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West Mountain Radio

Quarter 2 - 2022

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What is Noise? (Part 2 of 2)

By Dave Ingold WB9SXG

This is the second part of a two part series on noise. In part one, we learned the types of noise and possible sources. Mother Nature has some powerful transmitters and so does our own technology. Then as hams, we have to admit some culpability. Now let's find out how we can control our own destiny in reducing noise.

Find the source

Record the date/time/duration/type (pulse, hum, CW, voice, carrier) days/frequency ranges. Do these signals occur only on Wednesdays and Saturdays 2pm-4pm. Do these signals last 10 minutes every half hour? Are they random times? Are these pulses heard on 40 meters between 7.12 and 7.135 MHz every Wednesday 2pm to 4pm lasting 10 minutes every 25 minutes? Record the weather. Maybe the pulses only occur during snow. Try using a directional antenna.

Try moving your rig to a park or away from the city. Use battery power. Digital signals are bursts. Get away from things like LTE uplinks, bluetooth, industrial automation, leaky cable TV signals. Go to a rural area.

Walk around the house or your yard or neighborhood with a cheap battery operated AM transistor radio. Maybe you or your neighbor has a plasma TV or a noisy switching power supply. Offer ferrite beads to your neighbors. Let them know that it will reduce their interference as well. Ferrite beads are an inexpensive and magic way to reduce noise. They just clip around the power cable or audio/video cable. They are inexpensive and work great.

Maybe your antenna is picking up static electricity. Is it grounded properly? An OM once told me the wind blowing on an antenna can generate static electricity. I don't know how true this is, but the advice was to bond all equipment to a common ground rod and ground my antenna to a ground rod. Then run a ground wire to bond the two ground rods. Locate your antenna away from noise sources as best as you can.

Drastic measures

Put your rig on battery power. Tune to the noise source. Get a flashlight (very important!). Go to your home breaker panel. Turn off the master breaker. Go to your rig. Do you still hear the noise? Yes? Well, the source is not from your home. The noise is gone after you turn off the master breaker? Okay, now turn off all breakers and turn on the master breaker. Start turning on each circuit one at a time until you hear the noise. Ah-Ha! The noise is coming from that circuit. Unplug and/or switch off all devices in that circuit. Plug or switch on these devices one by one one by one until you hear the noise on your rig. Try plugging the devices into different outlets. Some GFCI Ground Fault Circuit interrupter outlets are noisy. Sometimes a loose connection makes sparkies. Found it yet? Put a ferrite bead on the power cable. Heck, maybe you don't even need the item plugged in!

Strategies

RTFM

Read the fine manual! Read it again. Maybe your rig has roofing filters. If you have notch filters. Notch out that noisy frequency. Adjust the AGC slow/medium/fast : slow for SSB, medium for SSB/CW or fast may help. Turn the RF gain to a minimum and turn up the AF gain. Both signal and noise is picked up in the RF stage. Turning down the RF gain lowers the noise floor. Set the Attenuator to reduce powerful sources of noise. Can you tune the IF passband? Try shifting the IF passband. Try adjusting the passband width. Try narrowing your passband. With my Yaseu rig, I can modify the contour of the response curve. It has a noise blanker, digital signal processor and digital noise reduction. Your rig may have a lot more features to use. I repeat: read the fine manual!

Modes and Noise

For digital modes, turn off the DNR, Noise blanker and notch filters. Let your computer do all the work.

AM and SSB have no inherent noise control. FM has some noise control due to the nature of the even modulation envelope. RTTY is actually FM frequency shift keying, so like FM, it has some inherent noise control. FT8 is also FM but with forward error correction built in. PSK-31 is phase modulated with inherent noise control like FM. Olivia has forward error correction that favors accuracy over transmit time. Pactor has forward error correction combined with ARQ (acknowledgment request) , When the transmitting station receives a NAK (non acknowledgment) the transmitting station repeats the message until it receives an ACK (acknowledgment). Thus, Pactor is error-free! CW has it's own noise control. That is the amazing device between your ears

Black Iron and Magic

Last but not least there are a couple of magic tricks to pull out. Ferrite beads and DNR (Digital Noise Reduction). Ferrite beads are iron ferrite cylinders coated with plastic with a plastic clips. There is a hole in the center of the ferrite cylinder. Clip these around the power cable or you mic cable or audio cable and RF energy hits the iron and stays in the iron and away from going into the wire. Just a piece of iron, but it's magic.

