

PVRC Newsletter

April 2019

Newsletter Editor: John K3TN 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 – Tom K3AJ

Some awards recognize the order of finish in a competition. Some awards recognize the accomplishment of some goal or milestone. For most of us whose are not likely to find ourselves at the top of the podium, we compete for personal reasons – for the love of the game, the satisfaction that comes from improving our performance and for achieving personal goals.

Awards, particularly those in the second category of reaching a goal or milestone can be motivating. The award gives us something to work for, and its presentation represents public acknowledgement by our peers that we have accomplished something worthwhile. The physical token – trophy, plaque or certificate – is a reminder of what we have achieved.

In radiosport, the contest sponsors do a good job of providing awards and recognition to contest winners. PVRC provides the opportunity for all of us to work toward awards based on accomplishments that are under our own control. The 5 Million Award is a brilliantly designed tool for recognizing the long-term accumulation of contest participation and scores. Since for some, the journey to 5 Million is a long one, a few years ago we introduced 1 Million to 4 Million Progress Awards to mark the milestones along the way to 5 Million. In 2018 and again in 2019, we are running the PVRC Olympics. The Olympics sets forth goals not only for on the air participation, but also rewards participating fully in the life of PVRC through attending meetings and events and doing other things to support the club. Unlike the 5 Million Award, which is a cumulative lifetime achievement award, the PVRC Olympics start fresh each year.

One thing in common across both the 5 Million and Olympics award programs: these awards incentivize turning in more and bigger scores for PVRC in club competition. While some of us may not be able to compete for the top spots as individuals, when we compete as part of PVRC we are part of a world-class team and can take pride in our many wins as a club.

PVRC receives awards from contest sponsors each year for wins in club competition. You may not be aware of what becomes of those awards. Upon receipt of each award, the officers review who turned in scores in that contest and decide who will be given the award in recognition of their contribution. But we don't just give the award to the high scorer every time. We look down the list to see who has been recognized before and who may have done something noteworthy to deserve recognition this time around. Look elsewhere in this issue of the Newsletter for recent club competition award winners, and we will continue to post those awards each month.

73 and Go PVRC! Tom K3AJ

Recent Club Competition Awards – Tom K3AJ

The following awards received by PVRC for victories in club competition have been presented to members making significant contributions to those wins:

- 2017 ARRL Sweepstakes – Barry WR3Z
- 2017 ARRL 160M Contest – Bud, W2RU
- 2017 ARRL 10M Contest – Vasiliy, K3ZU
- 2017 WAE DX Contest – Rol, K3RA

Doug AA3S Receives PVRC President’s Leadership Awards – Zory KB3VQC



Then-President Bud W3LL presents the PVRC President's Leadership Awards plaque to Doug Hart (AA3S) for his outstanding effort in helping to revitalize the Laurel chapter of PVRC. Presented at the Nov. 2018 meeting of the chapter. (Photo by Zory KB3VQC)

PVRC Officers:		Trustees:
President:	K3AJ Tom Valenti	K3MM, N3OC, WX3B, W4ZYT, N4NW, K2AV, K4ZA, W3TB, K3ZO, K2PLF, W3LPL, N4MM, N4ZR, W3MSH, N4NQY, W2RU, K3WRY
Vice President:	N4GU Mike Barts	
Vice President:	W3MMM Jay Horman	
Secretary:	N3QE Tim Shoppa	
Treasurer:	K2YWE Dan Zeitlin	PVRC Charter Members (all SK):
		W3GRF, W4AAV, W4KFC, N0FFZ, W4LUE, W7YS, VP2VI/W0DX, W3IKN, W4KFT
<p>Newsletter Editor: John K3TN jpescatore@aol.com PVRC Website: http://www.pvrc.org PVRC Meeting Info: http://www.pvrc.org/chapters.htm PVRC on Facebook: https://www.facebook.com/groups/PotomacValleyRadioClub/</p>		

Mystery UHF Connectors – Hal N4GG

(Editor's note: this piece is part of Hal N4GG's "Around the Shack" monthly series and has previously run in the FLARC and SEDXC newsletters)

"You get what you pay for" is certainly true when it comes to UHF connectors, including PL-259s, SO-239s, UG inserts, barrels, etc. Every hamfest seems to have at least one vendor selling "mystery" UHF connectors. Often these are found in the flea market, but they are sometimes sold inside by reputable vendors. Mystery PL-259s cost as little as \$1.

What are you buying when you spend \$1 for a PL-259? Nobody knows. Even the seller in the flea market doesn't know – he just knows its "great stuff." Without a doubt it's not.

PL-259s are simple enough, right? What could go wrong? A lot can go wrong. PL-259s have four parts: The outer sleeve called the "knurled nut," the connector body, the insulator/dielectric and the center pin. All four components can be compromised to the point of making a bargain connector useless.

Here are frequently encountered problems:

Finish – Bargain connectors sometimes have a finish you can't solder to. The non-solderable ones often have a chrome-like appearance, but some that look good are in fact impossible to solder to.

