

# PVRC Newsletter

## March 2021

**Newsletter Editor:** John K3TN [jpescatore@aol.com](mailto:jpescatore@aol.com)

**Website:** <http://www.pvrc.org>

**Meeting Info:** <http://www.pvrc.org/chapters.htm>

**Facebook:** <https://www.facebook.com/groups/PotomacValleyRadioClub/>

### President's Letter – Dan K2YWE

#### Perseverance

Promoting perseverance has become cliché with the abundance of corporate wall art on the subject, yet there is great truth in the collective message if properly applied. The advice we give beginning contesters and reinforce to everyone in preparation for the next contest always contains something on the order of “put in as much BIC (butt in chair) time as you can.” We know it works in radiosport because more time means more opportunity for QSOs, but there is more to it than that. We also observe that some are better at converting BIC time into points than others are. A wonderful property of PVRC members is that they strive to continuously improve and gladly share what they know and have learned. Working at continuous improvement qualifies as one type of perseverance.

I hope that you enjoyed seeing the reflector stories of members jumping into the recent 160m contest with makeshift antennas as much as I did. It was not too different from what more than a few of us did in VHF contests not long ago using improvised antennas (remember the pipe awards?). Both were instances of perseverance of a different sort from putting in more time or improvement. They were cases of moving out of comfort zones, away from “it won’t work,” and poking into “worth a try” under the motivation of making more points. Members persisted in their desire to add points and succeeded, often to their surprise and delight. They thought they had no 160m or VHF capability and found out different, aided and encouraged by others that had done the same.

Then there are always accounts of jury-rigging to overcome equipment, antenna, or software failures to carry on in the midst of a contest. That is yet another kind of perseverance, one of adapting to persist. Finally, what is a better example of perseverance than Ops who sit their stations on dead or near-dead bands, often inundated with ceaseless noise, and keep on hunting elusive Qs and Mults. Recognize yourself?

PVRCers continue to prove a persistent, adaptive, and tough breed, and the result is keeping us out in front of our competitors. I encourage you to continue as you have and to expand your limits of perseverance in whichever areas make the most sense for you.

For me, it will be rethinking my 160 and 80m antennas that I pronounced “good enough” a while ago and staying up a little later on contest weekends.

Go PVRC!  
73, Dan K2YWE

### Note from the PVRC Treasurer – Jay W3MMM

As in prior years, PVRC has provided modest 2021 donations to the following efforts in recognition of their support of both PVRC and the greater contesting community:

- Bruce Horn WA7BNM providing both [3830scores.com](http://3830scores.com) and [ContestCalendar.com](http://ContestCalendar.com),
- Scott Neader KA9FOX for his [QTH.com](http://QTH.com) webservices supporting PVRC's internet presence.”

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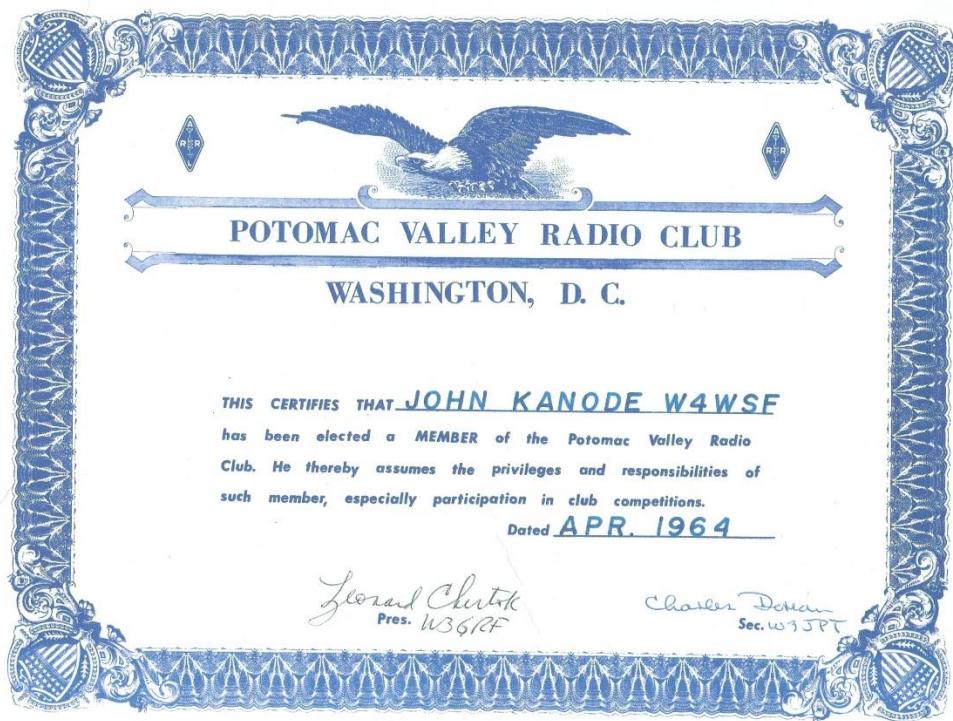
PVRC on Facebook: <https://www.facebook.com/groups/PotomacValleyRadioClub/>