The other magic is Digital Noise Reduction (DNR) technology. This is a feature with some radios and devices such as the CLRspkr and CLRdsp and CLRmodule. The secret sauce is the artificial intelligence algorithms used to sample a real signal and sample noise. It dumps the noise and sends the signal to the final IF or AF output. It looks for coherent signals such as voice and CW and sends this out. Then it dumps the rest into the bit bucket. Speech is coherent, so crosstalk won't be reduced, but static crashes will be reduced. DNR work great for AM/SSB/CW modes.

The magic with the CLRspkr and CLRdsp and CLRmodule lies in the ClearSpeech® adaptive digital signal processing algorithms. Adaptive digital filters are self learning filters. They listen to the incoming signal, go through a short "training" period, then adapt their operation based on the signal's noise content. During the training period the filter will pass the complete noisy signal. As each noise component is identified, the filter goes through a subtractive process to minimize the power of each component. What remains is the desired signal with only a small amount of noise.

Calling All Hams to AirVenture

By Joey Didion

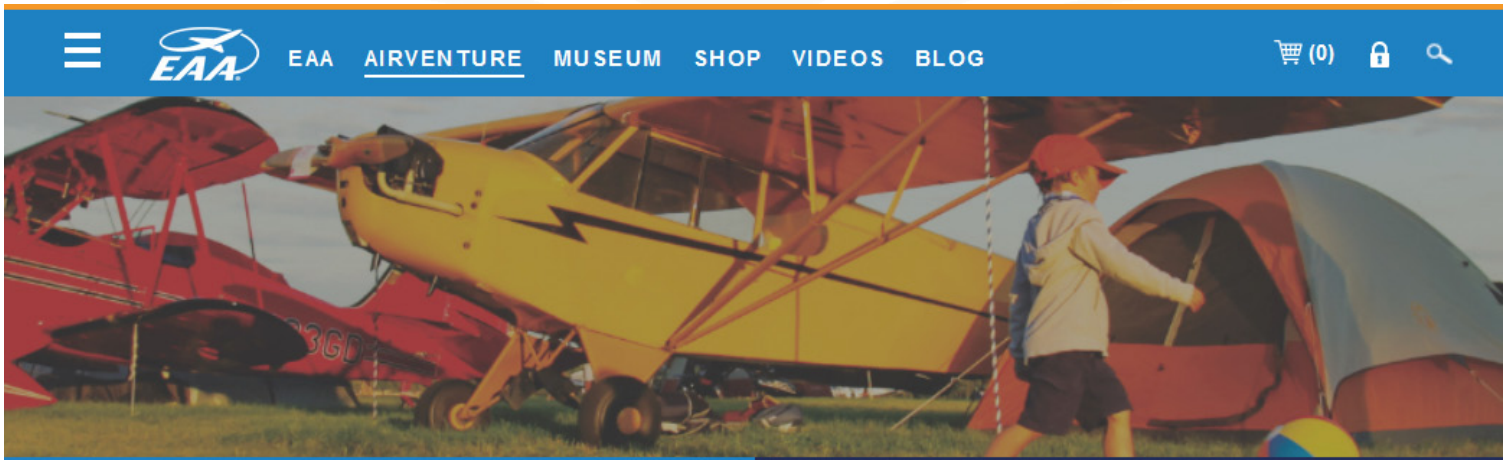
What is AirVenture you ask? The Experimental Aircraft Association was founded over 70 years ago in Oshkosh, Wisconsin. The founding pilot wanted to create aircraft enthusiam those who are innovative and spirited in aircraft. The association grew and attracted more enthusiasts when they gathered together the last week of July to fly in their crafts and show their “experiments” to others.

Gathering like-minded people to talk about their equipment and how many CQs made, Hamfests are the place to go. The EAA AirVenture is the eqivalent to a Hamfest, but now on a much larger scale. The week long event allows for pilots to fly-in and park their craft for display to all. Wisconsin gets the honor of having the busiest air traffic in the world that week. Putting this to scale, in 2021 there were a total of 608,000 visitors, 2,714 international visitors registered from 87 nations attended. There were approximately 10,000 aircraft, 2,979 show planes, and 976 media representatives on-site from six continents, along with 867 commercial exhibitors.

