



# PCARA Update



Volume 19, Issue 10 Peekskill/Cortlandt Amateur Radio Association Inc. October 2018

## Top dog

The September 2018 membership meeting was very well attended with a total of 19 attendees! We had a visit from Mike Lisenco N2YBB, the ARRL Hudson Division Director who discussed issues facing the League and his candidacy for the upcoming election. Mike took questions from members and it was a very productive session. We would like to **thank** Mike for taking time to visit us and answer questions.



Mike N2YBB

On Saturday September 15, 2018 PCARA held a **V.E. Test Session** at the John C. Hart Memorial Library in Shrub Oak, NY. Multiple VEs turned out as well at three candidates. We ended up with two new Technicians and one upgrade to General Class. Congratulations! We would like to thank everyone who came out in support, and especially Charles, Lou, and Fred for finding such a nice location. Look for the next session in November.



Ria N2RJ

Saturday September 22, 2018 was a busy day for PCARA. The day started with the **PCARA Breakfast** at Turco's in Yorktown Heights, NY at 9:00 am. A special guest was in attendance — Ria Jairam, N2RJ, candidate for ARRL Hudson Division Director. Ria stopped by to have breakfast and discuss issues for the upcoming ARRL election in October. We had an excellent

turnout of approximately thirteen members with much discussion. **Thanks** to Ria for visiting with us and taking our questions.

At 2:30 that afternoon, registration began for the **PCARA Fall Foxhunt**. Participants gathered at the Beach Shopping Center in Peekskill, NY and awaited the first transmission from Mike N2EAB a.k.a. *the Fox*. Mike did an excellent job of outfoxing the hounds and literally went to the dogs. He secreted himself in the Peekskill Dog Park at 1795 Main Street. Mike once again remained hidden and undetected. I think he cleverly disguised himself among the dogs since both dogs

and foxes are members of the biological family *Canidae*. More details can be found in this month's edition of the *PCARA Update*. Great work Mike!



The fox was in the doghouse on Sept 22.

PCARA will be participating in the **New York**

**QSO Party** on Saturday October 20, 2018 from Joe WA2MCR's home QTH, using the club call W2NYW. Please contact Joe if you are interested in participating. We are also sponsoring plaques in two categories this year as we have in years past.

PCARA will be helping provide communications support for the 38<sup>th</sup> **Harry Chapin Memorial Run Against Hunger** on Sunday October 21, 2018 at Croton-Harmon High School in Croton-on-Hudson, NY. We will be joined by our friends from WECA. If you are interested in helping out, please let us know at mail 'at' pcara.org. For more information on the Harry Chapin Memorial Run Against Hunger please visit: <http://www.runagainsthunger.com/>.

Our next regularly scheduled meeting is on Sunday October 7, 2018 at 3:00 p.m. at NewYork-Presbyterian/Hudson Valley Hospital in Cortlandt Manor, NY. We will be getting ready for elections and taking nominations. As always, I look forward to seeing each of you there.

- 73 de Greg, KB2CQE

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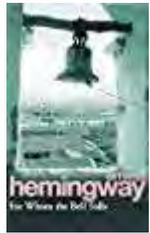
# Adventures in DXing

- N2KZ

## Old

Old is a relative term. I was at Yankee Stadium with friends and one of my pals remarks to another fan: 'You're 18? I was 18 when you were born! I'm already 37! Boy! Do I feel old!' Not as old as I, methinks. I turn 65 in a couple of months. I am all ready to receive my first Medicare card. Retirement planning is my new hobby. Am I old? Nah!

Consider my best ham radio buddies out in Michigan. We had our annual get together at The Peppermill in Bad Axe a couple of weeks ago. There were six of us in attendance and our combined age was 449! I am 28 years younger (and by far the youngest) than the oldest member there. How could I be considered 'old'?



Don't get too bold, Karl. Stay humble! I have to keep things in perspective. I am getting a lot of Medicare supplemental insurance junk mail in my mail box. I look forward to my weekly recruitment letter from the AARP. The bell is tolling. I continue to ignore it!

I had my annual physical recently, too. While waiting for my exam, I read an article taped to the wall. It stated that, at age 50, men can expect to live another 25.5 years. Do the math and you'll easily see the sum of 50 and 25.5 is 75½. I asked my doctor if she thought I had only 10 and a half years to go. After looking me over, she patted me on the knee and said 'Don't worry. You'll live to be 90!'

There are many other ways to try to establish what exactly is 'old.' I was one of many volunteer examiners at the PCARA VE test session on September 15<sup>th</sup>. In attendance were two legendary hams from my amateur radio history. I felt like a kid at a ballpark on old timer's day. "Hey! That's Stan Rothman! WA2NRV! That's Paul Maytan! AC2T! In person!" Both Stan and Paul signed my CSCEs when I was testing for my ham licenses 20 years ago. To me, they are the legacy major leaguers who are still with us. I won't tell you how old



L to R: VEs Karl N2KZ, Stan WA2NRV and Paul AC2T.

they are! To this humble ham, they are legends! How wonderful to see them both!

Your possessions can indicate your age. I'm very proud to report that I still maintain a fully stocked tube caddy complete with spare tubes for 'All-American Five' radios, orange drop capacitors, #47 indicator lamps and replacement dial string. I don't know how much help I might be if you need help with your SDR, but I certainly would be your best friend if you had a rectifier tube that was gassy and glowing blue.



Karl's fully-stocked vacuum tube caddy

A wonderful moment came when I completed the restoration of a friend's old Hallicrafters S-38C general coverage receiver circa 1954. I meticulously cleaned



Hallicrafters S-38C communications receiver covers 540 kHz - 32 MHz.

the chassis that was covered with nicotine goo left over from his Dad's smoking habit. It first looked like the rig had been dipped in Glyptal, like it was a piece of

military surplus gear. This alone was a great accomplishment.

I replaced the main multi-section filter capacitor with individual single units and replaced the paper capacitors with Sprague orange drops. One tube was soft under test, so I replaced that as well. Yes, I replaced the indicator lamp too to make it nice and bright. What a delight when this old radio came back to life and worked so well after a couple of minor tweaks. Yea! See? 'Old' can become new again!



Sprague Orange Drop® capacitors with Mylar dielectric and epoxy coat.

If I needed to earn my master's degree in 'oldness,' I

could certainly offer this tidbit of experience and knowledge for my thesis: A couple of times I have seen very typical and simple radios have devastating and debilitating problems with intermittent noise and poor output. You test or change all the tubes, check the filter caps for shorts, look at each and every solder connection for cold joints and even examine the plates of the variable tuning capacitor. The noise persists! Frustrating! The finest radio technician detectives have missed the cause: oxidized silver mica capacitors built into the base of I.F. adjustment coils or 'cans.'

This is a malady that only a seasoned *old* fossil repairman would recognize (like myself.) To create a complete L-C circuit within the shielded I.F. transformer can, some radio manufacturers would build in a layer or two of silver-foil plated mica, creating a picocap at the base of the coil. When the silver tarnishes and turns black, sometimes the sulfide will reach over the mica insulator and make a poor connection with another area of conductor, creating a high resistance short. The conductivity can change with humidity or even the time of day. The result is an awful racket of noise and screeching.

There is a cure! Try to clean away enough of the black silver sulfide with a Q-Tip® dipped in alcohol. When you are done, use a capacitor checker/meter and try to measure the value of the silver mica capacitor. A very typical value is 100 picofarads. Carefully clip out



*Silvered mica capacitor from I.F. transformer. Black areas are tarnished silver.*

and remove the original silver mica foil and wafer. Replace the foil/mica cap with a fixed miniature picocap (usually dipped in a dark brown color cover) and — if you are lucky — you will have a repaired (and



*Silver mica pF capacitors.*

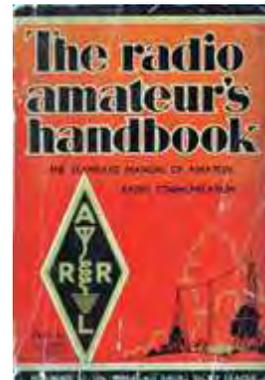
quiet) I.F. can that will last several lifetimes. I have pulled off this trick a few times and I have had great success. Sometimes a solid permanent fix makes a unit more stable than new. Instant gratification is a wonderful thing. Sometimes it is good to be 'old.'

### Old stories

Of course, 'old' folks are good sources for stories. For example: I actually had a job creating master duplication tapes used in the manufacture of audio cassettes and 8-track tapes! Similarly, I recall working with old-timers at ABC-TV who could recall the day when the first TV cameras were rolled in. The cameras came with

simple instructions: "See if you can figure out how to use them, boys!" I also remember seeing John F. Kennedy pass through my childhood neighborhood in a motorcade when he was running for president. The stories could go on and on forever!

I enjoy reading about those who came before me. I found a 1936 copy of the ARRL Handbook. It includes an account of the discovery of the wavelengths we take for granted today. In the early days of radio, 200 meters (1500 kilohertz) was the highest frequency where radio signals could possibly go. All attempts at going 'lower' (in wavelength) were considered useless. Most all amateur experimentation occurred at about 200 meters.



