PVRC Newsletter
April

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 – Mike N4GU

Living in "Interesting Times"

There is an old "Chinese curse" (most likely apocryphal) that goes, "May you live in interesting times". "Interesting times" usually means times of trouble. We are certainly living in those.

Russia's actions in Ukraine have resulted in their exclusion from numerous sports leagues such as most international soccer matches, including World Cup play. The UFEA Champions League final has been moved from St. Petersburg to Paris. Formula 1 racing has scrapped plans for a Grand Prix race in Sochi.

Closer to home, CQWW and WPX contests have announced that all Russian and Belarus entries will be classified as check logs and no points or multipliers will be awarded for contacts with them. The RSGB has ruled similarly for the contests they sponsor.

During the initial days of the invasion, questions arose about PVRC's participation the upcoming Russian DX Contest (RDXC). This has traditionally been a very popular contest in the club and worldwide. Initially, the officers felt that we should take no stand in the interest of avoiding politics and maintaining amateur radio's long-standing purpose of fostering international goodwill. However, as events developed and we received additional feedback from members, the officers re-considered that position and eventually decided to not compete in the club competition of the RDXC and hence not award any points in the 5 Million program to any members who chose to participate.

This will only have a small impact on the 5M program since it is a long term, cumulative award program. It does send a message, however. This decision does, however, impact the current season's Olympics program. Elimination of the RDXC means that there is one less opportunity to achieve medal status this year. To offset the loss of the RDXC, for the Olympics program for this year only, we will count participation in the New England QSO Party (NEQP) in lieu of the RDXC. The requirement for credit is still the same (50 QSOs minimum). To get credit for the NEQP, you must submit your score to 3830scores.com as this will not be tracked using our usual 5M program database.

In other contest news, I am happy to announce that we will award double 5M points for this year's June VHF contest. We have won the Unlimited Category Club Championship in the past, but it has been a few years. We intend to make a concerted effort this year by awarding double 5M points in order to encourage participation. For many folks it's motivation enough to try and win a PVRC Pipe Antenna award (©K3AJ), but hopefully we can encourage a few more to get on with double 5M points.

If you tried to access the PVRC website near the beginning of the month, you may have noticed some issues. Our web hosting site began having problems that resulted in downtime for our website. This wasn't the first time and our internal IT team decided it was time to make a change. Within a couple of days, our website was migrated to a new, better hosting platform and up and running again. I want to thank our volunteer IT team for such a great job. To those on the outside, it was just a couple of days of inconvenience, but behind the scenes, they put in a lot of work moving the website and making things work again. A big thanks to Howie, N4AF, Tim, N3QE, Bob, K4NTO, and Alan, AA4FU, for their hard work keeping us online.

Lastly, with spring poking its head out of the ground that means that Hamvention isn't too far off. It's been a few years and we're looking forward to getting back. PVRC will once again be sponsoring the pizza on Friday night at the Contest Super Suite. Hope to see you there!

73, Mike N4GU

Cherry Blossom Season in the PVRC Region – by John N3AM

FT8 Performance in a Strong Signal/Low Noise Environment – Mike W3IP

Over the last two years, I have been exploring ways to improve reception of weak FT8 signals on 6 meters in the presence of strong local stations operating at the same time. Many of the weak signals I am interested in are transmitted by transient rovers or casually operated small fixed stations located in areas with little 6 meter activity. The signals arrive at my QTH via Sporadic E propagation. To me, it is worthwhile to look carefully at any available means to improve my chances of reception of these signals that are on the air for a very limited period of time.

There are some characteristics of the six-meter band that make it unique. Atmospheric noise is usually lower than the HF bands, enabling reception of weaker signals. Local signals on the other hand can be just as strong as on any of the HF bands.

For this discussion, the software that processes FT8 signals (WSJT-X or JTDX) is considered a fixed resource. It is currently limited by the developers to an input bandwidth of 5 KHz and a maximum dynamic range of 16 bits. To decode the weakest FT8 signals (and accepting a few "bad" decodes along the way), we are using the "deep" option in WSJT-X to initially decode those weak signals.

To start with, weak signal reception on FT8 frequencies can be difficult due to nearby strong signals in the typical 3 KHz pass band. There are widely published suggested standards for when to transmit, optional frequencies for DXpeditions (i.e. Fox/Hound), and secondary frequencies for use when the band is wide open. Despite these suggestions to spread stations out and limit interference, very strong signals often still remain on the same part of the band and limit the ability of a receiver to decode wanted weak signals.

So how bad is the problem? There are several of us in the Greater DC area that are line of sight to other 6-meter stations running KWs and effective antenna systems. Our external noise levels are reasonably low (but always higher than we would like). Signal levels from these stations at my receiver input can be as high as -30 dBm.

The desired weak signals can be as weak as -145 dBm and ideally still be decoded (see the sidebar for signal level derivation). With the presence of a -30 dBm strong signal, a huge dynamic range (123 dB) is required by a receiver and sound card (either inside a PC or the USB Codec located inside a radio).

In practice, the dB signal level reported for each decode by WSJT-X is partially correlated to the calculations in the sidebar. Every signal level report also includes the effects of both external noise, interference, multipath, and statistics, plus the distortions and drift of both transmitter and receiver.

WSJT-X FT8 decoder sensitivity is derived from K9AN, G4WJS and K1JT's paper found at https://physics.princeton.edu/pulsar/k1jt/FT4_FT8_QEX.pdf Table 4 and Figure 7.

Earth based KTB	-174 dBm/Hz
Rx noise figure + external noise	13 dB
FT8 Symbol rate/mod index 6.25 Hz or 8 dB	
Net 6.25 Hz system noise floor	-153 dBm
75% decodeable FT8, Mid disturbed, no AP, 2500 Hz Signal to Noise	-18 dB
2500 Hz noise to 6.25 Hz noise	26 dB
Net signal (carrier) to noise 6.25 Hz BW	8 dB
Net FT8 required signal level	-145 dBm

Building a clean FT8 signal generator

To investigate the interactions of FT8 signals between receiver, sound card/codec, and WSJT-X, I put together a small FT8 signal source for 6 meters from junk box components to create one or more FT8 signals. The junk box transmitter then evolved through several iterations and improvements into an ultra-low noise commercial crystal oscillator found on Ebay and a new custom designed IQ upconverter PC board. This first version creates a single FT8 signal at 3 KHz above 50 MHz. See Figures 1 and 2.