Threading – The internal threads at the tail of a PL-259 are there to accept a UG-style insert, used to narrow the connector barrel to accept smaller-diameter coax such as RG-8X or RG-59. The threads on a PL-259 and/or a UG insert may be metric! Some bargain PL-259s will not accept an English thread (the US standard) UG insert. The knurled nut may also be metric.

Dielectric – Good connectors use quality phenolic or Teflon insulation between the center pin and the body. Bargain connectors might use anything, including materials like polystyrene, which will melt when the center pin is soldered.

Center pin diameter: This is one of the most common and insidious problems in mystery PL-259s. The center pin OD is often slightly smaller than it should be, and it's hard to notice. The center pin connection between a PL-259 and an SO-239 or barrel connector depends on correct diameters of the pin on the male plug and the mating fingers on the female socket. The fingers on the SO-239 socket must be made of the proper spring material (beryllium copper).

In addition to mystery SO-239s in which the center pin spring tension relaxes over time and/or temperature, the annulus flange that mates to a PL-259 may only have four indentations ("Four cuts" or "Four V" in connector lingo) to match up with the nipples on the body of the male connector. The SO-239 and barrel connectors I prefer have indentations all the way around the circumference ("Sixteen cuts" or "Sixteen V"). It is nearly impossible to mis-mate a quality PL-259 to a sixteen cut SO-239 or barrel connector.

With poor quality components, PL-259-to-SO-239 connections can become intermittent over time. They also become temperature sensitive when used outdoors. At N4GG I have had to replace several mystery PL-259s in the back yard that would be fine most of the time, and an open circuit on a cold day. I have had A LOT of intermittent linear amplifiers on the repair bench at N4GG. One particular amp manufacturer uses dismal quality SO-239s for the RF input and output connections and the spring tension is so bad – even when brand new – that they simply have to be replaced. You can tell bad ones

quickly – slide a PL-259 into an SO-239. It should fit snugly. If it doesn't, one side or both sides are most likely junk.

As bad as mystery PL-259 and SO-239 connectors can be, there is something worse. The really bad actors are Tee and right-angle (elbow) UHF adapters. Take a close look at what has to happen inside these adapters. The center conductor has to make a right angle turn inside the shell. How do they do that? In poor adapters the right-angle connection is done with a spring contact, and these do not hold up – particularly at QRO power. Quality Tee and right-angle adapters have internal conductors that are tapped and threaded. The male side center conductor is screwed into the female side(s) within the body at the right-angle junction. Adapters made this way are very reliable.

How can we tell the good connectors from the junk? Price, for one. If the price is too good to be true, it probably is. Finish is another tip-off. PL-259s with good silver plating have a dull appearance. Last but not least is the fact that all mystery UHF connectors have one thing in common: Mystery! Good connectors have a part number and the manufacturer's name stamped onto them. You can look up the connector's specifications if it's marked. Examples of this are connectors made by Amphenol, all of which have part numbers stamped onto or into the connector body. Old-timers are fond of saying: "Amphenol or not at all," although there are now other suppliers offering quality connectors. For the difference of a dollar or two, "mystery" UHF connectors are a very poor investment.

Note: The above is paraphrased from an article I wrote for the March/April 2017 issue of NCJ magazine, and some of the material appears in the 20th edition of the ARRL Handbook. It is used here with permission of ARRL. Sadly, there has been a new development since I wrote this in 2017.

My advice in 2017 was to look for PL-259s, SO-239s, etc. that are marked. "Amphenol or not at all" has always been a safe bet and all of their connectors are marked. They are worth an extra dollar or two. Some Amphenol PL-259s come in a sealed bag filled with dry nitrogen. NOS (new-old-stock) Amphenol connectors in sealed bags can still be found with a little looking. Ones from the 1960s and 1970s are as-new as they come out of the bag.

The bad news: Beginning in 2017 a new offering of rogue UHF connectors appeared at the Dayton hamfest - ones made in China and **marked** Amphenol. They **are not** Amphenol and they fall squarely in the junk category.

How to identify a phony "Amphenol" PL-259:

1. With a wet finger you can rub the marking off. I guess junk connectors deserve junk ink!
2. The center pin on an authentic Amphenol PL-259 is molded into the center insulator. Look inside one of the phonies and you will see the inside-the-barrel end of the center pin is square, and obviously crimped to the center insulator. You can sometimes twist the center pin with your fingers.
3. The price is too low.

In the original article I also mentioned there are some perfectly good UHF connectors that are not branded, but, also, not mysterious. Two sources for excellent UHF connectors that are manufactured specifically for the houses that sell them are:

- "MAX-GAIN Systems, Marietta, GA. WWW.MGS4U.COM Known for fiberglass poles and push-up masts, MAX-GAIN also sells a variety of UHF and other connectors. MAX-GAIN's PL-259s are silver plated brass with a high quality Teflon center insulator - that's as good as it gets.

- "[The RF Connection](#)" Gaithersburg, MD. In addition to their in-house UHF connectors, which are excellent, they carry Amphenol connectors and have a good stock of NOS Amphenol as well.

Both vendors' connectors are manufactured for them, to high-quality specifications. You can call either company and the principals can tell you everything there is to know - dielectric type, center pin ID and OD, plating, etc. There is no mystery involved!

