge of this impending switch-off. Broadcasters do not seem overly concerned, either. Fox Network's hugely successful *American Idol* suffered a complete loss of audio for over twenty minutes, including two commercial breaks, during the

first hour of its premiere broadcast, via digital WNYW-DT, on January 16. I had to switch to analog channel 5 to continue watching the show. Not a good sign! WFME's channel 29-2 has had a test slide up for years, but it has now decayed into a testament for good cooking or small chocolate



WFME-DT test slide

candies. Mmmmmm! The only welcome addition lately is channel 31-2 which has recently become a children's channel called Qubo. The two laggards in local signal strength, WNBC-DT and PBS' WNET-DT, have increased their power to the point of tentative reliability at my QTH. I fear when the leaves return to the trees these channels will, once again, become a memory.

### Genius?

Do you think you are so smart? Now you can find out! Tektronix, the test equipment manufacturer, and The IEEE's magazine *Communication*, are now sponsoring an on-line contest to test your RF IQ. It's free to enter, and you may become the next RF genius! The prizes are terrific. You can win Radio Shack gift cards or even a dream vacation to Hawaii to attend the IEEE's Microwave Symposium. To see if you are truly resonant, go to: [http://www.myrfiq.com/index\\_welcome\\_guest.aspx?Page=1](http://www.myrfiq.com/index_welcome_guest.aspx?Page=1) and try your luck!

### Back To Basics

I recently discovered a ham radio club that was custom made for my personality. No, it's not a group of hams who operate with rubber chicken mascots and fake arrows through their heads! It's the North American QRP CW Club! Founded by Tom, KB3LFC, the club was designed for hams that enjoy operating low power CW with straight keys and simple wire antennas (sound familiar?) The club now has nearly 1700 members (I am member 1688) and it's continually growing.



The NAQCC offers a variety of operating activities, and the price is right. Anyone can join with a 100% discount (it's free!) Join the club and you can go on a bear hunt (working a specific ham,) enter the 30-30

contest (work thirty stations in thirty days on thirty meters,) or strive for distant QSOs traveling more than a thousand miles per watt. The fun is nearly endless! In February, you'll find delight in the President's Challenge: Use the letters in the call signs of every station you work to spell president's names. Here's dozens of reasons to get on the air with your straight key. Check out all the adventure that awaits you at: <http://www.arm-tek.net/~yoel>. Don't complain that the bands are dead! Get on the air! (I need to work someone!)

Until next month, try to work a QSO a day! Happy trails es 73 de N2KZ, dit dit.

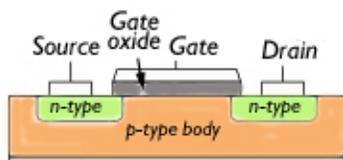


## Leaping over the high- $\kappa$ gate

On January 27, both IBM and Intel made announcements that may turn out to be the "Holy Grail" of current semiconductor development.

IBM announced that its Thomas Watson Research Center in Yorktown Heights, NY has found a way to improve the tiny transistors incorporated in microchips. Working with partners AMD, Sony and Toshiba, the company has found a way to construct transistor gates with a new material that allows circuitry to be smaller, faster and more power-efficient. The technology can be incorporated into existing chip manufacturing lines with minimal changes.

Silicon dioxide-insulated semiconductors are running out of steam. For the past 40 years, Moore's Law has predicted that the number of transistors on a chip would double every 18 months-to-two years. This has been accomplished by shrinking the MOSFET



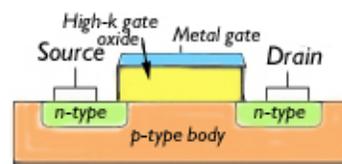
*Traditional silicon-based N-channel MOSFET uses silicon dioxide as the gate insulator (gray color).*

transistors' size and reducing the thickness of the silicon dioxide gate dielectric layer. As a result, speeds have increased and chip complexity has grown. But as the gate oxide layer dips below 2 nanometers thick, leakage currents due to tunneling increase and energy efficiency is reduced. To get back to acceptable leakage, the manufacturers need to move the gate electrode further away from the body, while maintaining the same capacitance. What is needed is an insulating layer between gate and body with a higher dielectric constant ( $\kappa$ ) than silicon dioxide.