Another Central VA Chapter Member Hoisting the K3LP Cup



"Finally got my photo holding the cup. Great to be a part of the effort" – Ken K4XL

From the Wayback Machine: PVRC New Member Certificate – John N4MM



## Some Low Band RX Antenna Notes and Switching Concepts – Ed N3CW

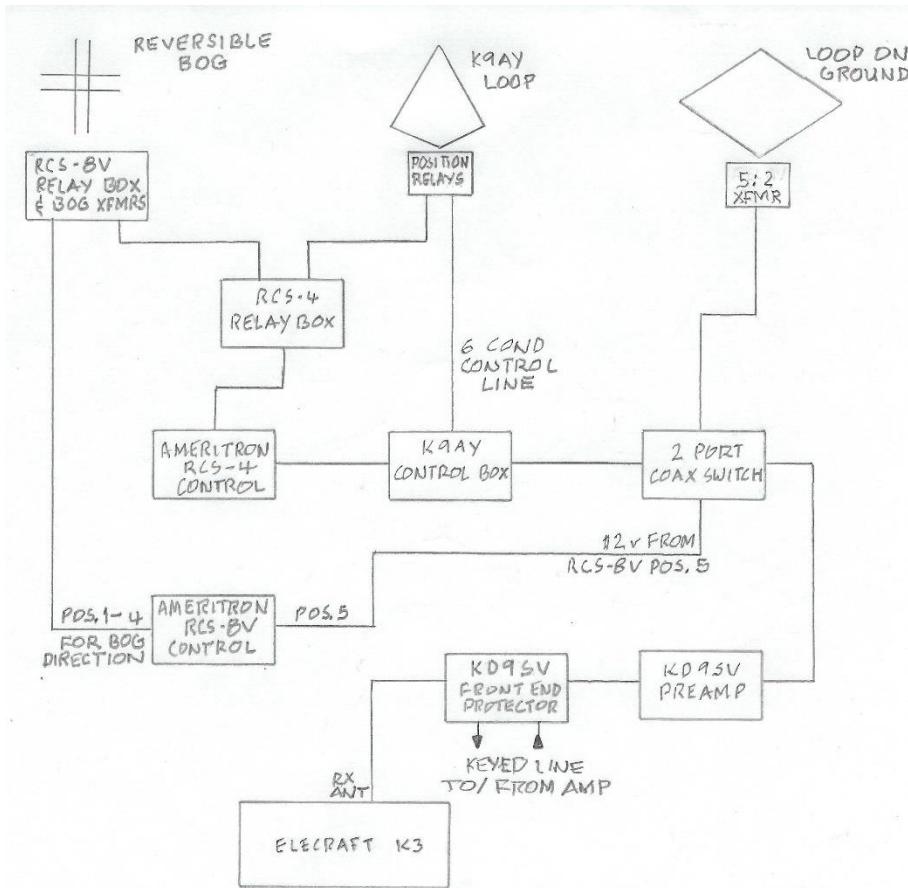
Early experimentation with a low band receiving antennas at the N3CW QTH started with a pair of reversible Beverage-on-ground (BOG) antennas. Soon, a 120-foot loop-on-ground was installed, followed by a K9AY loop system. It was apparent that a user-friendly way to switch between these receive antennas was necessary when operating in a contest environment, while also including a way to protect the K3 receiver front end.

At first glance this would seem an easy problem to solve, perhaps by using a three-way coax switch. However, the desire to minimize the number of long feedline runs out to antenna locations, combined with wanting to have easily accessible antenna direction switching complicated the design. What follows in this brief article is the result of how my switching design evolved, and a quick summary of how the antennas compare. It is hoped that some of the ideas and concepts shown can be applied to other stations' unique needs. For clarity, be aware that common elements of this system (such as power supplies and lightning protection) are not shown in this article.

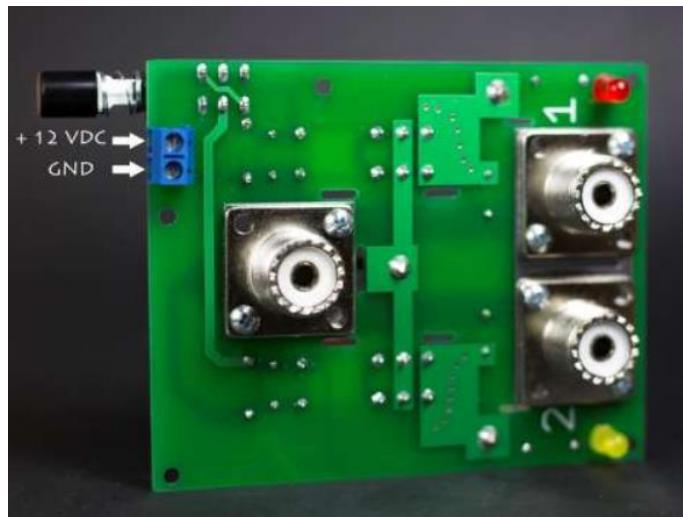
Some new-to-me concepts and hardware I wanted to incorporate and demonstrate the usefulness of included:

- Application of the Ameritron RCS-8V 5<sup>th</sup> switch position to operate an external 12 volt coaxial switching relay.
- Use of modified Electro-Resales 12 v coax switch
- A modified KD9SV receiver front end protector
- Reversible Beverage-on-ground
- Deer resistance of K9AY loop mechanical design

Block diagram of the receive antenna system can be seen in the below drawing. I basically had several guiding requirements: to devise a way to quickly switch between three different receive antennas, to have antenna directional controls within easy reach, and to protect the front end of the K3's receiver. Where possible, I used existing hardware I already had on hand, and the spare coax run and control line was already in place within a buried conduit.