One additional note: Given a choice, I avoid gold-plated UHF connectors. Gold does not tarnish and maintains its solderability forever, but gold-plating is often found on mystery connectors and silver is a better conductor than gold.

It's the seemingly mundane parts '*Around the shack*' that cause a lot of problems!



Figure 1. An Amphenol PL-259 in an Amphenol bag. The bag and connector are both marked. You can't go wrong here.



Figure 2. Examples of Amphenol PL-259 connectors. The left one is marked in ink, the center and right one have their markings stamped into the body. All carry both the name of the manufacturer and a part number. The inked PL-259 is an authentic Amphenol.



Figure 3. An Amphenol and an unmarked PL-259. The unmarked part was bought from MAX-GAIN and is known to be an excellent product.



Figure 4. An Amphenol UG insert. Note, the part number is stamped into the part and the finish is dull – it's silver plated, top quality.



Figure 5. SO-239s. The one on the left is an old Amphenol that is clearly marked. The marks include the manufacturer, the type and the part number – there is zero mystery about what this is. The one on the right is a “mystery” connector. The old Amphenol fits tightly with a PL-259 and is perfectly serviceable. The nice shiny brand new one on the right is junk – a PL-259 slips into it so easily the connection is intermittent.

Sixty Years On – Pete N4ZR

In 1959, I was a senior in high school, licensed as W8QZR, and Linn Hobbs, then K8BQD, was a freshman. We operated together for one weekend of the ARRL CW DX Contest (it was two weekends in those days). Those of us who are old enough will recall that 1959 was right after the highest solar maximum in recorded history.

Here we are in 2019, edging toward the lowest solar minimum in recent history, and Linn (now W1LWH, a professor emeritus at MIT) suggested that we reprise our 1959 collaboration. And so we did. He drove down from the Boston area, and we used my station (with the addition of a 40m full-wave sloper with parasitic director that he'd built) in this year's CW DX Contest weekend.

What a difference 60 years makes. In 1959, we used my RME-4350A receiver, with a Heathkit Q-multiplier for what little selectivity we had. The transmitter was a Heathkit DX-35, driving a single 813 Class C amp that Linn had built to about 500 watts input (nobody measured output in those days except the professionals). Our only antenna was a 20m quad about 40 feet up, which unfortunately was resonant at about 14.5 MHz – you see, this was before W6SAI published the fact that quad loops needed to be a little longer than earlier thought.

I have no idea what our score was, and the log is long gone, but my most vivid memory was when we destroyed the tube-based TR switch we were using for QSK. The RG-8 coupling capacitor arced and completely obliterated the 6AH6 tube in the TR switch. It was quite a memorable flash-bang, and we couldn't even find pieces of the tube.

Fast-forward to 2019. It's been quite a 60 years, but fortunately we can still send and receive CW. The transceiver is an updated K-3, driving a brand-new KPA-1500 amp. Antennas are a C-3 at 50 feet, a Carolina window with the feedpoint at only 25 feet, and the 40m parasitic sloper. Linn fortunately brought along a hefty capacitor and inductor and fabricated an L network so that we could drive the sloper on 160 (where it functioned as a quarter-wave sloping off-center-fed radiator). It worked surprisingly well, even though we had no other receive antennas.



We had a great time! Linn (on the right) took this selfie of the two of us right after the contest ended, and you can see how happy and tired we were. 40 hours (in laid-back shifts), 2.2 million points. 105 countries on 20, 31 on 160.

New Technology Removes the Tedium of Contesting – Jim N3JT

(Note: this article also appears in the April issue of CQ Magazine)

Competitive contesting today increasingly involves using techniques not commonly available even a decade ago. SO2R, which permits a single operator to simultaneously use two radios and two antennas, is an example. QSO rates for those adept at this are impressive, but it requires considerable practice to master. Some do it very well. But for multi-operator situations, a different set of approaches is used. Those stations typically have multiple antennas, with one antenna dedicated to each operator position, though sometimes with a second person listening on a separate receiver for multipliers. It is now even possible to use the same antenna, like a tribander, on three different bands by three operators at the same time. Filters with steep bandpass skirts are used, though reportedly there are some noise and artifact issues.

The latest idea now under development, which should eliminate these problems, involves application of principles of sampling that have been used in telegraph, telephone and data networks for a long time. It is referred to as Time Division Individual Unlimited Multiplexing, or TDIUM.

When applied correctly, TDIUM supports the following: A single-band antenna with multiple users (operator and spotter); a tri-band antenna with multiple users (and spotters); multiple antennas with multiple users. All of these are possible because time slots are assigned to each transceiver and synchronized so that no transmitter emits during a listening slot. Because the sampling is done so quickly, no operator is even aware that there is another signal on the same antenna. Of course, more than one transmitter on a band-mode is not generally acceptable in most contests, so the practical utility of TDIUM lies in using multiple antennas (even a tribander) with multiple operators and spotters without mutual interference.