Some brave and adventurous experimenters ventured down to 130 or even 90 meters in late 1922 and early 1923. These tests bore fruit. By late 1923, two New England hams using 110 meters achieved consistent direct communication with France literally opening a new world of radio. Commercial stations flocked to this region in response making the area around 3 megahertz a hotbed for information exchange.

In 1924, amateur radio was granted allocations for 80, 40, 20, 10 and 5 meters. 40 meters proved to be a fantastic short-range performer during the day with long-range possibility at night. Pioneer hams found operating on 20 meters was a miraculous breakthrough providing reliable daytime DX with worldwide results. Can you imagine? On 20 meters, you can DX in the daytime! What are our breakthroughs for the year 2018? Let's write it down for posterity!

Feeling old can also lead to becoming anxious. How many questions can you dream up that could be prefaced with the saying 'What will happen when..?' One can only wonder. Will I run out of time? Will I leave a legacy? What can I still remember about the past? What do I want survivors to remember about *me*?

One kind way to leave your survivors is to identify all of your gear. Keep a print inventory with pictures and descriptions of your treasures - and/or - tag each unit with model number and a short description. Have pity on your wife and family. Politely, give them a clue as to what inhabits your shack!

Most of all, enjoy your seniority! It took you a long time to collect all those stories and memories. Share them on paper. Share them on the air. Most of all...share them in person!

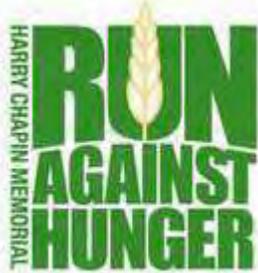
73 de N2KZ... 'The Old Goat'



# Run Against Hunger 2018

## Fifth year running

Following combined efforts of the past four years, organizers of the Harry Chapin Memorial Run Against Hunger have once again invited PCARA and WECA to provide communication support for their 2018 event, which takes place on Sunday October 21.



The first Run Against Hunger was organized in Croton-on-Hudson to honor singer-songwriter Harry Chapin who died in a Long Island auto-accident in 1981. This year's run will be the 38th annual event.

## Sunday schedule shifted

Timing of the three race events this year will be different from 2017. Based on feedback from participants, start time of the 5K Race/Walk has been shifted forward from 9:30 to **9:00 a.m.**; this is followed by the 10K Race which moves forward two hours from a 12 noon start time to **10:00 a.m.** The final event is the 1 mile Fun Run which now begins at **11:30 a.m.** instead of 11:00 a.m. With the exception of the starting point of the 'Fun Run', start and finish lines are all close to Croton-Harmon High School.

## 5K Race & Walk, 9:00 a.m. – 10:00 a.m.

The 5K Run/Walk begins near the High School and continues along Old Post Road South, down Truesdale Drive, east on Cedar Lane, then north up Nordica Drive and Truesdale Drive, through Croton Gorge and returning down Cleveland Drive to the High School.

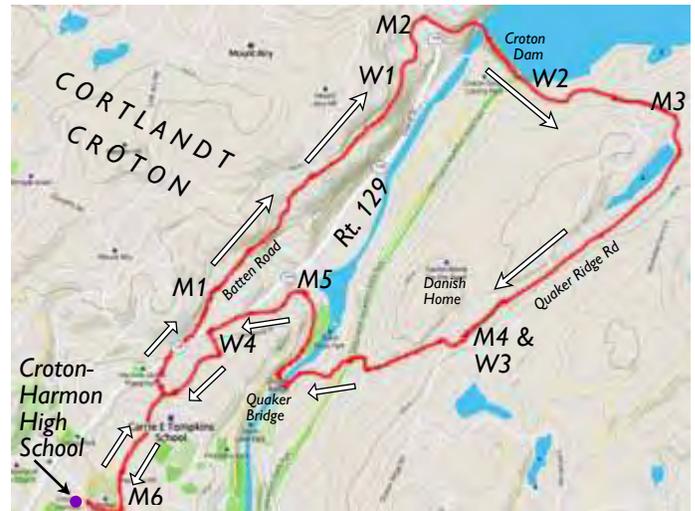
## 10K Race, 10:00 a.m. – 11:30 a.m.

Starting from near Croton-Harmon High School on Old Post Road South, north on Cleveland Drive, left on Gerstein Street and right on Wood Road onto Rt 129. Left onto Batten Road, then across the New Croton Dam. Return is along Quaker Ridge Road, crossing the



During the 2017 10K race, Boy Scout Troop 28 assisted runners at the Danish Home entrance on Quaker Ridge Rd.

river at Quaker Bridge Road, then Rt.129 to Jacoby Street and returning down Cleveland Avenue to Old Post Road South and the High School.



Course of the 10K Run Against Hunger. M1-M6 are mile points, W1-W4 are the Water Stops.

## One Mile Fun Run, 11:30 a.m. – 12:15 p.m.

The start point is on Cleveland Drive, just south of Veteran's Corners. North on Cleveland Drive to CET (Carrie E Tompkins) Elementary School on Gerstein Street, then back along Cleveland Drive, finishing at the High School.

Full details of the three race routes are available at the Run Against Hunger web site, <http://www.runagainsthunger.com/course/>

## Radio support

At the time of writing there had not yet been a meeting between WECA, PCARA and the Run organizers to discuss radio communication requirements. Please watch for announcements about possible changes to the routes and stations listed here. We have been informed that setup at the High School will be earlier than last year to accommodate the modified start times — so Net Control should arrive between 7:30 and 7:45 a.m. for setup at the usual location on the driveway.

In addition to Net Control and Organizer's Shadow the following stations will be required for each race.

## 5K Run / Walk, 9:00 a.m.

Station	Location
Stop #1, Start of Croton Gorge Trail	Truedale Drive, Silver Lake parking lot
Stop #2, End of Croton Gorge Trail	Trail end at Cleveland Drive
S3 Intersection	Cleveland Drive and Gerstein Street

### 10K Run Against Hunger, 10:00 a.m.

Station	Location
Net control	Croton-Harmon High School
Shadow	Croton-Harmon High School
Trail car	Following last runner
Water Stop #1	140 Batten Rd
Water Stop #2	East end of Croton Dam
Mile Point 3	Croton Dam Rd & Quaker Ridge Rd
Water Stop #3 / Mile 4	Danish Home
Mile Point 5	Quaker Bridge Rd & Niles Rd
Water Stop #4	Jacoby Street
Mile Point 6	Cleveland Dr & Alexander Lane

### One Mile Fun Run, 11:30 a.m.

Station	Location
Turn-around point	CET Elementary School, Gerstein Street.

### Come to the Run

If you would like to volunteer, please inform Greg KB2CQE using: [mail@pcara.org](mailto:mail@pcara.org) or sign up at the October meeting. There will be more information provided closer to the event.

### Get ready to run

If you have been assigned a position on the course, please drive straight to that location *before* the event begins. Croton-on-Hudson Police Department will close some streets ahead of each race, making it difficult to drive around the course immediately before the event.

If you do not have an assigned position, be aware that parking at Croton-Harmon High School is limited, and soon fills up. It may be better to check with Net Control via radio to find your location.

For maximum flexibility bring along a mobile radio with external antenna — if you have one — as well as your handi-talkie with spare batteries. Program your radio(s) with likely frequencies: 146.565 MHz simplex, 146.67 MHz -0.600 MHz offset, PL 156.7 Hz plus WECA frequency 147.060 MHz +0.600 MHz, PL 114.8 Hz. Be prepared to enter additional VHF or UHF frequencies if requested.

Bring suitable clothing and provisions to keep yourself safe and comfortable from roughly 9:00 a.m. to 12:00 noon. If you will be operating on a street near other vehicles and runners, wear a high visibility vest or jacket.

## New York QSO Party 2018

The New York QSO Party, sponsored by the Rochester DX Association, takes place on the third Saturday in October. For 2018, that date falls on **Saturday October 20**. The contest lasts 12 hours using all modes on HF and VHF/UHF bands.

Last year, PCARA's club entry, organized by Joe, WA2MCR claimed a total of 432 QSOs, for a score of 53,244 points. The actual results published in February 2018 gave W2NYW a total of **403 QSOs** and **48,590** points. This placed us second in the "Multi-One Low Mixed" category. The Lancaster Amateur Radio Club, W2SO completed 829 QSOs for 126,700 points and was awarded the winning plaque for this category — one of two plaques sponsored by PCARA. "Multi-One Low Mixed" means: multiple operators with only a single transmitted signal, 5 – 100 watts, mixed mode (CW/Phone/Digital).

The second award sponsored by PCARA in 2017 was the "Non-New York SSB Low Power" plaque, awarded to Stephen KE3ZT from Bedford, PA who made 78 QSOs and 3,120 points. The same two plaques will be sponsored by PCARA for 2018.



Charles N2SO (left) and Joe WA2MCR operate club entry W2NYW in the 2017 New York QSO Party.

If you are interested in operating in the New York QSO Party this year, you can take part from your own station, or contact Joe, WA2MCR for details of the club entry using W2NYW. The contest starts at 10:00 a.m. Eastern (1400 GMT) on Saturday October 20 and runs for 12 hours until 10:00 p.m. that same evening. New York stations send signal report plus county, using a three-letter abbreviation for county name. Westchester is **WES** and Putnam County is **PUT**. Stations outside New York will send their Signal Report plus State, Province or "DX".