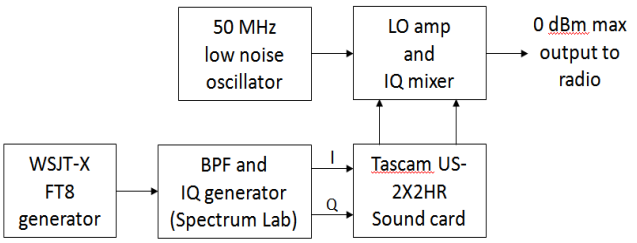


Figure 1 - Block Diagram - FT8 Signal Source

Figure 2 - FT8 Signal Source

The FT8 signal source uses a 50 MHz lab grade Wenzel crystal oscillator which had significantly better composite noise than any amateur transceiver on the market. The IQ mixer was required to reduce the level of the LSB image signal by 30 dB (i.e. 50.000 MHz minus the FT8 audio tone frequency). The resulting output spectrum (through 40 dB of attenuation) is shown in Figure 3.

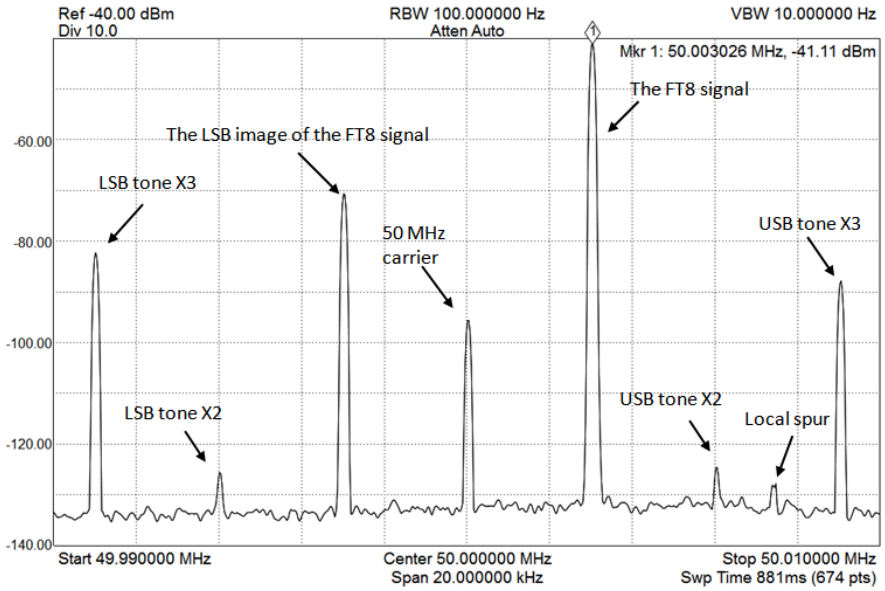


Figure 3 - FT8 Signal Source Output Spectrum through a 40 dB attenuator

FT8 test signal 50.003 MHz
FT8 test signal level -41 dBm

VFO A receive:
K4 tuned frequency 50.003 MHz
K4 receive bandwidth 300 Hz - 900 Hz
Preamp 3 on
DR+ on
AGC slow
RF gain 0
Noise blanker and notch filter OFF
Line out gain - Codec 29
Line out gain - Analog 20

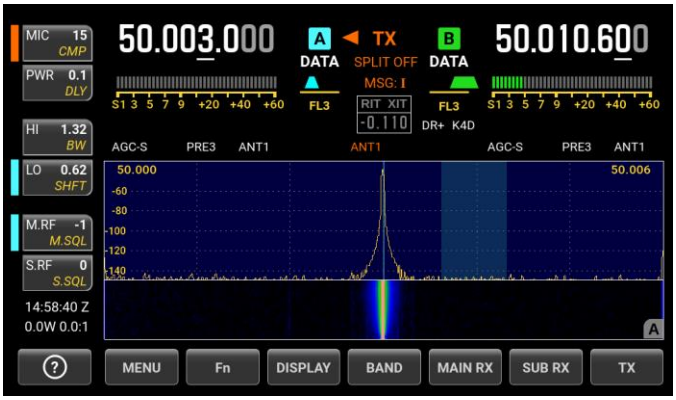


Figure 4 - FT8 Signal Source Output Signals on the K4D

The FT8 signal source was first used to examine a K4 receiver and its internal codec (i.e. sound card). As seen on the spectrum analyzer in Figure 3 and the panadapter on the K4D in Figure 4, the spectrum between the 50.000 MHz carrier and the 50.006 MHz USB tone X2 has only the desired -41 dBm signal visible above the noise floor. The weaker signals seen on Figure 3 will be outside of the receiver pass band and do not adversely affect any measurements. The 2nd receiver (the "B" VFO) is not used during these measurements.

K4D USB receive codec test results

The K4D receiver was configured for normal FT8 data reception. The K4D was tuned so the FT8 signal source was received at the low end of the pass band (at 300 Hz). The resulting audio output spectrum was analyzed by a software program called Spectrum Lab. The result in Figure 5 shows significant harmonic distortion, as high as -55 dBc. That is almost 40 dB above the noise floor, strong enough to interfere with the decoding of many potential weak signals. Figure 6 shows the result when the K4D is tuned so the tone is received at 2000 Hz.

