



PCARA Update



Volume 23, Issue 6 Peekskill/Cortlandt Amateur Radio Association Inc. June 2022

Field trip

I'm writing this article after returning from **DARA* Hamvention® 2022** at the Greene County Fairgrounds and Expo Center in Xenia, Ohio. I attended the event with a couple of retired colleagues and some folks from the Mount Beacon Amateur Radio Club (MBARC). As always, it was an experience and one that every Ham must try at least once — a pilgrimage of sorts.

*DARA = Dayton Amateur Radio Association.

On April 27, 2022, a **PCARA V.E. Test Session** was held at the Putnam | Northern Westchester BOCES (PNWBOCES) Tech Center in Yorktown Heights, NY where we welcomed two new technicians to the fold — KD2ZKN and KD2ZKS. Thanks to Dave KF2BD and our VEs for their efforts. We would also like to thank PNWBOCES for their continued support and for allowing PCARA to offer the Laurel VEC session at the Tech Center.

PCARA took a table at the **Orange County Amateur Radio Club Hamfest** on Sunday May 1, 2022, in Middletown, NY. There was a very good turnout at the fest and PCARA was very well represented with ten members. We saw some folks who we hadn't seen in a while, and everyone seemed to have a good time! Several members brought along items for sale and \$30 was generated for the Treasury. Thank you to our most generous members!

The **PCARA Breakfast** on Saturday May 7, 2022, was originally scheduled to take place at Downing Park



May 21 membership meeting at Putnam Valley Library.

in Yorktown Heights but was moved to Uncle Giuseppe's Marketplace due to threatening weather. As always, an incredible turnout with stimulating conversation and discussions.

On Saturday May 21, 2022, at 10:00 am a **PCARA Membership Meeting and PCARA VE Test Session** were held at the Putnam Valley Free Library in Putnam Valley, NY. Fifteen members were present but no candidates for the test session. Due to the absence of the President and Vice President attributable to attendance of the aforementioned Hamvention, the meeting was chaired by Vice President Emeritus Joe WA2MCR. Treasurer Dave KD2EVI announced that the reminder for dues will be sent out early in June and details can be found in this edition of the *PCARA Update*. Most of the meeting was taken up with discussions and planning for **ARRL Field Day 2022** on June 25-26. This year Field Day will not be held at Walter Panas High School due to construction of the new *Continued on page 2* ⇨



PCARA club table at Orange County Amateur Radio Club Hamfest on May 1.

Contents

Field trip – KB2CQE	1
VE. Test Sessions.....	2
Adventures in DXing – N2KZ	3
<i>Titanic</i> calling – KD2EVI.....	7
Stan Rothman WA2NRV Silent Key	8
A true Ham Spirit – NE2Q.....	8
Strowger revisited – N2SFS.....	9
Membership renewal time – KD2EVI.....	9
Building the Mercury IIIS amplifier – K2WPM	10
ARRL Club Grant Program – KD2EVI	11
Tuners I have known – NM9J.....	12

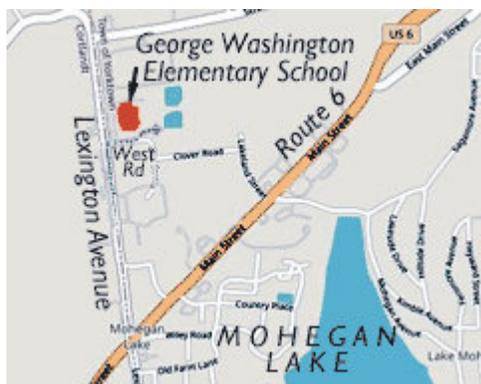
Athletic Field on the west side of the school and use of the grounds for graduation ceremonies that same



weekend. There will be a pre-Field Day planning meeting on Wednesday June 22, 2022 at 7:00 p.m. at the replacement Field Day location, George Washington Elementary School in

Mohegan Lake, NY (location to be confirmed by Lake-land Central School District.) A PCARA V.E. Test Session will be scheduled for Sunday June 26, 2022 at

10:00 a.m. at the Field Day site. If you know of anyone interested in taking an exam, please let them know they are welcome.



On Sunday May 22, 2022 between the hours of 10:00 a.m. and 12:00 p.m. Karl N2KZ held his **Beacon Challenge**. Karl hid CW (A1A) beacon N2KZ/B *somewhere* on the amateur bands. A full report with winners and results can be found in this month's edition of the PCARA Update. Check it out!

The next PCARA Breakfast is scheduled for 9:00 a.m. on Saturday June 11, 2022 at Downing Park in Yorktown Heights, NY. I look forward to seeing each of you there!

- 73 de Greg, KB2CQE

PCARA Board

President:

Greg Appleyard, KB2CQE; kb2cq@arrl.net

Vice President:

Bob Tarsio, N2CBH; bob@broadcast-devices.com

Secretary:

Lou Cassetta, KD2ITZ; radiocassetta@gmail.com

Treasurer:

David Fredsall KD2EVI; joanndavidss88@verizon.net

Director:

Mike Dvorozniak, W2IG

Vice President Emeritus: Joe Calabrese, WA2MCR.

Net night

Peekskill/Cortlandt Amateur Radio Association holds a roundtable net on Tuesday evenings at 8:00 p.m. and a directed 'Old Goats' net on Thursday evenings at 8:00 p.m. Both events take place on the

146.67 MHz W2NYW repeater, offset -0.600, PL 156.7 Hz.

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

V.E. Test Sessions

PCARA conducted a V.E. Test Session at Putnam|Northern Westchester BOCES Tech Center in Yorktown on Wed April 27. The session was held under the auspices of Laurel VEC. Team Leader Dave KF2BD had once again brought along his notebook computer with Laurel software, plus printer/scanner so that results could be submitted electronically.



V.E. Test Session on April 27 at BOCES Tech Center.

Two unlicensed candidates were successful in passing the Technician test. There was a long delay from April 19 to May 9 when the FCC was unable to process amateur license applications submitted to its ULS electronic batch filing system due to technical problems (most likely associated with introduction of the \$35.00 fee for new amateur licenses and renewals.) Fortunately, on May 12 FCC was able to issue licenses as follows:

Robert Greene, Mount Kisco NY, Technician - KD2ZKN

Patricia D'Antono, Wappingers Falls, NY, Technician - KD2ZKS

Thanks to all the Volunteer Examiners who took part in this session including Lou KD2ITZ, Dave KF2BD, Armando KC2EES, Rob AD2CT, Verle W2VJ, Joe W2BCC and NM9J. Also assisting were Greg KB2CQE and Frank K2DXS, Regional Safety Services Coordinator for PNW BOCES.

The V.E. Test Session scheduled for Saturday May 21st — following the membership meeting at Putnam Central Library — did not attract any candidates.

PCARA's next test session is now scheduled for Sunday June 26th, 10:00 a.m. at the Field Day location — George Washington Elementary School, 3634 Lexington Avenue, Mohegan Lake NY. Candidates should contact Mike W2IG using: w2igg@yahoo.com.

Adventures in DXing

- N2KZ

Speakin' Beacons

In a quest to add advanced sophistication and elaboration to PCARA special operating events, I decided to launch our first beacon hunt. The concept was simple: Place a beacon on the air and have our membership (and then some) discover the signal's frequency and relay the Morse message via e-mail before anyone else! Sounds simple, right?

There was a lot to be learned! First, I had to launch into my transceiver's massive manual and study the workings of my 'contest memory keyer' and its 'beacon mode.' My beacon's message text could not exceed 50 characters. Was my syntax correct so the message would continually repeat? Was my QSK* timing correct so my keying would not sound choppy?

[*QSK = full break-in. -Ed.]

Careful consideration of spacing between words and letters became essential to create best readability at very slow sending speeds. The time delay between message repeats required experimentation and tweaking, as well. There were a lot of menus to discover and test.

In turn, I schooled myself by listening to established continuous beacons already on the air. I noted their text content and their on-air formats. Many beacons use a series of 'VVV VVV' to alert listeners to standby for their identity. Some stations incorporated clever beacon controllers that would actually vary the power output of the transmission in steps to create an aural indication of field signal strength — 100 watts – 50 watts – 5 watts – 500 milliwatts. Fancy stuff!

I learned from my peers as I discovered and listened to their beacons already on the air full-time. My loggings were fascinating! I heard three different beacons from Mexico over several days: XE2O/B in Monterrey (using a modified Cobra CB radio!), XE1JAL/B near Veracruz, and XE1FAS/B southeast of Mexico City. I also caught K4PAR/B from the Piedmont Amateur Radio Club in Eatonton, Georgia between Atlanta and Augusta. They all gave me more ideas for our beacon's sound and presentation.