Full contest rules, including the list of three-letter county codes, are available from the New York QSO Party web site at: <http://nyqp.org/wordpress/>

# V.E. Test Session

PCARA's first Volunteer Examiner (V.E.) Test Session since 2003 took place on Saturday September 15, 2018. Thanks to Charles N2SO, Lou KD2ITZ and Fred KD2GJJ, our new venue was at the John C. Hart Memorial Library, Shrub Oak.

PCARA's VE Team Liaison **Mike W2IGG** had invited Volunteer Examiners from the surrounding area to take part. A good number of ARRL VEs arrived at the library as follows: Mike W2IGG; Stan WA2NRV; Larry AC2QH; Paul AC2T; Pietro KB2GEN; Lou KD2ITZ; Tom KD2JUH and Malcolm NM9J. Verle W2VJ and Greg KB2CQE were also present.



*A distinguished team of Volunteer Examiners came together at the John C. Hart Library in Shrub Oak. [Pic by KB2CQE]*

Three candidates arrived to take tests, administered in the Childrens' Reading Room on the ground floor of the library. The room was highly suitable for testing as it was cool, quiet, equipped with tables and had a fine view across the front lawn. Our thanks to the John C. Hart library staff who made us feel welcome.

All three candidates were successful — with Michael KD2PYS upgrading to General, Amol gaining Tech call KD2QLW and Jan LA1ZN receiving Tech call KD2QMA. Club information was handed out to the can-



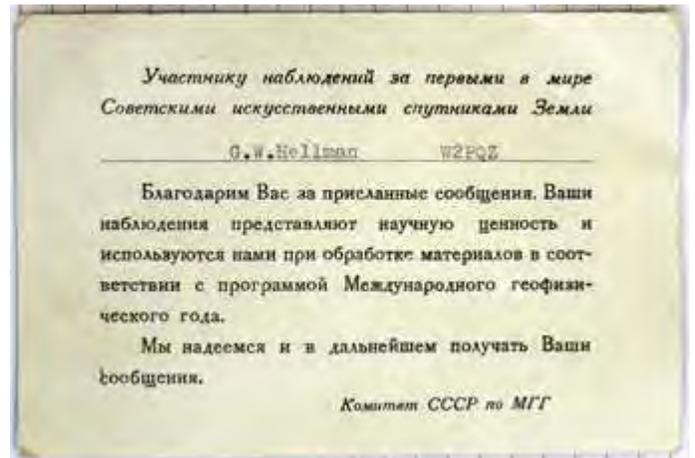
*V.E. test session in the Reading Room, with candidates under the supervision of Mike W2IGG and Lou KD2ITZ (foreground) plus other VEs seated around the room.*

didates as well as to a visitor who noticed the VE signs.

PCARA's next VE Test Session is provisionally planned for Saturday November 17.

## 61 years since Sputnik

At the September meeting, Bill Hellman NA2M brought along an unusual QSL card. Bill had heard signals from the first artificial Earth satellite — Sputnik, launched from the Soviet Union on October 4, 1957. The satellite was transmitting a simple “beep” “beep” CW signal on a frequency of 20.005 MHz, 5 kHz above standard frequency stations such as WWV. Bill sent a reception report to the USSR and received the QSL card shown here.



The Russian wording on the card reads:

*“To participant in observations of the first in the world Soviet artificial earth satellite*

*G.W.Hellman W2PQZ*

*Thank you for your report. Your observations are of scientific value and have been used by us in the analysis in accordance with the program of the International Geophysical Year. We hope to continue receiving your reports.*

*IGY Committee of the USSR.”*

Sputnik carried two antennas, consisting of pairs of whips 7.9 and 9.5 feet long. They were used for the one watt vacuum tube transmitters, operating on 20.005 MHz and 40.002 MHz. Temperature and pressure conditions within the satellite were encoded in the length of the beeps.

# Antenna analyzer kit

## Introducing the FA-VA5

For the past 22 years I've been using an original MFJ-259 antenna analyzer for checking the SWR of HF and VHF antennas. This was a great test instrument, combining VFO-controlled signal source, frequency counter and SWR/impedance meters into one case — but it had some limitations. Frequency coverage was only 1.8 – 170 MHz, the digital display only showed frequency (no complex impedance values) while portable use required two hands and *eight* AA cells.



MFJ-259

**Vector Antenna Analyzer**  
DG5MK has made some improvements to expand the frequency range and he added a USB-port for data processing and advanced measurements

**New model**

**FA-VA5**

- 10 kHz to 600 MHz • USB port
- Easiest to build
- All SMDs presoldered
- Kit with enclosure and english Assembly and Operating manual
- DG8SAQ software free downloadable

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All prices incl. shipping. Payable with paypal.

**www.box73.com**

network analyzer suitable for measuring antennas and components — though *not* suitable for testing two-port devices such as RF filters. The U.S. price was very reasonable so I checked the German web site — unfortunately the kit was out of stock. The web site then went out of action for several weeks, probably because of the European Union's General Data Protection Regulation (GDPR), whose rules had just come into effect.

Flash forward to early August and the 73.com web site was back in service, with stocks of the **FA-VA5** available once again. I placed an order and waited for delivery. The package took one day to cross the Atlantic, from Frankfurt to JFK, then after exiting Customs it took another *ten* days to reach Cortlandt Manor.

## Small box

The kit arrived in a surprisingly small cardboard box, just 10"×7"×2". Packed within was a circuit board on which all the



A few months ago, I noticed a small ad in the May 2018 *QST* for a new "Vector Antenna Analyzer" from *FunkAmateur* magazine's web store: [www.box73.com/](http://www.box73.com/). This type of instrument is a **single port**

surface mount devices were already mounted, a USB adapter board, the LCD display with backlight and a smart aluminum case containing all the other components. There was a full-color printed "Assembly and Operating Manual" included. I had ordered a "BNC Male Calibration Kit" supplied by SDR-Kits (<https://www.sdr-kits.net/>) which was in a separate bag along with its calibration data sheet.



FA-VA5 Analyzer Kit includes a circuit board with SMD parts, display panel, aluminum case and other components.

## Assembly time

I set aside a free afternoon for assembly of the kit. Some of the soldering operations were quite difficult, requiring a fine-tipped soldering iron for the close-spaced items and a 100 watt soldering iron for installation of the slide switch body and BNC socket ground lugs. The USB adapter had to be insulated from the board with a mica washer, then carefully soldered. The LCD display had to be positioned precisely above the board and cardboard spacers were included for this task. Somehow, I managed to forget three push-button switches until I noticed an empty area of board below the display — so I added these switches at the end of all the other soldering.



Installation of USB adapter module requires mica washer as insulator.

The Assembly Manual recommends a functional test before the circuit board is installed in its metal case. I loaded two AA cells into the battery holder and switched on... nothing! I re-inspected all connections then pushed the display *very firmly* into its sockets. This did the trick and switching on gave an illuminated display with a start-up message. Unfortunately, two of



Functional test before final assembly shows instrument working.

the push-button switches were not functioning and needed to be re-soldered. An illuminated magnifier was essential at this stage for examining the soldered joints.

I completed the assembly procedure by installing rubber feet on the metal case, sliding the circuit board with BNC connector into the case then tightening the mounting bolts. Finally, I installed the front cover. Total assembly time including trouble-shooting was about three hours.

### Initial impressions

The completed FA-VA5 analyzer is much smaller than MFJ's 259 series, measuring only 5"×3¼"×1" and fitting nicely into one hand. The unit will operate for a long time on two AA batteries — or from external power when the USB port is connected to a computer. The only controls are the on/off slide switch on the top and three push-buttons below the LCD. A minimalist design for such a capable instrument!

The interface takes a little while to get used to, but soon becomes familiar. The dot matrix liquid crystal display measuring 2½"×1½" shows menu choices as well as graphical results. The three push-button switches are mounted just below the display. Within menus, the center and right buttons move the selection bar "Down" or "Up" then the left hand button acts to "Select" the desired item. When adjusting a numeric value, the left hand button sets the digits position while the center and right buttons act as "-" (decrement) and "+" (increment). The current function of each button is displayed on the screen directly above.

### Wait to calibrate

After construction, the instrument is ready to make crude measurements at HF so I tried connecting 47 ohm and 100 ohm ±10% carbon resistors. Results were as expected, with SWR values of 1.12 to 1 and



FA-VA5 antenna analyzer has a minimalist design.

2.27 to 1 respectively. The analyzer displays complex impedance in the format:  $Z 44.7 + j1.4$  so you can see whether the reactive component is inductive or capacitive ( $X_L$  positive,  $X_C$  negative).

For precise measurements up to 600 MHz, the vector analyzer needs to be calibrated using accurate RF loads in a procedure known as 'SOL' for Short / Open / Load calibration. I had ordered the SDR-Kits 3-piece BNC Calibration Kit which consists of three male BNC plugs. The "short" plug has a short between inner and outer conductors, the 'open' connector has no center pin at all, while the "load" has a precision 50 Ω resistor within and is labeled with a serial number that ties it to a sheet of calibration data, also available online. The sheet provides precise resistance in ohms (50.13 Ω), parasitic capacitance in femtofarads, parasitic inductance in nanohenries plus delay in picoseconds.



