PCARA Update

Volume 25, Issue 9 Peekskill/Cortlandt Amateur Radio Association Inc. September 2024

Silver plated

I hope that everyone had a most enjoyable Summer. Things were quiet but a few activities took place during the season. Several PCARA members attended the Sussex County Amateur Radio Club Hamfest on Sunday, July 14, 2024. Among them were: David KD2EVI, Bob N2CBH, Mike N2EAB, Malcolm NM9J, and Mike KD2PYS. The PCARA Breakfasts took place on July 20 and August 17, 2024 at Uncle Giuseppe's Marketplace in Yorktown Heights, NY with 13 members in attendance at each. Who says 13 is an unlucky number?

Now it's time to get back to the serious business of Amateur Radio. In 2025 we have the **25th Anniversary of PCARA** to celebrate. Our Silver Jubilee! I would like to see us organize several events in commemoration. I welcome ideas and suggestions from the membership. Special Events and a banquet are excellent starts. Please share your ideas!

Please mark your calendars with the following upcoming events:

- Saturday, September 7, 2024 at 10:15 a.m: PCARA Membership Meeting at the Putnam Valley Library, 30 Oscawana Lake Road, Putnam Valley. NY.
- Saturday, September 7, 2024 at 11:30 a.m.: Laurel VE Test Session at the Putnam Valley Library. Candidates must register with Dave KF2BD at daveharper'at'vivaldi.net.

Greg KB2CQE (right) inspects outdoor offerings at the Sussex County ARC Hamfest on Sunday July 14.

Members gathered outside Uncle Giuseppe's for breakfast on Saturday August 17.

- Saturday, September 21, 2024 at 9:00 a.m: PCARA Breakfast at Uncle Giuseppe's Marketplace in Yorktown Heights, NY. Bring your appetite!
- Saturday, October 5, 2024: PCARA Membership Meeting and PCARA VE Test Session at the Putnam Valley Library, 30 Oscawana Lake Road, Putnam Valley, NY.
- Saturday October 19, 2024: New York QSO Party — arrangements to be decided.
- Sunday, October 20, 2024: 44th Annual Harry Chapin Memorial Run Against Hunger in Croton-on-Hudson, NY.
- Saturday, October 26, 2024: PCARA Foxhunt at FDR State Park in Yorktown Heights, NY. [Alternative: Nov 9, 2024]. *Continued on page 2* ⇨

Contents

Remember that our next PCARA Membership Meeting is on Saturday, September 7, 2024 at 10:15 a.m. at the Putnam Valley Library in Putnam Valley, NY. I look forward to seeing each of you there!

- 73 de Greg, KB2CQE

PCARA Board

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Net night

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

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

VE Test Session

PCARA's previous VE Test Session was scheduled for Sunday June 23rd at the ARRL Field Day site — George Washington Elementary School in Mohegan Lake, NY. Unfortunately the League was in the middle of its "Systems Service Disruption" and could not publicize the session, so no candidates enrolled.

ARRL's inability to post new VE Test sessions to its web site continued until mid-August. As a result no more PCARA Sessions were scheduled during the club's 'Summer Break'.

As September approaches and PCARA activities recommence, there is a new VE Test Session scheduled for **Saturday September 7** at Putnam Valley Library, 30 Oscawana Lake Road, Putnam Valley. Start time is 11:30 a.m. This will be a Laurel VEC session, and candidates must contact Dave KF2BD beforehand using: daveharper'at'vivaldi.net. As usual with Laurel VEC Test Sessions, there is **no** test fee.

Note: The new Extra Class question pool is now in effect, covering the period July 1, 2024 to June 30, 2028. If you are studying for Element 4, be sure to use current training materials including the *ARRL Extra Class License Manual* **13th** Edition, *ARRL's Extra Q&A* **6th** Edition and the *Gordon West Extra Class License Prep Book* **2024-2028**.

Graphic courtesy of Lou, KD2ITZ.

TX Factor episodes

TX Factor, a professionally produced series of TV shows covering all aspects of amateur radio, is now in its tenth year. Two new episodes were recently released.

In Episode 30, Bob McCreadie G0FGX looks back over the previous ten years, then shows how to setup a self-contained satellite station for the (European) geostationary QO-100 satellite. He also demonstrates Yaesu's latest FM/C4FM mobile transceiver, the FTM-500D.

Link to Episode 30: http://www.txfactor.co.uk/episode-30.html,

In Episode 31, Bob G0FGX reviews the Icom IC-R15 portable VHF/UHF receiver then joins with Mike Marsh G1IAR to demonstrate the Anytone BT-01 bluetooth speaker/microphone for use with Anytone's AT-D578-*xx* FM/DMR transceiver. The BT-01 has a larger 2.2 inch display compared to the tiny 1.7" color display in the AT-D578 mobile radio.

Link to Episode 31: http://www.txfactor.co.uk/episode-31.html

Adventures in DXing
- N2KZ

Summer Vacation Adventures

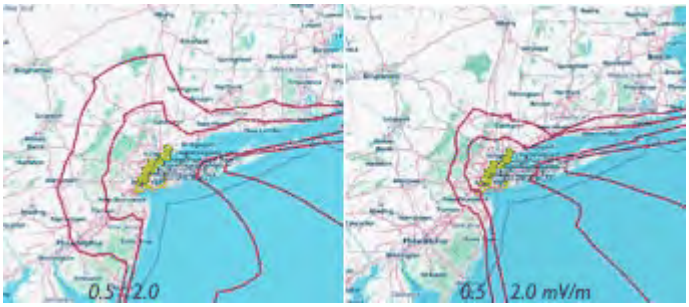
A Giant Falls

Broadcasting group owner **Audacy** announced on August 12th that the decades-old legacy of **WCBS**, Newsradio 880's all-news format, will come to an end on Monday morning, August 26. The frequency will be repurposed as **WHSQ** (**H**udson **SQ**uare — a Manhattan neighborhood and site of Audacy's studio facilities.) WHSQ will serve as an affiliate of nationwide all-sports ESPN Radio.

The WCBS all-news format began on August 28, 1967 almost exactly 57 years ago. WCBS was the nationwide cornerstone of the CBS Radio Network, always held in high esteem and dignity. Their clear channel 50,000 watt omni-directional signal could be heard by DXers all over the world — indicating their dominance and authority.

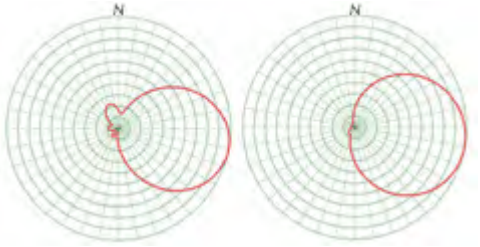
I have been listening to WCBS 880 for my entire life. My Dad was an avid WCBS listener always having the station playing on our household radios. My very early experiments building crystal radios and one-transistor radios with the famous GE 2N107 transistor easily received the strong signals of WCBS. Growing up in Eastern Queens, WCBS 880 was always, by far, the strongest signal that I could pick up with my little Masonite breadboard rigs fitted with a high impedance ceramic earpiece. In the beginning, WCBS was a full-service station with news, music and a variety of entertainment programs.

Today's over-the-air listeners will be left with only all-news WINS 1010 AM and 92.3 MHz FM for up-to-the-minute reports.



Daytime ground wave contours for WCBS-AM 880 (left) and WINS-AM 1010 (right). Red lines indicate 0.5 mV/m and 2.0 mV/m service contours. *[FCC maps.]*

WINS shares the 1010 kHz frequency with Newsradio 1010 CFRB Toronto. This arrangement requires WINS to use a directional antenna pattern to protect the signal of CFRB. Unfortunately, those of us listening in Northern Westchester and beyond often hear a blend of both stations at night. Their 92.3 FM outlet is our only option for clear reception.



Daytime (left) and nighttime (right) field strength patterns for WINS-AM, 1010 four-tower array in Lyndhurst, NJ. WCBS-AM 880 has a non-directional antenna. *[FCC.]*

Two days later, on the morning of August 14th, another leaf fell off the AM Radio tree. Exceptionally powerful "Newsradio 900 CHML" Hamilton, Ontario (just outside of Toronto) went off the air forever just before their 11:00 a.m. newscast. With no notice, the transmitter was abruptly turned off and only static was heard. The end!

CHML had been an institution — on the air for 96 years — one of the very first radio stations to broadcast in Canada. They also featured an all-news format with old time radio drama replays sometimes at night. 50,000 watts with a pattern aimed right at New York City, CHML was very hard to miss even on the simplest of radios in our area at night. What station is next?

For those who may be anticipating news withdrawal, I offer these suggestions: I have always enjoyed the CBS Radio top-of-the-hour newscasts. They are available in podcast form, continually updated, if you know where to find them. In Apple Podcasts, search "CBS News: On The Hour" — or — at TuneIn Podcasts https://tunein.com/podcasts/CBS-News-On-The-Hour-p1767212/. Look for their black-toned logo.

Over-the air, several news stations are available in our area. Of course, WINS 1010 AM and 92.3 FM will continue direct from New York City. Out-of-town stations you can receive at night are WBZ 1030 Boston, KYW 1060 Philadelphia and WFED/WTOP 1500 Washington, DC. All three of these stations can also be directly streamed on-line. Always highly recommended is "the world's radio station" – BBC World Service streaming at: https://www.bbc.co.uk/sounds/play/live:bbc_world_service.