Lessons to be learned: Beacons often operate at low powers and on bands where propagation may be sometimes marginal. It is not unusual to listen to a bea-



Transceiver Operating Manual

con repeat over several minutes before you copy its message exactly. Be patient! You may possibly need to return to the frequency at a different time or even a different day to pull through every

text character. This will also be a great time to experiment and master your transceiver or receiver's filter set and offsets to minimize noise and fading while resolving every last letter you long for. Read your rig's manual. You may discover new and great things! *You become a very good listener!*

Now I understood essential beacon content basics: You need to mention callsign, operating power, Maidenhead grid and some indication of identity. After several trials, my message and sending speed were finalized. On the air I went! For my first on-air tests, my band and frequency were carefully chosen where my quick broadcasts would not be recognized or expected by reception skimmers or passerby listeners! My power was reduced to lowest levels.

As it began to send, I honed the spacing between letters and added double spacing at the beginning of full words. This created a Farnsworth sound to the message keeping the text easy to identify but still slow enough for those who would need to copy each letter manually and with care. I truncated the text to include only the most essential facts of identification.

Many different combinations of text were tested for best results. The trial results were sweet. I achieved my goal: The 5 words per minute speed combined with ample spacing between characters blurred my presence in the eyes of automatic loggers. My identity was no longer read on skimmers like Reverse Beacon Network (<http://www.reversebeacon.net/>). I beat the system and became invisible! My signals could be seen — but not stand out — on distant KiwiSDRs. I watched the SDR waterfalls to determine just the right amount of transmit power and to verify I was exactly on frequency. It became a working system ready to go!

Was I very sneaky? Not always! Some of my first brief higher power beacon trials did appear on Reverse Beacon Network and DXWatch.com while I was transmitting on bizarre and illogical amateur frequencies. I had to smirk and smile! These log records revealing my test activity would actually create unintentional diversion and distraction. I might test on these frequencies with



XE2O/B beacons on 10 meters and 6 meters feature a modified Cobra 148 GTL and a Ranger RCI-5054DX transceiver.

high power but I wouldn't return on the day of the challenge! These early tests left literally *no clue!*

Another day, I decided to do a complete field test visiting several locations to emulate lengthy transmission on the day of the event. How was the reception? I found the right amount of power to gracefully distribute enough signal within the PCARA listening area. I settled on ten watts. QRO (for me, anyway!) Antenna? A homebrew 10 meter dipole on my roof up about 30 feet pointed nearly exactly north/south.

What was the most essential variable to consider? *Power and field strength.* The PCARA Beacon Challenge was intended to be an *advanced* event filled with puzzles and mysteries — and — requiring thoughtful skill. It was never my plan to bombard the airwaves and burn holes in the ionosphere with a megawatt beacon. *Au contraire!* (It wasn't to be a milliwatt marvel, either!) Please note: I never mentioned that you could sit at home and leisurely get your results. Indeed, with good equipment and an efficient antenna, you could be blessed with this luxury but <ahem!> maybe not!

On the other hand, I never mentioned that owning a portable general coverage or a mobile amateur radio with CW capability might make your day, either! I love to hike and discover new amazing vistas and forested places. I visited a lot of them during my tests of the PCARA beacon. My trusty battery-operated Sony ICF-SW7600GR came in very handy! I verified and guaranteed that N2KZ/B could be heard. No complaints! I gave all of you two whole hours of continuous operation to find my frequency and read the content. Get to work. Find the beacon!



Sony ICF-SW7600GR portable shortwave receiver for checking beacon coverage. [N2KZ pic.]

Also quite valuable to my pursuits was the use of the KiwiSDR conveniently in place at the QTH of Matt Williams, WB2EEE in nearby Highland Falls, near West Point. (<http://matt1234.viewnetcam.com:8073/>). Viewing his waterfall made my life easy throughout the testing and actual day of the event. It provided instant verification of my signal and also



Matt WB2EEE.

allowed me to perfectly align the frequency of my signal to exactly 28.150 MHz. Thanks, Matt! Another useful hint: Looking for very weak signals using a KiwiSDR? Zoom in (+) on your waterfall as far as you can then look very carefully. You will have excellent frequency resolution (down to one cycle or better) and enjoy the finest sensitivity possible.

One problem appeared: Even at low power, my transceiver ran too hot for my liking. A leftover server fan was added to the system to air cool my rig... propped up to just the right height sitting atop a handy box of spiral pasta. (You can't write this stuff!) This scheme worked famously — and boy! — did my shack get warm while we were on the air. I really was a lot of hot air! Keep the door open and keep the fan rolling, Karl!



Additional cooling for Karl's FT-DX1200 transceiver. [N2KZ pic.]

Another lesson learned: *Slow speed CW* increases duty cycles of transmitters enormously. I had never been confronted with this reality in a very long time. When you send at snail-paced speeds, you multiply your key-down times in legions. 5 words per minute is 4 times longer than 20 words per minute in transmit time. Go really slow and you are really turning up the burners in your shack. Another incentive to increasing your day-to-day CW proficiency and sending speed. Got it!

Read All About It!

Every good show has good publicity. I crafted a one-page teaser hand-out to encourage participation. "How would you like to find a beacon?" (You get the idea!) Each written sentence of print copy required consideration and thought. A proper brew between inconclusive information and mystery was concocted. Don't lead them on! Don't tell them too much! List time, date, and callsign — but no indication of frequency, operating power or content!



At the end of the beacon challenge everyone would gather together on the PCARA two meter repeater to hear results. Who would the winners be? How long did it take to resolve the entire message and send an e-mail? It would be just like election night coverage!

Some soft warnings were included: If you cheat, you ruin the challenge! No discussion between players or groups! Radio direction finding will not help you! Don't reveal the ending of the movie until everyone has seen it! Get the idea?

After the release of the one-sheet, I was encouraged by the response. I heard from The QSY Society, The Yonkers Amateur Radio Club and the Westchester Emergency Communications Association (WECA) asking if they could join in. Yes, please!

Figure this one out: I also created and posted a simple QRZ.com page for listeners of N2KZ/B. After I was done, I noticed under the 'Details' tab, QRZ.com assigned a location to my beacon that was 3.3 miles from my home QTH randomly set away from any main road or terrain marker. This was not my intention but it would only add to the anonymity and mystery of its actual location. Thanks for the free help, QRZ!



On The List

Beacon school did not end here! The next step was to not step on other beacon's toes. My first inclination was to self-coordinate myself with the myriad of beacons already on the air. I searched beacon lists and found many of them out-of-date going back to even before the year 2000. Amazement came from the complexity and self-regulation created by the worldwide beacon community. Beacon segments on amateur radio are packed with station allocations. Really packed!

Most notable was the admirable NCDXF/IARU (Northern California DX Foundation / International Amateur Radio Union) joint beacon round-robin network. Through decades of development, they have designed and launched an incredible gathering of beacons situated all over the world to broadcast on several amateur bands with GPS clock precision. Worldwide beacons share time on single frequencies in perfect synchronicity — three minutes for each participant — in a



never ending round robin. The system produces and creates a powerful database revealing real-time HF propagation like no other.

Look to: <https://www.ncdxf.org/pages/beacons.html> for a detailed introduction to the workings of the system. Monitor the current status and active transmitters at: <https://www.ncdxf.org/beacon/>. You will see the system predictably step through this fascinating rotating system to your eye's delight. Tune to one of the system's frequencies to hear which beacons are reaching you: 14.100, 18.110, 21.150, 24.930 and especially 28.200 MHz.

Give Me Ten!

Days went by and I found many, many beacon frequency rosters online. Most were hopelessly old and out-of-date. I finally fell upon the list that was most relevant to my project (and 10 meter beacons specifically) maintained by the IARU's beacon coordinator for Region 2 and The Ten-Ten Club's



Denny WI5V is the IARU Region 2 Beacon Coordinator.

master: Denny Stice WI5V: <https://wi5v.net/beacon-list-table-version/>. Denny also serves as the *de facto* frequency coordinator for all beacons using ten meters.

Study Denny's list and you will understand my frequency co-ordination dilemma. Nearly all amateur radio beacons use frequencies that are meticulously planned by gentleman's agreement. Finding an unused frequency is like finding a good apartment in Manhattan. You know there must be one out there... but where should I look? I needed some direction!