SDR-Kits' Short / Open / Load male BNC calibration kit with measured data sheet.

I followed the instructions to enter these parameters into memory of the FA-VA5, then commenced Master Calibration with the Short connected to the BNC socket on top of the instrument. This was followed by the Open element, then the Load element. The analyzer takes about nine minutes to measure each element's electrical parameters over the full frequency range up to 600 MHz.

Once the Master Calibration is completed, the FA-VA5 holds the correction data in memory so that future impedance measurements made at the BNC connector are automatically compensated — for optimum accuracy at all frequencies.

However, if the "device under test" is connected to the analyzer via a length of coaxial cable — or even through a BNC-to-*something else* coax adapter — then the "measurement plane" has shifted away from the analyzer and a separate calibration run has to be performed with appropriate SOL elements connected at the measurement location.

I carried out a few multi-frequency mode SWR sweeps of antennas that I was already familiar with, including a multiband sloper for 160/80/40 meters. The low-resolution graphs dis-



Screen plot of SWR for multiband sloper antenna on 7 MHz.

played on the LCD screen showed appropriate dips in the bands of interest.

### Analyzer on-line

One of the major improvements made by designer Michael Knitter DG5MK over his earlier FA-VA4 analyzer was addition of a USB port for data transfer to a PC. This is accomplished using 'VNWA' software by Tom Baier, DG8SAQ, available as a free download: <https://www.sdr-kits.net/DG8SAQ-VNWA-software-documentation-user-guide> .

I followed instructions in the FA-VA5 Operating Manual to connect the Analyzer to my notebook PC using a USB cable with mini-B connector. This type of cable is used with some cameras and cell-phones — I found a low-cost cable at the “Five Below” store. Once the FA-VA5 was connected, Windows installed the appropriate driver and assigned it to COM9.



FA-VA5 Antenna Analyzer with USB A-to-mini-B cable.

Continuing with instructions in the FA-VA5 manual, I installed the DG8SAQ VNWA software on my notebook computer, with no license key or root certificate required. When the software was run for the first time, I used Options → Select Instrument to choose the DG5MK Antenna Analyzer on port COM9.

### Superior software

Operating standalone, the FA-VA5 is a lightweight analyzer that can be used for measuring antenna characteristics out in the field, far from any power source. The results from each frequency scan can be saved in up to 16 available “Datasets” in the FA-VA5’s memory, automatically labeled with date and time.

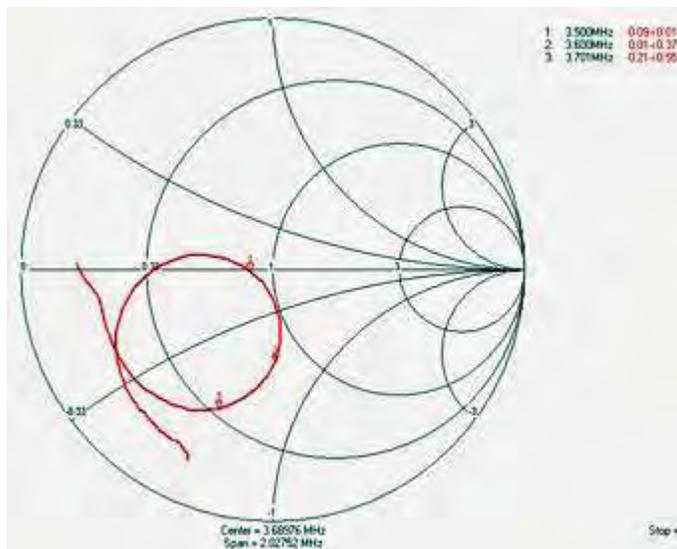
Once the FA-VA5 is connected to the computer, it displays “USB Mode” on the LCD panel and control passes to the computer software. Data saved in the FA-VA5’s memory can then be transferred to the computer using VNWA software and the menu choice: Settings → Sweep, under the “Dataset Import” tab.

Data gathered by the analyzer can then be saved to file or clipboard, for import into VNWA. VNWA can plot data from the vector analyzer in a variety of ways — the most useful plots for radio amateurs are probably VSWR versus frequency, Return Loss (dB) versus frequency and the famous Smith Chart. These plots are more accurate than the crude graphs displayed on the FA-VA5’s small screen. They can be examined on the computer, tagged to show frequencies of interest, printed out in color or saved to a graphic file in .png,



Screen shot of VNWA software as it plots multiband sloper’s VSWR in red (vertical scale 1-10) and Return Loss in blue (vertical scale 0 to -100 dB). Horizontal frequency scale covers 2.8 - 4.6 MHz, centered on 3.6 MHz.

.jpg or .bmp format. The Smith Chart graphs complex impedances using circles to indicate constant normalized resistance and arcs of circles to indicate constant normalized reactance on a two-dimensional plane.



Smith Chart exported from VNWA software as a .jpg file shows behavior of multiband sloper antenna on 3.5 MHz in red. Frequency markers added at 3.5, 3.6, 3.7 MHz. Antenna fed through 40 ft of coax – which affects this plot.

### Full control

With the USB cable connected to the computer, VNWA software can take control of the FA-VA5 analyzer for measurement purposes. Compared with gathering data in the field using the analyzer’s own controls, this can be very convenient — provided the antenna or other device on test can be plugged directly into the analyzer BNC socket. As an alternative, the antenna could be attached through a length of coaxial cable — though a new calibration run would then be advisable.

Under computer control, it is easy to carry out an

SOL calibration using on-screen controls. This is followed by setting start and stop frequencies and the number of data points by typing values into the pop-up windows. As the frequency scan takes place, values from the analyzer are plotted directly on the computer screen and data is immediately available for further analysis within VNWA. The on-screen plots can be zoomed to see detail, tagged to show significant frequencies, then printed or saved to file. If results are not satisfactory, the frequency range and number of data points are easily modified.

### Better than an MFJ?

The FA-VA5 uses modern technology to squeeze an impressive array of features into a small metal case, ideal for antenna investigation in back yard or wilderness. The wide frequency range, different types of measurement and various plots mean that the interface takes some time to get used to. The FA-VA5 is not as easy to use as an MFJ-259 type analyzer — which only had two rotary control knobs to adjust before making an SWR measurement. But the results from the FA-VA5 are more accurate and provide more insight into antenna performance — from the very low to the ultra-high frequencies.



*The FA-VA5 Vector Antenna Analyzer (right) is smaller and more accurate than the MFJ-259 SWR Analyzer.*

Supplying the unit as a kit with surface mount components pre-installed is a good way to keep costs down. If you are prepared to carry out assembly yourself, you will have an excellent instrument which is less expensive than the MFJ-259 series' elderly design.

There are a couple of minor problems — if there is another transmitter operating nearby, RF energy will be picked up by the FA-VA5's antenna and cause confusion in the readings. And if there is an intermittent connection (easily achieved when using cheap BNC adapters) then high SWR readings may appear.

Nevertheless, compared to commercial vector network analyzers currently available, the FA-VA5 offers very good value plus wide frequency range — even if the interface is a little sparse.

- NM9J

## PCARA Gallery

The month of September featured several noteworthy events as well as distinguished visitors.



*ARRL Hudson Division Director Mike Lisenco N2YBB came to the September meeting to discuss ARRL matters and the upcoming election. Mike is seated at the head of the table.*



*During the September 9 meeting, Greg KB2CQE presented David K2WPM (right) with the "Radio Amateur Operator of the Year 2018" award for his unstinting efforts to achieve 501(c)(3) status for PCARA.*



*At the September 22 Breakfast at Turco's we were joined by Ria Jairam, N2RJ (left). Ria is standing as candidate in the upcoming election for ARRL Hudson Division Director.*

# Fall foxhunt

## Back at the Beach

As the end of summer arrived on Saturday September 22, the temperature had reached a pleasant 69°F and hunters began to gather at the Beach Shopping Center in Peekskill. There was a good turn-out of members, with neighbors from Candlewood ARA and WECA joining the search for PCARA's fox, played this time by Mike N2EAB.

After checking antennas, the nine hunters split themselves into four teams occupying separate vehicles as follows:

- Car 1: Al K2DMV, Jay, N1NRP and Mike W2IGG.
- Car 2: Stan WA2NRV, Gil KD2PFQ and Verle W2VJ
- Car 3: Malcolm NM9J and Greg KB2CQE
- Car 4: Karl N2KZ.



Some of the hunters at the Beach Shopping Center on September 22. L to R: Karl N2KZ, Jay N1NRP, Al K2DMV, Greg KB2CQE, NM9J and Verle W2VJ. [Pic by W2IGG]

## A fresh fox

At 3:00 p.m., Mike N2EAB came on-air for the first 5 minute transmission on 146.565 MHz. Signal strength was good as the beam antennas swung around. Stan WA2NRV was making use of body fade while Jay N1NRP had a small loop antenna. There were some odd reflections, but the strongest signal was from the west. That direction could pass by several Peekskill high spots.