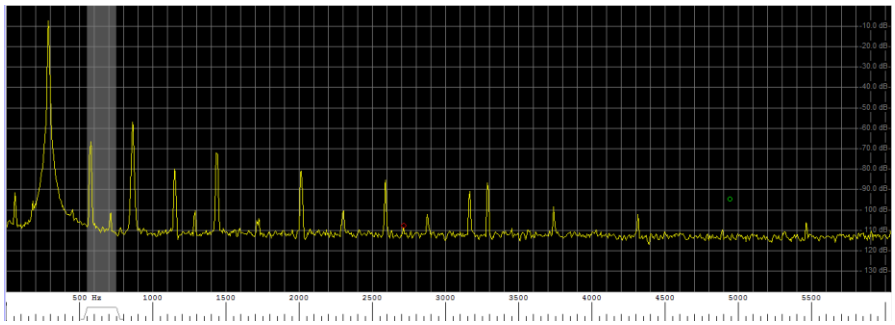


Figure 5 - K4 USB receive codec distortion from 300 Hz tone as viewed on Spectrum Lab

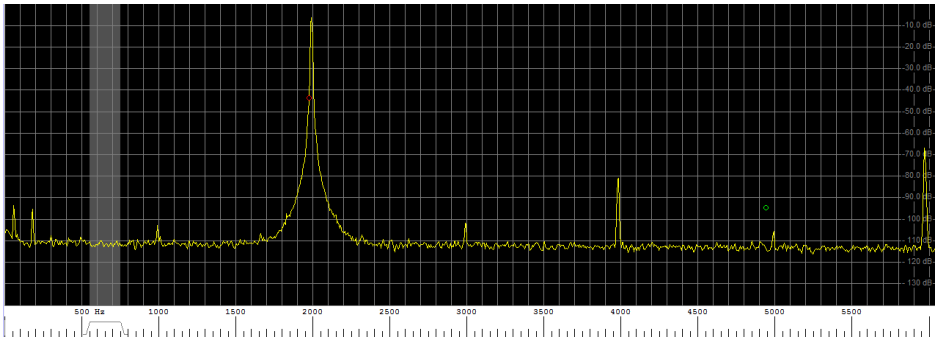


Figure 6 - K4 USB receive codec distortion from 2000 Hz tone as viewed on Spectrum Lab

K4 USB receive analog line out test results

In contrast, the K4D analog line out harmonic distortion is less than the USB codec distortion - fewer harmonics are visible, and at higher frequencies (2000 Hz and up) the strongest harmonic is -78 dBc. Figure 7 shows the results of the same FT8 signal source with the K4D tuned for a 300 Hz tone, in Figure 8, the K4D tuning has been changed so the FT8 signal source appears at 2000 Hz.

The signals to the left of the intended FT8 signal (in both Figures 7 and 8) are ground loop artifacts. They can be minimized by using cables that are as short as possible and are well shielded and ensuring that all grounds in the shack are bonded together. See K9YC's presentation on audio and grounding at for further information to reduce these unwanted signals. It is a lengthy presentation, there is a lot of good information included.

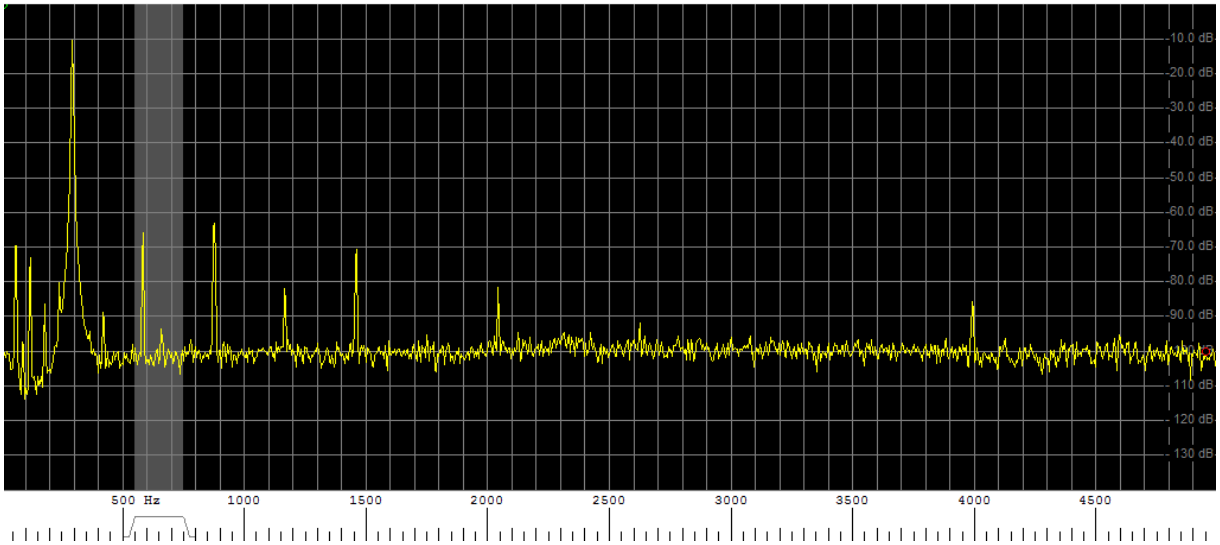


Figure 7 - K4D Analog Line Out distortion from 300 Hz tone as viewed on Spectrum Lab

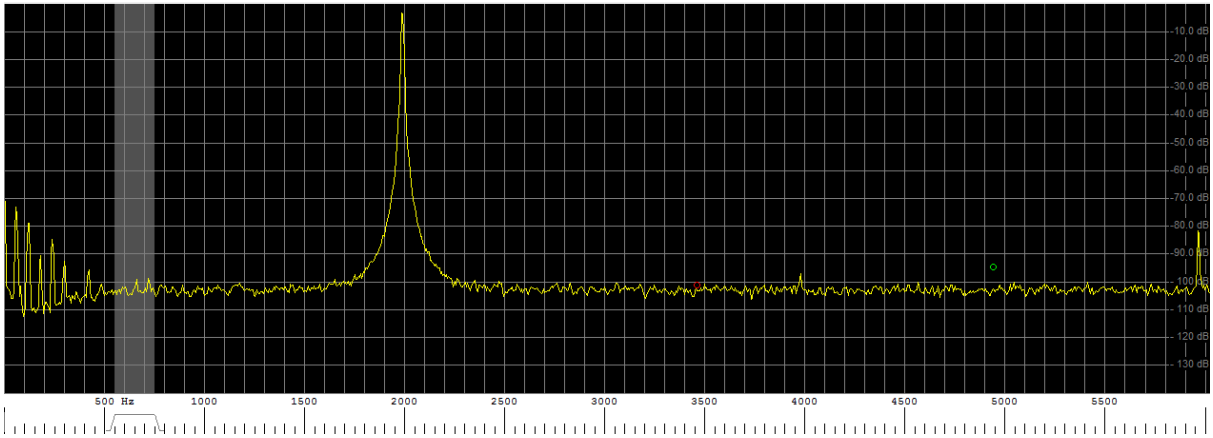


Figure 8 - K4 Analog Line Out distortion from 2000 Hz tone as viewed on Spectrum Lab

Bottom line - the audio distortion in the K4 audio processing thru the USB codec (and probably many other receivers) can hurt weak signal FT8 reception wherever the harmonics appear.