A quick e-mail to Denny solved my problem! But, wait! You tried to get me to tell you the frequency! Oh, that's right. The beacon challenge already happened! Here's what Denny replied: *'I would suggest, since you are going to be nearby the controls on this special one-time event, to use 28.150 MHz.'*

Read FCC Rule 47 CFR § 97.203(d):

Beacon Station

'A beacon may be automatically controlled while it is transmitting on the 28.20-28.30 MHz, 50.06-50.08 MHz, 144.275-144.300 MHz, 222.05-222.06 MHz or 432.300-432.400 MHz segments, or on the 33 cm and shorter wavelength bands.'

Denny knew I would be present at my QTH during the two-hour beacon event. Operation would not be 'automatic.' Therefore, Denny gave me a frequency

used by past temporary and event stations just outside of the very packed 28.200 to 28.300 segment. Officially coordinated, I was ready to launch the PCARA beacon!

Message Received?

So...What was the message?

PCARA TEST DE N2KZ/B FN31 10W

QSL? Note: There were no wasteful VVV sequences. Conversational text (including 'PCARA test') and overall brevity blurred the beacon's true identity and purpose. Spaces between most letters and double spaces between words added readability to those not fluent in Morse.

Good hiding: My carefully crafted message simply did not meet the criteria of Reverse Beacon Network's algorithms. (Hint: Those spaces between each letter went a long way to disguise myself from the RBN skimmers of the world!) I did squeeze in my Maidenhead grid location and operating power. All this in less than 50 characters!

The Big Day

Sunday morning, May 22, 2022, was chosen as the day of the first PCARA Beacon Challenge. It was one day after the PCARA monthly membership meeting and a nice casual date and time to allow for many participants. The previous day was unseasonably warm with high humidity — way up into the low 90s — and this day was to repeat the previous day's performance.

In the very early hours, I once again tested the beacon system to make sure it was ready to go. I could see my signal on the WB2EEE KiwiSDR and I checked to see if my frequency was zero beat to 28.150 MHz. Good to go! At exactly 10:00 a.m., (1400 UTC) I took to the air and away I went!

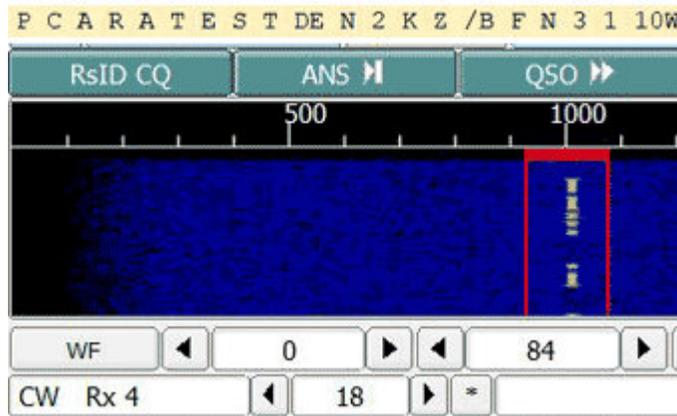


Karl's Yaesu FTdx1200 transceiver is pictured transmitting the beacon message on 28.150 MHz. [N2KZ pic.]

Results were quite fast! Location was very important. Jay, NE2Q, won the challenge with a correct report received in e-mail at 10:02 a.m. at 5.7 miles away. "20 over on a 3 element Yagi. S9 on a 44 FT edz vertical with a feedpoint at 45' above ground. I guess you were horizontally polarized." (Yes, I was!) Congratulations, Jay! That was fast!

Malcolm, NM9J was right behind at 10:13 a.m. at

13.2 miles away. "Message copied on Yaesu FT-991A. I had checked all bands from 80m to 2m before returning to 20m then to 10m where I found you. RST 579 on wire sloper. (Now with some aircraft flutter?)"



Waterfall display within Fldigi shows reception of N2KZ/B during the Beacon Challenge.

One late comment came in from Mike, N2EAB, at 11:33 a.m. at 13.6 miles away: "So, exactly how many microwatts is your beacon transmitting? I'm wearing out my VFO." Actually, it was broadcasting at ten watts — a lot of power (for me, anyway!) Rob, AD2CT, at 15.6 miles away, checked in during our 2 meter repeater chat at noon. Rob could not copy my beacon, but thanks for trying!

Congratulations to our winners! Thanks for participating!

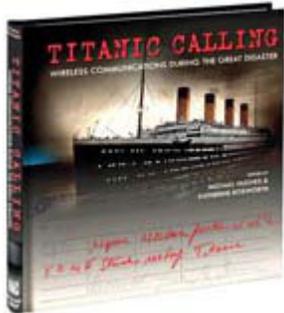
Don't Stop Now!

Make a note to tune through the beacon frequency allocations now and then, (especially 28.200 through 28.300 MHz,) and really see where exact band openings may be at any moment. You can't say 'nobody's on the air' ever again! Happy trails and enjoy our hobby! 73s and dit de N2KZ "The Old Goat."



Titanic calling – KD2EVI

Some of you may have listened to or participated in Jay NE2Q's discussion on the sinking of the *Titanic* on the 146.67 MHz W2NYW repeater on Monday May 2. Jay's email announcing the discussion prompted me to retrieve my copy of "Titanic Calling: Wireless Communications during the Great Disaster". This book, published by the Bodleian Library, University of Oxford in 2012 was edited by Michael Hughes and Katherine Bosworth. It is still available on Amazon

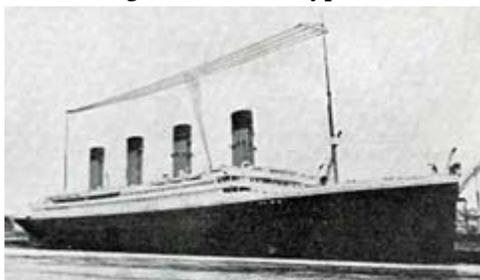


and through the Westchester Library System.

In 2002 the Marconi Collection was donated to the University of Oxford. See: <https://www.mhs.ox.ac.uk/marconi/collection/>. The collection includes transcripts of ships' and shore stations' radio logs. Not all records have survived and gaps remain. For instance, the radio operator on the *Carpathian*, which picked up the *Titanic* survivors, was too busy sending lists of the survivors to keep a log. The *Carpathian* messages were reconstructed from the logs of other stations, as were the logs of the *Titanic*, which were lost in the sinking. These records form the basis for the book.

The *Titanic* had one of the most powerful radios of its time, a 5 kilowatt motor generator at 300 volts ran a Marconi rotary disc discharger to enable the spark.

Marconi claimed a range of 400 miles during the day and up to 2000 miles at night. A twin "T-type" antenna ran between two masts 200 feet high and 600 feet apart. Most other vessels had less powerful sets and could not equal the *Titanic's* range.



RMS Titanic with T-antenna for 600 and 300 meter wavelengths emphasized.

The radio equipment was owned by the Marconi Company and the operators were Marconi employees. Messages relating to the navigation of the ship were handled at no charge, while passengers were charged. Most ships only carried one operator, who had no fixed hours, but sent messages as needed. Ships with two operators maintained a continuous watch. The *Titanic* carried two, Jack Phillips, senior operator and Harold Bride, junior operator. Only Mr. Bride survived and assisted handling messages once aboard the *Carpathian*. He was injured in the sinking and had to be carried to the radio room.

On the night of the disaster, April 14, 1912, ice



Wireless room on board RMS Titanic, call sign MGY.

warnings were sent by several ships and relayed by others. The *California*, which was stopped due to ice approximately 20 miles from where the *Titanic* struck an iceberg, was told to "keep out" by Mr. Bride when relaying an ice warning and later when trying to notify *Titanic* and other ships that it was stopped due to ice. At the post-sinking inquiry Mr. Bride testified that he had copied and sent the earlier ice message to the officers on the *Titanic* prior to the *California* relaying the message, but this was not corroborated by other testimony. The *Titanic* operators were quite busy sending passenger's messages and "keep out" was commonly used when working another station. The *Titanic* struck the iceberg shortly after 10 p.m. local time. Unfortunately the operator on the *California* had closed his station and retired prior to that time.

Form No. 1-200-171131. Sent date April 15 1912

The Marconi International Marine Communication Company, Ltd.
WATERGATE HOUSE, YORK BUILDINGS, ADELPHI LONDON, W.C.