## Heights and depths

Your editor was accompanied by Greg KB2CQE, who knows his way around Peekskill from time spent with the Community Volunteer Ambulance Corps. We headed down Route 202, then south to Seneca Street to try to obtain a cross-bearing. Direction was now NNW, toward Hillcrest School — so we crossed Routes 202 and 6 to investigate. There was no sign of Mike near the school, by the River House apartments or around Peekskill reservoir. And bearings had now

swung around to the SSE.

Meanwhile Al K2DMV and his team had left the Beach Shopping Center, turned west onto Route 6 then into Benefield Boulevard. Their next bearing was toward the Hot Dog Stand on the Bear Mountain Parkway, but from that point the signal had weakened and the bearing took them to Radio Terrace, former home of WLNA/WHUD. The beam antenna now pointed back toward the start — so they returned along the Parkway.

## Strong signals

Al's team and your editor were now looking for likely places west of the Beach Shopping Center. At separate times, the two teams entered Tompkins Park, the ball park off Route 6 between Husted Avenue and Benefield Boulevard. Signals from the fox were now very strong on the NM9J S-meter, with the harmonic on 439.695 MHz peaking to the west. Reception of the 440 harmonic is usually a sign that the fox is close.



Tompkins Park entrance.

But there were no other vehicles visible from Tompkins Park. The site is bordered by McGregory Brook and an impenetrable fence. We returned to Route 6 and drove — past a dog-walker — into the AutoZone parking lot. This was equally free of foxes. High spots and low spots in the immediate vicinity were investigated and we even drove past another corner of Tompkins Park.

## Masking the noise

During the 3 minute transmissions, Mike N2EAB had been reading an article about a white noise generator — then as the end of the hunt approached we heard him say “the hounds are here”. This sounded as though one of the teams had arrived at the site, and our hopes fell.

Karl N2KZ had also set off due west and made a tour all the way around Depew Park, scene of an earlier Foxhunt. In the closing minutes, Karl's vehicle crossed paths with the NM9J/KB2CQE vehicle, still searching for N2EAB near Villa at the Woods. Neither team had found the fox.

## Fox final

On the final fox transmission from N2EAB at 4:30 p.m., Mike announced that hunters should make their way to the 202 Diner on Route 202. There we

found the other teams just as puzzled as we were. Mike explained that **nobody** had found the fox. He had been



Entrance to City of Peekskill Dog Park located on the south side of Route 6.

located at the **Peekskill Dog Park**, off Route 6, between Tompkins Park and AutoZone.

The entrance has a subdued

sign with a long track through the woods to a fenced-off area where the dogs can exercise. Mike's message — "the hounds are here" was meant to cover the loud barking sounds as yet another vehicle full of dogs arrived at the park.



Subdued entrance sign.

### Gone to the dogs

Mike subsequently described his concealed station as follows:

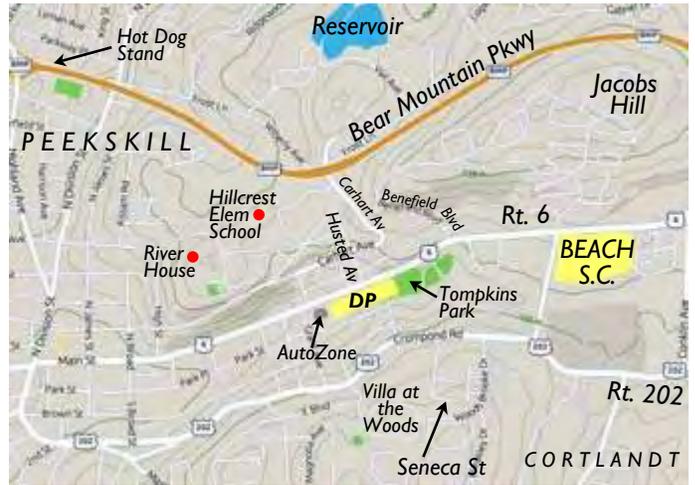
"The fox's lair was at the Peekskill Dog Park. I estimate a distance of approximately 3/10 of a mile west of the start site. GPS reported an elevation of 250 ft. As in past fox hunts, I suspect the terrain was a factor in making this the challenging hunt that it turned out to be. The dog park is nestled in a three-sided ravine."

"The fox's equipment was as follows:

- Icom IC-2GAT with 8.4V, 2000mAH NiMH battery pack
- Icom HM-46L speaker/mic
- Horizontally polarized 2 meter dipole antenna on fiberglass pole



The N2EAB fox vehicle was concealed at Peekskill Dog Park. Fenced-off area is where the canines congregate. [N2EAB pic.]



Map shows significant locations during PCARA's 2018 Fall Foxhunt. City of Peekskill Dog Park, depicted by "DP", lies between Tompkins Park and AutoZone. (Older maps mark this location as "Penelope Pond" or "Lake Penelope".)

"The RF power output was kept constant at 3.5 watts and the dipole was fixed with maximum lobes in an east-west direction."

Well done Mike — once again you kept the teams of hunters at bay until the end of the event and everyone felt better, knowing they were neither first nor last. There were no certificates to present this time, but those who stayed on at the 202 Diner enjoyed a good meal and an opportunity to share their experiences.



Happy hunters pictured at the 202 Diner after Mike N2EAB explained that nobody found the fox. [Pic by N2EAB]

Thanks to all who took part and to Mike N2EAB. Your mission, Mike — should you choose to accept it — will be an encore performance as fox around the second weekend of May, 2019.

- NM9J

# FT-991A review

## Time for a change

It was time to replace my Icom IC-706MkIIIG. Originally purchased in December 2000 and used on various PCARA Field Days and Special Events, the IC-706MkIIIG was a little miracle in its day, transmitting 100 watts of all-mode RF on HF/6m (plus 144-440 MHz) from a tiny package. After studying various options



*Icom IC-706MkIIIG all-mode transceiver.*

I decided on a Yaesu FT-991A and picked one up from KJI Electronics at the CARA Hamfest. At the time Yaesu had a \$200 “Instant Coupon” in effect as part of their “Field Gear Summer Promotion”.

## One step forward...

There are several reviews of the Yaesu FT-991A available, including an excellent article “Yaesu FT-991A HF, VHF, and UHF Transceiver” by Joel W1ZR in *QST* for May 2018, pp 50-57. I won’t dwell on the performance measurements in the *QST* article but instead I’ll describe my own experience with setting up the radio and seeing how it compares with the IC-706MkIIIG. Radio upgrades remind me of an old saying “one step forward, two steps back.” Let’s see how true that is of the FT-991A.

## Out of the box

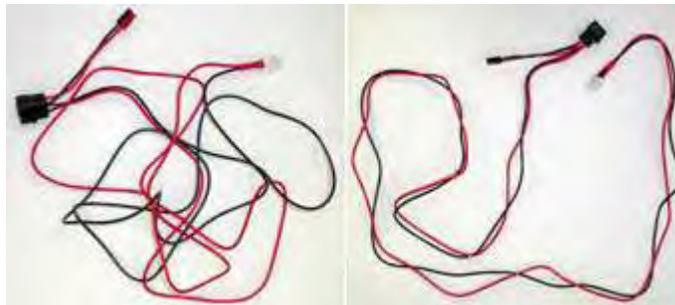
Yaesu’s cardboard box contains only four items — the radio itself, a Yaesu MH-31-A8J dynamic microphone, the DC power cord with spare fuse and a 150-page Operating Manual. No mobile mounting bracket, DTMF microphone or remote keypad was included as they are all optional extras.



*Contents of the FT-991A cardboard box.*

The first difference from the IC-706MkIIIG is the larger 9" × 3" front panel — which cannot be detached from the main chassis. The IC-706 was popular as a mobile radio — it *could* be easily separated from the front panel. The FT-991A is not so well suited to mobile operation because of its somewhat larger size and fully attached front panel with touch-screen.

Yaesu’s power cable consists of 8½ feet of 12AWG wire. I crimped a pair of Anderson Powerpoles® onto the free end and noted that — just like the FTM-100D VHF/UHF radio — Yaesu made their cable from separate black and red insulated wire rather than the molded zip-cord provided with Icom radios. I added nylon cable ties every 12" to prevent future tangles.



*Original FT-991A power cord (left) had nylon cable ties added every foot to keep red and black wires together.*

Although the MH-31 microphone is marked “Made in China”, the transceiver itself is labeled “Made in Japan”. This country of origin is reassuring, especially when making a substantial amateur radio purchase.

## First switch-on

I set up the FT-991A near my IC-706MkIIIG to allow side-by-side comparisons while switching between antennas. Maximum current draw for the Yaesu radio is 23A — three amps more than the IC-706MkIIIG — so I connected my Alinco DM-330MV as the 12V DC power supply.

After initial switch-on, the FT-991A asks for entry of date, time and station call sign. This was my first introduction to the color **touch-screen** — I’m happy to report that the screen’s ‘touch’ function operates **far** better than previous Yaesu radios. After entry, the GMT clock appears top-right on the liquid-crystal display — where it might be obscured by the black bezel when viewed from above.