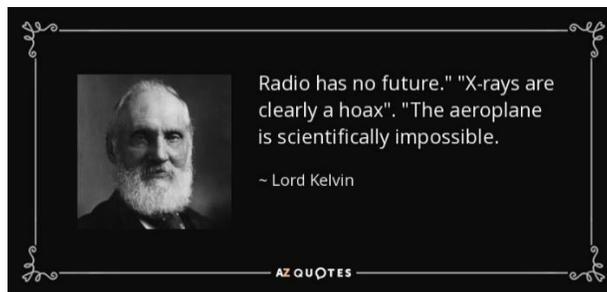
Basically, each antenna-radio path is sampled at a sufficiently fast rate to permit transfer of the communications content seamlessly, for both send and receive. The sampling is referred to as the Nyquist Interval (later proved by Shannon) and is equal to the reciprocal of twice the highest frequency component of the sampled signal. The communications path (cables) must be capable of transporting this bandwidth, but as you'll see this is not a problem in the typical ham radio shack.

As a basic example of how this works, consider that two voice signals can be transmitted along a single pair of wires by switching in a synchronized way between the two users at 6 kHz, with 3 kHz being the highest frequency component of typical human voice transmission. The path, meaning the cables and wires, all have a bandwidth of at least 6 kHz. This can be applied to more than two users, which is where it gets interesting. The sampling rate then must be increased linearly so that 4 users would need 24 kHz, and so on.

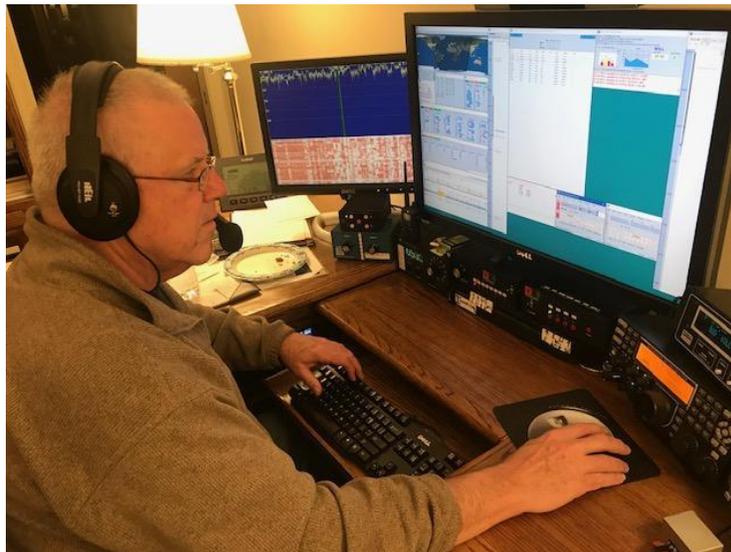
The SSB operation may be intuitive, but how does TDIUM apply to CW? At 30 wpm there are 150 characters/minute, or 2.5 characters per second (cps). If we digitize CW we need to accommodate at least 36 characters (plus punctuation, etc.). This means we need 2^6 different values, or 6 bits per character, which translates to 15 bps at 30 wpm, meaning a 30 Hz bandwidth would be sufficient. Two operators could share one antenna (two bands on a tribander, or an operator and spotter on the same band) using a CODEC cable of also sampling at 60 Hz. To be safe and avoid artifacts, let's assume we sample at 3 kHz. In the TDIUM application for the shack the existing cables would more than suffice for this bandwidth under the Nyquist Interval criterion. A CODEC may soon be available to handle this encoding, too.

Imagine what this all means. At our future HF contest station, we will have a tribander and separate antennas for 40, 80 and 160m. There will also be a receive antenna for 160m. With TDIUM it will be possible to have 12 operators actively sending, receiving and searching for multipliers on all 6 bands, two per band, meaning 12 transceivers (or VFOs in transceivers with second receivers) – all without any problem of mutual noise or interference. For Field Day it means using multiple modes on the same band with the same antenna! Each antenna feed will of course have to be able to handle the transmit power, but that is already done with sturdy vacuum switches in other applications.

The notion of TDIUM is upon us, and soon the contesting world will be better than we have imagined it, with room for more operators and more active stations at a given location. It is not folly to think that with this system most stations in a contest can be worked in a shorter period of time, leaving Sunday afternoon for viewing sporting events or joining the family instead of passing the day suffering the tedium of calling incessant CQs!!



NX3Z At W3LL in the ARRL DX SSB Contest – Bud W3LL



Jim NX3Z is my close neighbor.

Once Again, Fred K3ZO Comes In First – With 3 QSOs! – Dan K2YWE

K3ZO and his First Place North America Padang DX (YB) Contest plaque at the Annapolis chapter meeting. Fred won the prize by making three contacts. It doesn't sound like much, but it is. Many of us haven't made that many YB contacts over a period of years!



Fred noted: "It illustrates once again the usefulness of submitting logs, no matter how small, to the sponsors of any contest that you enter, and to check regularly at WA7BNM to see what contests are out there. I happen to be especially interested in Southeast Asian contests given my long association with Thailand. The only contacts I made in this contest were on 40 meters -- as far as I could tell it was the only band open to the area - and conditions were not good, but that happens to be the favorite band for the Indonesians.