No. 311 *Celtic* OFFICE *16 April 12*

Prefix *CG* Code Words CHARGES TO PAY

Office of Origin *Titanic*

Service Instructions:

Marconi Charge
Other Line Charge
Delivery Charge
Total

Charges in This Bill To Value Paid

OK 11:30 3

READ THE CONDITIONS PRINTED ON THE REVERSE OF THE FORM

To: *CG*

<i>CG</i>	<i>require</i>	<i>assistance</i>	<i>position</i>	<i>41.46 N</i>
<i>CG</i>	<i>struck</i>	<i>iceberg</i>	<i>11.14 W</i>	<i>Titanic</i>

PLEASE TAKE FROM OFFICIAL RECEIPTS.
All Cable Communications sent and all Cable Connections are not made for messages having special rates. See conditions.

Message sent from RMS Titanic, as received by RMS Celtic, 700 miles east. "To: CQ." "CQD require assistance position 41.46 N 50.14 W struck iceberg Titanic".

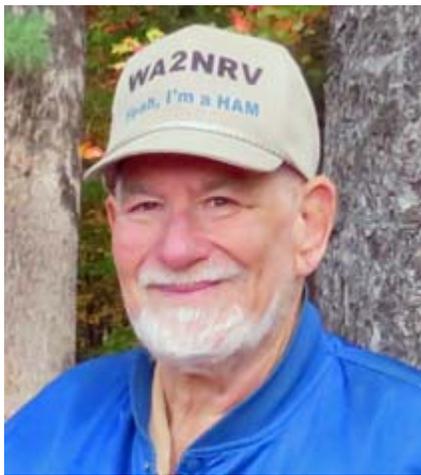
The book consists of a description of the radio equipment of its day, the procedures followed, and how the investigations into the sinking were conducted. The second half of the book lists the messages sent among the various ships and shore stations. I found the book to be interesting and can recommend it to anybody with an interest in the early days of radio or the *Titanic* disaster.

- 73 David, KD2EVI

Stan Rothman WA2NRV Silent Key

Stan Rothman WA2NRV passed away on April 23, 2022. Stan was a member of Westchester Emergency Communications Association

(WECA) and took part in activities at several neighboring clubs. He was an active participant in PCARA's Foxhunt efforts going back to the Tape Measure Yagi construction night in April 2017. Stan took part in several PCARA foxhunts and in many PCARA V.E. Test



Stan Rothman, WA2NRV during PCARA's fall foxhunt, October 2021.

Sessions after they resumed in September 2018. He wrote an article "Hidden transmitter hunting" for the November 2019 *PCARA Update*.

WECA Membership Director Peter Johnson N2TFC wrote: "Sadly, Stan Rothman / WA2NRV passed away yesterday at the ripe old age of 80! Stan was a long-time member of WECA. He served on the Board of Directors for many years and was our Club President at one time. Stan was always talking about Club Projects, hidden transmitter hunts, and getting the members together for some social event."

Jay NE2Q has his own memories of Stan Rothman and submitted the recollection below for this issue of the *PCARA Update* newsletter.

A true Ham Spirit – NE2Q Stan Rothman WA2NRV, epitome of the real "Ham Spirit"

I met Stan at the Westchester Amateur Radio Association (WARA) back in 1959. We were both 16 and got licensed in 1958. My original call was WA2BLX. We were both lightweight fellows back then. Probably no more than 140 lbs.

WARA was a terrific radio club. We held our meetings at the White Plains County Center. As we were both beginners we learned from many of the wise old timers. Especially Charlie Hellman, W2RP who lived in Hastings-On-Hudson. He was a wealth of knowledge and always willing to help anyone, especially newcomers. Charlie lived to over 100 years of age.

We both experienced our first Field Day at WARA

which was held on a property overlooking Long Island Sound. It is off King Street near the Westchester airport. A very exciting event indeed.

I always remember the jovial personality Stan exuded. He was always very friendly and quick witted. Whenever he called me by phone or when we talked on the air he always had a good "Zinger" to blast me with.

We both enjoyed power boating and flying small aircraft out of the local airport. As a member of the Civil Air Patrol, Stan rose through the ranks to Lt. Colonel. He was very active for over 50 years and was the communications officer for much of that time.

He was an original founding member of WECA and guided that club through many years of its existence till the present day.

He was ready to help anyone and gave his time and energy extensively to anyone that asked or needed help. Stan was one of the original Volunteer Examiners and attended many exam sessions all around this area. He supervised more exams than most V.E.'s in the USA.



A distinguished team of Volunteer Examiners came together at John C. Hart Library in Shrub Oak when PCARA resumed V.E. Testing in September 2018. Stan WA2NRV is third from the left.

Over the years my wife Ulla and I socialized with Stan and his wife Reva. We'd enjoy dinners together at local eateries. We both attended his 80th birthday party in July 2021. All four of us have our birthdays in July. We were supposed to get together this July to celebrate. We'll all miss Stan... a true Ham's ham and great, giving person.

- Jay NE2Q

Strowger revisited – N2SFS

[“Club callings” in May 2022 described the trades and professions of radio club members, including engineers from the British Post Office who looked after automatic telephone exchange equipment invented by Almon B. Strowger. Steve N2SFS has his own memories of that era and sent the following recollections to the editor.]

Hi Malcolm — It was nice to meet you at the Orange County Hamfest. As promised here are my memories of the Strowger switch. I serviced them for the Telephone Company in Middletown, N.Y.

They were reliable, very well built and made to last. They worked with solenoid coils and springs with contacts. When WALL Radio* ran a contest, the whole dial office got noisy with all the relays. But they kept running. The biggest problem I remember was “ring no answer”. The relay in the 5th selector would activate when the customer picked up the phone. Springs would lose their tension and would not make contact with the spring next to it. In came the trouble call and

a quick adjustment of the spring would fix it.

Mr. Strowger was quite an inventor — a stepping stone between ringing the operator for all your calls and then electronic dial offices.

In the 1970s there was Don Imus on WNBC 660†. He had the morning show. One morning he told his listeners — “I will play any song you want to hear and call from anywhere”. Next morning in a local NYC paper, there was an article: “Imus destroys the switching office”. It was too

overloaded to handle all the calls.

Type in Strowger switch on the search engine and you will see lots of info. Happy DXing in solar cycle 25.

- 73 de Steve Schumm, N2SFS

[*WALL, 1340 kHz AM plus FM translators is licensed to Middletown, NY –Ed.]

[†WNBC-AM used to be the call letters on 660 kHz AM until WFAN took over the frequency in 1988. Karl N2KZ and other sources suggest there was a time when ‘shock jock’ radio stations welcomed the publicity from overloading a telephone company’s central office. –Ed.]

Membership renewal time – KD2EVI

Our club’s membership renewal time is coming up shortly. The PCARA membership year runs until June 30. I will soon be forwarding an e-mail from Greg KB2CQE to the Google Groups list reminding you to renew your membership. If you are not a member you are very welcome to join. A hard copy renewal request will be sent through the mail to those who do not respond to the e-mail.

Annual dues support PCARA activities, pay insurance premiums and contribute to the cost of repeater maintenance and upgrades. The dues schedule is as follows:

- Full Membership (\$25.00/year)
- Associate Membership (\$15.00/year)
- Student Membership (Free)
- Senior Membership (65 years and older - \$10.00/year)
- Family Membership (\$30.00/year)
- Family Membership (65 years and older - \$20.00/year)

When you get your Google Groups or hard copy renewal please mail the form to:

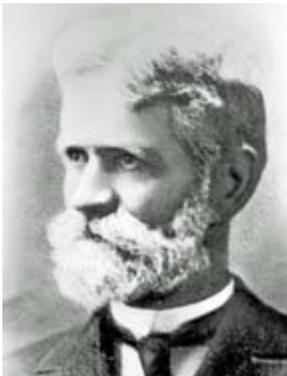
PCARA
P.O. Box 146
Crompond, NY 10517.

At this time we can only accept checks or money orders through the mail. I will accept cash at meetings.

Postscript

This year we are including a short voluntary survey of our members’ equipment and interests. The survey can be completed on line at <https://forms.gle/fzcNfj5e-h2xxLFBQ8> or be filled out by hand and returned with your check. Thanks to Vincent, KD2VAV for putting the form online.

- 73 de David, KD2EVI



Almon B. Strowger, inventor of the automatic telephone exchange (1891 Patent).