There are air shows daily, the EAA Museum and many of the 800 vendors selling products and components for large aircraft, model airplanes and yes, Ham radio equipment as well. West Mountain Radio had a booth last year and this coming year. Experimental aircraft builders have no limitations, so the 12V DC equipment was of great interest.

We were shocked to find so many pilots that are also hams. Pilots operate Aeronautical Mobile. Using portable radios, they transmit on the amateur bands, mostly at 2M and other times on HF. How many of you out there have made your own QSO to an aircraft? If you catch a call sign ending in “/AM”, you found an aircraft. During the fly-in might be a good time to try! Maybe you know a pilot that does not have their license? It has never been easier to get one! Check out https://www.arrl.org/getting-licensed

The 2022 AirVenture begins July 25 through July 31. Further details can be found on the EAA website: https://www.eaa.org/eaa Come with your walking shoes on and I can guarantee you will exceed the 10,000 steps day!



An Introduction to JS8Call

By Sholto Fisher, K7TMG

JS8Call has been around for a few years but until fairly recently may not have been on the radar for most digital mode operators. The name JS8 sounds very like FT8 so perhaps it was reasonable to conclude it might just be another fork of the WSJT-X software and not pay attention to it (the name incidentally comes from the initials the author Jordan Sherer, KN4CRD).

If that was you, then you ***really*** need to take a closer look at JS8Call.

Firstly, JS8Call is indeed derived from the WSJT-X software and uses FT8-like modulation but that's where the similarity ceases. JS8Call is designed with a whole new concept in mind.

FT8 is designed to fill up the log book quickly. It's an incredible mode that can uncover the weakest of signals and allow even a modest station to complete QSOs and work DX more-or-less anytime they want to. For that purpose it can't be beat.

JS8Call is designed for so much more that it's actually difficult to do it justice in a short newsletter article.

If you have operated FT8 you'll know the standard method of making a QSO is a "rubber-stamp" format and very little input is required by the user.

JS8Call is much more like a conventional digital mode program in that you can type whatever text you want. You aren't limited to oft-repeated text phrases.

But JS8Call also adds features which are very reminiscent of Packet Radio such as acknowledgments, heard lists, a simple mailbox, digipeating, & APRS reporting. There is a sub-network called the Heartbeat Network which allows for stations to periodically send a "ping" and receive acknowledgments from other stations in range.

Automatic SNR values can be seen and requested from other stations, you can relay through one station to request the stations heard by another, or leave a message for a station in the mailbox of another, and all the time you're using the superior decoding ability of modulation designed for weak signals and poor band conditions. There are four different modulation speeds: Slow, Normal, Fast, & Turbo but all speeds are decoded at once from the entire waterfall range.

This all might sound very complicated but none of the advanced features are actually required to chat to another station so you can learn-as-you-go with JS8Call. By observation you'll naturally start to understand what else is going on and can be done.

If we take a look at the main screen of JS8Call it is divided up into sections each of which have a purpose (see figure 1).