The switching system makes use of two different Ameritron coax switch units. One is their RCS-4, which uses an AC voltage injected on the antenna's coax feedline to switch up to four different antennas; only two positions are used in the current design. The RCS-4 is used to switch the 150-foot feedline run between the BOG hub and the K9AY loop. The second Ameritron unit is an RCS-8V remote coax switch, which uses a control line to an external relay box.



The coax switch shown above is used to select the BOGs or the loop-on-ground and comes from Electro-Resales [here](#); it is available for \$30 from their eBay site. As received, it required a 12-volt supply and switching between the A and B ports was done using a small pushbutton switch on the board. I installed it in a small enclosure, removed the pushbutton switch, and modified the board to actuate upon application of 12 volts, which is available from the Ameritron RCS-8V control box when in position 5 (the loop-on-ground position). The first four positions of the RCS-8V control box are used to select BOG direction. The KD9SV front-end protector uses a QSK-type relay circuit to disconnect the receive antenna during transmit, while shorting the receive antenna input to ground. I modified the stock protection circuit to include a bypass switch and indicator LEDs, so that I could turn off the QSK function of the box when I was not using a separate receive antenna or operating on the higher frequency bands.



Beverage-on-ground hub, showing balun, feed and reflection transformers, and RCS-8V relay box.

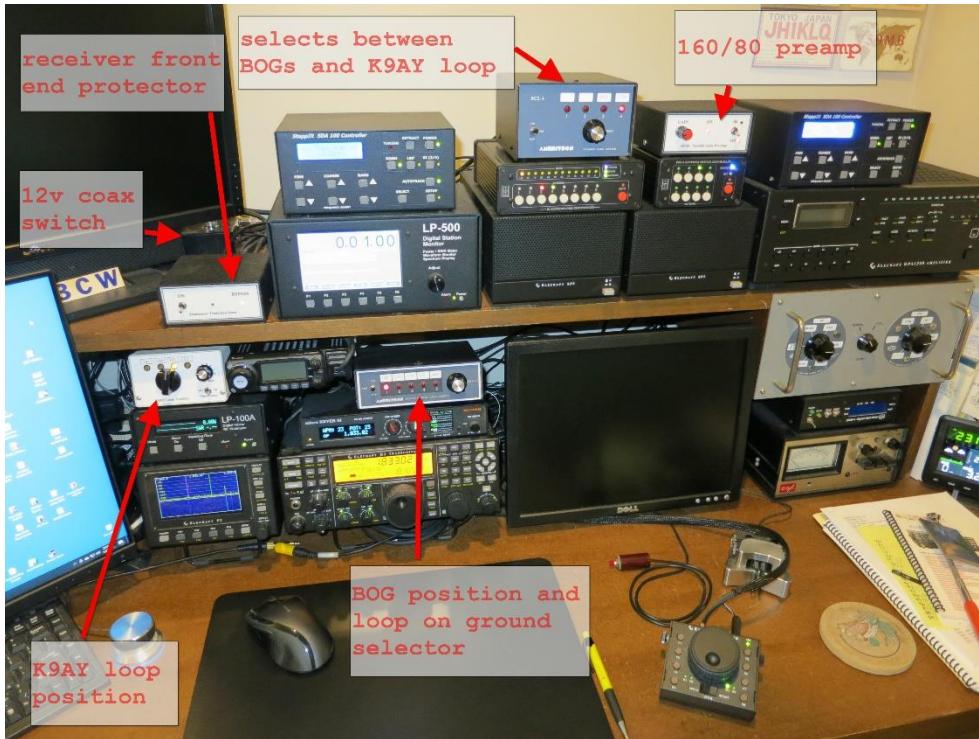


Above photo shows the RCS-4 relay box on the left of the conduit junction box mounted on a backyard shed. The RCS-4 relay box allows switching of one feedline between the BOGs and the K9AY loop. The loop-on-ground antenna is located in the front yard and uses a separate RG-6 feedline to the shack.



K9AY loop seen above, showing 28-foot mast and PVC spreaders. The spreaders fold up for grass cutting. With a center 4x4 post set in concrete, no guys or stakes are needed, and the design shown above has proven to be deer-resistant so far.