Building the Mercury IIS amplifier – K2WPM

Barefoot to QRO

I had not built anything since a Heathkit in my childhood. So when I saw the **Mercury IIS** power amplifier kit, I jumped. In case anyone has missed one of the hottest pieces of ham gear on the market today, the Mercury

IIS is a solid state LDMOS amplifier for 160 to 6 meters, rated for 1200 watts



KM3KM Electronics Mercury IIS amplifier.

SSB/CW and 700 watts digital modes. The switch-mode power supply is auto-sensing for 120 or 240 volts AC, and the unit features a 7 inch full color touch screen.

The kit is sold by KM3KM Electronics LLC and comes with pre-populated circuit boards. The minimal assembly required includes installing all the printed circuit boards; installing the screen, switches, input and outputs; wiring connecting cables between the boards and the inputs, outputs and screen; installing power supply, and testing all contacts.



Mercury IIS kit during the later stages of construction. [K2WPM pics].

Just enough to challenge, not enough to claim you really built the thing. The reader can probably complete it in an afternoon. It took me a week, mostly due to my lack of proper soldering equipment. (Thanks to PCARA members' help in selecting a new Weller 100/140 watt iron and Kester 44 solder).

As of this writing, the 61 reviews on eHam web site

garner this equipment a 5.0. A rarity in ham equipment. I was charged \$2,500 shipped. A big purchase for my ham budget! I justified it by thinking I will have this, and use it, for many years. And when I decide to sell it, it won't be dinosaur tech-



Rear panel view during construction.

nology. The kit remains for sale at \$2,500 plus shipping; the seller now offers the amp, fully assembled, for \$2,800 plus shipping.

The amplifier is definitely plug-and-play. After completing the kit, attach the coax, plug it into the power outlet, and connect a control cable to your rig. My Icom IC-7300 had no trouble communicating with the Mercury III. I have mine powered by 120 volts AC, which has worked fine; I have not run it at more than about 800 watts.

The initial test showed the amplifier worked well. On 20 meters, with about 6 watts from the IC-7300, the amplifier gave me 781 watts of RF and reflected power 0 at SWR 1:1. See photo below.

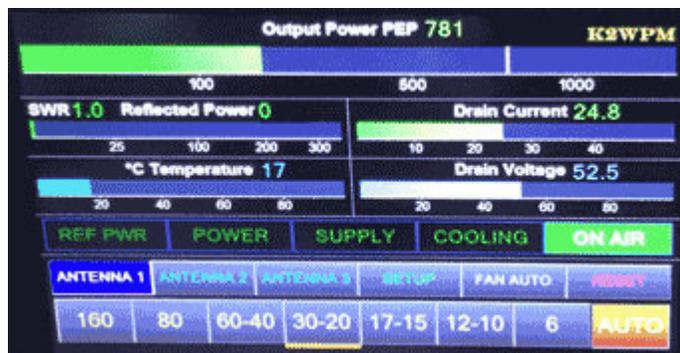


Photo of Mercury IIS display screen during testing by K2WPM shows power output of 781 watts PEP

The amplifier automatically changes bands when you do, sensing the RF from your transmitter. There are no loading or tuning knobs, just a colorful screen that tells you (a) what band you're on, (b) how much RF the amplifier is sending out, and (c) reflected power. The higher the SWR, the higher the reflected power. The amplifier will tolerate an SWR up to about 1.2:1. It will shut down if it senses reflected power of 125 watts. I always run it into a 1:1 load, thanks to an

inherited MFJ-962D manual tuner and RigExpert antenna analyzer. However, when an antenna connection unexpectedly came loose, yes, the amp beeped indignantly, and shut down.

The amplifier has connections for three different antennas. I have mine connected to a dummy load and to a single antenna.

I planned to use the amplifier for portable operations. It weighs 28 pounds. All I need to do is get rid of some nasty RFI from the portable generator. I have run the IC-7300 at 5 to 6

watts — which produces 500 to 600 watts from the amp. I built a plywood double platform, which sits on the seat of my truck; it accommodates the radio, amplifier, tuner and leaves some arm space for my CW paddle. See photo.



Plywood platform built to house Mercury IIIIS amplifier and Icom IC-7300 transceiver. [K2WPM pics.]

If you're in the market for an amplifier, I recommend the Mercury III! (See: <https://www.km3km.com/>)

- David, K2WPM

ARRL Club Grant Program – KD2EVI

I sat in on WECA's May 9 Zoom meeting. The ARRL Hudson Division Director, Ria Jairam N2RJ was the guest speaker. In addition to updates on the ARRL itself, most of her talk was devoted to the **Club Grant Program**. I thought a quick description of this program would be interesting.

The Club Grant Program has been funded by **Amateur Radio Digital Communications***. A total of \$500,000 is available this year and grants are made up to \$25,000 through the ARRL. Details can be found on the ARRL web site, <http://www.arrl.org/club-grant-program>.

Slides from a May 4 Webinar on the ARRL Foundation Club Grant Program are available at: <http://www.arrl.org/files/file/Foundation/Club%20Grant%20Presentation%205-4-2022%20pdf.pdf>. As you can see on the slide show, "Projects that create significant impact beyond the applying club" are likely to be successful. Projects involving schools, elementary, high school, and undergraduate are desired as are improvements to emergency communications, spectrum defense (utilizing VHF + bands). The example was given of a grant that enabled a school to contact the International Space Station. The students had previously built simple electronic circuits to gain an understanding of the principles behind radio.

That was the good news. The grant program was announced earlier this year and the first deadline for applications is June 30, 2022. I do not think that we can identify a need and prepare the proposal in this time frame. Ria indicated that the grant program is likely to be renewed, so there may be future opportunities for PCARA to participate.

Please take a look at the information on the ARRL web site and if you have an idea that may deserve a grant, or any idea about an activity the club should be involved in let us know.

- 73 de David KD2EVI

*Amateur Radio Digital Communications and AMPRNet

AMPRNet got its start in 1981 when Dr. Hank Magnuski, KA6M, was assigned a block of 16.7 million Internet IPv4 addresses for use by licensed radio amateurs in the then-emerging amateur packet radio network. The actual space extended from 44.0.0.0 to 44.255.255.255, written as 44.0.0.0/8. This was at a time when there was little demand for Internet address space.

Over the years, AMPRNet allocated IP addresses from this block to radio amateurs so they could experiment with Internet-related Amateur Radio communications, from simple TCP/IP connectivity to radio and wireless techniques, digital voice, telemetry, repeater linking and other activities. In 2011, "Amateur Radio Digital Communications" (ARDC) was formally incorporated as a 501(c)(3) non-profit to own and manage the address range.



Meanwhile, there was a growing demand for Internet IPv4 addresses from commercial organizations. In 2019, ARDC realized that radio amateurs would probably never use the entire block of 16.7 million IPv4 addresses and decided to sell the top **one-quarter** of them. A block of approximately four million consecutive AMPRNet addresses denoted as 44.192.0.0/10 was sold to the highest bidder, Amazon Technologies Inc. for use by Amazon Web Services.

The sale generated millions of dollars for ARDC, which changed to a private foundation and established a grant program. The program uses proceeds from the address space sale to fund grants and scholarships in support of communications and networking research — with a strong emphasis on Amateur Radio.

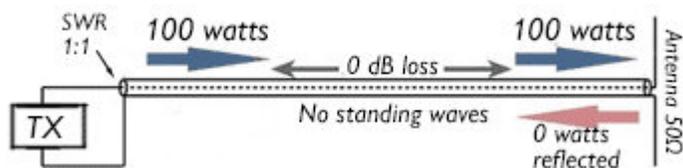
AMPRnet's remaining block of more than 12 million IPv4 addresses, occupying the spaces of 44.0.0.0/9 and 44.128.0.0/10, remains available for amateur radio activities. For more details see: <https://www.ampr.org>.

Tuners I have known

Most HF Amateur Radio stations have an **Antenna Tuning Unit** or ATU. Alternative names are the **antenna coupler** or **transmatch**. Louis Varney G5RV himself suggested a more accurate name for the device should be the **Antenna System Tuning Unit** or ASTU, since the tuner often acts on the combined system of feeder and antenna.