The fact that hams have performed well in the aftermath of the frequent natural calamities buffeting Indonesia has made Amateur Radio a very popular pastime in that country. The current President of Indonesia is YD2JKW and the Vice-President of the country is YC8HYK. As the ham population has grown the Indonesian hams have discovered contesting, and some local and regional clubs there are now sponsoring DX contests."

Support Our Newsletter Advertisers!













Another “The Way We Were” Entry – Dick WN3R

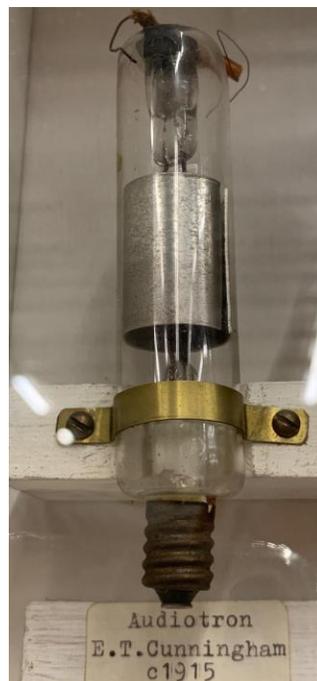


K3DML and K3NFU ran the ham radio classes at Camp Comet in Waynesboro, Pa. We licensed 15-20 kids each year for 3 years. Camp Comet had all of the camp activities plus others which focused on the arts and sciences. Camp Wohelo was the girls camp across the pond.

The old camp was sold and is now called Capital Camps. Sadly, no ham radio.

1915 Audiotron Vacuum Tube – John N3AM

There’s an interesting Wiki article [here](#) on E. T. Cunningham, the manufacturer of this tube.



Ted N9NB 5M Plaque Award at FrostFest – Anthony WM3T



(L-R) Tim N3QE, Tom K3AJ, Anthony WM3T, Ted N9NB, Mike N4GU, Jay W3MMM

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 and Log Due Dates

Contests This Month

- Apr 6 – SP DX
- Apr 6 - EA RTTY
- Apr 13 – Yuri Gagarin DX
- Apr 13 – JIDX
- Apr 20 – YU DX
- Apr 27 – Helvetia DX

Logs Due This Month

- Apr 5 – CQ WPX SSB
- Apr 15 – UBA Spring

See WA7BNM's [Contest Calendar](#) for more detail and the latest information.

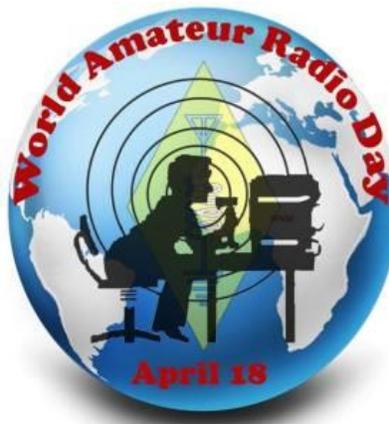
Editor's Last Word – John K3TN

Thanks to Hal N4GG, Pete N4ZR, Zory KB3VQC, Jim N3JT, John N3AM, Dan K2YWE, Dick WN3R and Bud W3LL for contributions to the PVRC newsletter. We have an amazing array of operating, technical, writing and photography skill across the club!

For those of you going to Dayton/Xenia in May, Ed W0YK has asked me to do a presentation on the controversial topic of “The Future of FT8 in Contesting” as part of his Friday morning “Digital Contesting Forum” (I think it shows up as RTTY Contesting right now. No matter how you feel about FT8, the level of activity on that mode is staggering. I had input from Joe K1JT (FT8 inventor) and RTTY/FT8 contesters like Dave K6LL, Don AA5AU, Steve N8BJQ and many others. Come and hear the discussion and then make your feelings known to the contests sponsors one way or the other – they will make the final decisions.

Spring has sprung – time to shift the coax from the 160 T antenna to the 6 meter beam and swap the positions of the snow blower and the lawn tractor in my garage and shed – and start thinking about Field Day. The PVRC/CARA W3AO operation will have a temporary location this year and I'm thinking investigating some new territory as well – maybe a maritime mobile operation from the Chesapeake Bay!

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](mailto:jpescatore@aol.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.

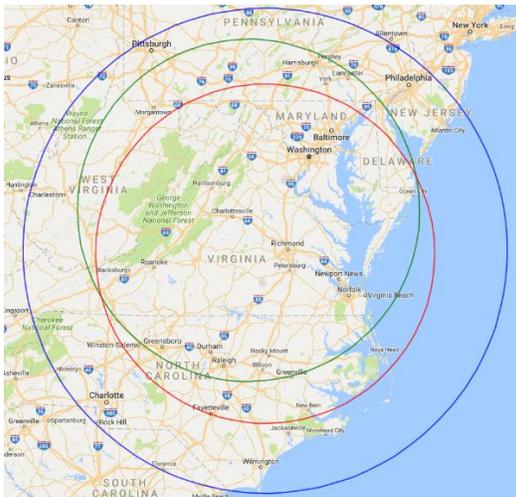
Direct donations to PVRC via Credit Card or PayPal may be made by clicking this "Donate" button and clicking the next Donate button that appears on your screen:



Donations to PVRC are not tax deductible

Eyeball QSO Directions

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](#).