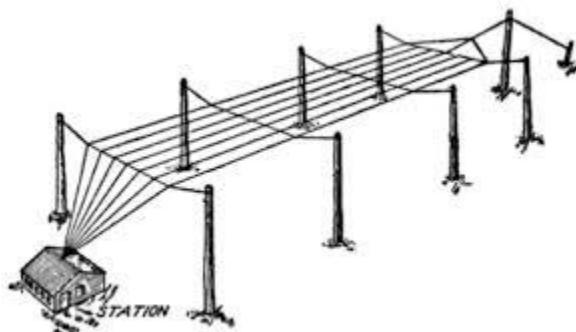
So how does the entire receive antenna system work? Actually, quite well, with all three receive antennas being somewhat close in performance. All switching and directional controls proved to be easy to reach and change while operating in a contest environment, as shown below.



Evaluation in the recent CQ 160 CW contest leads me to believe the K9AY loop is the best performer of the three. The loop-on-ground does surprisingly well on both 160 and 80 meters. For those with limited real estate for a 160-meter receiving antenna, consider the loop-on-ground or the K9AY loop. Overall, I would rank the antennas in sync with how W3LPL listed performance in a recent presentation on receiving antennas (chart courtesy of Frank, W3LPL). Antennas shown in the chart are rated in db for Receiving Directivity Factor (RDF).

- 4 dB: Bidirectional 8 foot diameter "magnetic" loop *close to the ground*
- 5 dB: Single vertical antenna (short vertical or  $\frac{1}{4}$  wavelength vertical)
- 6 dB: 225 foot Beverage on Ground (BOG) poor low angle response
- 7 dB: 250 foot Beverage about 7 feet high better low angle response
- 7 dB: Unidirectional terminated small loop
  - flag, pennant, EWE, VE3DO
- 8 dB: Close spaced arrays of two small terminated loops
  - K9AY Array
  - Shared Apex Loop Array
- 8 dB: Pair of 250 foot staggered Beverages about 7 feet high
- 9 dB: Two phased short verticals with 60 to 80 foot spacing
- 9 dB: Triangle array of phased short verticals with 60 to 80 foot spacing
- **11 dB**: Vertical Waller Flag: 2 phased vertical loops close to the ground

Now that these three receive antennas are functional, some future related projects will explore the use of diversity receive and some Elecraft K3 receive antenna options such as use of a splitter. Note: the splitter will allow use of the receive antenna on the K3 main receiver when not using the sub-receiver. Frank, W3LPL, has also suggested that a pair of phased short verticals or a VE3DO loop be considered where physical space is not unlimited; future experimentation with these two alternatives is a real possibility, with performance of the phased short verticals projected to be somewhat better than the K9AY loop.



## Meet the PVRCer – Jay KC3EMA

**First Year Licensed:** 1915 Oh wait 2015

**Previous Calls:** none YET. Waiting to get my extra, then a vanity call sign

**QTH and PVRC Chapter:** Taneytown, MD 1 mile from the great WX3B mega station (Northwest chapter)

**Favorite Contest and Why:** Definitely the CQ World Wide DX contest. I love seeing how far I can get a signal from the shack that I built. I have had great conversations from people of other countries.

**Least Favorite Contest and Why:** Not sure I have found one yet. Although, it may be Sweepstakes. Trying to remember and spout off all that information gave me a headache and was very tiring. I could only run a pile up for about an hour before losing my mind.

**Favorite part of Ham Radio other than contesting:** DXing and building antennas. I love learning the technology. Ham radio is pushing me to learn more about electronics and radio theory but never had a good reason to push myself to pursue. I have spent the last year just consumed by all the various aspects to learn from this hobby.

**Favorite thing to do other than Ham Radio:** The space isn't big enough to list. I have way too many hobbies. But the short list: Sailing, hobby farming, RC airplanes, Scuba Diving, hunting, RV camping, Backpacking, metal detecting.

**Anything else you'd like to say?** Not to make his head swell any more but, WX3B has been an awesome resource to both myself and my son in this hobby. I can't say enough without getting all choked up. He has shared his time, many-many did I say many - years of knowledge and, treasure in this hobby freely and with enthusiasm. He has gently pushed me into spending thousands of dollars in this hobby and to keep learning. I'm sure he is making a commission from someone! And, If I don't get my Extra, I'm sure he's going to come take my antenna away from me. He has been a role model as I now Elmer my friends in this hobby. Thank you, Jim.



## Copying (as in Writing Down) High Speed CW – John K3TN/Ken KE3X

**K3TN** - Last year I decided to get the ARRL 30 and 35 WPM proficiency award. I can head copy in the mid-forties and type from printed copy at 80 – 100 WPM but found I couldn't write or type what I heard reliably even at 30 wpm.

I worked on it, got my writing speed with sentences up to a marginal 35, passed the 30 WPM but got interrupted before the 35-wpm block, will be going back again. So, I decided to ask high speed CW competition op Ken KE3X how it was done.

**KE3X:** The 'short answer' is the top guys all use shorthand (no pun intended). Just like Secretaries did in the 1800's and early 1900's before typewriters and keyboard technology got faster. At the HST competitions, the Russians, Belarus, and Romanian guys all scribble down what they hear in their own custom shorthand during the qualifying runs, then they have 15-minutes or so to transcribe it into the Scoring Computers.

Before a HST competition, I used to practice my Code Groups on [LCWO.net](http://LCWO.net). That's DJ1YFK's free website. Sign up with a free login, then hit the 'High scores' tab. Under Code Groups section you'll see the fastest guys listed under the 3 categories of Letters, Figures and Mixed. Mixed is the toughest since they add the '-', '.', ',', and '?' characters.