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The new technology employed by IBM and Intel is called "high- $\kappa$  metal gate". IBM substitutes a material with higher dielectric constant than silicon dioxide to insulate the conductors. IBM is said to be using **hafnium oxide** as the dielectric, though other possible materials are hafnium silicate or zirconium silicate. IBM says it has already inserted the technology into its semiconductor manufacturing line in East Fishkill, NY.

Intel said it is using two new materials to build the insulating layer and switching gates of its latest 45 nanometer transistors. Hundreds of millions of these transistors will be inside the next generation of Intel multi-core processors. The silicon dioxide gate dielectric is replaced with a thicker hafnium-based high- $\kappa$  material, reducing leakage by more than ten times. The high- $\kappa$  gate dielectric is not compatible with the traditional polysilicon of the gate electrode, so Intel substitutes new metal gate materials in its 45nm transistors that also increase the gate field effect. The specific metals used for the gate remain secret, and different combinations are used depending on whether the MOSFETs are N-channel or P-channel.



*In "high- $\kappa$  metal gate" chips, the silicon dioxide dielectric is replaced with a thicker layer of hafnium-based material (yellow). The gate material is changed from polysilicon to a combination of metal materials (blue), with different compositions for NMOS and PMOS.*

According to Intel, source-drain leakage in the new 45nm transistors is reduced by more than five times, improving the energy efficiency of the transistor. The reduction in active switching power is approximately 30 percent.

Intel said the first of its 45 nanometer processor products with codename "Penryn", should become available in the second half of 2007. IBM will be close behind, applying the new technology to products with chip circuits as small as 45 nanometers starting in 2008.

### Essential<sub>2</sub> chips

You may not have realized it, but there is an enormous amount of chemistry involved in the preparation of silicon chips. Manufacturers such as Intel, IBM, TI and AMD use some remarkably exotic materials in their fabrication factories. The company I work for has a unit producing high purity organometallic compounds for "doping" the silicon substrate with. If you ever need some trimethylgallium, trimethylindium or triethyl antimony, let me know.

- NM9J

# Sangean component

Long-time readers may be aware that I have been on a multi-year crusade in search of the perfect FM tuner. Recent issues of *PCARA Update* documented how Ray, W2CH and I tried Radio Shack's Accurian HD Radio at the end of last year. Performance on VHF-FM was quite good, and I have been using the Accurian on a daily basis ever since.

 The Accurian is a **table radio** with built in amplifier and loudspeakers. Those close-spaced tiny speakers barely do justice to the potential sound quality, so I feed the Accurian's headphone output into an external amplifier with full-size speakers.

During December, a new entry appeared in the HD Radio sweepstakes... the Sangean HDT-1. This was interesting for several reasons... first the HDT-1 is a component tuner, with low-level line outputs suitable for feeding into a separate amplifier... just what I needed. Second, the manufacturer is Sangean, a Taiwan company with an established reputation for portable AM/FM and shortwave receivers. I could not find a local vendor, so decided to go mail order.

**What's within:** A few days later, I was opening a package containing a brightly colored cardboard box. Inside was the HDT-1... in a larger case than I expected. The tuner is the standard HiFi component



*Sangean HDT-1 metal case is almost empty. RF tuner and DSP stages are on the circuit board near the center.*



*Sangean HDT-1 AM/FM HD-Radio tuner*

width of 16.9" but the height is a chunky 2.9 inches. In today's world of miniature components, that's quite tall. Before incorporating the HDT-1 into my radio room, I popped the metal cover off to see what was taking up all the space – and the answer was 'next to nothing' – apart from a power supply and a couple of circuit boards, the metal enclosure is practically empty. The only item that really needs all that height is the large numeric pad on the front panel for preset selection.

I had seen several comments on message boards that HD Radio's originator Ibiquity had asked Sangean to produce a component tuner suitable for radio stations to use as an inexpensive monitor, as well as being at a price-point that would be attractive to enthusiasts. I was therefore expecting good performance when I unplugged the antenna from my trusty Technics ST-S6 FM tuner and connected it to the F-connector on the back of the Sangean HDT-1.