A Partial Fix for Harmonic Distortion

There is a way to minimize the harmonic distortion and provide some improvement in FT8 reception, given that most radios have pass band tuning limits set by the manufacturer. Here are some examples to improve FT8 reception for the main 6 meter FT8 band at 50.313 MHz (remember WSJT-X is artificially limited to an upper frequency of 5 KHz).

Radio	Tuned Rx frequency	Pass band low	Pass band high	Improvement
Ideal	50.311	2.3 KHz	5 KHz	Harmonics limited to between 4.5 and 5.0 KHz Receiver band pass matches FT8 band
K3	50.312	1.25 KHz	3.95 KHz	Harmonics limited to between 2.6 and 3.95 KHz Receiver band pass slightly wider than FT8 band
K4D (R28)	50.311	.94 KHz	5.0 KHz	Harmonics limited to between 4.5 and 5.0 KHz Receiver band pass wider than FT8 band

A plea!

Folks, if you haven't done so already, please take a look at the close in RF spectrum (i.e. plus or minus 2 KHz) of your on the air transmitted FT8 signal, especially on 6 meters - or have a neighbor that has a panadapter look at it with you . There is more than one way to inadvertently reduce the dynamic range of your transmitted signal, which reduces the ability of your neighbors to hear weak signals.

Things to check:

- **WSJT-X** - Keep the power slider on the lower right side of the main WSJT-X screen all the way up. Why? Lowering the slider lowers the dynamic range of the audio signal created by WSJT-X.
- **Sound card output** - If you use a sound card in your computer between WSJT-X and the Line In of your radio, keep the sound card level as high as you can without audio clipping. Why? To maximize the signal to noise ratio you created in WSJT-X.
- **Transmitter Line in** - Use the Line In gain control to set the level into your radio - the input gain control in the radio will reduce both signal and noise equally.
- **Transmitter output level** - see Rob Sherwood's comments about transmit composite noise at different power levels in his many presentations on Youtube and in his test results.

Thanks to Fred N3FL and Hank K3YDX for their review and comments on this paper.

Bucket Truck Use for Hexbeam Repairs – Bill K3XA

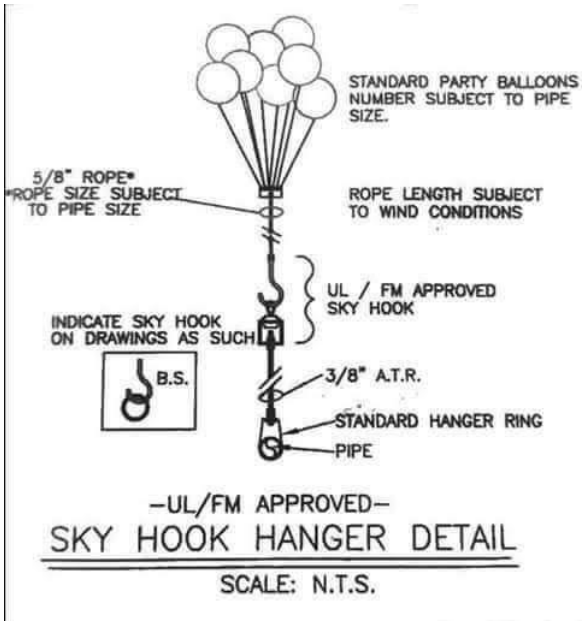
I recently required some mechanical repairs to my Hexbeam, mounted on a 40' light-weight tower. I tried to find a local bucket truck and operator to assist with the repairs but had no luck. Dave W4JVN came upon a bucket truck doing light pole repairs, and he asked the operator if might be able to assist me. The operator, Bob Smith, said that he would entertain such assistance.

Subsequently, I spoke with Bob, telling him about the project and specifically what needed to be done. On March 15 2022, Bob came to my QTH in Great Falls, VA, along with his assistant and a heavy duty 60' boom truck. I gave Bob the parts necessary to repair the Hexbeam, after which he took the bucket up to the antenna and successfully completed the repairs.

I asked him if he would be interested in assisting other members who might also require some antenna repair work. He said yes, and that he would schedule it around his regular commercial sign and light pole activity. He works in MD and Northern VA, but is actually based in Street, MD which is by the PA border. There might be a possibility for some southern PA coverage, too.

Bob and his assistant clearly have great mechanical skills and equipment, and they are willing to entertain various projects. They are also accommodating and easy to work with.

Any member requiring bucket truck services can contact Bob as follows:
Bob Smith – "Roberts Signs" 443-506-7457 (cell), 410-879-6240 (office)



Award Presentations – Dan K2YWE

On the left, Tim N3QE is being awarded the 2021 CQ WW WPX RTTY Club plaque since he was PVRC's top contributor. On the right, N3QE is accepting the 2021 K3LP Cup for most improved number of logs which was awarded to the DC Downtown chapter and being received by Tim to present to chapter chair W3DQ. Tim also accepted the 2021 President's Leadership Award for W3DQ for work his efforts on the club reflector.

Photos by Ulis K3LU.

Contributing to the ARRL Foundation Scholarship Fund – Ted WA3AER

There has been some discussion about ARRL enabling payment other than via USPS and an enclosed check. We've all been hoping ARRL would set up some form of online electronic payment in these days of questionable USPS service. Our wishes may come true soon.

While at Hamcation I stopped at the ARRL booth and talked with the person representing the ARRL Foundation Fund about this same topic. I was informed that they have heard us and that something is in the works to support online Fund submittals and payments. No details were forthcoming, but I was led to believe something will happen sooner than later.