The World Champions now are mostly in their 20's and they started training when they were less than 10 years old. In Russia they have special schools that teach HST twice a day in class. That way they get the kids early when their brains are still forming. Example is Anna Sadukova RA4FVL from Russia [here](#).

**K3TN:** I've been using LCWO.net for many years, but I had been doing the callsign training since that was applicable to contesting. I did switch to the plain text testing, since the ARRL test is essentially plain text. The Code Group testing was too hard!

**KE3X:** For typing fast, I have found I need the right keyboard. The ones with raised keys work best, not the flat ones. That reduces the number of times I mistype.

I continue to search for the optimal keyboard. The most recent one I experimented with is the Dierya DK61E Mechanical Gaming Keyboard, available on Amazon for about \$60. It allows me to type with a minimum of errors. That keyboard does not have F-Keys above the regular keys, so it's not suitable for SO2R contesting at all - just for HST copying only. Better for SO2R is the Lenovo ThinkPad Compact USB ... but it does not have raised keys.

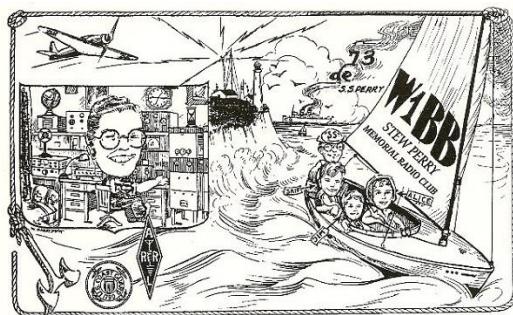
**K3TN:** A few years ago, Das Keyboard had a Prime day sale and I bought one of their keyboards that does not have the number keypad, uses mechanical switches and has great feel. I used that for remote opping K4VV and it has been awesome and now use it on my main home position. I can definitely type faster and more accurately, but they are expensive unless on sale.



## PVRC 160 Meter DXCC Standings – Frank W3LPL

Below are the 160M DXCC totals for PVRC members, transcribed from the ARRL [DXCC data](#) as of the 20<sup>th</sup> of each month or so. Thanks to Frank for the data each month to make this a regular feature. Please report any omissions or errors to [Frank](#).

CALL	DXCC	CALL	DXCC	CALL	DXCC	CALL	DXCC
W8LRL	344	W0VTT	215	N3RC	145	K3OSX	114
W4ZV	338	W4NL	214	N3KK	144	K5RJ	114
W4DR	336	W3YY	213	N4GG	144	N3MN	114
W3UR	321	W3YY	213	K3TN	143	N4DJ	113
W3LPL	316	N4MM	212	NR4M	143	K1KO	112
K4CIA	306	N1LN	211	WA2BCK	143	N4TL	112
K4ZW	302	AB3CV	209	W2YE	138	W3MR	111
W4PK	287	K3WA	209	W3BW	138	KA4RRU	110
K3SX	285	W3GG	200	W4YV	138	N3HBX	110
N2QT	283	K5RT	196	W4VIC	136	NA1DX	110
KG4W	269	K3JT	193	N3OC	135	K1BZ	108
K4SO	268	N4DB	192	N4PY	135	W3KB	107
K5VRX	256	K4FJ	191	AA4NC	132	W4ZYT	107
W3DF	252	K1GG	181	N3KS	129	K3WC	106
N3NT	250	K2PLF	174	N3RR	129	W2GPS	106
WB3AVN	245	W4FQT	172	K3XA	128	N4NW	105
WX4G	239	N4XX	169	K5VIP	128	W3NRJ	105
KG7H	237	K3KY	166	W0YVA	127	W3TMZ	104
K1HTV	236	K3AJ	165	KM3V	123	W3EKT	102
K3SWZ	233	K4XD	165	N3MK	122	W4JVN	102
W3KX	226	N4QQ	163	W2GG	121	KE4S	101
WS6X	221	N8II	153	K2BA	120	K3TZV	100
K1AR	219	W2RS	152	W4PRO	120	KC4D	100
K5EK	219	N3QE	150	W4HZ	119	N3AF	100
W3LL	216	N5JB	149	N3UA	118		
K4XL	215	K4RG	147	N3ND	117		



**Membership News – Tim N3QE**

PVRC did not add any new members in the latest reporting period.

Chapter leaders please remember to complete the [Meeting Attendance Report](#).  
Members can check and update their roster details via the [Roster Lookup](#).

**Upcoming Contests – from [WA7BNM](#)****March 2021**

+ ARRL Inter. DX Contest, SSB	0000Z, Mar 6 to 2400Z, Mar 7
+ Stew Perry Topband Challenge	1500Z, Mar 13 to 1500Z, Mar 14
+ North American Sprint, RTTY	2300Z, Mar 13 to 0300Z, Mar 14
+ BARTG HF RTTY Contest	0200Z, Mar 20 to 0159Z, Mar 22
+ Russian DX Contest	1200Z, Mar 20 to 1200Z, Mar 21
+ CQ WW WPX Contest, SSB	0000Z, Mar 27 to 2359Z, Mar 28

**Editor's Last Word – John K3TN**

Thanks to Ken K4XL, John N4MM, Ed N3CW, Jay KC3EMA, Ken KE3X and Frank W3LPL for contributions to this issue of the PVRC newsletter.