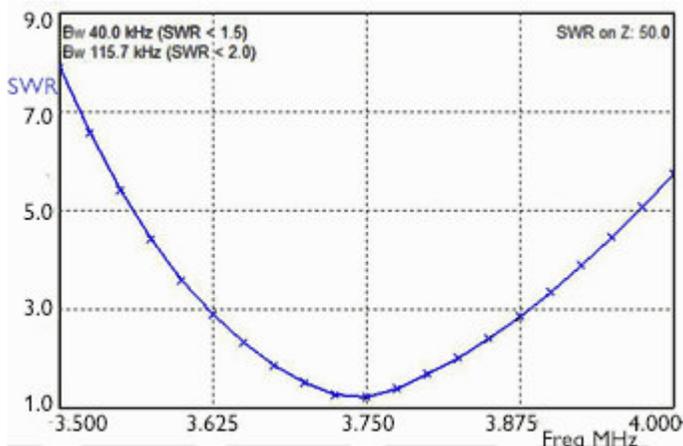
E pluribus tunum (one from many)

Vacuum tube transmitters from long ago could be adjusted to match a *range* of impedances. In contrast our modern solid-state transceivers are designed for a single antenna impedance of 50 ohms resistive. In a perfect world we would have an antenna with an impedance of 50 ohms, fed with low-loss 50 ohm coaxial cable. The RF energy produced by our transceiver would flow down the feeder and be 100% radiated by the antenna. There would be no RF energy reflected at the antenna, so no standing waves on the feeder. Perfection!

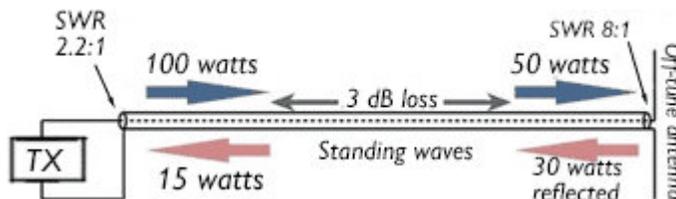


Perfection! A transmitter designed for a 50 ohm load feeds a 50 ohm antenna through loss-free 50 ohm coaxial cable.

Perfection fades as we reach the amateur MF and HF bands — 160 to 10 meters. The popular center-fed half-wave dipole has an impedance of 70 ohms at resonance, rather than 50 ohms, and its real-world impedance varies with height above ground. Even if you design this antenna for resonance at the center of a relatively wide band like 80 meters (3.750 MHz), the impedance will be different at the band edges, 3.50 MHz and 4.00 MHz. The voltage standing wave ratio (SWR) can rise as high as 8:1 at the band edge.



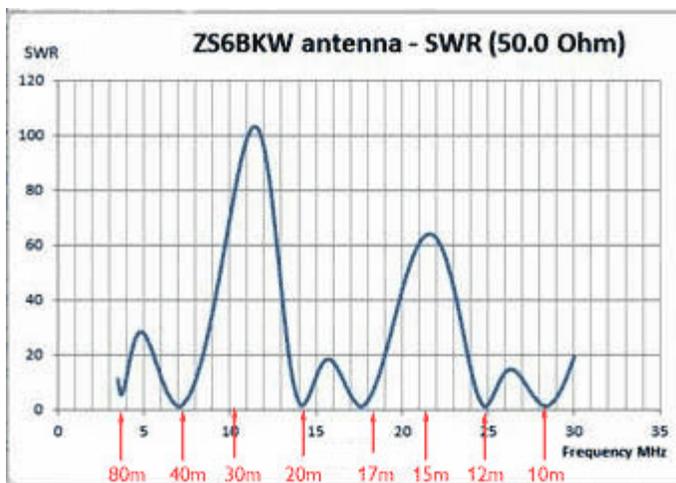
Half wave wire dipole cut for center of the 80 meter band will have a high SWR at the band edges. [MMANA-GAL].



The transmitter is now feeding an off-tune antenna with SWR of 8:1 through a length of lossy coax. Not perfect!

The situation deteriorates further when we try to use a single antenna on a second band. A center-fed half-wave dipole for the 80 meter band would be approximately 130 feet long. That same antenna acts as a **full-wave** dipole on 40 meters and would have an impedance of around 4000 ohms when center-fed at 7.15 MHz. (The *actual* impedance seen at the radio end of the feeder will depend on feeder length and its characteristic impedance.)

Life becomes even more difficult when we try to cover multiple HF bands with one antenna. Examples include the 132 foot end-fed long wire, the off-center fed dipole and the doublet fed with open wire feeder as in the G5RV or ZS6BKW designs. Impedance of the antenna-plus-feeder combination might vary between 5 and 3000 ohms, possibly reactive, with SWR as high as 60:1 on some bands. (Power loss in most coaxial cable is likely to be unacceptable at such a high SWR.)



SWR of a multi-band ZS6BKW antenna over the range 3-30 MHz as predicted by MMANA-GAL. Note the high SWR for the 30 meter and 15 meter bands.

The built-in ATU

Today's full-size HF transceivers often have a built-in automatic antenna tuner. Small HF transceivers such as the IC-706, IC-7100 and FT-891 with insufficient room for an internal tuner may have a companion ATU available from the manufacturer (e.g. Icom AT-180 and Yaesu FC-50). These tuners all have **limited matching ranges**, for example 16.7 – 150 ohms for the HF bands or 20 – 125 ohms at 50 MHz, corresponding to a standing wave ratio below 3:1 at HF or 2.5:1 at 50 MHz.

This type of compact ATU may be adequate to compensate for a resonant HF antenna used at the edges of an amateur band. For example, a half-wave wire dipole cut for the center of the 40 meter



Automatic antenna tuner in Yaesu FT-991 transceiver can match up to a 3:1 SWR.

band (7.15 MHz) and fed with 50 ohm cable should have an SWR less than 2:1 from 7.00 to 7.30 MHz. But we have already seen that SWR can rise above 3:1 at the band edges of the relatively wide 80 meter band. And ‘multiband’ antennas like the G5RV and ZS6BKW can have even higher SWRs on certain frequencies.

The external tuner

If your HF antenna has an SWR greater than 3:1 on frequencies where you need to operate, you may need an **external** tuner that is capable of matching a wider range of impedances.

Be aware that high SWR on amateur-grade coaxial cable can lead to heavy losses. The ARRL Antenna Book includes the program “Transmission Line for Windows” by N6BV to calculate loss. For a rough calculation you can go to a web site such as: https://www.qsl.net/co8tw/Coax_Calculator.htm. Just enter feeder type, length, frequency, SWR at load and transmitter power output to see the loss in the cable and the actual power radiated.

Set Parameters as Desired		Results	
Line Type:	Belden 9258 (RG-8X)	Matched Loss:	3.001 dB
Line Length:	188 Feet Meters	SWR Loss:	3.318 dB
Frequency:	28.4 MHz	Total Loss:	6.319 dB
Load SWR:	8 : 1	Power Out:	23.341 W
Power In:	100 W		
Calculate			

CO8TW coax calculator shows loss in 188 ft of RG-8X cable at a frequency of 28.4 MHz with SWR at load = 8:1.

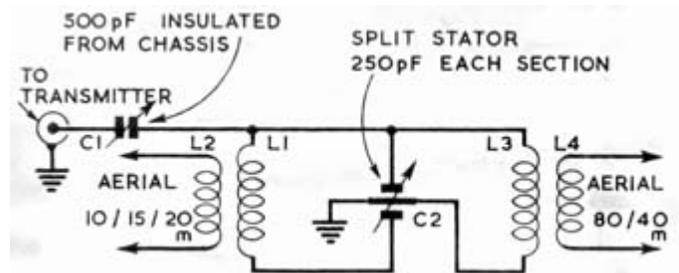
Also be aware that when using an external tuner, you should **turn off** the transceiver’s built-in tuner. All tuners have losses, and running two tuners in series soaks up more RF power as well as adding to the complexity of adjustment.

Some of my tuners

My very first antenna tuner was all home-brew. When first licensed, with limited funds, my station

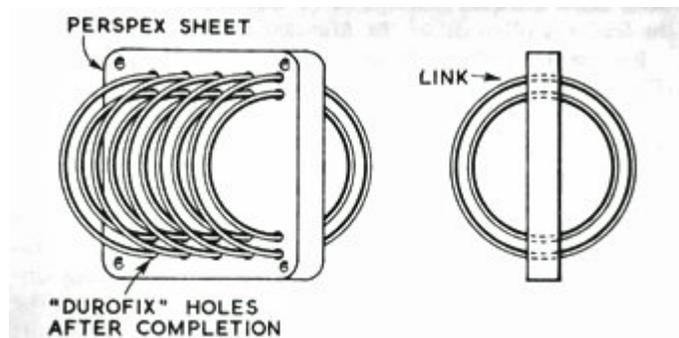
equipment was either government surplus (R1155L, CR100, BC348 receivers) or home-made. The standard method of construction was to start with an aluminum chassis plus a sheet of aluminum for the front panel. After drilling small holes and punching larger holes for vacuum tubes and meters, construction could begin.