Oh...rora !

It all started a few weeks ago. Solar activity began to stir up HF frequencies especially on the low bands like 75/80 and 160 meters. Long distance contacts often became difficult. Nighttime medium wave listening

was often oddly filtered. Stations out to about 500 miles away sounded in the clear but longer distance stations completely disappeared. Common to all bands was the characteristic aurora signature: very fast and sporadic fluttering. CW signals sometimes lost their musicality and sounded more like old-time spark transmissions.

We all discovered that the sun had much more to offer! Very early in the morning on August 12th I received an e-mail from fellow DXer Walt Salmaniw in Masset, British Columbia, just south of the most southern tip of Alaska:

"Things just might be interesting to the south with auroral conditions and on top of that the peak of the Perseids meteor shower. I've had a lot of overnight activity on meteor skip on FM from Masset (British Columbia) so I'll set up the HF Discovery I have here for some band recordings tonight. Perhaps Australia/New Zealand will have a boost, as they did last night, albeit modestly compared to July. Fingers crossed the skies remain clear up here for possible aurora....Walt (Masset)"

Dr Walter Samaniw.

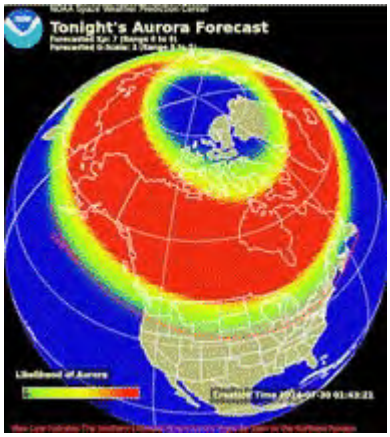
Walt must have been psychic! He is qualified! Walt is a long-time expert DXer often featured on the popular dxer.ca website. DXer.ca is the Internet home for articles by some of the finest North American DXers. Start here: http://dxer.ca/index.php/the-team.

What a night this would be. Old men (much like myself) often awake in the middle of the night. This was to be a *special* night! The Perseid meteor event was near its peak. I saw Walt's note and decided to take a look outside. The sky was clear as could be. The meteor shower was in fine form as I saw many shooters fly by up in the sky. I took some time-exposure pictures with my cell phone and I was amazed! Cell phones are super sensitive to infrared light and revealed quite strong auroral activity just slightly east of due north. The pink renditions moved in waves from about 2:45 a.m. to fade out around 3:20 a.m. Eastern Daylight Time.

Cell-phone photo of pink, auroral night sky. [N2KZ].

Through many back-and-forth e-mail chats, I quickly saw I was not alone! Those west of me and farther north in latitude saw brilliant classic green curtain auroral displays to their delight. Walt took some great pictures in British Columbia. Another friend of mine, Noble Harper in Deckerville, Michigan, also gathered a series of fascinating green curtain auroral pictures. Yet another friend, Mary Ellen Kincaid, also captured a blend of both green and pink auroral renditions from the beach at Port Crescent State Park — also in Michigan. What a night!

Don't miss future auroral action! A great place to watch for possible activity is the National Oceanic and Atmospheric Administration's Space Weather Prediction Site at: https://www.swpc.noaa.gov/products/aurora-30-minute-forecast. You will see current space weather conditions and terrific full-color auroral activity maps. Stop by regularly for current updates. See all the colors of the sky!



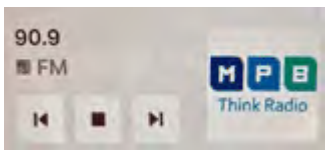
Aurora forecast from noaa.gov shows an unusually wide area where aurora might be visible on northern horizon.

Automatic E-skip Logging

Auroras are not the only way you can find fun during the height of the 11 year solar cycle. How about logging fleeting and sporadic E-skip? I discovered a *digital* way to chase E-skip casually on the FM broadcast band. You don't need to attend. Just leave your car's 'stations' screen up and wait for the logos to roll in!

I was cruising around Central Michigan on vacation and saw some strange things on my readout. It seems that digitally encoded FM station ID information sometimes reaches advanced receivers before audio is finally resolved and listenable. Look at that! Another DX station logo! Switch quickly to the stated frequency and you'll hear very distant audio!

When I first noticed this kind of reception was possible, I took a double take. I looked quickly at my radio 'stations' screen and saw all sorts of odd callsigns and logos. The one that stood out for me was WMAO 90.9 FM from Greenwood, Mississippi. This is one of a cluster of stations owned by Mississippi Public Broadcasting using the motto: *MPB Think Radio*. At first glance, I had to wonder out loud "What is that?" I had never logged that station before!



Sure enough, their audio was coming through crystal clear to Central Michigan. I must admit, this was a relatively easy DX catch. WMAO operates with an effective radiated power of 100,000 watts from a tower nearly 1,000 feet tall. Bang! No need to mention, during E-skip seasons I will now be scanning my car's over-the-air FM Radio screen for even more distant stations! It's nearly automatic DXing! See? I even received an instantaneous color logo as my QSL!

Out To See The Sea

Summertimes are good times to work on your 'bucket list' of things you've always wanted to do. How about visiting Block Island? My wife and I recently boarded the mighty Point Judith ferry and sailed to Block Island — centered between Montauk, New York and Newport, Rhode Island, located in the entry mouth of Long Island Sound. The almost hour-long ride is effortless. Sit back and enjoy the sun, passing beaches and flocks of seagulls!

Block Island lies 14 miles east of Montauk Point, and 9 miles south of mainland Rhode Island. *[Open Street Map.]*

Before you know it, the ferry gracefully delivers you in the heart of Block Island in the main city of **New Shoreham**. Stroll off the boat and walk a few steps up to Water Street where you will see the landmark National Hotel and a grand collection of stores and restaurants waiting for you to explore.

National Hotel, New Shoreham, Block Island. *[N2KZ pics.]*

Old Harbor, Marine Channel 12.

Scanner fans will hear the Old Town Dock on VHF-FM marine channel 12 (156.6 MHz) and transient boat hook-ups on channel 10 (156.5 MHz.) The ferry uses both channel 9 — (156.45 MHz) and channel 16 — (156.8 MHz) and the on-board Block Island Ferry shipmates' HTs can be found on channel 69 (156.475 MHz.)

Just north of town, it is hard to miss the tall communications tower topped with a dominant 6-bay FM broadcast antenna array complete with hardy looking radomes for protection from the sea air and winter's ice. This impressive eye-catching installation radiates an unusual station: WCRI-FM "The Classical Station" — with an effective radiated power of 6,000 watts on 95.9 MHz. WCRI is a beautiful sounding station in true high fidelity — and — unusual as being a commercial station with a classical format. WCRI is an important neighborhood asset that thrives upon a strong local identity, serving Block Island and Southern Connecticut and Rhode Island. Listen in online at: https://classical959.com.

WCRI tower from downtown New Shoreham. *[N2KZ pics.]*

There is so much to see on Block Island! Personal automobile traffic on the ferry is quite limited and requires advance reservations for carriage. Most everyone leaves their cars on the mainland. Hardy tourists can rent bicycles, E-bikes and cars from several convenient depots in North Shoreham. Many mini-buses are also available for hire, offering personal 90 minute guided tours to see all the sights around the island in leisure and comfort.

Block Island sits in a very strategic spot right out in the Atlantic Ocean at the mouth of Long Island Sound. It has a centuries-old history as a watch point to guard the mainland. The island is a continuous collec-

tion of picturesque rolling hills dotted with stately houses all in classical New England architecture. Many buildings include informative plaques telling the stories of their history. Lots of fascinating people and events have called Block Island their home.

The North and Southeast Lighthouses are stately landmarks that are hard to miss! We saw the North Lighthouse from afar way up the beach from the road we traveled. There is no wonder why it was built there. It warns mariners that land begins here!

Down at the bottom of the island is the hardy brick and steel Southeast Lighthouse. It was an engineering marvel when it was first built in 1873. Beach erosion demanded that the lighthouse be moved (!) away from shore in 1993. Take a tour of Block Island and hear the tale for yourself! Watch this amazing video at: https://youtu.be/o39xw9M_ar8?si=xvZN5M5n1te6iO3p.

Block Island Southeast Lighthouse, New Shoreham RI.

We also chanced by the old "U.S. Weather Bureau of the Department of Agriculture" Building — a beautiful example of the kind of classic architecture that is seen in most buildings all across the island.

U.S. Weather Bureau Building on Block Island was used as a government weather station until 1950. [N2KZ pics.]

You'll see dramatic picturesque views from the high rolling hills everywhere you go and will find yourself awestruck by the steep, marvelous and haunting cliffs! Block Island... isn't it time *you* planned a visit? What a fascinating place for a rare IOTA activation (hint hint!) Block Island is IOTA designate NA-031. Look for IOTA CW stations especially on 14.040 MHz worldwide. Learn all about this facet of the hobby and the IOTA group at: https://www.iota-world.org.

Find your way back to New Shoreham and enjoy a fresh-caught seafood dinner and some spectacular bayside views. Top your day off with delicious gelato and ice cream offerings all around town. Trust me! You will want to stay until the very last ferry heads off to the mainland.