Green: ARRL VHF Circle
175 mile radius
Around 38.075N,
78.171W

Red: ARRL HF Circle
175 mile radius
Around 37.43168N,
77.858482W

Blue: CQ HF Circle
250 mile radius
Around 37.43168N,
77.858482W



Now a Word From Our Sponsors

PVRC doesn't ask for dues, but the Club does have expenses. You can also support the Club by buying from the firms listed who advertise in the newsletter!



Your source for DX News!

Get a free two week trial of The Daily DX and The Weekly DX by sending a request to bernie@dailydx.com.

The Daily DX
3025 Hobbs Road
Glenwood, Maryland 21738
Phone: 410-489-651



PVRC QSL Cards
by
LZ1JZ QSL Print



GREEN HERON ENGINEERING LLC

(585) 217-9093
www.greenheronengineering.com

RT-21 DIGITAL ROTATOR CONTROLLERS
Unmatched Performance for any Rotator

RT-21



RT-21D



RT-21 AZ/EL



Rotator Packages



FREE Shipping for PVRC Members
At Checkout Enter Coupon Code "PVRC"

Heavy Duty Custom Mast Clamps
-for G-2800 and Orion



Wi-Fi Option
-control your rotator from any web browser device

GH EVERYWARE WIRELESS CONTROLS

- Internet access for switches and rotators
- Eliminate cables and tethered control boxes
- Create customized on-screen controls
- Great circle maps

GH Everywhere Base and Remote

- USB and wireless relay controls
- Utilizes your existing antenna switches

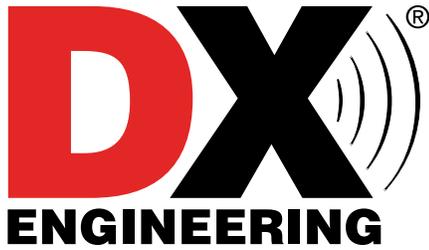


Select-8 Wireless Remote Coax Switch

- Built-in GHE Wireless
- Powered through the coax
- Tower leg Mount
- Amphenol RF connectors





Showroom Staffing Hours:
9 am to 5 pm ET, Monday-Saturday

Ordering (via phone):
8:30 am to midnight ET, Monday-Friday
9 am to 5 pm ET, Weekends

Phone or e-mail Tech Support: 330-572-3200
8:30 am to 7 pm ET, Monday-Friday
9 am to 5 pm ET, Saturday
All Times Eastern | Country Code: +1
DXEngineering@DXEngineering.com

800-777-0703 | DXEngineering.com

Get Your Shack Ready for Spring with DX Engineering!

YAESU



New Yaesu SDR Transceivers

The FTdx-101D 100 W and FTdx-101MP 200 W transceivers come with leading-edge hybrid SDR technology and a host of other perks: 160-6 meter coverage, real-time waterfall and spectrum scopes, and two independently controlled receivers. Both models deliver superb close-in dynamic range performance. Enter "FTDX" at DXEngineering.com.

ICOM



IC-9700 VHF/UHF/1.2 GHz Transceiver

Built for those who relish the rewards of VHF/UHF weak-signal operating, ICOM's new IC-9700 delivers the goods. The rig supports CW/AM/SSB/SM/RTTY/FM and D-STAR DV and Digital Data modes. A must for Amateur Radio satellite enthusiasts, order yours today! Enter "9700" at DXEngineering.com.

DX ENGINEERING



Your Trusted Source for Coax and Tool Kits

Purchase low-loss [cable assemblies](#) in standard lengths with DX Engineering's patented [PL-259 connector](#). Use the online [Custom Cable Builder](#) at DXEngineering.com to build assemblies made to your exact specs. Coaxial cable is also available by the foot or in bulk spools. For do-it-yourselfers, prep and install connectors with complete kits that include everything you need. Individual tools also sold separately.



DX ENGINEERING

Free Standard Shipping for Orders Over \$99*

If your order, before tax, is over 99 bucks, then you won't spend a dime on shipping. (Additional special handling fees may be incurred for Hazardous Materials, Truck Freight, International Orders, Next Day Air, Oversize Shipments, etc.).



YAESU ICOM KENWOOD ALINCO

Check Out DX Engineering's Facebook Page and YouTube Channel! Stay connected: Email Support 24/7/365 at DXEngineering@DXEngineering.com

Array Solutions Your Source for Outstanding Radio Products

Professional Grade Equipment from Array Solutions



JK Antennas Are Now Sold by Array Solutions

NEW!

High Quality HF Antennas for the Contester and DXER. We Focus on Quality and it Shows in Everything We Do. Call or email for antenna systems.



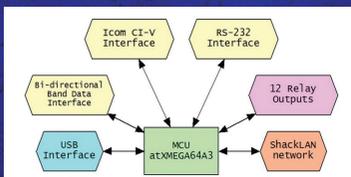
Announcing the new BM-5 BandMaster V

The next generation of the popular BM-3 with direct USB support for FLEX Radios

NEW!