I also learned that contributions may be made to the Foundation via telephone and a credit card. If you wish to do that, here is the ARRL Development Manager's contact info:

Melissa Stemmer, KA7CLO, Email: mstemmer@arrl.org, Phone: 860-594-0348

So, if you have wanted to contribute to the ARRL Foundation Scholarship Fund on behalf of PVRC but were reluctant to put a check in the mail, here is one way to make your contribution now.

Let's Talk Power – Alan WA3EKL

I would like to start with the simple facts about amplifiers be they tube or solid-state. Then we will discuss some differences between the two types. To start off we are talking here about RF amplifiers.

The longer time the amplifier is turned "off" or not actually drawing current the more efficient it is. The longer it is turned "on" the less efficient it is. This holds true for both tubes and solid-state amps. There is no magic about solid state amplifiers. They follow the same physics as tube amplifiers. Tubes basically amplify by varying voltage and transistors amplify by varying current. Remember I said we are just talking basics.

A class A amplifier is the least efficient amplifier at about 50%. It is also the most linear, meaning whatever you put into it comes out of it with little or no spurious emissions. It is pulling current 100% of the time. Any type of signal can pass through this amplifier. CW, SSB, digital, etc.

A class B amplifier is turned on exactly 50% of the time and can have modulated signals pass through it but it will produce some spurious emissions which need to be filtered out. However, it has efficiency rated at 75%. Modulated signals are AM, SSB, FT8, PSK, RTTY and various other digital waveforms. These are all forms of amplitude modulated signals.

Class C is the most efficient, above 75 %, depending on its "on" time, but for Amateur use can produces a lot of spurious emissions depending on what type of signal is fed into it. A class C amplifier can only be used for CW work. It is normally turned on less than 50% of the time and its spurious emissions need to also be filtered out.

To reduce spurious emissions, which include harmonics and splatter, you want to run your amplifier away from class B and towards class A but not very much because too much will reduce the efficiency of the amp. This is where class AB1 and class AB2 come into play. AB2 is a less efficient but produces less spurious emissions or is more linear. This is why most manufactures produce linear amps running in AB2.

Let's talk tubes for just a minute since they are a little easier to understand. Physically in a tube you have some type of vertical metal cylinder in the center that is heated by wires inside of the cylinder. That cylinder is called the Cathode and it emits electrons when it gets hot. In a triode tube you then have a screen like cylinder surrounding the cathode but not touching it. That screen cylinder is called the Grid. Finally surrounding the grid and not touching it is a large thick cylinder and it is called the Plate or Anode.

The plate has a very high plus voltage on it. The cathode is emitting electrons. The plate is pulling the electrons towards it. What is slowing down or stopping the electron flow? The electrons must pass through that cylinder of screening called the Grid. If you put enough negative voltage with respect to the cathode on the grid the electrons will be repelled back to the cathode and will not make it to the plate. Therefore, no electrons (current) can flow from the cathode to the plate. In a way, the electron flow is current flowing through the tube that is being controlled by voltage on the grid!

When I said the amplifier is turned off or turned on by some percent here is what it means. If you key the amplifier and no plate current is flowing the amp is running in either class C or class B. If the least amount of drive starts to cause plate current to flow it is mostly likely class B. If it takes a little more drive, it's probably class C.

How much plate current is flowing with no drive applied when you key the amp is what determines the class of the amplifier. That plate current flow is determined by the bias voltage applied to the Grid. In a grounded grid amp, regardless of class, it's the amount of bias on the Cathode or the filaments that determines the current flow.

Suppose you put just enough negative voltage on the grid to just stop the plate from drawing current when you key the amp. That would be the 75% efficient Class B amplifier. When you apply drive the "plus"-going side of your signal reduces the negative voltage on the grid thus allowing plate current to flow (amplification.) Now suppose you reduced the voltage on the grid just a little more so that the plate starts to draw a little current such as 50 ma on a pair of 3-500Z tubes but no grid current is being drawn yet. That amp is in class AB1. If you lower the grid voltage farther so the tubes now draw between 100 to 120ma of plate current when keyed with no drive and grid current starts to flow, then that tube is in class AB2.

The rule of thumb is when the grid is drawing current with no drive it's AB2 and when the grid does not draw current it's AB1. Now before you go turning on your amp, keying it and looking to see if grid current is flowing while plate current is flowing be warned. Not all amp circuits are designed the same. The Heathkit SB220/221 amps are wired so that grid current will only be seen when the tubes are actually being driven. Simply keying the amp will not show grid current but will only show plate current.

The Ameritron amps are wired differently. Their Grid meters are wired to read grid current full time. This caught me at first because you should not have grid current unless you have grid drive which is what I have been taught and probably what most of you all have been taught. But, this statement is only true for a class B class AB1 or class C amplifiers! There will be some grid current flowing with an AB2 designed amp. Example: my AL80A converted to 6 meters only with a single 3-500z keyed on with no drive draws 65 ma of plate current and about 15 ma of grid current. I know that an AL82 which has two 3-500z tubes will draw between 50 to 100 ma of plate current and a little grid current because the AL82 is wired to show it also. The SB220/221's are not.

Now the basics are out of the way we can get down to why I wrote this article.

Many years ago, the FCC rules said amateurs could have 1000 watts DC input to the final amplifying stage. What did that mean? Simple example. volts x amps = power, 2500 volts x 0.400 ma = 1000 watts input power. If you were running class B then you could technically get out 750 watts at 75% efficiency.

When running a "grounded Cathode" circuit in class B all of the power used to drive the tube gets eaten up in the tube but it takes the minimal amount of power to drive this type of amp because you are applying drive to the grid.

If you designed a class B "grounded Grid" amp, which grounds the grids and drives the cathodes or the filaments it takes much more power to drive this circuit to the full 750 watts out, but 90% of the driving power appears in the output. So, if it takes 100 watts to

drive a 2500 volt x 0.400 ma amp to get 750 watt out assuming 75% efficiency you can add to that another 90 watts for a total of 840 watts out, just by changing to a grounded grid circuit. (This would give some Hams an advantage over others who were legally running their amps at 1000 watts DC input.) A grounded grid amp looks more efficient than it actually is and manufactures today take well advantage of this affect by saying their amps are so very efficient. As I said in the beginning you can't change the laws of physics. An AB2 amp is still about 70% efficient. It just seems better when the tube is running in grounded grid because most of the input power is appearing in the output.