Not ready to travel? You can find fun at home with your 2 meter transceiver. Just tune in to The Old Goat's Net every Thursday night on the PCARA repeater at 146.67 MHz with a minus 600 kHz offset and a 156.7 Hz PL. We would love to have your company! Until next month, 73s and dit dit from N2KZ "The Old Goat."

WECA Tech Class

Westchester Emergency Communications Association (https://www.weca.org) will sponsor a free Technician Class License course, in-person at the Westchester Fire Training Center, 4 Dana Road, Valhalla, NY 10595 and also on Zoom. Take your first steps and join the exciting world of Amateur Radio. Enjoy talking to other Amateur Radio Operators, near and far! This interactive course will be taught by a team of knowledgeable Amateur Radio Operators with a passion for their subjects.

You can qualify for an FCC Amateur Radio Technician license by passing a 35-question multiple-choice examination. No Morse code test is required! The exam covers basic regulations, operating practices and electronics theory, with a focus on VHF and UHF communications. All information needed to pass the test will be covered in this course.

The required text is the "ARRL Ham Radio License Manual 5th Edition". The book includes all questions in the test pool and access to on-line practice tests. An accompanying text, "ARRL's Tech Q&A 8th Edition" may be helpful, but is not necessary. They are available from ARRL, Amazon and local dealers. Please obtain the license manual and begin reading.

Classes will start on Tuesday evening, September 17th 2024 and run for nine weeks mostly on Tuesday evenings from 7:00 - 9:15 p.m. ET. All WECA classes are recorded and posted to https://www.weca.app/ for review and self-study. If you or someone you know would like to become an FCC licensed Radio Amateur, please contact Larry W2UL by email at: Education'at'WECA.org.

- W2UL

WWVB Update

In *PCARA Update* for July 2024, p11 there was an article on NIST's standard frequency and time station WWVB. WWVB operates on a frequency of 60 kHz and provides a synchronization signal for a variety of radio-controlled clocks. NIST has provided a further update on the situation, previously reported on May 20 2024.

"**Official Notice:** Commencing from 0000 Coordinated Universal Time (UTC) on April 7, 2024, the southern antenna of WWVB has been rendered non-operational due to damage sustained from wind gusts exceeding 90 MPH. Please be advised that WWVB continues to function at a diminished overall power, utilizing only its northern antenna."

"**Update 01 July 2024:** The components necessary for the refurbishment of the southern antenna's triatic are currently being manufactured and shipped. The projected timeline for the completion of these repairs is tentatively set for the latter part of September 2024. We would like to emphasize that this is an estimated timeline and may be subject to alterations based on a variety of factors. We greatly appreciate your understanding and patience during this process."

Detailed photographs of the damaged components were available in June at the web site of the WWV Amateur Radio Club, https://wwvarc.org. They can still be viewed through the Wayback Machine at: http://web.archive.org/web/20240610181131/https://wwvarc.org/WWVB_wind_damage_2024

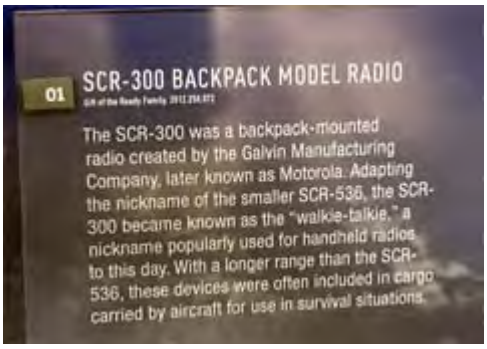
Museum pictures - AD2CT

Rob AD2CT has submitted several pictures, taken in July 2024 at the **National WWII Museum in New Orleans, LA**. (https://www.nationalww2museum.org/)

SCR-300 Backpack radio (left) and SCR-536 Handy-Talkie.

The first picture shows a Galvin Manufacturing Corp SCR-300 transceiver as used in World War II alongside the smaller SCR-536 handie-talkie. Text on the accompanying plaque reads:

"The SCR-300 was a backpack-mounted radio created by the Galvin Manufacturing Company, later known as Motorola. Adapting the nickname of the smaller SCR-536, the SCR-300 became known as a 'walkie-talkie', a nickname popularly used for handheld radios to this day. With a longer range than the SCR-536, these devices were often included in cargo carried by aircraft for use in survival situations."



The smaller SCR-536 handie-talkie was designed by Don Mitchell's team at Galvin beginning in 1940. It was a 5-pound self-contained 5-tube AM-voice transceiver operating on a single crystal-controlled channel in the range 3.5-6.0 MHz. The circuitry was activated when the 40" telescopic antenna was pulled out of the case. This inefficient antenna combined with low power output limited range to around ¼ mile — perhaps more if you were lucky. The set was in production from 1941 and by the end of WWII, 130,000 had been produced. It saw service in Italy, Sicily, North Africa and during the 1944 D-Day invasion of Normandy, France, just 80 years ago.

The SCR-300 walkie-talkie was developed by Daniel Noble's team at Galvin. Historical details were provided in *PCARA Update* for December 2010. The design overcame some of the limitations of the SCR-536 HT. In production from 1943, the SCR-300 was a larger, backpack radio weighing 35 pounds. It operated on VHF-FM, with 41 channels available at 200-kHz spacing in the range 40 - 48 MHz. A squelch control could quiet reception with no signal present. Output power was 0.3W. The set also had automatic frequency control and a crystal calibrator. Range was up to 8 miles.

Museum gift shop item.
[All pics by Rob AD2CT].

Galvin/Motorola produced almost 50,000 SCR-300 sets — they saw service in Italy, in the Pacific Theater and throughout Europe, including D-Day.

His Master's *new* Voice – Yaesu FT-2980R - N2KZ

At approximately 8:50 p.m. on Thursday night, August 8, 2024 my trusty Yaesu FT-1900 2 meter 50 watt transceiver turned off right in the middle of the weekly Old Goats Net. It was as if someone had pulled the plug. No smoke. No noise. Done! I finished the net using my Yaesu FT-60 HT at 5 watts.

Yaesu FT-1900 2m FM transceiver introduced in 2009.

I immediately removed the unit and looked inside. The single printed circuit board was quite permanently mounted inside the cast metal casing. Even if I sweated the SO-239 connector away from the chassis, one connection would remain to be physically cut or undone just to remove the single printed circuit board. Most of the internal parts were micro-miniature or within sealed modules.

FT-1900 antenna connector was soldered to the circuit board. [N2KZ pic.]

I dropped an e-mail to Tim Factor at Yaesu's American headquarters in Cypress, California. The FT-1900 was no longer supported and unrepairable. Immediate help was gone.

My FT-1900 was a trooper. Purchased more than ten years ago, it suffered from very hot operation, thousands and thousands of miles of mobile use and abuse, and even survived a car wreck! I brought the unit inside and retrofitted a small muffin fan to the rear of the rig. This compact transceiver ran flawlessly for what seemed like forever. It served me well and it was a very inexpensive radio. I left grateful with no regrets!

I wanted to replace my beastie with an inexpensive single band 2 meter transceiver with as little features as possible. I required very basic electronics for just everyday analog FM conversations. Nothing more! I have operated on 70cm / 440 MHz about once every five years. I am out of range from most 70cm repeaters at my QTH. It didn't make sense for me to go for a dual band unit and all the extra complexity and expense.

Icom currently offers their new 65 watt IC-V3500. It looked too complex for me! Even the microphone was involved and scary! Kenwood only offers dual band radios. Yaesu offers two single band 2 meter transceivers: The FTM-3100R at 65 watts and the ultra-rugged FT-2980R at up to 80 watts. The FTM-3100R had fairly consistent wonky reviews. The FT-2980R was a big heavy beast with a not-to-be-believed heat sink. I needed some advice.

I shopped the FT-2980R on line the next morning and saw that it was, for the most part, price fixed. I called down to Ham Radio Outlet in New Castle, Delaware and spoke to HRO salesperson Brian Meconnahey, K3LBX. He had very little experience with the Yaesu FTM-3100R but could say nothing but good things about the FT-2980R. It was Friday at about noon time. Brian checked his delivery schedule. I could have a FT-2980R in my hands by Saturday evening. It arrived in the middle of Saturday afternoon. How do they do that? Amazing!

I have only had the FT-2980R for a few days but I am satisfied with its operation. It is about twice the size of my little old FT-1900 and twice as heavy at 4.2 pounds. It features a three year warranty. It can be programmed remotely using the same port as the microphone but this wasn't a needed luxury. The software and a connection cable would cost half the price of the rig itself. I was going to configure it for a couple of dozen frequencies at best!

Karl's brand new Yaesu FT-2980 transceiver is pictured underneath the smaller (and no longer functional) FT-1900 transceiver. [N2KZ pic.]

I have set up many VHF/UHF transceivers in my day and owned both Icom and Yaesu rigs. With my experience, configuration of my new FT-2980R was quite easy and effortless. I had driven this car before and I knew how to handle it with proficiency (so to speak.) It includes a handy broadband high VHF receiver (136-174 MHz) so I could monitor all sorts of communications beyond amateur radio conversations.