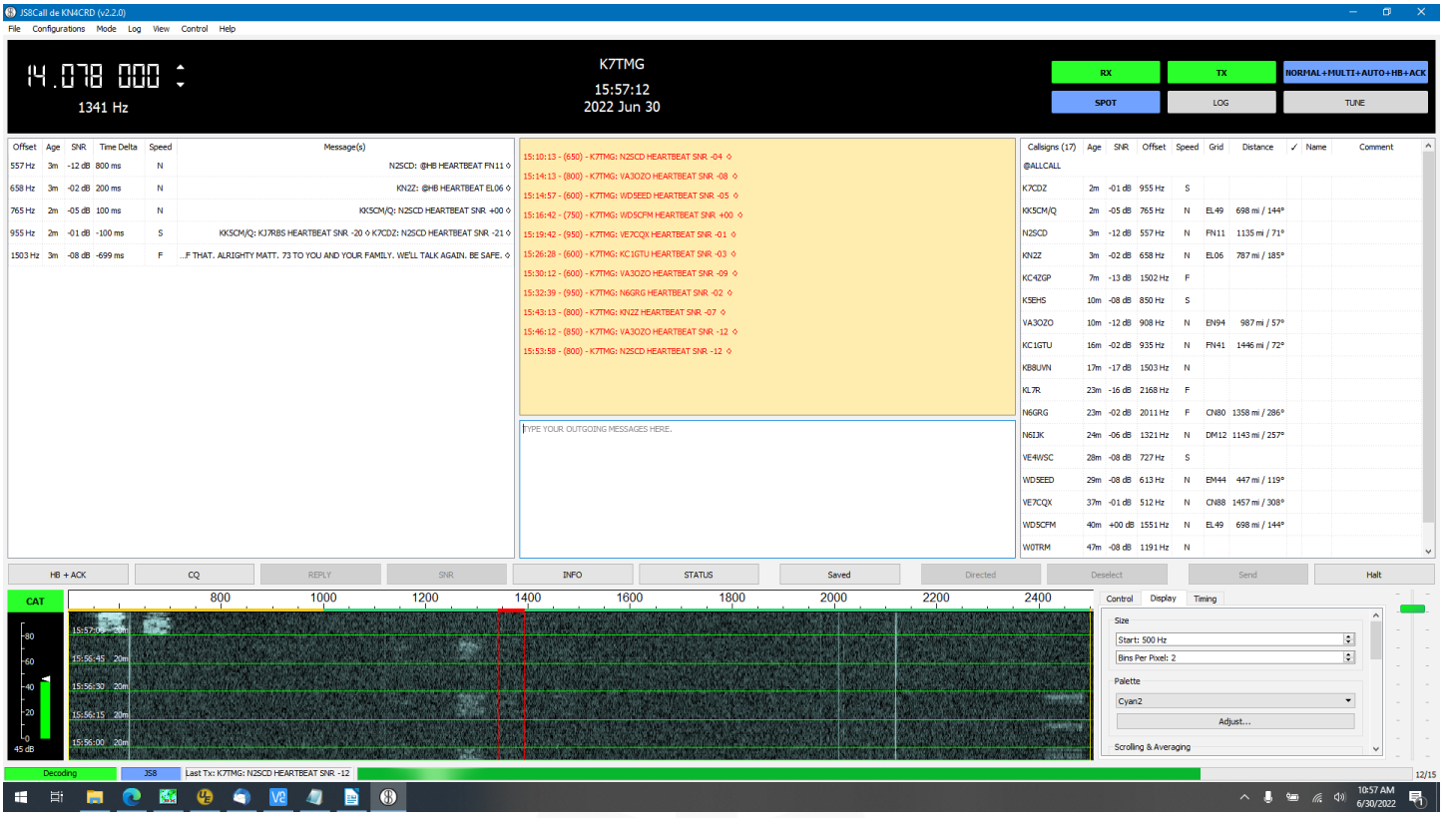
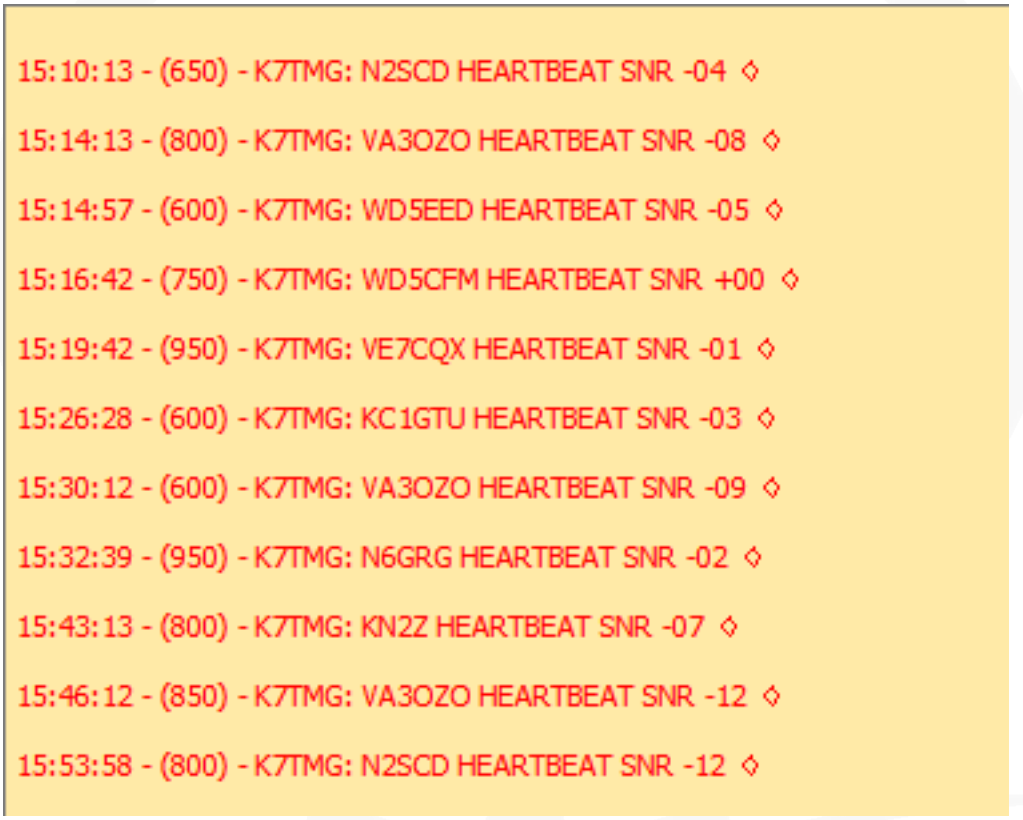