This also holds true for AB1amps. Change the configuration from grounded cathode to grounded grid, increase the driving power and get out more power than what the FCC expected us to be putting out which was a maximum of 750 watts on a modulated signal. Then the rules changed, but did they?

I spent two years in Electrical Engineering at U of MD, and two years in an Electronic Technical School. During the Electronic Technical School, I earned my First Class Radio Telephone License with Radar endorsement. One of my teachers was a math major that showed us some very interesting formulas because he was also a design engineer and taught us electronic design engineering.

voltage x current = power. Let us break it down farther
rms voltage x rms current = rms power, or for our purposes "average power"
peak voltage x peak current = peak power

1.414 or PI is the square root of 2. I cannot show the square root of 2 on the computer so
I will use 1.414 to represent the square root of 2

peak voltage/1.414 = rms voltage
peak current/1.414 = rms current
Therefore, rms voltage x rms current = rms power (average power for our purposes)

Now more in detail, what is the relationship between rms voltage and rms current and peak voltage and peak current. From the above equations:
(peak voltage /1.414) x (peak current/1.414) = peak power/ by what?
In other words how do you get peak power back to rms power because you have just calculated rms power in the left side of the equation?

You have divided the left side of the equation, by multiplying 1.414 or the square of 2 by its self which is equal to "2". The square root of 2 times the square root of 2 in the denominators on the left side of the equation is equal to "2". Therefore, you must divide the right side of the equation by the same amount or you will destroy the value of the equation. Result

(peak voltage /1.414) x (peak current/1.414) =Peak power /2
OR
Average power is Peak power / 2
OR
Peak power is **twice** the average power.
(Looking at this on a black board with the square root sign makes it a lot easier to understand.)

Now let us go back to the rules. Originally the FCC wanted us to have no more than 1000 watts DC input which translated to 750 watts average power out. The rules now allow 1500 watts peak power out. Therefore 2 x 750 (750 rms watts)or average power out = 1500 watts peak power out. Absolutely nothing has changed except for where we are now measuring the power.

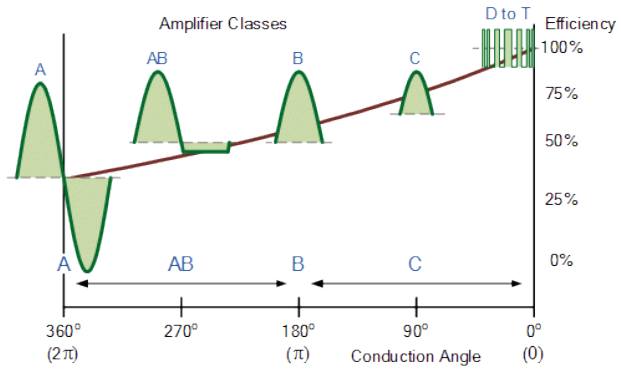
But something **has** changed. No matter what type of amp is built, how efficient it is or how much drive it takes, the max power out shall be 1500 watts from the top of the waveform to the bottom of the waveform. Not 1500 up and 1500 down from zero. That would be 3000 watts. No one who is following the rules will have an advantage over anyone else any more regardless of the amp design or the class it's running! Furthermore, it is very easy to tell if you are in compliance with the 1500 watt rule. On CW hold down the key and increase the drive until the output power meter reads 1500 watts. The same goes for FT8, RTTY, PSK and other digital signals. Increase the drive while one of these signals is being transmitted and adjust for 1500 watts out of the amp. A SSB voice driven amp is another subject for another time. I have heard many spirited discussions on this subject but never a technically reasonable solution that would satisfy everybody who wants to stay within the rules.

One more word on a different part of amplifier efficiency. That is how much power is drawn from your wall socket as to how much power is going out on the air. Tube amps first - I will use my 813's as an example.

1000 watts showing on the meters key down or 2800 volts x .357 ma. So, 1000 watts is being drawn from the wall. Plus filament voltage and current: 10 amps at 10 volts = 100 watts. Bias and control circuitry 2 watts. Total 1102 watts from the wall. The amp is about 70% efficient because it's running AB2 grounded grid, therefore putting out 750 watts with 1000 watts DC input. We are neglecting the 90 watts feed through because that is not part of the amp's efficiency and is coming from the transmitter and not the amp. 750 watts/1102 watts = 68% efficiency. So, with my tube amp whatever power I am pulling out of the wall 68% of that power is going to my antenna.

Here is the bad news. Everywhere I have read on the net **all** solid state RF amps are 50% efficient; meaning that 1500 watts going to your antenna is costing you 3000 watts out of your wall socket!

I hope you have enjoyed this article.



PVRC 6M DXCC Standings – Frank W3LPL

Below are the 6M DXCC totals for PVRC members, transcribed from the ARRL DXCC data as of the 20th 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
W3BTX	167	KG7H	129	K3KO	108
K1HTV	165	AB3CV	128	W3XY	108
W4DR	164	WX4G	124	W3DF	107
N4MM	152	NW5E	123	N4VA	106
W3LPL	148	K3SX	122	W2YE	106
W3UR	144	W3KX	122	K3ZO	103
N4BAA	142	AK3E	120	N3DB	103
N2QT	135	K3XA	119	W3OR	103
K4CIA	134	N4TL	119	N4PY	102
K2PLF	133	K5VIP	111	W4FQT	102
K4SO	132	N4JQQ	111	K3WC	101
K5EK	132	W3EKT	111	W3XO	100
K4SN	131	N4DB	110	W4TJ	100
W3LL	130	W4PK	109		

Membership News – Tim N3QE

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

April 2022	
+ JIDX CW Contest	0700Z, Apr 9 to 1300Z, Apr 10
+ OK/OM DX Contest, SSB	1200Z, Apr 9 to 1200Z, Apr 10
+ Yuri Gagarin International DX Contest	2100Z, Apr 9 to 2100Z, Apr 10
+ ARRL Rookie Roundup, SSB	1800Z-2359Z, Apr 10
+ Holyland DX Contest	2100Z, Apr 15 to 2100Z, Apr 16
+ YU DX Contest	0700Z, Apr 16 to 0659Z, Apr 17
+ CQMM DX Contest	0900Z, Apr 16 to 2359Z, Apr 17
+ Helvetia Contest	1300Z, Apr 23 to 1259Z, Apr 24
+ North American SSB Sprint Contest	0000Z-0400Z, Apr 24

Editor's Last Word – John K3TN

Thanks to John N3AM, Mike W3IP, Bill K3XA, Dan K2YWE, Alan WA3EKL, Ted WA3AER and Frank W3LPL for contributions to this issue of the PVRC newsletter.