After initialization, the radio displays a frequency of 7.000 MHz, VFO-A, with mode SSB, lower sideband. Appearance is far superior to the IC-706MkIIIG which only had a monochrome liquid crystal display backlit



*Fresh out of the box, the FT-991A powers up on 7.0 MHz, VFO-A and lower sideband.*

by a dim green LED light. Yaesu's high-resolution color display is bright and easily readable from any direction.



Icom IC-706MkIIG monochrome display is on the left, FT-991A color touch display on the right.

Sixteen front-panel buttons on the FT-991A are backlit with white LED light, making them equally legible. By contrast, the on/off switch, front panel jacks and four rotary controls are labeled with gray paint on a black background... Not so easy to read in a dark environment.

### Take a tour

After connecting antenna and external speaker, I took the new radio on a short tour of the 40 and 20 meter bands. My first discovery was that receiver bandwidth could be easily adjusted in steps, but getting there was a little involved. The procedure is as follows:

- (1) Press the F/(M-List) button on the front panel. This brings up a display of eight "Soft Key" Functions on the touch display, directly underneath the S-meter.

- (2) Press the  $\leftarrow$ BACK and FWD $\rightarrow$  soft keys to scroll through the

- groups of available functions —until a WIDTH soft key appears.

- (3) Press the WIDTH soft key on-screen.

- (4) You can now adjust IF bandwidth using the MULTI rotary

control knob which is bottom right of the display. When using SSB, width settings can range from 1800 Hz to 3200 Hz in 13 steps. Actual bandwidth is indicated numerically on the WIDTH soft key and graphically underneath the main frequency display.

This may seem a complicated way to achieve the desired result. In fact, many of the FT-991A's common adjustments are achieved in a similar manner. Fortunately, it



Scroll through functions by pressing BACK or FWD arrows until WIDTH appears.



MULTI control knob.

does not take too long before the method becomes familiar — the worst part is remembering which of the 10 groups of function soft keys contains the one you need.

The IC-706MkIIG took a different approach... there was a "Display" button to select one of three menu sets as well as the "Quick set" menu. Pressing the "Menu" button scrolled through menus in a menu set, with choices made on soft keys below the display. That routine was also easily learned.

### Selectivity

The adjustable selectivity of the FT-991A proved to be highly effective. As well as the thirteen settings from 1800 to 3200 Hz, an additional **narrow** range is available by pressing the NAR/WIDE soft key. This provides nine more settings from 200 to 1800 Hz while on SSB. All this flexibility is the result of digital signal processing carried out at the 24 kHz third intermediate frequency. (Intermediate frequencies are 69.450 MHz, 9.000 MHz and 24 kHz on SSB, CW, data and AM.)

Those different bandwidth choices are *built in* to the radio at no extra cost. Compare this with the IC-706MkIIG which came with just one 9 MHz crystal filter fitted as standard, providing a fixed bandwidth of 2.4 kHz. I installed two more Icom crystal filters for narrow SSB (1.9 kHz) and CW (350 Hz). Performance was excellent, but those extra filters were not cheap.

### Stability

While mentioning optional extras from Icom, I had also installed a CR-282 high-stability crystal unit in my IC-706MkIIG. The stock crystal in the frequency synthesizer only had a temperature stability of  $\pm 5$  ppm, resulting in a possible drift of more than  $\pm 2$  kHz at 450 MHz. The CR-282 high stability unit reduced drift from  $\pm 5$  ppm to  $\pm 0.5$  ppm, though the radio then needed a warm-up time of 15-30 minutes.

The FT-991A has a TCXO included for excellent  $\pm 0.5$  ppm frequency stability *without* optional extras. Initial checks on 144 and 440 MHz SSB showed good long term stability without any warm-up time. And the radio chassis does not run as 'hot' as the IC-706MkIIG thanks to a large cooling fan on the rear panel.

### Audio quality

While tuning around, I noticed that audio quality of SSB signals sounded rather "bassy" compared with other receivers. I found the radio has a CONT control to alter shape of the I.F. passband. By applying a



CONT soft key modifies contour of the IF response.

Contour cut of -15 dB centered around 100-120 Hz, the audio became less boomy and more intelligible.

The CONT soft key allows the contour center frequency to be shifted using the same MULTI control knob previously used to change IF bandwidth. This is the second function I encountered that is adjusted by turning the MULTI control.

### A multitude of functions

Each soft key on the touch panel that influences the MULTI control is 'sticky' and continues in effect until another soft key for a different function is

RF-P	Adjusts transmission output
MIC-G	Adjusts the microphone gain
NB-L	Adjusts the noise blanker level
SHIFT	Shift function
WIDTH	Width function
NOTCH	Notch function
CONT	Contour function
DNR	Digital Noise Reduction function
PROC	Adjusts Speech Processor Gain
MONI	Adjusts the monitor level
DT-G	Adjusts the input level during data communication
CH-D	Frequency tuning in the pre-programmed steps
SPEED	Adjusts keying speed
APF	Audio Peak Filter function
PITCH	Adjusts the CW pitch
SQL	Adjusts the squelch level
STONE	Selects the tone frequency
DCS	Selects the DCS code
MCH	Selects the memory channel
GRP	Selects the memory group

Twenty functions can be adjusted using a soft key and the MULTI control knob.

(CH DIAL) and selecting memory channels (MCH). The current action of the MULTI control knob is always displayed top left on the touch-screen, alongside the 'progress bar' and below the mode indicator.

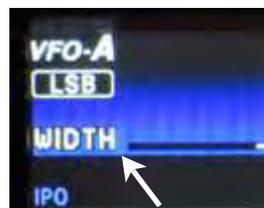
This may seem awkward, compared with a full-size transceiver that has separate controls for most of the frequently-used functions. Fortunately, a set of four function keys is constantly displayed at the bottom of the touch-screen. In SSB mode, the four default keys, known as 'Main control buttons' are: METER, RF PWR, MIC GAIN and SWEEP.



Four soft keys stay permanently in place at the bottom of the touch-screen.

another function — and the choices can vary by mode.

pressed. This 'stickiness' applies even after soft keys have been scrolled aside or cleared from the display. Some twenty functions can be adjusted — from IF shift (SHIFT), RF power (RF PWR), microphone gain (MIC GAIN) and squelch (SQL) to stepping the VFO frequency

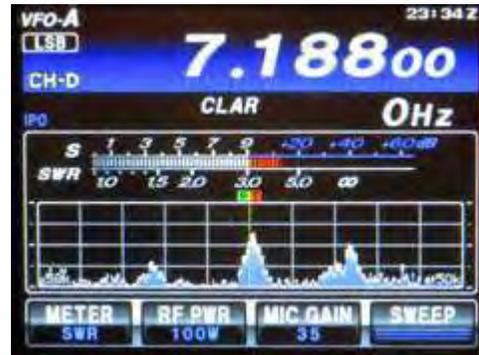


Current action of the MULTI knob is indicated top left on the display (arrow).

If you do not like this combination, each of the keys F1-F4 can be swapped for

### Beside the waterfall

The original Yaesu FT-991 introduced in 2014 had a 'single-shot' spectrum scope display with monochrome waterfall. As a result the receiver was muted whenever the spectrum was scanned. The newer FT-991A has additional hardware that allows continuous



Real-time spectrum display shows activity above and below FT-991A receive freq.

real-time display of spectrum scope and waterfall — while simultaneous reception takes place, unmuted. Continuous display of the RF spectrum around the receive frequency is a great tool when looking for activity — especially in a contest. With the FT-991A's small touch-screen, I found the combined spectrum/multicolor waterfall display best for spotting weak stations since the waterfall tends to 'integrate' short bursts of RF into a highly-visible vertical trace.



Combined real-time spectrum and multicolor waterfall display on FT-991A.

### Dive into the menu

In order to modify the spectrum scope's frequency span and turn the waterfall on and off, a visit to the menu choices of the FT-991A is required. This is accomplished by pressing the MENU/SETUP button, just



Menu choices 001 to 003 (of 153) displayed on lower half of touch-screen.

below the F/MEM-LIST button on the front panel. Menu choices are then displayed in the bottom half of the touch-screen, where they can be scrolled up and down

and down

using the MULTI rotary control.

On my FT-991A with the latest Firmware, there are 153 choices available on the menu, ranging from '001 AGC Fast Delay' time to '153 Wires DG-ID'. Most of these are 'set and forget' items that only need visiting once to set the value and can then be left alone. But there are one or two — such as 025 NB Noise Blanker Level — which require more frequent adjustment and might be better located on a Function soft key.

### Manual dexterity

The 150 page printed Operating Manual includes a 15-page section that describes all the Menu choices in detail. The manual is well-written and clearly illustrated, but it has a few problems, such as missing cross-references in the section describing front panel controls and a very short index that lacks inverted listings. For example the microphone equalizer is listed under “P” for “Parametric microphone equalizer” instead of under “M” for “Microphone equalizer, parametric”.



Nifty Mini-Manual for Yaesu FT-991A.

To fill the gaps I purchased a “Nifty! Mini-Manual™ for the FT-991A as published by N6FN (https://www.niftyaccessories.com). Nifty Manuals pack a lot of information into a small space and add a few hints not included in the manufacturer’s own publications.