Figure 1. It may be difficult to see this image in the newsletter format so here's a zoom-in on the left hand side:

Offset	Age	SNR	Time Delta	Speed	Message(s)
557 Hz	3m	-12 dB	800 ms	N	N2SCD: @HB HEARTBEAT FN11 ◊
658 Hz	3m	-02 dB	200 ms	N	KN2Z: @HB HEARTBEAT EL06 ◊
765 Hz	2m	-05 dB	100 ms	N	KK5CM/Q: N2SCD HEARTBEAT SNR +00 ◊
955 Hz	2m	-01 dB	-100 ms	S	KK5CM/Q: KJ7RBS HEARTBEAT SNR -20 ◊ K7CDZ: N2SCD HEARTBEAT SNR -21 ◊
1503 Hz	3m	-08 dB	-699 ms	F	...F THAT. ALRIGHTY MATT. 73 TO YOU AND YOUR FAMILY. WE'LL TALK AGAIN. BE SAFE. ◊

Figure 2. This window is showing recent activity. Because the program scans the entire waterfall for transmissions it shows an Offset (in HZ) where the transmission occurred. In this example there were four stations participating in the Heartbeat Network. The fifth station was in QSO and note the text is normal conversational instead of canned phrases.

Figure 3. Moving to the center of the main screen is a yellow rectangle which shows transmissions made by your station and stations which are on the exact same audio offset.



In this example my station has replied (automatically) to stations on the Heartbeat Network and provided a SNR figure. The little diamond character at the end of each line indicates EOT (end of text). It's a way to know when another station has finished sending and you can transmit. Think of it like the "K" or "KN" in Morse Code.

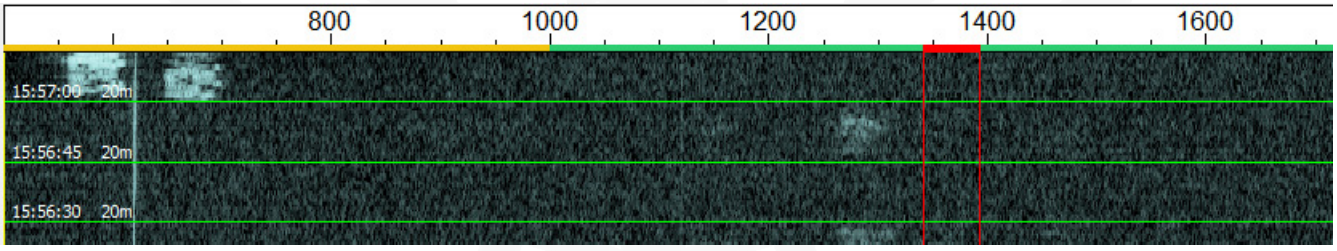
Figure 4. The white rectangle on the right-hand side of the main screen is analogous to a "Heard list" in Packet Radio but it actually shows a lot more. It's called the Call Activity window.