My own antenna tuner was based on a design from the Radio Society of Great Britain’s “Amateur Radio Handbook”. The **Z-match coupler** was intended to cover 3.5- 29.7 MHz and was capable of matching a wide range of impedances, including tuned open wire feeders.



Circuit diagram of Z-match coupler from RSGB Amateur Radio Handbook, 3rd Edn. C1 is a series capacitor and C2 the split-stator capacitor in the multiband tuning circuit.

There were two sets of tightly coupled coils — they were wound on sheets of Perspex® (British trade name for acrylic resin) with holes drilled for the individual turns.



Method of construction for antenna coupler coils. The coils should be 2½" and 3" in diameter, and the turns spaced ¼" using 14 s.w.g wire (12 AWG). L1 and L2 are both 5 turns tightly coupled; L3 and L4 are 8 and 6 turns resp.

The wide-spaced variable capacitors came from a local emporium — high voltage components like these were readily available at the time from government surplus.

The balanced outputs from the tuner could be used with coaxial fed antennas if one side of the link coil was grounded.

The RSGB ‘Handbook’ design only covered 80 – 10 meters, but I was also active on 160 meters. I was able to cover this band by adding a “roller inductor” variable inductance with moving wheel contact. The roller inductor was placed in series with my 120 foot ‘long wire’ antenna.

British integration

As well as the ATU I had constructed a separate SWR bridge (housed in a water conductivity tester) and a dummy load, for tuning up the vacuum tube transmitters. Then I came across a British unit that incorporated *all* this equipment into a single case, along with an antenna switch — so when I saw a small ad for a second-hand KW Electronics “KW 107 Antenna Tuning System” I sent off a check.

The KW 107 was constructed inside a sturdy, wrap-around perforated metal case that matched KW Electronics’



KW Electronics KW 107 Antenna Tuning System.

other “G-Line” equipment including the KW2000 transmitter and KW1000 linear amplifier. The metal case shields RF components inside and was less than half the size of my home-brew ATU built on a metal chassis.



L to R: KW Electronics KW 1000 Linear Amplifier, KW 2000E HF transceiver and KW 107 Antenna Tuning System from ad in Radio Communication, Jan 1973.

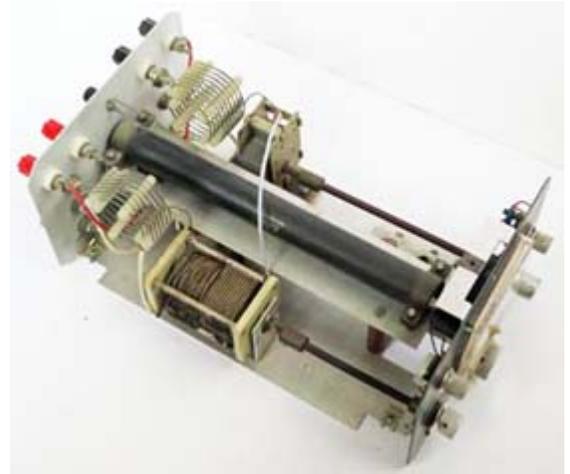
The large front panel meter of the KW107 could be switched to indicate forward and reflected voltage and was calibrated to show SWR when the forward reading was adjusted to full scale. Two additional switch positions metered forward power of 0-100 or 0-1000 watts.

The antenna tuner part of the circuitry was similar to the RSGB Handbook Z-Match Coupler, with balanced outputs for 40-80 meters and 10-15-20 meters. There was a large ceramic switch to carry out antenna switching — and the printed manual gave suggestions for wiring this switch to suit different antenna combinations. I grounded one side of the balanced outputs so that my two coaxial-fed antennas could be connected, with the rotary switch selecting either antenna direct or tuned. The internal dummy load could also be selected for tune-up purposes. The large, internal 52 ohm resistor could dissipate 100 watts for 6 minutes.

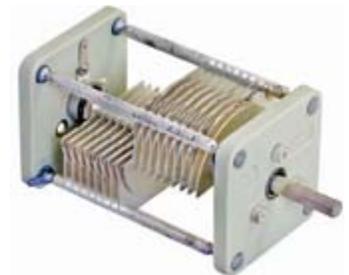
There was lots to like about the KW107. The coils were kept well away from surrounding metal. The two variable capacitors had slow-motion drives with shiny

metal knobs and red dial pointers to allow precise adjustment. The shafts were extended to the front panel using insulated rods. One capacitor had its frame insulated from chassis, the other was a wide-spaced split-stator type to maintain balance. The split-stator capacitor with common rotor shaft means that circulating RF currents are not forced to pass through a sliding contact or through the moving ball bearings that support the rotating mechanism.

That KW107 tuner is still working well, fifty years after I acquired it in England.



View inside the KW 107 shows the two coupling coils top left, the air-spaced variable capacitors operated from the front panel and the 52Ω carbon resistor dummy load.



A split-stator capacitor.

A mighty fine tuner?

Several decades later, I acquired an MFJ-948 “Deluxe Versa Tuner II” at the Candlewood ARA Hamfest in Newtown, CT. This was another second-hand unit, but it had a few **disappointments** in store. On the surface it looked fine, with a large cross-needle meter on the front panel, capable of displaying forward and reflected power, while indicating SWR where both needles crossed. A six-position rotary switch allowed selection of two different coax-fed antennas (with or without tuner), long wire or external dummy load. A 4:1 balun was built-in for balanced feeders. The accompa-



MFJ-948 antenna tuner acquired at a CARA Hamfest,

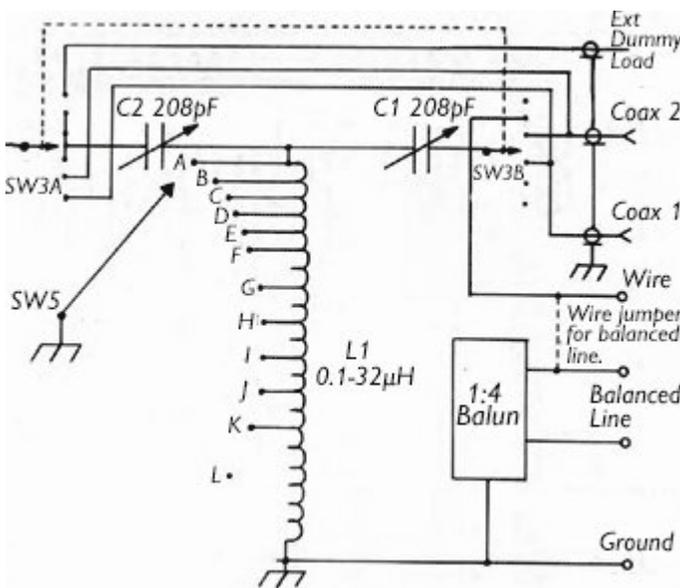
nying manual suggested a mid-1990s manufacturing date.

The first problem appeared when I tested the unit on the workbench. The cross-needle power meter was indicating some odd readings on transmit, including “negative” reflected power (with the right-hand meter needle deflecting *below* zero). I found instructions on-line for re-calibrating the meter, but accurate calibration on one power range would cause erroneous readings on the other range. I suspect that one of the germanium diodes might have been damaged.



Internal view of the MFJ-948 tuner. Tapped inductor is at top right with air-spaced variable capacitors alongside.

The internal tuner consists of a “T” network with two variable capacitors and a single tapped inductor. The tap position is selected using a 12-position rotary switch labeled A, B, C... to L. These positions seemed to be reversed compared with those described in the manual. I had my doubts about the large inductor, which is very close to the top and bottom of the alu-



Schematic of the T-network matching section and antenna switch of the MFJ-948 tuner. Circuitry is similar for the MFJ-949 and other MFJ tuners with a T-network.

minum case. Good RF practice suggests that air-spaced inductors should be kept at least one coil diameter away from nearby metal surfaces.

In a “T” network, both variable capacitors are isolated from ground. Each rotor shaft should be extended with an insulated rod through the front panel to maintain isolation. MFJ adopted a different approach, with the capacitors’ metal rotor shafts emerging through the front panel via insulating bushes. The 3/8" mounting hardware, control knob metal center and Allen screw are all *live* to RF — and only a fraction of an inch from your wandering fingertips during tune-up. Suggestion — make your tuning adjustments at low power as recommended in the manual, and be careful of higher power! See: <https://owenduffy.net/blog/?p=17503>. There are even reports of



‘Antenna Matching’ control of MFJ-948. The arrowed 3/8" mounting hardware and Allen hex screw are all ‘hot’ to RF.