All seven NOAA weather channels are factory loaded into a separate memory group along with two more to cover Environment Canada broadcasts. There is also a useful weather alert system built-in to automatically hear inclement weather advisories. Just press P4 on the microphone! Overall, the transceiver is capable of storing 200 channels. Does anyone use that many?

Every channel entry can have a six character alpha-numeric name. This is handy especially when you now lack an endless-retention encyclopedic mind like you did when you were 30 years old! The Yaesu design really makes 'set and forget' a reality. If you are familiar with the system you don't even need the operating manual!

The FT-2980 memory channels can be displayed with channel frequency or a 6-character alpha-numeric label. [N2KZ pic.]

I will always be amazed at the versatility that can be designed into these transceivers. There are 59 different front panel settings you can utilize. If you want to go there, you can learn about the ARTS system — a DCS selective signaling system between Yaesu units. The transceiver can even recite Morse code lessons to encourage you to grow your amateur radio expertise!

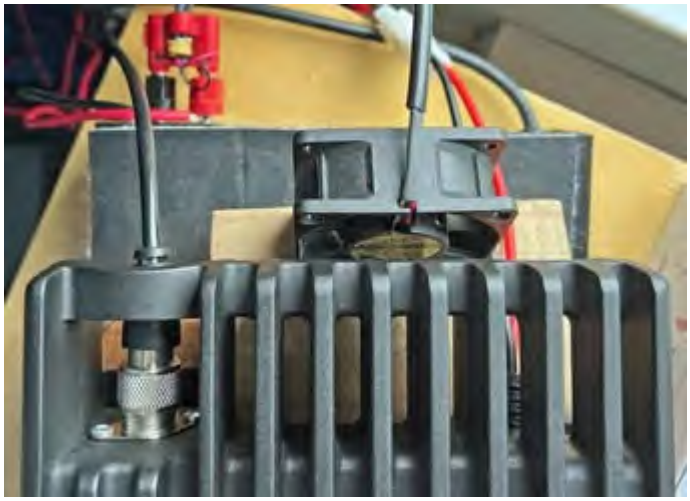
The features go on and on. There is enough here to keep even the most prolific hacker going for quite a long time. I know there was incredible design, development and intent for all the scanning, signaling and utility features available. I am mesmerized by all this unit can do!

Some notes about operation: If you have bad eyesight... this unit was made for you. The display is bright and enormous and can be seen, even without your glasses, from across a room. The audio output and sound are loud and clear. Everyday use is logical and stress-free.

The operating manual is forthright and understandable. I have always found that my every answer is in there. Hint: Download a copy of the manual as an Adobe Acrobat .pdf file onto your phone. It's easy: Just go to Yaesu.com. You'll never be frustrated to unveil where that lost button or feature might be!

One caveat: The most stressful chore you can ask of a transceiver is when it is used for hosting a long talk and discussion net. You will be making repetitive long transmissions for an hour or longer. Your RF transmission final output devices will generate and build considerable heat over time. Be aware and be prepared.

This transceiver features a large heat sink for just this reason. I have been operating it at the 'Low 3' 30 watt output setting. After an hour or more the internal temperature of the rig can reach as high as 110° Fahrenheit. I re-purposed a small muffin fan I used with my old FT-1900 to cool the rig during these long transmissions. It makes a world of difference. Although the FT-2980R is capable of a full 80 watts RF output, I am not sure that I would want to use this much power unless my transmissions were quite brief.



A small muffin fan was added to force air across the substantial heat sink. [N2KZ pic.]

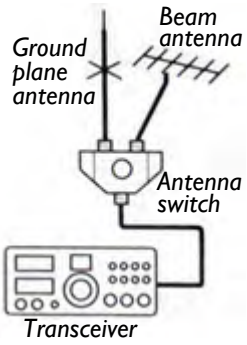
I am quite satisfied with this replacement rig and I enjoy its relative simplicity. I am convinced that it is a cost-effective way to get on the air and would be a nice and simple unit for a beginner to master and enjoy. Yaesu factory support has always been very responsive and useful and will answer my occasional questions promptly and authoritatively. If you need a basic work horse, this is it. Highly recommended!

- Karl N2KZ

Antenna switch choices

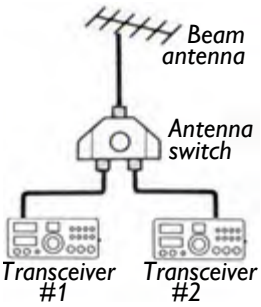
At the NM9J shack I have two HF transceivers. One is better for seeking out weak signals while the other is more suited to digital modes. Rather than changing HF antennas by plugging and unplugging coaxial cables, I used a pair of switches — they were "MFJ-1702C 2-Position Coax Switches", made in Taiwan.

Similar products are available from Daiwa, Opek and others. These simple switches were originally designed for selection of **two** antennas connected to a single transceiver. I had mine wired 'in reverse' so they could select from one of two transceivers connected to each antenna.



Switch selects from two antennas connected to one transceiver.

The MFJ switches performed adequately — I would be careful to switch them together so both antennas were connected to either transceiver #1 or to transceiver #2. When electrical storms were approaching, I would disconnect the antennas by unscrewing their PL-259 coaxial plugs.



Reversed switch selects from two transceivers connected to one antenna.

Practical concern

In the July 2024 edition of UK magazine *Practical Wireless*, I came across an article by Richard Constantine, G3UGF — "Antenna switches: why pay more?" In the article, G3UGF describes how he damaged a transceiver and believes the cause was a faulty antenna switch. The switch, wired like mine to transfer an antenna from one transceiver to another, might have allowed too much transmit power to pass across the switch ports into the receiver of the second radio.

G3UGF showed a picture inside one of his MFJ-type antenna switches. A rotating cam grounds the unused springy contact while simultaneously moving it away from the common connection. The second springy contact can then move toward the common connection. In Richard's example, the contacts were worn, and it was possible to park the switch knob in a position where the cam was not fully grounding the unused contact.

MFJ-1702C two-position coaxial switch. As cam rotates, it grounds the unused port and allows springy contact of connected port to touch the common connector. A worn switch can be parked with the unused port not fully grounded (inset arrow). [NM9J pic.]

How much protection?

When a coaxial switch transfers an HF antenna from one transceiver to another, there are two important figures to bear in mind:

1. How much leakage takes place through the switch from the connected port to the disconnected port? This is usually expressed in decibels (dB) of isolation between the two ports at a particular frequency.
2. How much RF power can the receiver safely stand without any damage? This can be expressed in milliwatts — or in dBm — a logarithmic decibel scale referenced to one milliwatt (mW). It can also be expressed as an S-meter reading where S9 corresponds to a receiver input signal of 50µV into 50 ohms, or an input power of -73dBm.

An Internet search suggests that modern HF transceivers can survive an RF input signal of **100 milliwatts** — or +20dBm, or 93dB over S9. This figure is stated by G3UGF and W2AEW, quoting Robert Sherwood NC0B. 100mW is also regarded as safe by W8JI.

The DX Engineering "Receiver Guard" for protection of an attached receiver limits signals to 25mW, +14dBm or S9 +87dB. If you have a separate software-defined radio (SDR) on one of the antenna switch ports — such as the SDRPlay RSP1A — the manufacturer suggests a **safe limit of 10mW** or +10dBm.

SDRPlay RSP1A software-defined radio receiver.

Let's assume the HF transceiver is transmitting with 100 watt output (+50dBm) through switch port 1 and we'll play safe by restricting power on switch port two to 10mW (+10dBm). In that case, the isolation required across the switch is 10,000 times less — or 40dB.

Specifications

According to the packaging, my MFJ-1702C 2 Position Coax Switch: "Has better than 60dB isolation at 300 MHz and better than 50dB at 450 MHz." That *should* be more than enough for use on the HF bands — but the figure could be worse after a switch has suffered wear and tear. I decided to carry out my own measurements.

Feeling isolated

Measurement of antenna switch isolation figures by an average amateur would have been difficult until quite recently. A brave radio amateur might connect a separate, calibrated receiver to the unused port of the antenna switch while transmitting through the live port. But would **you** risk your $1,000+ transceiver in this situation?

Nowadays, the **nanoVNA** provides a safer way of carrying out the measurement. I wrote a brief review of this inexpensive two-port **v**ector **n**etwork **a**nalyzer in the November 2019 *PCARA Update* and described how you could use the nanoVNA's single port (S_{11}) capability to graph the SWR of amateur radio antennas over a wide frequency range.

Any port?

In order to measure the isolation of a coaxial switch, we have to use the two-port capability (S_{21}) of the nanoVNA. $\mathbf{S_{21}}$ means the signal is measured at port 2 of the device under test (filter, amplifier, attenuator) while the 'stimulus' or test signal is applied at port 1.

I calibrated the nanoVNA then cabled it up to one of my MFJ-1702C antenna switches. CH0 of the nanoVNA was wired to the "A" connector of the switch while a 50 ohm dummy load was connected to the switch's common contact. CH1 of the nanoVNA was wired to the "B" connector of the switch to measure the leakage.

NanoVNA (right) is connected to an MFJ-1702C 2-position coax switch to measure the leakage from port A to port B.

The amount of isolation varies with frequency, becoming worse at higher frequencies. I set the nanoVNA scan range to 1.0 - 52 MHz, then carried out spot measurements using the movable marker at 29.5 MHz (for HF transceivers covering 1.8 – 29.7 MHz) and at 50.5 MHz (for transceivers covering the HF bands plus 6 meters). Results for my two MFJ switches, labeled "Beam" and "Sloper" are shown below.