Callsigns (17)	Age	SNR	Offset	Speed	Grid	Distance	✓	Name	Comment
@ALLCALL									
K7CDZ	2m	-01 dB	955 Hz	S					
KK5CM/Q	2m	-05 dB	765 Hz	N	EL49	698 mi / 144°			
N2SCD	3m	-12 dB	557 Hz	N	FN11	1135 mi / 71°			
KN2Z	3m	-02 dB	658 Hz	N	EL06	787 mi / 185°			
KC4ZGP	7m	-13 dB	1502 Hz	F					
K5EHS	10m	-08 dB	850 Hz	S					
VA3OZO	10m	-12 dB	908 Hz	N	EN94	987 mi / 57°			
KC1GTU	16m	-02 dB	935 Hz	N	FN41	1446 mi / 72°			
KB8UVN	17m	-17 dB	1503 Hz	N					
KL7R	23m	-16 dB	2168 Hz	F					
N6GRG	23m	-02 dB	2011 Hz	F	CN80	1358 mi / 286°			
N6IJK	24m	-06 dB	1321 Hz	N	DM12	1143 mi / 257°			
VE4WSC	28m	-08 dB	727 Hz	S					
WD5EED	29m	-08 dB	613 Hz	N	EM44	447 mi / 119°			
VE7CQX	37m	-01 dB	512 Hz	N	CN88	1457 mi / 308°			
WD5CFM	40m	+00 dB	1551 Hz	N	EL49	698 mi / 144°			
W0TRM	47m	-08 dB	1191 Hz	N					

The author of the program has this to say about the Call Activity window:

> In the Call Activity, when a station responds to you a ★ indicator will be displayed next to their callsign. This helps you find, at a glance, other operators that are confirmed to be able to hear you.
>
> When a station is calling CQ, a ☎ indicator will be displayed next to their callsign for 5 minutes. This helps you find, at a glance, other operators that are looking to make contact.
>
> If a station has left you a message, a ⚑ indicator will be displayed next to their callsign. You can read that message by right clicking on the station and clicking “Show Message Inbox”.

If the other station had sent their Maidenhead Grid locator then the great circle distance and direction is calculated automatically. SNR and modulation speed is shown too.



If we take a look at the waterfall in JS8Call there are actually two regions of activity.

The region from 500Hz to 1000Hz has a yellow horizontal line above it and the region from 1000Hz to the end of the passband is green.

In the yellow section transmissions are part of the Heartbeat Network while in the green section will be QSOs and other activity. If you participate in the Heartbeat Network any transmission you make automatically will be within the audio offset range of 500 to 1000Hz. The actual value will be picked at random as an effort to reduce doubling.

Different Message Types

In JS8Call there are three different message types: Standard (i.e. free text), Undirected (not to a particular station), and Directed (to a station and your call sign is included so no need to repeat it).

You can also send Group Messages which are specially formatted. The Heartbeat Network is an example of a Group Message.

Another example is the @APRSIS group message. Sending a formatted message to this group may be picked up by another station (if they have APRS monitoring enabled) and automatically forwarded to an APRS internet server.

> The @APRSIS group is an experimental feature allowing APRS messages to be spotted to the APRS-IS gateway. Two message commands are available, GRID for spotting your callsign at a specific location and CMD for sending a raw APRS packet.
>
> For example, any station receiving my message:
>
> `KN4CRD: @APRSIS GRID FN04TV53`
>
> Will submit that spot to JS8NET and spot my callsign at that location to the APRS network. You would then be able to query that spot in an APRS client, like https://aprs.fi
>
> To send a raw frame (say a direct APRS message to SMSGTE), we'd send:
>
> `KN4CRD: @APRSIS CMD :SMSGTE    :@5551212 TEST`

The author has this to say about it:
The ability to send an SMS message could prove to be a life-saver. It is also possible to send a short WL2K message using a similar mechanism.