I'm 65 years old and have bought four transceivers over the 53 years I've been a ham: Tempo One {really an off-brand, low end Yaesu}, TS-830, TS-850, K3), So, I seem to average about 13 years between new rigs. Since I bought the K3s in 2011, I guess near the peak of this sunspot cycle, I'll be due for a new toy!

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 – Ted WA3AER

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.

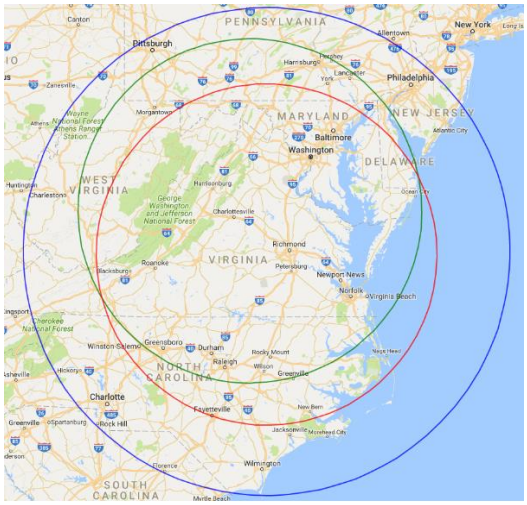
Direct donations to PVRC via Credit Card or PayPal may be made by clicking this "Donate" button and clicking the next Donate button that appears on your screen:

Donate

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!

DX Engineering Makes Spring Maintenance a Breeze!

Coaxial Cable Assemblies

These low-loss cable assemblies are available in standard lengths with DX Engineering's revolutionary patented PL-259 connector. Use the online Custom Cable Builder at DXEngineering.com to build assemblies made to your exact specs. DX Engineering's coaxial cable is also available by the foot or in bulk spools.

Weatherproofing Kits

DX Engineering kits make it simple to protect your coaxial connections from damaging moisture. They include self-fusing 3M Temflex 2155 Rubber Splicing Tape to create a strong barrier followed by 3M Vinyl Electrical Tape for added UV protection. Choose from Super 88 Premium tape, Super 33, or economical Tartan 1710. Each kit will weatherproof 6 to 10 double connections. Also available are kits that include 3M tape and self-adhesive weatherproofing material. **Enter "Weatherproofing" at DXEngineering.com.**

DX Engineering Clamps and Hardware

Tackle your spring antenna projects with high-quality parts. DX Engineering U-Bolt, V-Bolt, Super-Duty and Heavy-Duty Saddle Clamps come in a range of sizes to deliver strong and durable solutions no matter what you're building. You'll also find stainless steel V-clamps; resin support block clamps; Genius clamps that let you create a tower standoff to side-mount an extra antenna; and DX Engineering stainless steel hardware sets. **Enter "Clamps" at DXEngineering.com.**

Guy Line Ropes

Choose from non-conductive, non-stretching Mastrant ropes for wire antennas, supporting Yagi booms and elements, and guying verticals and antenna masts; Synthetic Textile Industries' double-braided, decay- and mildew-resistant Dacron/polyester ropes; and high-performance Phillystran guy lines made from Aramid fiber with a strength-to-weight ratio five times greater than steel. **Enter "Rope" at DXEngineering.com.**

Grounding and Lightning Protection

Don't let spring storms zap your station. DX Engineering carries the gear you need to protect your investment, including Georgia Copper flexible copper grounding straps, lightning and surge protectors from PolyPhaser and Alpha Delta, Erico copper-bonded ground rods, and an array of DX Engineering gear: coaxial cable grounding brackets, universal copper grounding clamps, radio RF ground plane kits, and more. **Enter "Grounding" at DXEngineering.com.**

RigExpert Analyzer and NANUK Case Combos

In the field, an antenna analyzer is especially at risk for weather and shock damage. We've paired select RigExpert Antenna Analyzers with perfectly sized NANUK equipment cases. Each case is filled with cubed, sectioned foam for custom configuration. Available separately or in combos. **Enter "Analyzer Combo" at DXEngineering.com**

Jet-Lube SS-30 Pure Copper Anti-Seize Lubricant

No station is complete unless it's well-stocked with Jet-Lube, a Ham's best friend. Use it on taps, lugs, aluminum tubing joints, copper grounding, and virtually anywhere you need excellent electrical and RF conductivity. Safe for aluminum, copper, tin, bronze, steel and galvanized hardware, it prevents oxidation and corrosion, and its superior anti-seize properties make it a must-have when making metal-to-metal connections. **Enter "SS-30" at DXEngineering.com.**

YAESU ICOM KENWOOD ALINCO TBX Tower ROHN Products LLC American Tower Company

Check Out DX Engineering's Facebook Page and YouTube Channel!