Inverted index terms notwithstanding, the parametric microphone equalizer does a very good job of optimizing transmitter audio response in order to punch through QRM — despite the rather bassy MH-31 microphone.

### VHF/UHF and TNX for the memories

I checked VHF and UHF performance of the FT-991A, starting out on SSB/CW. All the useful functions for improving HF reception were present with one exception — on 144 and 440 MHz it is no longer possible to adjust front end gain by switching in a first or second preamplifier or an attenuator. Gain is fixed on all VHF/UHF bands and modes, apart from 6 meters. By contrast, the IC-706MkIIG had a preamp and attenuator available on VHF/UHF as well as HF.

I had an opportunity to test SSB operation during ARRL’s September VHF Contest — with several successful contacts accomplished on 6 meters and 2 meters.

Switching from SSB to FM, I noted that bandwidth could only be set to NAR or WIDE (9 kHz or 16 kHz) — the stepped WIDTH adjustment available on SSB/CW

was now grayed out. To see how difficult manual setup of an FM channel might be, I programmed a well known 2 meter repeater with offset frequency and PL tone then stored it into a memory location. Programming of repeaters is relatively straightforward using the function soft keys — repeater shift is automatic.

The FT-991A has 99 standard memory locations available and I had a bunch of HF, VHF and UHF frequencies that I wanted to program into memory. Computer programming is possible using the USB jack on the rear panel — though Yaesu does not provide a cable or software for this activity. I decided to purchase a copy of RT Systems’ (https://www.rtsystemsinc.com/) ADMS-991A Radio Software which is available with or without a USB A-to-B programming cable. I already had a USB ‘printer’ cable so I downloaded the software and installed it on my notebook computer. Installation was straightforward, and I was soon getting initial data from the radio then saving to file for safety reasons.

	Receive Frequency	Transmit Frequency	Offset Frequency	Offset Direction	Operating Mode	Tx Operating Mode	Name	
001	146.37000	146.37000	600 kHz	Minus	FM	FM	MBEacon	To
002	145.25000	144.65000	600 kHz	Minus	FM	FM	OrangeRIS	To
003	147.06000	147.66000	600 kHz	Plus	FM	FM	W/CA	To
004	145.17000	144.57000	600 kHz	Minus	FM	FM	Rockland	To
005	146.76000	146.16000	600 kHz	Minus	FM	FM	Middleb	To
006	146.52000	146.52000		Simplex	FM	FM	Simplex	Nc
007	146.58000	146.58000		Simplex	FM	FM	Simplex	Nc
008	146.67000	146.07000	600 kHz	Minus	FM	FM	PCARA	To
009	146.67000	146.07000	600 kHz	Minus	FM	FM	PCARA-1z	To
010	145.13000	144.53000	600 kHz	Minus	FM	FM	PEARL	To
011	147.01500	147.61500	600 kHz	Plus	FM	FM	NW/SAFA	To
012	147.10500	147.70500	600 kHz	Plus	FM	FM	Rockland	To
013	146.79000	146.19000	600 kHz	Minus	FM	FM	BergerAR	To

Screen-shot of RT Systems’ FT-991A Programmer software. 29 columns are available for information about channels.

Instead of entering all my memory channels one by one into the spreadsheet-like table, I found I could copy and paste memory channels from the RT Systems’ software for my Yaesu FTM-100DR. Much easier, and all the memory tags were transferred as well. Once the programming was complete, I tested C4FM operation through the N2CBH repeater and on a local simplex channel.



Sample of C4FM reception on FT-991A showing callsign and distance to station.

RT Systems’ software for the FT-991A also handles Menu Settings, ‘Main Control Buttons’ for each mode, keyer settings and the five CW message memories.

## Digital signals

The FT-991A has a built-in sound-card adapter, so the rear panel USB jack can also be used for digital modes such as RTTY and PSK-31 using a **single cable** connected to the computer. My notebook already had FLdigi software set up for the IC-706MkIIIG with Signalink™ USB, so I re-configured FLdigi for use with an additional radio then followed instructions by Bob KR4DA to set-up both software and FT-991A for digital modes operation. (See: <https://ft991a.blogspot.com/2016/09/fldigi-setup-my-version-3227-win-10-com.html> .)

Once I had the COM ports correctly identified, FLdigi began showing its own waterfall display of incoming audio from the FT-991A and decoding digital signals. Despite the recent predominance of FT8, there is still plenty of activity on PSK-31— and I had a pleasant 20 meter QSO with OZ1KBS in Denmark.

I tried decoding CW with my K44 CW Keyboard. Fixed level audio from the radio is desirable for the Morse decoder and I found a suitable cable available from West Mountain Radio. Their “Fixed Level Audio for Yaesu MiniDin6” #58131-997 plugs into the “RTTY/DATA” jack on the rear panel of the FT-991A.



West Mountain Radio fixed level audio cable for Yaesu Mini-DIN 6-pin connector.

## Guess meter

The FT-991A has an excellent simulated analog meter visible at all times on the touch screen. On receive it displays signal strength, while on transmit it can be toggled between indicating RF power output, Automatic level control, SWR, Compression level, Drain current or Drain voltage (VDD).

The S-meter works particularly well, displaying multiple white bars from S1 to S9, then showing vivid red bars as the signal exceeds S9 all the way to +60dB over. There are 75 separate segments that can be individually turned on, giving a smooth representation of varying signal strength. This compares with just 15 segments on the IC-706MkIIIG meter.



Close-up view of the FT-991A's S-meter displaying a really strong signal.

## Antenna tuner

The Icom IC-706MkIIIG did not have an internal antenna tuner, so I had to purchase Icom's optional AT-180 external tuner which sat alongside, matching 1.9 – 54 MHz with SWR up to 3:1 at HF.

The Yaesu FT-991A is sufficiently large to include a *built-in* antenna tuner with similar specifications — it covers 1.8 – 54 MHz and matches a 3:1 SWR at HF. The design differs from the rotating air spaced variable capacitors of the AT-180, which are only aided by relay-switched components. In the FT-991A,



With the FT-991A bottom cover removed, automatic antenna tuner is located behind the rear cooling fan, under the shield case cover.

three sets of eight relays carry out *all* adjustments, selecting combinations of inductance and capacitance to find the best match with a high-pass “Tee” network. The tuner is speedy and efficient, but makes a terrible chattering noise when first asked to find a match.

The 3:1 SWR matching range proved adequate for my coaxial-fed antennas. If your antenna has a higher SWR than 3:1 then you might need an external tuner — but be prepared for losses in any coaxial feeder with high SWR.

## Conclusions

After the first few weeks with the FT-991A, I decided that it was a very good choice to replace the Icom IC-706MkIIIG. There are a few niggles such as the lack of warning beeps at the band edge, the carrier frequency changing between USB and LSB, and the “multi” knob being too close to the VFO knob — which you might hit by mistake. Receive coverage is not as wide as the 30 kHz - 199 MHz / 400 - 470 MHz of the '706. The GMT clock drifts. And “DNR” (dynamic noise reduction) is overpowering in the current version of the DSP firmware. But the huge number of improvements compared with my eighteen-year old Icom radio more than make up for the minor deficiencies. There is even a voice memory for recording repetitive messages... “CQ Contest, CQ Contest, this is...”

- Malcolm, NM9J

# A new tuner at N2CBH

Recently I replaced my aging SGC HF antenna tuner with a new Icom AH-4 tuner. The old tuner had served me well for 15 or so years but it developed problems and about 2 weeks ago it failed — so it was time for a new plan.

## Sloping off

My antenna location in the backyard is like many with a limited amount of space and appurtenances to attach them to. We have very few trees that we can call our own and they aren't suitable to string wire antennas to. We do have a couple of overhanging blue spruce branches from our neighbor's property and they form the apex point of my HF antenna. This is a **sloper** with the wire starting about two feet off the ground near the feed point and reaching the apex at approximately 40 feet. The wire is roughly 75 feet in length.



Antenna tuning unit is enclosed in a wooden shelter. [N2CBH pic]

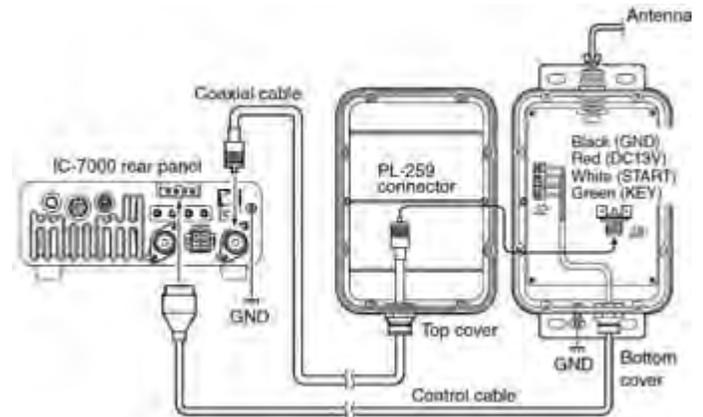
The low end of the wire is fed by the new Icom AH-4 automatic antenna tuner which is designed for mounting outside in the weather. I have it enclosed in a small wooden shelter because the old tuner required protection from the weather. The AH-4 has a clamshell design with a weatherproof gasket between the two halves of the plastic case. Coaxial cable and control wiring enter through two weatherproof connectors at the bottom. The unit comes with a metal mounting bracket and is designed to be mounted upright with the insulated output on top. This is good practice to keep water out of the connectors.