MFJ-1702C 'Beam'	CH1
29.5 MHz	-60.2 dB
50.5 MHz	-56.2 dB

MFJ-1702C 'Sloper'	CH1
29.5 MHz	-58.1 dB
50.5 MHz	-53.8 dB

These figures should provide adequate protection for a connected receiver on the HF bands and even on 6 meters. But they also suggest that MFJ's own figure of 60dB isolation at 300 MHz might be a bit optimistic, especially if the switches have seen a lot of wear.

The nanoVNA was additionally set up to measure return loss/SWR at the CH0 port. SWR was 1.04:1 at 29.5 MHz and 1.07:1 at 50.5 MHz. If your own antenna has higher SWR or you are running a lot more than 100W, leakage into the unused radio port could be greater than intended, exceeding the safe limit.

Alpha Delta to the rescue

Richard Constantine G3UGF suggests that RF switches from Alpha Delta Communications Inc. might prove more reliable than the MFJ-style switches from the far east. Alpha Delta Communications, currently located in Manchester, Kentucky, has been manufacturing RF components in the USA since 1983. A 1988 advertisement for their Delta-4 RF Coax switch describes:

- Exclusive center "off" (ground) position internally disconnects and grounds all antenna circuits for maximum protection when operator is away — an Alpha Delta first.
- Incorporates the famous replaceable Arc-Plug® cartridge for continuous protection of the active antenna circuit. Unused antenna circuits are automatically grounded — an Alpha Delta first.
- The Model DELTA-4 Switch features a custom designed cast housing with constant impedance micro-strip cavity construction for outstanding performance through UHF. No lossy wafer switches are used.

Internal inspection of a DELTA-2 switch shows contact is made through silver-plated phosphor bronze metal strips housed in their own cavities. The switch mechanism carries two rotating plastic cylinders. As the knob is turned, the lower plastic cylinder raises the flat connector strip of one port, breaking its connection to chassis ground and making connection to the common port contact above. A second plastic cylinder engages with detents in the cover.

Alpha Delta DELTA-2 coaxial switch with cover removed. As knob is turned, plastic cylinder raises end of metal strip (right) from chassis ground so it connects to the common port's curved metal strip. [NM9J pic.]

Alpha Delta's data sheet claims >60dB isolation at 30 MHz with an SWR <1.1:1. At 150 MHz the isolation is >50dB and SWR is <1.3:1.

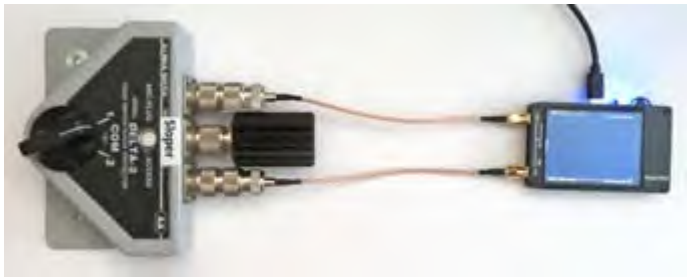
Spares box

In my antenna parts box, I had an unused Alpha Delta Communications DELTA 2B switch, purchased in 2011 from KJI Electronics for $59.00. (Current price is around $120.00.) In order to replace the MFJ switches, I would need another DELTA 2B — I was lucky enough to find one in used condition at the 2024 Sussex County ARC Hamfest. It was date-stamped 'MAY 2001'. Continuity tests with a multimeter showed the contacts were making and breaking satisfactorily, but it would be worth checking performance with the nanoVNA.

I connected the 'unused' switch to the nanoVNA and measured isolation at 29.5 MHz and 50.5 MHz once again. The measurements were then repeated for the 'used' switch. Results are shown below.

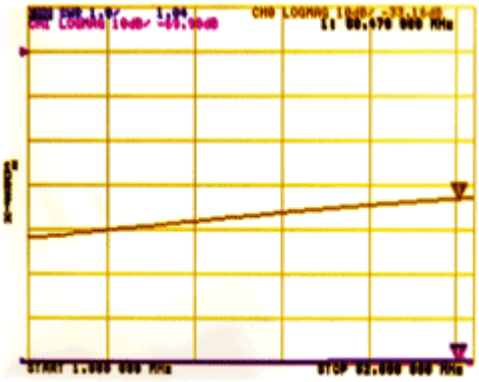
A D DELTA2 'Unused'	CH1
29.5 MHz	-86 dB
50.5 MHz	-81 dB

A D DELTA2 'Used'	CH1
29.5 MHz	-82 dB
50.5 MHz	-72 dB



NanoVNA (right) is connected to an Alpha Delta DELTA-2 2-position RF coax switch to measure the leakage from port 1 to port 2.

Isolation results were much better than the MFJ switches, by as much as 20dB. The second-hand Alpha Delta switch was slightly inferior to the new one, so I removed its cover and cleaned the silver-plated contact strips and chassis contacts using Q-Tips and paper strips dipped in isopropyl alcohol. This removed the silver tarnish and improved the 'Used' switch performance to the same level as the unused switch. (Note that with these high isolation values, the nanoVNA is operating at the limit of its capabilities.)

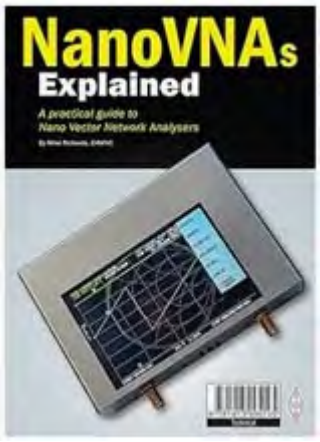


NanoVNA screen for Alpha Delta switch. Colors inverted for readability. On-screen text reads:
CH0 SWR 1.0/ 1.04 CH0 LOGMAG 10dB/ -33.16dB
CH1 LOGMAG 10dB/ -59.96dB 1: 50.470 000 MHz
START 1.000 0000 MHz STOP 52.000 000 MHz

SWR measured at the nanoVNA's CH0 was 1.02:1 at 29.5 MHz and 1.03:1 at 50.5 MHz.)

The two Alpha Delta switches are now in everyday use, switching antennas to two different HF transceivers.

Hint: For practical information about using the nanoVNA — including measurements on antenna switches — obtain a copy of the book "NanoVNAs Explained" by Mike Richards, G4WNC, published by the Radio Society of Great Britain.



- NM9J

Mount Beacon ARC Tech Seminar - W2BOS

The Dutchess County Department of Emergency Response and the Mt. Beacon Amateur Radio Club offer a free one evening/two day "Amateur Radio License Test Review Seminar" to be held on Friday evening and Saturday/Sunday 4 - 6 October 2024. Friday: 6:00 p.m. to 9:00 p.m.; Saturday: 8:00 a.m. to 5:00 p.m.; Sunday: 8:00 a.m. to 12 noon

FCC License Exam Session held starting Sunday at 1:00 p.m., Location: Dutchess County Department of Emergency Response, 392 Creek Road (near Dutchess Community College), Poughkeepsie, NY 12601 {GPS: 41.7465676, 73.8983243}

Why Amateur Radio?

- To assist your community in time of need when all else fails
- To promote good will around the world
- To have fun communicating with fellow hams!
- Morse Code knowledge is no longer a requirement!

The seminar is open to all without age limit and is for the entry level FCC Technician Class Amateur Radio License.

Textbook

Obtain & study the text before the seminar: "ARRL Ham Radio License Manual 5th Edition" with FCC Technician class license questions, July 1, 2022 to June 30, 2026 (ISBN 978-1-62595-155-7) or through Amazon.

This seminar will review all material and test questions for the FCC exam, but attendees are expected to study material ahead of time in the License Manual.

Register

For registration (cutoff date is September 13) and/or additional information, contact: Adam Nowak Jr. AE2AN at 845-849-3666 or AE2AN'at'aol.com.

VE Test Session

FCC License Exams on Sunday 1:00 p.m. Open to all hams, regardless of whether they took the class. A $15 FCC exam fee (cash or check) is due to take the test. Upon successful completion, a $35 FCC license fee will be charged directly by the FCC for all new licenses.

Test pre-registration for all required if not taking the class, contact: Lynn Rightmyer KV2J using kv2j54'at'yahoo.com.

- Andrew, W2BOS

Plaques and backslaps

In August, **Joe WA2MCR** received a handsome plaque from organizers of the New York QSO Party. This plaque was for the PCARA entry using club call W2NYW in the QSO Party held on October 21, 2023.

Joe WA2MCR and the NY QSO Party plaque.

There were two entries from PCARA members — Joe WA2MCR was unable to host contestants from his sun room in 2023, so a limited-time operation took place from Joe's basement shack with assistance from NM9J. In the low-power multi-single category, W2NYW scored 23,436 points from 257 contacts.

Plaque for 2023 New York QSO Party for first place in New York multi-one, low power category.

Meanwhile **David K2WPM** carried out a two-county activation from Putnam and Westchester Counties with a score of 65,962 points from 680 total contacts, gaining first place in the portable low power mixed mode category. Full details are in the report in the April 2024 *PCARA Update*, pages 7-9.