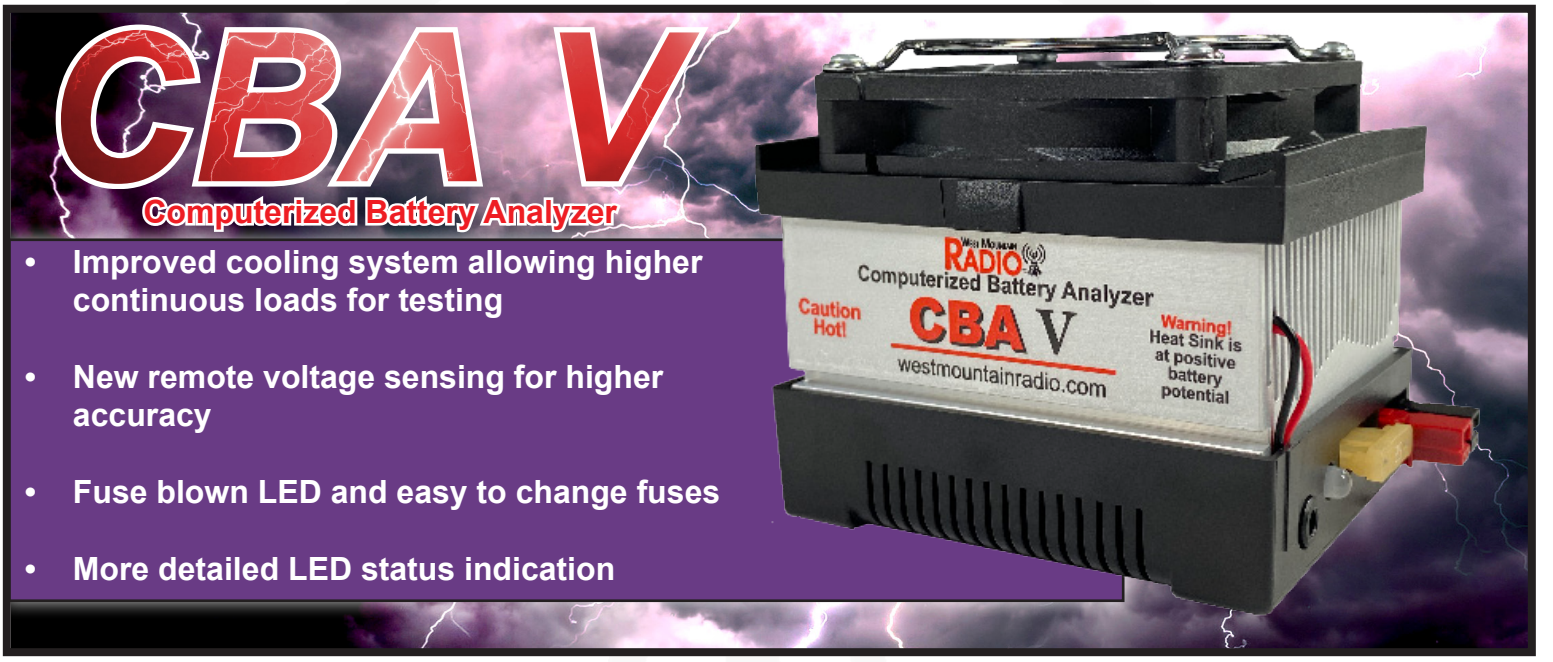
As you can see, there is a lot to the JS8Call software and Jordan has done an amazing job of making this available to all of us for free. There are native builds of the software for Windows, Linux, Raspberry Pi, and Mac-OS.

Resources

Home page: http://js8call.com/
Downloads: http://files.js8call.com/latest.html
Documentation: https://tinyurl.com/js8doc

The JS8Call guide is a must read and really explains much more than this article can. It's available from the Documentation link above.

There is a very active JS8Call forum at https://groups.io/g/js8call



WE WANT TO HEAR FROM **YOU**!

Please send pictures from recent Field Days and of your Shacks.

If you would like to submit an article for consideration in future newsletters please contact marketing@westmountainradio.com

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Oshkosh, WI
July 25-31, 2022

Due to COVID-19, production has been delayed. West Mountain Radio encourages all the hams to keep communication going through these hard times over radio! Stay healthy!

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