The BM-5 BandMaster V is a full featured unit that contains a universal band decoder and antenna switch controller. It features five communication channels. All channels are active simultaneously and provide data translation for your station accessories. In other words, if you are using an Icom radio on the CI/V interface the BandMaster V will output 4-bit band data as well as RS-232 data in Yaesu or Kenwood format. In reverse, when using a radio on the RS-232 interface the BandMaster V will output 4-bit band data as well as an Icom CI/V data stream. The USB interface may be connected to your PC for radio control. **The USB interface may be connected directly to a Flex SDR with no additional cables or interfaces required.**



RatPack Remote Antenna Switch

Six antenna remote switch with rotary switch controller. Push button controllers available. HF and 50 MHz. Power rating is 5 kW CW.



StackMatch

The original, not the imitations. For phasing 2, 3, 4 and even 6 antennas. Also it can be used to combine vertical and horizontal polarized antennas to diminish fading.



TwoPak

Two antenna switch, 12V DC via wires or optional via coax cable. DC to 150 MHz. HF 5 kW rating. Metal box.

Off-Center Fed Dipole Antenna

AS-OCF-2K, AS-OCF-5K Seven bands antenna (80 to 6 m). Heavy duty materials. 4:1 balun included. Ratings: 2 or 5 kW or higher available.



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.



OM Power Amplifiers, The New RF Power Benchmark!



OM Power Amplifier Sales Program

Lower prices than the competition's equivalents, most modern design, and strongest warranty in the market!

OM4000HF	Manual 160-10 m 4 kW
OM4000A	Automatic 160-10 m 4 kW
OM2500HF	Manual 160-10 m 2.5 kW
OM2500A	Automatic 160-10 m 2.5 kW
OM2000+	Manual 160-6 m 2 kW
OM2000A+	Automatic 160-6 m 2 kW

OM Power was founded in 2004 as an initiative of two enthusiastic Slovak ham operators. Since that time OM Power has become a successful and well established company in the production of amplifiers. OM Power amplifiers can be found on all continents and in almost every country of the world. All of the amplifiers have state of the art design, and are solidly built.

The automatic amps can drive an antenna switch of up to 10 antennas and select up to ten bandpass filters applies to all automatic models

OM4000A - OM4000HF OM2500A - OM2500HF

The A-series are automatic band change amplifiers.

The HF-series are manual band change and tuning amplifiers.

OM4000: 4 kW SSB and CW, 3 kW RTTY, AM and FM

OM2500: 2.5 kW SSB and CW, 2 kW RTTY, AM and FM

OM2000A+ - OM2000+

The **OM2000A+** is the lightest and smallest 2000 W fully automatic HF/6 m power amplifier in the market. Its manual tuning version, the **OM2000+**, is our affordable unmatched best-seller.

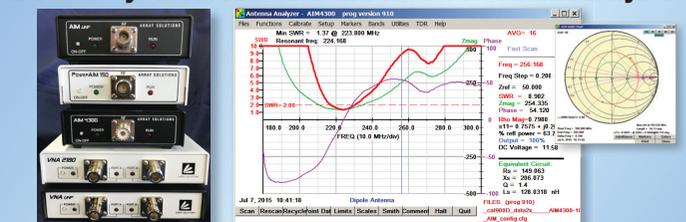
Frequency coverage:

Amateur bands 1.8 - 29.7 MHz including WARC + 50 MHz

Power output: 2000+ W in SSB/CW on HF bands, 1500 W in RTTY
1500 W CW/SSB on 50 MHz



Laboratory Grade Antenna and Vector Network Analyzers



One Port Analyzers and Two Port Vector Network Analyzers ranging from 5 kHz up to 1 GHz

AIM 4300	\$495
AIM UHF	\$695
VNA 2180	\$995
VNA UHF	\$1,295
PowerAim 150 Broadcasting Engineers Choice. 150 V peak RF capable	\$2,495

Surge Arrestors

AS-302, AS-303 Coaxial cable arrestors. DC to 500 MHz. N-type or SO-239 connectors. **AS-300SB** Stacking fixture available. **AS-309H**, ladder line arrestor. All have static bleed function. **AS-8SP, AS-12SP** and **AS-16SP** control cable arrestors. Protect your rotator's and other control cables.



Baluns & RF Transformers

Ratios 1:1, 1:2, 2:1, 4:1 and more. RF line isolators. Ratings 3, 5, 10 kW+. Get the most out of your antenna by stopping the coaxial cable from becoming part of it.



www.arrayolutions.com

2611 North Beltline Rd., Suite 109
Sunnyvale, Texas 75182 USA
sales@arrayolutions.com
Phone 214-954-7140 Fax 214-954-7142

Check our Website for more new products!

Array Solutions' products are in use at top DX and Contest stations worldwide as well as commercial and governmental installations. We provide RF solutions to the DoD, FEMA, Emcomm, UN, WFO, FAA and the State Dept. for products and installation of antennas systems, antenna selection, filtering, switching and grounding. We also offer RF engineering and PE consulting services.