This year's NYQP

The 2024 New York QSO Party is scheduled for Saturday October 19, 2024, from 10:00 a.m. to 10:00 p.m. Eastern. Details are available at: https://nyqp.org/wordpress/.

Multiband dipole revisited

One of the antennas used at PCARA's 2024 Field Day effort was a multi-band dipole of the type sometimes described as a "fan-dipole". This particular antenna had been used at a number of previous PCARA events. Unfortunately, while it was being hauled into the air at George Washington Elementary School on June 22, 2024, it showed its age by **falling apart** at the end insulator!

Antenna raising crew prepares to pull up the multiband dipole at GW Elementary School for Field Day 2024.

The wire elements of the dipole had been folded back, twisted around and secured with tape. I made a rapid repair of the end insulator and the multi-band dipole then performed well throughout Field Day 2024.

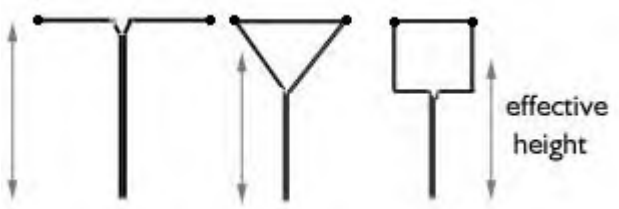
After Field Day was over, I revisited the design to see if it could be improved. I checked the original description in a previous edition of *PCARA Update* and was amazed to find it was **20** years old! In case you don't have a copy of the June 2004 newsletter, I have reproduced the original article below. Read on after the end for some suggested improvements.

Perfect FD Antenna?

(Reprinted from PCARA Update, June 2004 pp 4-5.)

Here's an episode in my continuing search for a perfect Field Day antenna. You may remember that in 2003 I was fixated on loops! We erected a sloping loop antenna based on an April 2002 *QST* article by KI8GX, "A One-Masted Sloop for 40, 20, 15 and 10 Meters". SWR was excellent on 20m and 40m but the performance on 20m left something to be desired. We finally switched to a vertical delta loop for 20 meters.

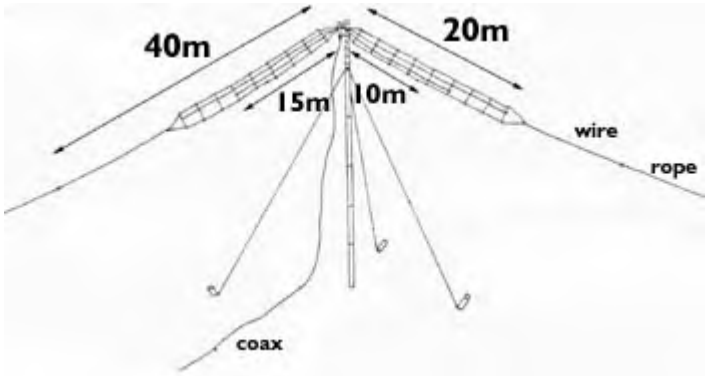
I had seen a couple of articles suggesting that if you only have two support points to suspend a wire antenna, it makes more sense to pull up a half wave dipole than a quad loop or delta loop. That's because the average effective height of the loop antenna will always be less than the height of the dipole – so the loop's low-angle radiation will not be as good.



Dipole effective height versus Delta Loop and Quad antennas.

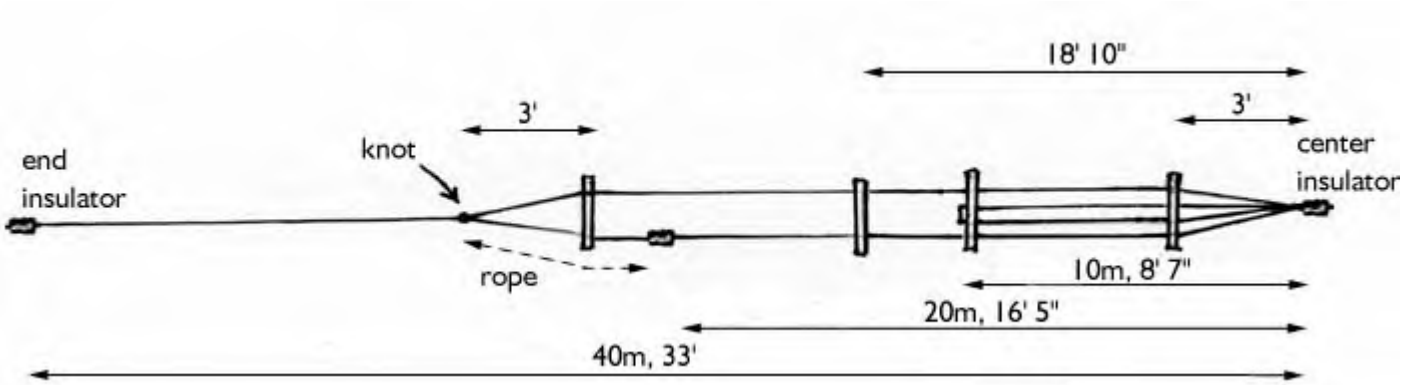
I set out on a fresh search for the perfect Field Day antenna. With the sunspots as they are at present, I decided that performance had to be optimized on 20 meters and 40 meters. Depending on conditions, there might be some activity on 15 and 10 meters, but these bands would be secondary to a good 20m/40m design. The antenna should preferably have a 50 ohm coaxial feed on all four bands so it could be used without an antenna tuning unit if necessary.

There are several possibilities, including the W5GI Mystery Antenna reviewed by Mike N2HTT in *PCARA Update* for November 2003. The solution I settled on was the multiband dipole described by K0GPD in ARRL's Antenna Compendium volume 1, under the title "A Great 10 Through 40 Portable Antenna". This is a paralleled dipole design with separate wire elements for 40, 20, 15 and 10 meters connected through a 1:1 balun to the common coaxial feeder at the center. The wire elements for adjacent bands are separated with wood or plastic dowels 5¾ inches long.



K0GPD multiband antenna has parallel dipoles for each of the bands 40m, 20m, 15m and 10m.

My first attempt showed some drawbacks with the original design. The wire elements were only 1¾ inches apart and their lengths tend to interact with each other – adjust one pair of wires for resonance and the adjacent pairs are thrown off frequency. In addition, the close spacing reduces the effective bandwidth even on 10 meters.



One half of the multiband dipole Field Day antenna, as modified from the K0GPD design. The second half would be a mirror image to the right.

I made some changes to the design – first of all the 15 meter element had to go. I'm not expecting a lot of 15m activity this Field Day, and the 40 meter dipole should be resonant at roughly three times its fundamental 7.15 MHz frequency. With one dipole removed, the others could be spaced farther apart for less interaction. Since our main interest is 20m and 40m, these dipoles were spaced as far apart as possible.

The bandwidth of the 10 meter dipole, positioned between the other elements, was still rather narrow (200-300 kHz) so I "fattened" it out by using two wire elements connected in parallel at both ends. (See the diagram.)

Most of the raw materials for this antenna came from that well known radio resource, *Home Depot*. A 500 ft reel of 14 gauge stranded copper wire covered with black PVC insulation and a thin nylon coat cost me $20.00. The wooden dowels were replaced with foot-long plastic spacers cut from a 10 foot length of ½ inch diameter CPVC plastic pipe from the plumbing section. A 100 foot reel of 14 gauge solid copper insulated wire provided plenty of 6 inch wire lengths for securing the wire dipoles to the spacers. The center insulator and end insulators came from the usual amateur radio dealers.

If you would like to try out the antenna yourself, here are the wire lengths that need to be cut:

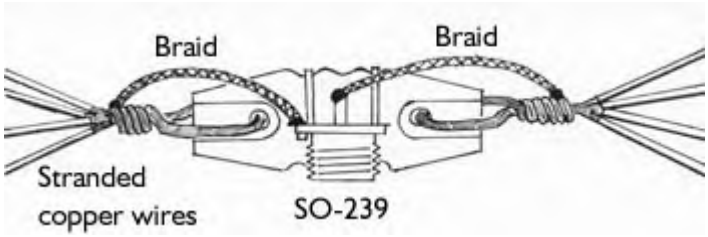
14 gauge stranded copper wire:
Two lengths 33 ft 10 inches (40 meters/15 meters)
Two lengths 17 ft 7 inches (20 meters)
Four lengths 9 ft 2 inches (10 meters)

You will also need two lengths of 3/32" Dacron (polyester) rope, around 6 ft long, to support the ends of the 20 meter dipole. Additional rope will be needed to suspend the dipole from trees or poles.

Incidentally, the 14 gauge stranded wire and 3/32" polyester rope make a good combination when it's time to pull the antenna out of storage — since they both resist snags and kinks.

Cut the ½" plastic pipe into eight 12 inch lengths. Drill holes at ½" from each end and drill two more holes equal-spaced in between. Cut twenty four 6 inch lengths of solid copper wire – these lengths go through the holes in the plastic pipe and are then wrapped around the stranded wire to secure it in place.

Those stranded wire lengths are deliberately overlong. Trim 6 inches of insulation from one end of each wire, thread once through the center insulator then wrap over the bare wire to secure. The dipole is fed by coaxial cable at the center – solder the coaxial connector to the two sides of the dipole using flexible leads made from copper braid.