**Aerial antics:** First impressions were not good... various VHF-FM stations that I could receive in full HD

on the Accurian were only reproduced in old-style stereo FM on the HDT-1. The three program streams from WNYC on 93.9 MHz were coming and going... something was very wrong! I checked upstairs in the attic where the 5 element Yagi should have been pointing south... only to find that one of its supports had broken and the antenna was beaming upward!

I fixed the antenna so it was horizontal again and HD performance improved substantially... all three streams of WNYC could be heard reliably and most of the other HD stations previously received on the Accurian were tuned in. One difference from the station listing in December's *PCARA Update* is that Dance Hits station WNEW on 102.7 MHz has changed its call to WWFS ("Fresh") and adopted an Adult Contemporary format. Those WNEW call letters have been sent south to Florida by CBS Radio. Newark's WBGO on 88.3 MHz could not be received in HD on the Accurian, but the Sangean displays the HD symbol blinking. Unfortunately, a strong signal on the adjacent channel (88.5 MHz, WEDW, Stamford) prevents reliable HD reception.

My fallen antenna incident does highlight one drawback of HD-Radio in its current hybrid form. The digital information is only being transmitted with 1% of the analog FM signal's carrier power. A signal that is just strong enough for traditional stereo-FM reception will be inadequate for HD-Radio... and even if you have a sufficiently strong HD station, powerful signals in the adjacent channels can wreak havoc with those delicate digital sidebands. In our part of the world, with most HD-Radio signals 35 miles away, well-sited directional antennas will be a necessity.

HD Reception of FM stations on the Sangean is very pleasant, with excellent stereo separation and elimination of the background hiss that can mar stereo-FM reception. If a station is sending out program data, the artist and title are shown on the large, blue LCD display along with the station frequency and call letters.

**RDS:** Even when signal strength is inadequate for

HD reception, the HDT-1 offers good FM-stereo quality. If the analog FM station is also broadcasting RDS (RBDS) data, this is shown on the Sangean's bright blue display. I would go so far as to say that this is the best receiver I have encountered for decoding RDS on weaker signals. My guess is that this excellent performance is the result of digital signal processing in the IF strip.

**Awful AM:** Switching bands, the overall good results from VHF-FM are replaced with a mixed performance. Analog AM stations are reproduced with distinct distortion on signal peaks. There is even more distortion when selective fading removes the carrier, leaving just the modulated sidebands. During analog reception, the bandwidth seems to vary with signal strength. Fortunately, adjacent channel rejection can be quite good.

When an AM HD signal is discovered, the display shows the station call, then after about 8 seconds of buffering data, reception changes from analog to digital. There is *some* improvement in the high frequency response, but I have not been impressed with the quality of AM HD-Radio reception on the Sangean. It has a spacy, phase-shifting characteristic that is a long, long way from the quality of VHF-FM. Whatever high frequency content is present in the AM station's audio is reproduced in a very artificial way, sounding to me as though somebody is opening a steam pipe on every sibilant. Listening just after dawn or shortly before dusk is unsatisfactory, as HD reception comes and goes in a most annoying manner. This can be caused by distant signals fading in and out on the adjacent channels ( $\pm 10$  kHz) where the digital sidebands lie. Electrical interference can also knock out digital reception, even though the analog AM signal sails through regardless.

In our area, I was only able to receive AM HD signals from WFAN (660 kHz), WOR (710 kHz) and WABC (770 kHz). HD-Radio signals from WCBS-AM on 880 kHz have been missing in action lately, even after I substituted a large "AM Advantage" loop antenna from Terk in place of the Sangean's small loop antenna.

I'll repeat my previous assertion that "success" does not seem to be in the future for AM HD-Radio. There is too much effort involved for both broadcasters and listeners, for almost no return. Early in my tests, HD-pioneer WOR was not even matching the delay of its analog and digital signals for a smooth blend from analog to digital. And at this time of year, the short period of daylight means there are very few hours of AM-HD signals to enjoy.