HAM RADIO OUTLET

WWW.HAMRADIO.COM

APRIL IS ICOM MONTH AT HRO!



IC-9100 | The All-Round Transceiver

- HF/50MHz 144/43vuv0 (440) MHz and 1200MHz*1 coverage
- 100W on HF/50/144MHz, 75W on 430 (440) MHz, 10W on 1200MHz*1 • Double superheterodyne with image rejection mixer



Coming Soon!

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-R8600 | Wideband Software Defined Receiver

- 10 kHz to 3 GHz Super Wideband Coverage • P25, NXDN™, dPMR™, D-STAR Mode • Large Dot Matrix LCD Display w/ Quick Spectrum Scope • SD Card Slot • Remote Control Function



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-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



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-7700 | HF/50MHz Transceiver

- The Contester's Rig • HF + 6m operation • +40dBm ultra high intercept point • IF DSP, user defined filters • 200W output power full duty cycle • Digital voice recorder



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-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-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-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



IC-R30 | Digital/Analog Wideband Xcvr

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



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-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

ID-51A PLUS2

VHF/UHF D-STAR Portable

- RS-MS1A, free download Android™ application
- New modes for extended D-STAR coverage • Terminal Mode & Access Point Mode allow D-STAR operation through Internet • DV & FM repeater search function • Dplus reflector link commands



- RETAIL LOCATIONS – Store hours 10:00AM - 5:30PM - Closed Sunday
- PHONE – Toll-free phone hours 9:30AM - 5:30PM
- ONLINE – WWW.HAMRADIO.COM
- FAX – All store locations
- MAIL – All store locations



ANAHEIM, CA
(800) 854-6046

OAKLAND, CA
(877) 892-1745

PORTLAND, OR
(800) 765-4267

PHOENIX, AZ
(800) 559-7388

MILWAUKEE, WI
(800) 558-0411

WOODBIDGE, VA
(800) 444-4799

PLANO, TX
(877) 455-8750

BURBANK, CA
(877) 892-1748

SAN DIEGO, CA
(877) 520-9623

DENVER, CO
(800) 444-9476

ATLANTA, GA
(800) 444-7927

NEW CASTLE, DE
(800) 644-4476

SALEM, NH
(800) 444-0047

ONLINE STORE
WWW.HAMRADIO.COM

HAM RADIO OUTLET

WWW.HAMRADIO.COM

NOBODY BEATS AN HRO DEAL!



FTDX5000MP Limited | 200W HF + 6M Xcvr

- Internal Power Supply • Two Totally Independent Receivers
- Super Sharp "Roofing" Filters • High Performance Yaesu Custom- designed 32-bit Floating Point DSP • True Analog Meter Precision



FTDX3000 | 100W HF + 6M Transceiver

- 100 Watt HF/6 Meters • Large and wide color LCD display • High Speed Spectrum Scope built-in • 32 bit high speed DSP /Down Conversion 1st IF



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



FTDX1200 | 100W HF + 6M Transceiver

- Triple Conversion Receiver With 32-bit Floating Point DSP • 40 MHz 1st IF with selectable 3 kHz, 6kHz & 15 kHz Roofing Filters • Optional FFT-1 Supports AF-FFT Scope, RTTY/PSK31 Encode/Decode, CW Decode/Auto Zero-In • Full Color 4.3" TFT Display



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



FT-857D | Ultra Compact HF/VHF/UHF

- 100w HF/6M, 50W 2M, 20W UHF • DSP included • 32 color display • 200 mems • Detachable front panel (YSK-857 required)



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



FTM-100DR | C4FM FDMA/FM 144/430 MHz Xcvr

- Power Packed System Fusion Transceiver • High Audio Output Power • Rugged Powerful Transmitter • Integrated 66ch High Sensitivity GPS • 1200/9600 APRS Data Communications



FTM-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-2DR C4FM/FM 144/430 MHz Xcvr

- Analog/C4FM Dual Monitor (V+V/U+U/V+U) • System Fusion compatible • 1200/9600 APRS Data Communications • Integrated 66ch High Sensitivity GPS • Wide Band Receiver • Snapshot Picture Taking Capability With Optional MH-85A11U



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 Flash-light, 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



- **RETAIL LOCATIONS** – Store hours 10:00AM - 5:30PM - Closed Sunday
- **PHONE** – Toll-free phone hours 9:30AM - 5:30PM
- **ONLINE** – WWW.HAMRADIO.COM
- **FAX** – All store locations
- **MAIL** – All store locations

YAESU
The radio

ANAHEIM, CA (800) 854-6046	OAKLAND, CA (877) 892-1745	PORTLAND, OR (800) 765-4267	PHOENIX, AZ (800) 559-7388	MILWAUKEE, WI (800) 558-0411	WOODBIDGE, VA (800) 444-4799	PLANO, TX (877) 455-8750
BURBANK, CA (877) 892-1748	SAN DIEGO, CA (877) 520-9623	DENVER, CO (800) 444-9476	ATLANTA, GA (800) 444-7927	NEW CASTLE, DE (800) 644-4476	SALEM, NH (800) 444-0047	ONLINE STORE WWW.HAMRADIO.COM