Dipole center insulator has SO-239 connector secured with nylon ties. Stranded copper wires from dipole elements are twisted together, looped through the insulator then wrapped around six times and secured. Copper braid (removed from coax) is soldered to dipole elements and SO-239.

Lay out the wires on the floor or in the yard and measure the lengths as shown in the diagram. Tie a loose knot in the 20 meter wires for attachment of the polyester rope. For the 20 meter and 40 meter wires, pass the wires through the end insulators then wrap excess cable length back over itself. Later, you can adjust resonance by untwisting the excess length. Secure the stranded wires to the plastic pipe spacers using 6 inch lengths of solid wire. For the 10 meter dipole elements, trim to size, leaving sufficient overlap to allow removal of 1" of insulation — then twist the ends together and solder.

Wire spacers made from plastic pipe.

When all connections have been made, secure the wrapped wires with short lengths of vinyl tape. Take the antenna outside and suspend in the clear as high as

is convenient. Choose a flat- top dipole arrangement or inverted-V, depending on your final intended configuration. Use an antenna analyzer or transceiver plus SWR meter to check resonance in each of the four bands. Starting with the lowest band, 40m/7.0 MHz, adjust for resonance at the desired center frequency by untwisting the stranded wire ends.

Twist end of wire back on itself to allow subsequent adjustment.

Here are initial test results for my antenna at a height of 10 feet, using an MFJ-259 SWR Analyzer:

Band	Resonant freq	SWR	Bandwidth <2:1
40m	7.12 MHz	1.5:1	340 kHz
20m	14.27 MHz	1.0:1	370 kHz
15m	21.8 MHz	2.3:1	1.0 MHz (<3:1)
10m	28.18 MHz	1.2:1	500 kHz

The low SWR results suggest the antenna could be used without a matching unit on 40m, 20m and 10m. The SWR on 15m is higher – probably because of the increased radiation resistance of a 3/2 wave dipole. I am hoping the automatic antenna tuner will be able to cope if we need to go on 15m!

Low SWR is no guarantee of good antenna performance – though there isn't much that can go wrong with a dipole. The real test will come on Field Day.

One final thought – if RF on the outer coaxial conductor proves to be a problem, I have a ferrite choke balun ready to insert at the center of the dipole.

- Malcolm, NM9J

(Reprinted from PCARA Update, June 2004, pages 4-5)

Multiband update

The new multiband dipole was *first* used on PCARA's 2004 Field Day from the summit of Bear Mountain. The Class 2A entry made 968 QSO points and 2,946 total points. Twenty years later, that same antenna contributed to PCARA's Field Day 2024 result of 1060 QSO points and 3090 total points.

At GW Elementary School the antenna was fed through a ferrite choke balun with RG-8X coaxial cable and connected to Joe WA2MCR's IC-7410. While gain was down on the 3-element 40 meter wire beam designed by Jay NE2Q, contacts were obtained throughout North America including the far southwest USA.

Tormented tape

After Field Day, I pulled the wire antenna out of its plastic storage box for inspection. With the antenna fully extended, it was clear that the end insulator was not the only point of potential failure. The 6-inch lengths of solid copper wire that passed through CPVC spacers to hold the stranded copper wire in place were also in trouble. They had been secured with the same black vinyl tape. A combination of old age, high temperature and sand from Walter Panas' softball field had caused much of the twenty-year-old vinyl tape to deteriorate.

Vinyl tape removed from antenna was contaminated with sand.

I decided to substitute 4-inch black nylon cable ties to hold the wire elements in place instead of the tape — black cable ties are more resistant to ultraviolet radiation than other colors. I removed the old vinyl tape then used a tightening tool to pull a cable tie firmly around each pair of plastic-covered wires, keeping them in place. Excess tie length was cut off with side cutters.

Black nylon cable ties keep the antenna wires in place on the plastic spacers.

Those cut-off cable ties still had sharp edges, so in a 'belt and suspenders' approach I wound a new length of vinyl tape around the secured wires plus cable tie. Lengths of the wire elements were left the same as before. This task required around 48 cable ties!

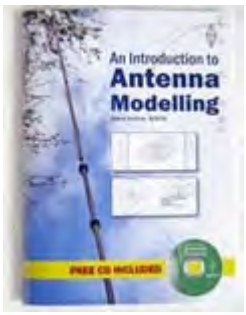
After the fact analysis

Back in 2004, I had determined optimum wire lengths for the multiband dipole by suspending it in the back yard then adjusting wire lengths. This was accomplished by twisting and untwisting wires folded back around the end insulators. Measurements were made

Back yard antenna testing with MFJ-259 in May 2004.

using my MFJ-259 SWR Analyzer.

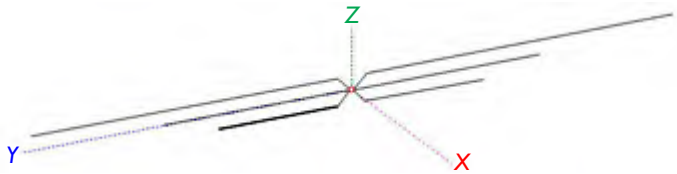
One tool I did not have in 2004 was efficient antenna modeling software. In 2015 I acquired a copy of "An Introduction to Antenna Modelling" by Steve Nichols, G0KYA (Radio Society of Great Britain) which included a copy of the free modeling software MMANA-GAL with plenty of sample files on CD-ROM. There was a write-up in *PCARA Update* for June 2015, pages 6-9.



I tried modeling the multiband dipole in MMANA-GAL using dimensions from the 2004 *PCARA Update* article. My first attempt showed satisfactory resonances on 40 meters and 20 meters, but the 'wideband' 10 meter dipole formed from two parallel wire elements was not behaving. MMANA-GAL — and NEC, on which it is based — both have a problem with closely-spaced parallel wires.

New model

I started again, this time using an existing model for a fan-dipole included with G0KYA's book. This describes a fan dipole with wire elements cut for 10.1, 18.1 and 24.9 MHz. The feed point is in the center of a short wire connecting the two fanned-out sections.



Multiband dipole for the 30m, 17m and 12 meter WARC bands as pictured in element view by MMANA-GAL.

I modified this "WARC dipole" so it had the same wire lengths as the Field Day design. The 40 meter and 20 meter dipoles were spaced 1 foot apart, with the shorter 10 meter band elements located in between. Instead of using parallel wires for the 10 meter 'fat dipole' I changed the wire radius from 0.8mm (14 AWG) to metal tubing with radius 12.5mm (1 inch diameter). The model was then run at a height of 10 meters (32' 10") above real ground.

Here are the wire lengths derived from the model after optimization — they do *not* include any excess for folding back or trimming and are calculated for *bare* copper wire. For plastic-covered wire, you may need to shorten these lengths by approximately 5%.

Wire element lengths

40 meters	33 ft 9 inches (10.29m)
20 meters	17 ft 4 inches (5.29m)
10 meters	8 ft 6 inches (2.58m)

Resonant frequencies, SWR (50 ohms) and bandwidths were calculated by MMANA-GAL as follows:

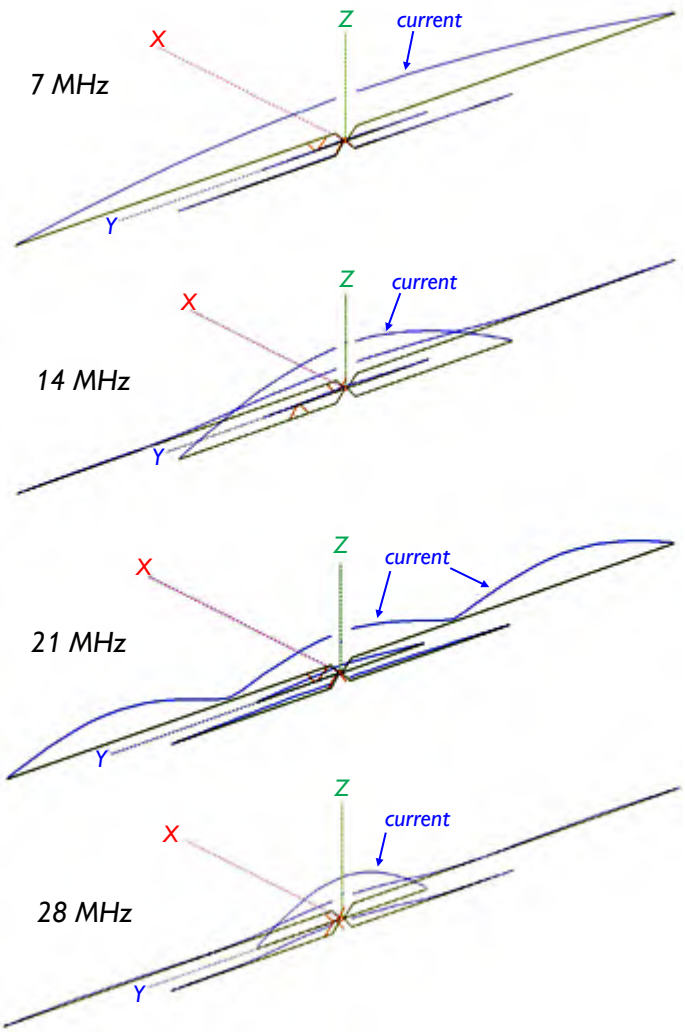
Band	Resonant freq	SWR	Bandwidth (<2:1 SWR)
40m	7.027 MHz	1.56:1	310 kHz
20m	14.193 MHz	1.55:1	500 kHz
15m	21.775 MHz	1.87:1	230 kHz
10m	28.828 MHz	1.39:1	1000 kHz

These results are a little different from the SWR/bandwidth measurements made in 2004 in my backyard — but those figures were obtained at the lower height of 10 feet above ground, not 10 meters.