Some thoughts, in a style honoring Herb Caen, the San Francisco Chronicle columnist and humorist who passed away in February 1997:

*There sure are a lot more contests these days, are there more contestants? ... I tried to mail an envelope to my friend in Freeport, NY but it came back because the USPS didn't recognize the Zip Code AAE2T – I guess they don't grok cut numbers... What's with the long delays before CQers come back to my call?? It's like trying to talk to a teenager who is staring at their cellphone... When a PY station is calling CQ test at 13 wpm and obviously sending by hand, how often does calling them at 40 wpm really work? ... Is using history files in a contest really any different than operating FT8?... I miss the full line scores in QST and CQ magazine... I don't miss dupe sheets... I always enjoy working EE5E in contests, but I'm glad MM0OMG doesn't toss his call into many pileups... Did you ever try to explain to somehow how sending 5NN MD to hundreds of hams across the world prepares you for emergency communication services?*

The quality and usefulness of the PVRC newsletter depends on contributions from members. If you have photos from club meetings, screen shots of new contest software, or brief writeups on station improvements or contest war stories, send them in any format to jpescatore at aol dot com.

## From the PVRC Treasurer – Dan K2YWE

PVRC has chosen not to implement an annual dues requirement. We depend on the generosity of all our club members to finance our annual budget. In addition, active PVRC members are expected to participate and submit logs for at least two PVRC Club Competition contests per year.

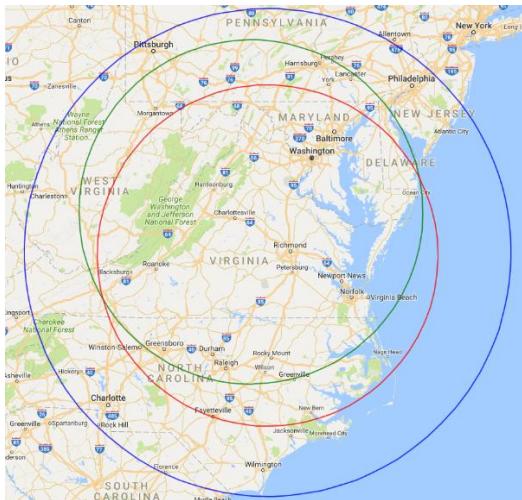
When contemplating your donation to PVRC, each member should consider the benefit you are receiving from PVRC and its many opportunities for your personal growth in our wonderful hobby, then donate accordingly.

Direct donations to PVRC via Credit Card or PayPal may be made by clicking this "Donate" button and clicking the next Donate button that appears on your screen:



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The latest info on local club meetings and get togethers will always be sent out on the [PVRC reflector](#) and posted on the PVRC [web site](#).



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**Red: ARRL HF Circle**  
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Around 37.43168N,  
77.858482W



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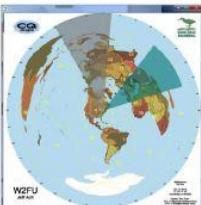
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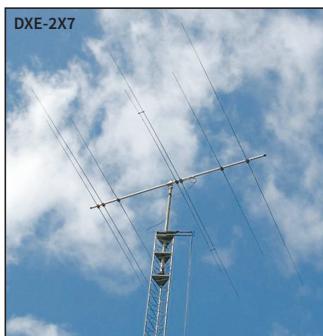

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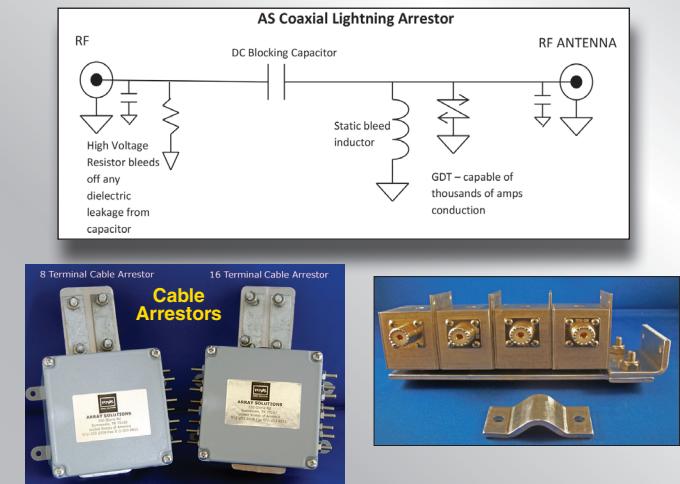


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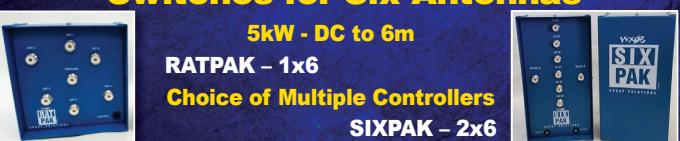
- Available in SO-239, Type-N, and 7/16 DIN
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- Models for HF, VHF to UHF – Extremely low loss and Low VSWR