The AH-4 is designed to directly connect to the Icom models IC-706, IC-7000 and IC-736 radios in addition to others. The AH-4 is supplied with a 25 foot control cable with a Molex connector on one end for plugging in to the radio and a bare end to connect to barrier terminals inside the tuner box. In addition, a 25 ft length of RG-8X without connectors is supplied



Icom AH-4 automatic antenna tuner.

for RF input. The RF connector inside the tuner is an SO-239 (J8). I used a short length of RG-58U for my installation as I did not have sleeves for the PL-259 connectors needed for RG-8X cable.



Connections to the Icom AH-4 automatic antenna tuner from a typical Icom HF transceiver (IC-7000).

The feedline from my shack is connected to a Dow-Key® coaxial relay, with one side of the relay connected to the tuner. I can switch to another antenna remotely but that second antenna is a future project.

I did not use the control cable supplied. My transceiver is located in the shack and the tuner is fed by underground coax and control cabling that was already installed. Another factor is that I do not have an Icom radio in my main station but a Yaesu FT-991. The FT-991 is a nice transceiver — with an *internal* tuner — but not suitable for my setup — thus the external tuner.

Connections for the control cable at the antenna tuner end (J2) are:

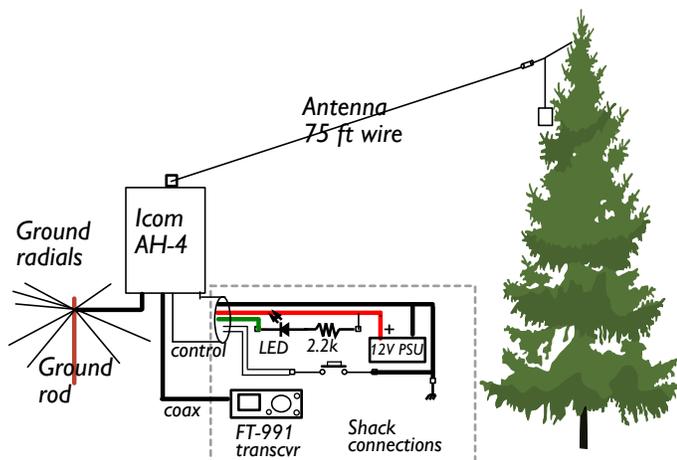
- Black (GND)
- Red (DC+13V)
- White (TUNE Initiate)
- Green (TUNED Status)

The 'TUNE Initiate' connection is brought to ground by an Icom radio or in my case by a push-button switch connection to ground. The tuner will then initiate a tuning cycle once RF is applied. This is automated with an Icom transceiver as the radio will be commanded to transmit during this cycle. In my case I have to manually push the 'TUNE Initiate' button in my shack and key the radio at low power.

When the tuning cycle is complete, the 'TUNED status' pin at the tuner is pulled low and in my shack this lights an LED to indicate the tuning cycle is complete, so I can let go of the push-button. Its sounds more complicated than it actually is. It is quick and almost as fast as if I had an Icom radio connected.

## Get grounded

The other part of the antenna system connected to the tuner is the antenna ground — which consists of



Connections to the Icom AH-4 antenna tuner in Bob's installation using a non-Icom transceiver. [N2CBH diag.]

twenty wire radials varying in length from 60 feet down. A couple of things about ground radials and this type of installation — my antenna system is treated like a vertical, insulated at the base with a series of ground radials underneath. The “vertical” is sloped over at a 30° angle. The ground radials should be numerous and long, regardless of frequency of interest.

However, under real world conditions many of us do not have enough real estate for 60 foot radials in every direction. I used 60 feet where I could and shortened them where I could not.

The reason for ground radials in this type of antenna system is to minimize ground losses around the feed point. A better way to do this is to have copper mesh or sheet around the base and attach wires to it at a distance. Copper mesh or sheet will offer lower resistance per unit area than a series of ground radials. The lower the resistance per unit area the lower the ground losses and therefore the higher radiating efficiency of your antenna.

Ground systems are important for quarter-wave and shorter radiators as radiation resistance — and efficiency — drops with shortened lengths. If you can end-feed a half wave vertical you really don't need a radial system at all, just a local ground for the tuning network. Half-wave vertical antennas aren't really popular in amateur radio because they are tricky to tune due to the high feed point impedance — but they can be effective and easier to implement.

### Why we match

An antenna tuner's function is to provide a good match at the characteristic feed impedance of the transceiver it is connected to. The antenna connection point of the tuner might have a good match or it might not. The tuner isolates a potential high VSWR from the rig.

My transmission line is about 50 feet in length and buried for all but ten feet — which is inside the house. If I used a coaxial input/output tuner in the shack, I could have a very high VSWR on the output feedline to the antenna and most of the output power would then

be lost, heating coax and ground.

In a coaxial-fed tuned system the output feed-line can become part of the antenna if RF current is induced on the outer conductor and causes radiation — especially if the cable is unobstructed and above ground. I eliminate this problem by placing the tuner at the far end of the coaxial feed line then connect the output of the tuner directly to the antenna feed point — which is well away from the shack and above ground. This way, all of the energy fed down the coaxial cable is radiated into space except for the small resistive losses in the matched coaxial cable itself. Another benefit is — no stray RF running around my shack or my basement even though a short length of cable passes through.

Some things to consider if you are thinking about a similar installation. You can locate the tuner closer to your shack if desired. This will shorten the coax plus control cable lengths. The control and coax don't *have* to be buried, particularly if the tuner ends up close to the shack. You could mount the tuner to the side of your house for example and then just have a short coax and control cable run to your equipment.



Icom AH-4 tuner mounted in the wooden shelter. [N2CBH pic.]



Bob's sloping wire antenna. [N2CBH pic]

I decided to have the tuner out away from the house to minimize RF in my shack but this may not be a real problem. The great thing about our hobby is experimentation. Plan an antenna system today and if you get one working let's hear about it!

- 73 de Bob, N2CBH

# 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 Update Editor:** Malcolm Pritchard, NM9J

E-mail: NM9J 'at' arrl.net

*Newsletter contributions are always very welcome!*

Archive: <http://home.lanline.com/~pcara/newslett.htm>

## PCARA Information

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

**Organization.** PCARA meetings take place the first Sunday of each month\* at 3:00 p.m. in Dining Room B of NewYork-Presbyterian/Hudson Valley Hospital, Rt. 202, Cortlandt Manor, NY 10567. Drive round behind the main hospital building and enter from the rear (look for the oxygen tanks). Talk-in is available on the 146.67 repeater. \*Apart from holidays and July/August break.

## 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

**Sun Oct 7:** PCARA meeting, NewYork-Presbyterian /Hudson Valley Hospital, 3:00 p.m.

**Sat Oct 20:** PCARA Breakfast, Turco's, Yorktown Hts. 9:00 a.m.

**Sat Oct 20:** New York State QSO Party 10:00 a.m. - 10:00 p.m.

**Sun Oct 21:** 38<sup>th</sup> Harry Chapin Run Against Hunger, Croton-on-Hudson.

## Hamfests

**Sun Oct 7:** Hall of Science ARC Hamfest, NY Hall of Science, 47-01 111<sup>th</sup> St., Flushing Meadows, Queens. 9:00 a.m.

**Sat Oct 13:** Bergen ARA Fall Hamfest, Westwood Reg HS, 701 Ridgewood Rd., Township of Washington, NJ. 8:00 a.m.

**Sun Oct 28:** Mt Beacon ARC Fall Hamfest, Employee Recreation Center, 83 Red Schoolhouse Rd., Fishkill NY, 8:00 a.m.

**Sun Oct 28:** LIMARC Hamfest, Levittown Hall, 201 Levittown Parkway, Hicksville, NY. 9:00 a.m.

## VE Test Sessions

**Oct 11:** WECA, Westchester Co Fire Trg Center, 4 Dana Rd., Valhalla, NY. 7:00 p.m. Contact S. Rothman, (914) 949-1463.

**Oct 13:** Bergen ARA Fall Hamfest, Westwood Reg HS, 8:00 a.m.

**Oct 14:** Yonkers ARC, Office of Emerg Mgmt, 789 Saw Mill River Rd, Yonkers. 11:30 am. Pre-reg. John WB2AUL, (914) 969-6548.

**Oct 15:** Columbia Univ ARC, 531 Studebaker Bldg, 622 W 132nd St, New York. 6:30 pm, Alan Crosswell (212) 854-3754.

**Oct 19:** Orange County ARC, Munger Cottage, 183 Main Street, Cornwall NY. 6:00 p.m. Contact Joseph J. DeLorenzo (845) 534-3146.

**Oct 28:** Mt Beacon ARC Hamfest, Fishkill. 9:00 a.m. Contact A.D. Schmidt, 845 462-7539.



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