One pleasant surprise with AM reception on the HDT-1 is that analog **AM-stereo** signals are also decoded. Unfortunately there are not many stereo stations left on the AM band these days... during daytime, I was able to tune in oldies station WREF

(Ridgefield CT) on 850 kHz and WLAD in Danbury CT on 800 kHz. Apparently AM-stereo reception was a simple add-in for the HDT-1's Digital Signal Processing system – and a very welcome one at that. The Accurian HD-Radio can also receive stereo-AM.

**Sangean strangeness:** Returning to the Sangean's good points, the excellent performance of the HDT-1 on VHF-FM does make up for the spotty AM performance. The front panel controls are large and easy to use and the giant, blue LCD display provides a clear view of what is going on. Unfortunately, there are a couple of flaws in the ergonomics.

The credit-card sized remote control uses a membrane-style keyboard. I have never liked these... each button requires a firm press, and it feels like you are wearing out the mechanism every time you use it.

The 10-digit numeric pad on the Sangean's front panel and on the remote can



*Sangean HDT-1's remote control alongside the large keypad and blue LCD display.*

be used for selecting memory presets or for direct frequency entry. Unfortunately, preset selection is goofy! A single button press does not work, you first have to press "preset". Tuning up and down the presets is painful, involving two presses of the "Preset" button.

There is an "Info" button on the front panel and on the remote. Pressing it brings up screen after screen of information. The first screen shows the clock, the second shows "SSI" – an 18-segment S-meter. This is followed by frequency, and an audio spectrum analyzer.

Holding down the "Info" button for two seconds brings up a different set of screens. The first two show system reset and display contrast options. Subsequent screens give information about digital signal reception, including "bit error rate", "carrier to noise ratio", "fuse bit check" (eprom related?), "transmission mode" (MP1, MP3, MA1), "station ID" (e.g 0.114.0.21), and receiver software version.

**Component conclusion:** If you need a component tuner capable of HD-reception in the \$200 price range, then the Sangean HDT-1 is not a bad choice. (In fact, it's the *only* choice in this price range.) Development of HD-Radio receivers is still at an early stage — I would expect designs to improve with time... either that, or the entire U.S. HD-Radio experiment will disappear in a puff of smoke and something better will appear in its place.

"What... is your quest?" "I seek the grail." - NM9J

# 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. \*Apart from holidays.

## 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 Feb 4:** January meeting, 3:00 p.m. Hudson Valley Hospital Center.

## Hamfests

**Sun Feb 25:** Long Island Mobile ARC Hamfair & Electronics Show, Levittown Hall, 201 Levittown Parkway, Hicksville, NY. Doors open 9:00 a.m.

**Sat Mar 3:** Splitrock ARA North Jersey Hamfest, Parsippany Police Athletic League Building, 33 Baldwin Road, Parsippany NJ. Doors open 8:00 a.m.

## VE Test Sessions (*Last chance for a code test!*)

**Feb 4:** Yonkers ARC, Yonkers PD, 1st Precinct, E Grassy Sprain Rd, 8:30 a.m. Contact D. Calabrese, 914 667-0587.

**Feb 8:** WECA, Westchester Cnty Fire Trg Center, 4 Dana Rd., Valhalla, NY. 7:00 p.m. Contact Stanley Rothman (914) 831-3258.

**Feb 12:** Split Rock ARA, Hopatcong HS, Hopatcong, NJ. 7:00 p.m. Contact Sid Markowitz, (973) 663-0518.

**Feb 12:** Columbia Univ ARC, 612 W 115th St, Columbia Univ-Morningside Hgts, Watson Labs, 6th floor, New York, NY. 6:30 PM. Contact: Alan Crosswell, (212) 854-3754.

**Feb 16:** Bergen ARA, Westwood Regional HS, 701 Ridgewood Rd, Washington Township, NJ. 7:00 p.m. Contact Donald C Younger (201) 265-6583.

**Feb 23:** Orange County ARC, Munger Cottage Riverlight Park, Hudson St, Cornwall, NY. 6:00 p.m. Contact Ronald Torpey, (845) 783-1692.



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