### OM Power Amplifiers Sales and Service



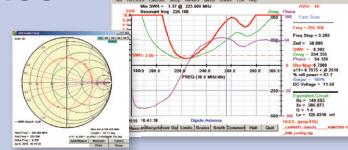
### Switches for Six Antennas



### VNAuhf Back in Stock!

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5 kHz - 1.3 GHz \$1295



16 Terminal Cable Arrestor

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### StackMatch

### The Shared Apex Loop Array™!

Capture the whole band or the whole HF spectrum at once with the Shared Apex Loop Array 2nd Generation. Can be remote controlled over the internet or in your station. 8 directions of directivity.



The Shared Apex Loop Array™ is a revolutionary receiving antenna that will change the way that you listen to the radio! The patented design provides performance in a size and over a wide range of frequencies that will please both the rag-chewer and DXer alike.

Three models to choose from:

- AS-SAL-30 - optimized for VLF, BCB, 1.8-10 MHz
- AS-SAL-20 - optimized for BCB, and 1.8-30 MHz
- AS-SAL-12 - optimized for 3-30 MHz



### PowerMaster II



RF Power and SWR meter. Couplers for 3 kW, 10 kW or higher available for HF/6 m. VHF and UHF couplers for 1.5 kW. You can connect up to 5 couplers to the display to monitor RF power on different TX lines.



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### IC-9700 | All Mode Tri-Band Transceiver

- VHF/UHF/1.2GHz • Direct Sampling Now Enters the VHF/UHF Arena • 4.3" Touch Screen Color TFT LCD • Real-Time, High-Speed Spectrum Scope & Waterfall Display • Smooth Satellite Operation



### IC-718 | HF Transceiver

- 160-10M\*\* • 100W • 12V operation • Simple to use • CW Keyer Built-in • One touch band switching • Direct frequency input • VOX Built-in • Band stacking register • IF shift • 101 memories



### ID-5100A Deluxe

#### VHF/UHF Dual Band Digital Transceiver

- Analog FM/D-Star DV Mode • SD Card Slot for Voice & Data Storage • 50W Output on VHF/UHF Bands • Integrated GPS Receiver • AM Airband Dualwatch



### IC-7851 | HF/50MHz Transceiver

- 1.2kHz "Optimum" roofing filter • New local oscillator design • Improved phase noise • Improved spectrum scope • Dual scope function • Enhanced mouse operation for spectrum scope



### IC-705 | HF/50/144/430 MHz All Mode Transceiver

- RF Direct Sampling • Real-Time Spectrum Scope and Waterfall Display • Large Color Touch Screen • Supports QRP/QRPp • Bluetooth® and Wireless LAN Built-in



### IC-R8600 | Wideband SDR Receiver

- 10 kHz to 3 GHz Super Wideband Coverage • Real-time Spectrum Scope w/Waterfall Function • Remote Control Function through IP Network or USB Cable • Decodes Digital Incl P25, NXDN™, D-STAR • SD Card Slot for Receiver Recorder



### IC-7100 | All Mode Transceiver

- HF/50/144/430/440 MHz Multi-band, Multi-mode, IF DSP • D-STAR DV Mode (Digital Voice + Data) • Intuitive Touch Screen Interface • Built-in RTTY Functions



### IC-7610 | HF/50 MHz All Mode Transceiver

- Large 7-inch color display with high resolution real-time spectrum scope and waterfall • Independent direct sampling receivers capable of receiving two bands/two modes simultaneously



### IC-2730A | VHF/UHF Dual Band Transceiver

- VHF/VHF, UHF/UHF simultaneous receive • 50 watts of output on VHF and UHF • Optional VS-3 Bluetooth® headset • Easy-to-See large white backlight LCD • Controller attachment to the main Unit



### IC-7300 | HF/50MHz Transceiver

- RF Direct Sampling System • New "IP+" Function • Class Leading RMDR and Phase Noise Characteristics • 15 Discrete Band-Pass Filters • Built-In Automatic Antenna Tuner



### IC-2300H | VHF FM Transceiver

- 65W RF Output Power • 4.5W Audio Output • MIL-STD 810 G Specifications • 207 alphanumeric Memory Channels • Built-in CTCSS/DTCS Encode/Decode • DMS

### ID-4100A | VHF/UHF Dual Band Digital Xcvr

- Compact, Detachable Controller for Flexible Installation • DV/FM Near Repeater Search Function • Apps for iOS™ and Android™ devices • Wireless Operation with VS-3 & UT-137 Bluetooth® Headset & Module • MicroSD Card Slot



### IC-V86 | VHF 7W HT

- 7W Output Power Plus New Antenna Provides 1.5 Times More Coverage • More Audio, 1500 mW Audio Output • IP54 & MIL-STD 810G-Rugged Design Against Dust & Water • 19 Hours of Long Lasting Battery Life • 200 Memory Channels, 1 Call Channel & 6 Scan Edges



### IC-R30 | Digital/Analog Wideband Xcvr

- 100 kHz to 3.3 GHz Super Wideband Coverage • P25 (Phase 1), NXDN, dPMRTM, D-STAR Mode • 2.3" Large LCD Display & Intuitive User Interface • MicroSD Card Slot for Voice & Data Storage • USB Charging & PC Connection



### ID-52A | VHF/UHF D-STAR Portable

- Bluetooth® Communication • Simultaneous Reception in V/V, U/U, V/U and DV/DV • Enriched D-STAR® Features Including the Terminal Mode/Access Point Mode • UHF (225~374.995MHz) Air Band Reception

This device has not been approved by the F.C.C.