DX ENGINEERING

Ordering (via phone) Country Code: +1
9 am to midnight ET, Monday-Friday
9 am to 5 pm ET, Weekends
Phone or e-mail Tech Support: 330-572-3200
9 am to 7 pm ET, Monday-Friday
9 am to 5 pm ET, Saturday
Email: DXEngineering@DXEngineering.com

Ohio Showroom Hours:
9 am to 5 pm ET, Monday-Saturday
Ohio Curbside Pickup:
9 am to 8 pm ET, Monday-Saturday
9 am to 7 pm ET, Sunday
Nevada Curbside Pickup:
9 am to 7 pm PT, Monday-Sunday

800-777-0703 | DXEngineering.com

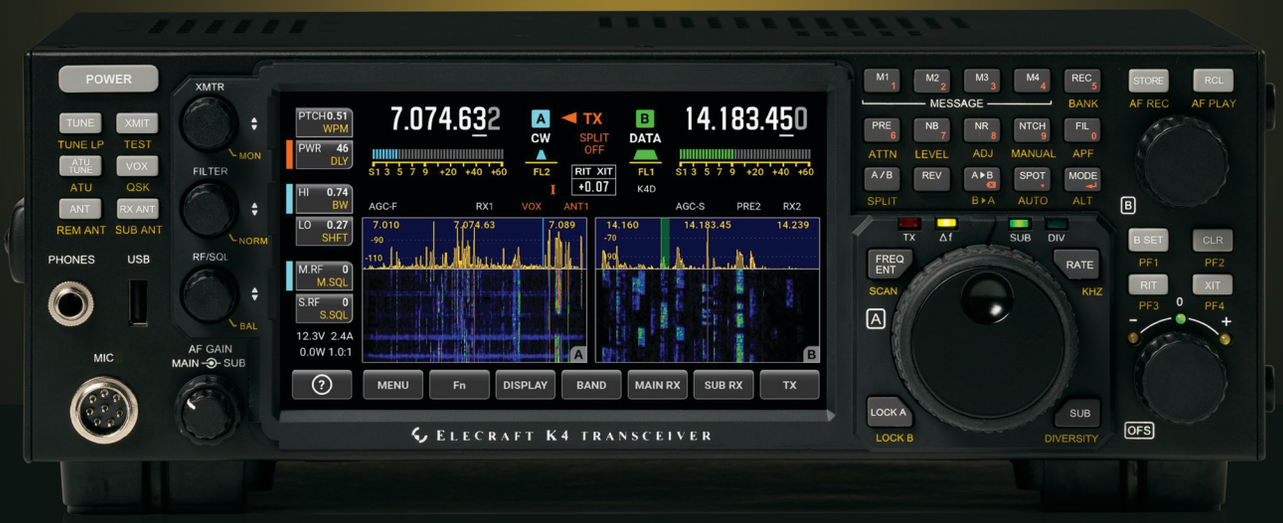
ON ALL BANDS

YouTube

We're All Elmers Here! Ask us at: Elmer@DXEngineering.com
Email Support 24/7/365 at DXEngineering@DXEngineering.com

ELECRAFT K4

High-Performance Direct-Sampling SDR



A direct-sampling SDR you'll love to use

Our new K4 transceiver harnesses advanced signal processing while retaining the best aspects of the K3S and P3. It features a 7" touch display, plus a rich set of dedicated controls. Per-VFO transmit metering makes split mode foolproof. Band-stacking registers and per-receiver settings are versatile and intuitive. Control usage information is just one tap away thanks to a built-in help system.

Modular, hybrid architecture adapts to your needs

The basic K4 covers 160-6 m, with dual receive on the same or different bands. The K4D adds diversity receive, with a full set of band-pass filters for the second receiver. (Thanks to direct RF sampling, there's no need for crystal filters in either the K4 or K4D.) The K4HD adds a dual superhet module for extreme-signal environments. Any K4 model can be upgraded to the next level, and future enhancements–such as a planned internal VHF/UHF module–can be added as needed.

Single or dual panadapter, plus a high-resolution tuning aid

The main panadapter can be set up as single or dual. Separate from the main panadapter is our per-receiver *mini-pan* tuning aid, with a resampled bandwidth as narrow as +/- 1 kHz. You can turn it on by tapping either receiver's S-meter or by tapping on a signal of interest, then easily auto-spot or fine tune to the signal.

Comprehensive I/O, plus full remote control

The K4's rear panel includes all the analog and digital I/O you'll ever need. All K-line accessories are supported, including amps, ATUs, and our K-Pod controller. The USB display output supports its own user-specified format. Via Ethernet, the K4 can be 100% remote controlled from a PC, notebook, tablet, or even another K4, with panadapter data included in all remote displays. Work the world from anywhere–in style!

K4 KEY FEATURES

- Optimized for ease of use
- Modular, upgradeable design
- 7" color screen with touch and mouse control
- ATU with 10:1+ range, 3 antenna jacks
- Up to 5 receive antenna sources
- Full remote control via Ethernet

The K4 interfaces seamlessly with the KPA500 and KPA1500 amplifiers

'The performance of their products is only eclipsed by their service and support. Truly amazing!' **Joe - W1GO**

ELECRAFT®

For complete features and specifications visit elecraft.com • 831-763-4211

HAM RADIO OUTLET®

WWW.HAMRADIO.COM

*Free Shipping and Fast Delivery!

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

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)

FT-991A | *HF/VHF/UHF All ModeTransceiver*

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

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

FTM-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-818ND | *HF/6M/2M/440 All Mode Portable Xcvr*

• Ultra-Compact/Portable • Multi-Color Easy to See LCD • 208 Memory Channels/10 Memory Groups • Built-in Electronic Keyer • Internal Battery Operation Capability • Two Antenna Connectors • Built-in High Stability Oscillator ±0.5 ppm

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-5DR *C4FM/FM 144/430 MHz Dual Band*

• 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 • Supports Simultaneous C4FM Digital • 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

FTM-6000R | *50W VHF/UHF Mobile Transceiver*

• All New User Operating Interface-E2O-III (Easy to Operate-III) • Robust Speaker Delivers 3W of Clear, Crisp Receive Audio • Detachable Front Panel Can Be Mounted in Multiple Positions • Supports Optional Bluetooth® Wireless Operation Using the SSM-BT10 or a Commercially Available Bluetooth® Headset

5 Ways to Shop!

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

YAESU The radio

FOLLOW HRO ON SOCIAL MEDIA

twitter.com/HamRadioOutlet
facebook.com/HROHamRadioOutlet
instagram.com/HamRadioOutlet
youtube.com/HamRadioOutlet

* On most orders over $100 in the continential US. (Rural Locations excluded.) Contact HRO for promotion details. Toll-free including Hawaii, Alaska and Canada. All HRO 800-lines can assist you. If the first line you call is busy, you may call another. Prices, specifications and descriptions subject to change without notice.