“hand effect” changing the dial settings during tune-up and arcing from rotor shaft through insulating washers to the adjacent front panel. Another problem with the variable capacitors — there is no reduction drive to assist in fine tuning.

The built-in 4:1 voltage balun is a *tiny* component connected to 4 mm binding posts on the rear panel for open wire feeders. I would be wary of running the tuner’s rated 300 watts through this balun unless you are quite sure it is connected to a balanced feeder with low SWR. Tuned feeders with high SWR could lead to rapid overheating and damage to the ferrite core. See: <https://owenduffy.net/blog/?p=728>. If balanced output is needed, I would suggest a larger, external balun.



MFJ-948 4:1 balun for use with balanced lines.

The last problem I came across was a **deal breaker**. From time to time I was able to hear signals on the HF bands even when the tuner was connected to a shielded dummy load. “Wiggling” the coaxial cables indicated the problem was associated with the SO-239 connectors on the rear panel of the MFJ-948.

Instead of using nuts and bolts, each SO-239 connector was held in place on the rear panel with two POP® rivets. Some of the rivets had worked loose — so the connection to chassis ground was intermittent. I carried out a temporary repair by squeezing the rivets



SO-239 riveted to the painted rear panel of the MFJ-948 tuner.

with pliers. This worked for a while but eventually the fault returned. Online advice was to drill-out the rivets and replace them with nuts and bolts. But the painted chassis is a lightweight affair and there was always the chance of dropping metal filings into the air-spaced capacitors — so I postponed an immediate repair. Luckily there was an intervening hamfest.

A more refined tuner?

At the Orange County ARC Hamfest on May 1, where PCARA had a club table, I came across a better tuner. The unit was on sale at a nearby table and the price was right.

The item I brought home was an **MFJ-949E** “Deluxe Versa Tuner II”. On the surface, this is similar to the MFJ-948 except that a 50 ohm dummy load is built-in instead of requiring an external connection. There were several clues indicating the design was more up-to-date than my MFJ-948, including that version letter “E”.



MFJ-949E Versatuner II with built-in dummy load.

The outside appearance was different... instead of MFJ's early color scheme of cream gloss paint with black lettering, the front panel was finished in dark grey crinkle to match the color of the metal cover. Two extra sheet-metal screws secured the top of the cover to the front panel. Lettering was silk-screened onto the front panel in white/orange.

On the rear panel there were three SO-239 sockets, now secured to **unpainted** metal with nuts, bolts and star washers. This was much better than POP rivets! I made

with pliers. This worked for a while but eventually the fault returned. Online advice was to drill-out the rivets and replace them with nuts and bolts. But the painted chassis is a lightweight affair and there was always the chance of dropping metal filings into the air-spaced capacitors — so I postponed an immediate repair. Luckily there was an intervening hamfest.

with pliers. This worked for a while but eventually the fault returned. Online advice was to drill-out the rivets and replace them with nuts and bolts. But the painted chassis is a lightweight affair and there was always the chance of dropping metal filings into the air-spaced capacitors — so I postponed an immediate repair. Luckily there was an intervening hamfest.

A more refined tuner?

At the Orange County ARC Hamfest on May 1, where PCARA had a club table, I came across a better tuner. The unit was on sale at a nearby table and the price was right.

The item I brought home was an **MFJ-949E** “Deluxe Versa Tuner II”. On the surface, this is similar to the MFJ-948 except that a 50 ohm dummy load is built-in instead of requiring an external connection. There were several clues indicating the design was more up-to-date than my MFJ-948, including that version letter “E”.



SO-239 connector fastened to bare metal panel with nuts, bolts and star lock washers.

The outside appearance was different... instead of MFJ's early color scheme of cream gloss paint with black lettering, the front panel was finished in dark grey crinkle to match the color of the metal cover. Two extra sheet-metal screws secured the top of the cover to the front panel. Lettering was silk-screened onto the front panel in white/orange.

On the rear panel there were three SO-239 sockets, now secured to **unpainted** metal with nuts, bolts and star washers. This was much better than POP rivets! I made



View inside the MFJ-949E Versatuner. Dummy load resistor is visible at left. Tapped inductor and variable capacitors of the T-network are on the right.

sure that all fasteners were tightened to avoid any chance of a loose connection to chassis ground.

I also carried out a test of the forward/reflected power/SWR meter which was showing more accurate results than the MFJ-948 meter with its strange negative readings.

The built-in 50 ohm dummy load resistor is not as large as the one in my KW107 tuner. Continuous power rating is only 25 watts, so exposure to higher power should be limited, with time to cool down between transmissions. Even so, it is much more convenient to have the dummy load built in to the cabinet.

Design of the “T” matching network is identical to the MFJ-948, with the same air-wound tapped inductance mounted close to the metal cabinet. Tuner losses can be quite high at certain settings — VK1OD suggests the efficiency can go as low as 35%, with 65% of RF power dissipated inside the tuner. (<https://owenduffy.net/blog/?p=7035>). General advice is to tune the capacitors for minimum SWR with the smallest amount of inductance in circuit that will still allow a match. The variable capacitor shafts that emerge through the front panel are still ‘live’ to RF as in the MFJ-948.

The MFJ-949E is now wired in line with my Yaesu FT-991A transceiver. Most of the time it is in “bypass”, selecting one of two available antennas — but it stands ready to be put to use whenever SWR exceeds 3:1.

- NM9J

Peekskill / Cortlandt Amateur Radio Association

Mail: PCARA, PO Box 146, Crompond, NY 10517

E-Mail: mail 'at' pcara.org

Web site: <http://www.pcara.org>

PCARA on Facebook: <https://www.facebook.com/pcararadio>

PCARA Update Editor: Malcolm Pritchard, NM9J

E-mail: NM9J 'at' arrl.net

Newsletter contributions are always very welcome!

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

PCARA Information

PCARA is a **Non-Profit Community Service**

Organization. PCARA meetings take place every month (apart from July/August break). See <http://www.pcara.org> for current details.

PCARA Repeaters

W2NYW: 146.67 MHz -0.6, PL 156.7Hz

KB2CQE: 449.925MHz -5.0, PL 179.9Hz

N2CBH: 448.725MHz -5.0, PL 107.2Hz

PCARA Calendar

Masks and Social Distancing may be required.

Sat June 11: PCARA Breakfast, 9:00 a.m., Downing Park Pavilion, 2881 Crompond Road (Rt 202), Yorktown Heights.

Wed Jun 22: Field Day reconnaissance meeting, 7:00 p.m., PCARA Field Day site, George Washington Elem. School.

Sat/Sun June 25 - 26: ARRL Field Day, Grounds of George Washington Elementary School, 3634 Lexington Ave, Mohegan Lake, NY. (Map: page 2.)

Sun June 26: PCARA V.E. Test Session, 10:00 a.m., Field Day site. See below.

Hamfests

Check with organizers before leaving.

Sat June 4: Fairlawn ARC Hamfest, Memorial Pool South Parking lot, Essex St & Bellair Ave, Fair Lawn, NJ. 8:00 a.m.

Sun June 5: LIMARC Hamfest, 1055 Stewart Ave, Bethpage, NY. 9:00 a.m.

Sat Jun 18: WRAET Hamfest, United Methodist Church, 99 Parish Drive, Wayne, NJ. 8:00 a.m.

VE Test Sessions

Check with the contact before leaving.

Jun 9: WECA, Westch Cnty Fire Trg Center, 4 Dana Rd Rm 3, Valhalla NY. 7:00 p.m. Must contact: R. Casino, (914) 755-7908.

Jun 4, 11, 18, 25: NYC-Westchester ARC, 43 Hart Ave, Yonkers NY. 12:00 noon. Must contact VE: Lester Tirado k2ltm'at'aol.com

Jun 17: Orange County ARC, Munger Cottage, 183 Main St, Cornwall NY. 6:00 p.m. Must contact w2bcc'at'arrl.net (845) 534-3146

Jun 26: PCARA Field Day Site, George Washington Elementary School, 3634 Lexington Ave, Mohegan Lake, NY. 10:00 a.m. Must contact Michael W2IG w2igg'at'yahoo.com, (914) 488-9196.



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