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**NEW**

### FTDX101MP | 200W HF/50MHz Transceiver

- Hybrid SDR Configuration • Unparalleled 70 dB Max. Attenuation VC-Tune • New Generation Scope Display 3DSS • ABI (Active Band Indicator) & MPVD (Multi-Purpose VFO Outer Dial) • PC Remote Control Software to Expand the Operating Range • Includes External Power With Matching Front Speaker



**NEW**

### FTDX10 | HF/50MHz 100 W SDR Transceiver

- Narrow Band and Direct Sampling SDR • Down Conversion, 9MHz IF Roofing Filters Produce Excellent Shape Factor • 5" Full-Color Touch Panel w/3D Spectrum Stream • High Speed Auto Antenna Tuner • Microphone Amplifier w/3-Stage Parametric Equalizer • Remote Operation w/optional LAN Unit (SCU-LAN10) • This device has not been approved by the FCC.



### FT-991A | HF/VHF/UHF All Mode Transceiver

- Real-time Spectrum Scope with Automatic Scope Control • Multi-color waterfall display • State of the art 32-bit Digital Signal Processing System • 3kHz Roofing Filter for enhanced performance • 3.5 Inch Full Color TFT USB Capable • Internal Automatic Antenna Tuner • High Accuracy TCXO



**NEW**

### FTDX101D | HF + 6M Transceiver

- Narrow Band SDR & Direct Sampling SDR • Crystal Roofing Filters Phenomenal Multi-Signal Receiving Characteristics • Unparalleled - 70dB Maximum Attenuation VC-Tune • 15 Separate (HAM 10 + GEN 5) Powerful Band Pass Filters • New Generation Scope Displays 3-Dimensional Spectrum Stream



### FT-891 | HF+50 MHz All Mode Mobile Transceiver

- Rugged Construction in an Ultra Compact Body • Stable 100 Watt Output with Efficient Dual Internal Fans • 32-Bit IF DSP Provides Effective and Optimized QRM Rejection • Large Dot Matrix LCD Display with Quick Spectrum Scope • USB Port Allows Connection to a PC with a Single Cable • CAT Control, PTT/RTTY Control



**NEW**

### FT-300DR | C4FM/FM 144/430MHz Dual Band

- 50W Reliable Output Power • Real Dual Band Operation (V+V, U+U, V+U, U+V) • 2-inch High-Res Full Color TFT Display • Band Scope • Built-in Bluetooth • WIRES-X Portable Digital Node/Fixed Node with HRI-200



### FT-2980R | Heavy-Duty 80W 2M FM Transceiver

- Massive heatsink guarantees 80 watts of solid RF power • Loud 3 watts of audio output for noisy environments • Large 6 digit backlit LCD display for excellent visibility • 200 memory channels for serious users



### FT-7250DR | C4FM/FM 144/430MHz Dual Band

- 50 Watt Mobile • System Fusion-II Compatible • Operates Advanced C4FM Digital & Conventional FM Modes • 3 Watt Powerful & Clear Audio with Front Speaker



### FT-400XD | 2M/440 Mobile

- Color display-green, blue, orange, purple, gray • GPS/APRS • Packet 1200/9600 bd ready • Spectrum scope • Bluetooth • MicroSD slot • 500 memory per band



### FT-70DR | C4FM/FM 144/430MHz Xcvr

- System Fusion Compatible • Large Front Speaker delivers 700 mW of Loud Audio Output • Automatic Mode Select detects C4FM or Fm Analog and Switches Accordingly • Huge 1,105 Channel Memory Capacity • External DC Jack for DC Supply and Battery Charging



### FT-3DR | C4FM/FM 144/430 MHz Xcvr

- High Res Full-Color Touch Screen TFT LCD Display • Easy Hands-Free Operation w/Built-In Bluetooth Unit • Built-In High Precision GPS Antenna • 1200/9600bps APRS Data Communications • Simultaneous C4FM/C4FM Standby • Micro SD Card Slot



### FT-65R | 144/430 MHz Transceiver

- Compact Commercial Grade Rugged Design • Large Front Speaker Delivers 1W of Powerful Clear Audio • 5 Watts of Reliable RF Power Within a compact Body • 3.5-Hour Rapid Charger Included • Large White LED Flashlight, Alarm and Quick Home Channel Access



### FT-60R | 2M/440 5W HT

- Wide receiver coverage • AM air band receive • 1000 memory channels w/alpha labels • Huge LCD display • Rugged die-cast, water resistant case • NOAA severe weather alert with alert scan



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