The trends are similar, in particular, the 21.775 MHz resonance of the 7 MHz dipole at 3 $\times f$ is higher than expected, so it ends up out of band.

Current view

MMANA-GAL's element view shows how maximum current flows in the fan dipole element that is resonant for a particular band. It also shows how the 7 MHz dipole becomes active on its 3rd harmonic, 21 MHz.



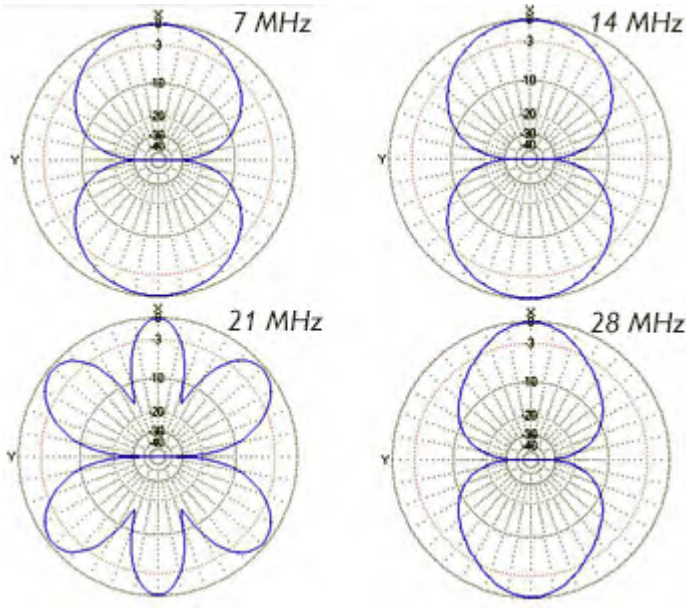
MMANA-GAL view of the multiband dipole on 7, 14, 21 and 28 MHz. Currents in each element are shown in blue.

As well as the large current flowing in the resonant wire, some current also flows in adjacent wire elements. This is especially noticeable on 28 MHz where

significant currents are also flowing in the nearby 7 MHz and 14 MHz dipoles.

Polar plots

MMANA-GAL shows that the azimuthal radiation patterns are the expected doughnut-shape for a horizontal dipole, on 7, 14 and 28 MHz, with two lobes broadside (X-direction) to the dipole length (Y). On 21 MHz the horizontal pattern breaks up into 6 lobes as expected for a three-half wave antenna.

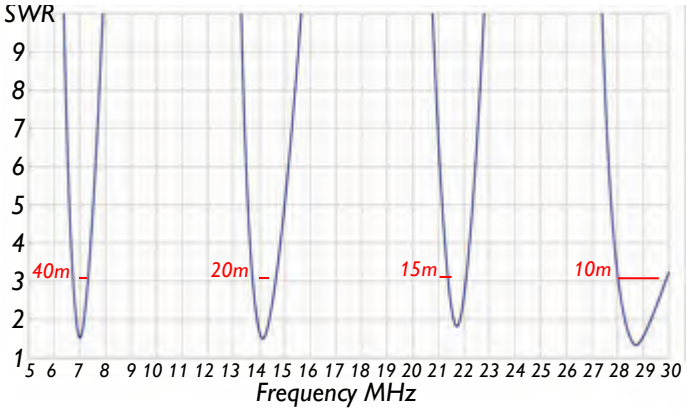


Azimuthal patterns (horizontal polarization) for multiband dipole on 7, 14, 21 and 28 MHz bands. [MMANA-GAL.]

The horizontal polar diagram for 28 MHz is sharper than might be expected for an isolated dipole — possibly because of those currents in nearby wires.

SWR graph

A plot of SWR against frequency from 5 – 30 MHz shows that the only resonances fall on 7 MHz, 14, 21.8 and 28.8 MHz. This is **not** an antenna for use on any of the WARC bands, where SWR is above 30:1.



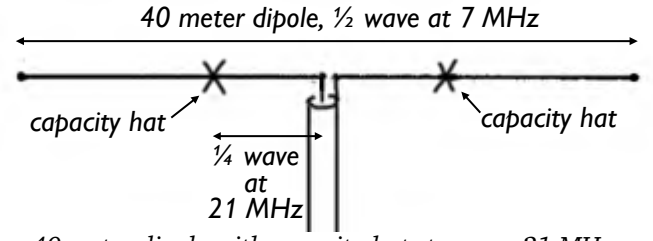
SWR (based on 50 ohms) for the multiband dipole plotted against frequency. Amateur bands shown by horizontal red bars. [MMANA-GAL data graphed by MS Excel.]

Fixing fifteen

As measured in 2004 and modeled in 2024, use of the 40 meter dipole on 15 meters has its problems, with resonance occurring on a frequency *higher* than the third harmonic, falling on 21.8 MHz, outside the amateur band.

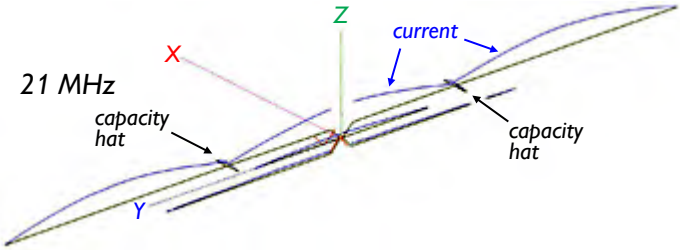
A 'half-wave' wire dipole is resonant when its length is slightly *less* than a free-space half-wave due to **end effect**. This 'end effect' increases capacitance near the ends of the half-wave conductor, effectively lengthening the antenna. When the same antenna is used as a **three**-half-wave, the end effect only affects the outer tips of the waveform — so the antenna-lengthening effect is less on the third harmonic, leading to a higher resonant frequency.

An article in *QST* for June 1991 by Rus NJ2L suggests adding **capacity hats** to the 7 MHz half-wave dipole at positions that are ¼-wavelength (on 21 MHz) from the center of the dipole.



40 meter dipole with capacity hats to move 21 MHz resonance inside 15 meter amateur band, 21.0-21.45 MHz.

I modeled the multiband dipole using MMANA-GAL with capacity hats added. Each hat was represented by two horizontal wires, 0.4 meters long (15 inches) attached to each element of the 7 MHz dipole at a distance of 3.35m (11 ft) from the center of the antenna. I also shortened the overall length of the 7 MHz elements from 10.29 meters to 9.89m (32 ft 5 in). This reduced the resonant frequency on the 15 meter band from 21.772 MHz to 21.314 MHz (SWR 1.62:1) while the resonant frequency on the 40 meter band increased from 7.02 to 7.127 MHz (SWR 1.5:1).



MMANA-GAL view of multiband antenna on 21 MHz with capacity hats added to the 7 MHz dipole, compensating for a lack of "end effect" on the third harmonic.

Addition of capacity hats could be a worthwhile modification if you are building your own version of the multiband dipole.

- NM9J

Peekskill / Cortlandt Amateur Radio Association

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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

Sat Sep 7: PCARA meeting, 10:15 a.m., Putnam Valley Library, 30 Oscawana Lake Rd., Putnam Valley, NY.
Sat Sep 7: PCARA V.E. Test Session, 11:30 a.m. Putnam Valley Library. See below.
Sat Sep 21: PCARA Breakfast, 9:00 a.m., Uncle Giuseppe's, 327 Downing Dr. Yorktown Heights, NY.

Hamfests

Check with organizers before leaving.
Sat Sep 7: Fair Lawn ARC Hamfest, Fair Lawn Memorial Pool, Bellair Ave., Fair Lawn, NJ. 8:00 a.m.
Sat Sept 14: Wayne RAE Team Hamfest, United Methodist Church, 99 Parish Drive, Wayne, NJ. 8:00 a.m.
Sat Sept 28: Garden State ARA Hamfest, 100 Tornillo Way, Tinton Falls, NJ. 8:00 a.m.

VE Test Sessions

Check with the contact before leaving.
Sep 7: PCARA, Putnam Valley Library, 30 Oscawana Lake Rd., 11:30 a.m. Must contact VE KF2BD, daveharper'at'vivaldi.net.
Sep 7, 14, 21, 28: NYC-Westchester ARC, 43 Hart Ave, Yonkers NY. 12:00 noon. Must contact VE, k2ltm'at'aol.com.
Sep 12: WECA, Westch Cnty Fire Trg Center, 4 Dana Rd Valhalla NY. 7:00 p.m. Contact VE, N2gdy'at'weca.org
Sep 20: Orange County ARC, Munger Cottage, 40 Munger Dr Cornwall NY. Contact VE: w2bcc'at'arrl.net
Sep 28: PEARL, Mahopac Public Library, 2nd floor, 668 Route 6, Mahopac NY. Contact VE: carmelink'at'aol.com

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