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# Radio, after the masks come off

## Which effects of the pandemic on workflow will be permanent?



**Paul McLane**  
Editor in chief

It's safe to assume that the landscape of radio operations will never be quite the same as before the pandemic. Remote work and hybrid approaches will be much more common.

But what does that mean for how radio's technical workflows are managed? How will your next technical project be different because of the experiences of the last 18 months?

In our latest ebook, I asked a number of technologists and manufacturers to reflect on these questions.

Engineers and managers, I found, are taking hard looks at some common assumptions. Efficiency is a byword — more than ever, they don't want their CEOs walking down a hall and seeing rooms being unused.

To cite just one example, John Kennedy, senior VP of technical operations at Audacy, described his mindset for future buildouts: "Do I need one on-air studio and one or two production rooms for each brand in a market? I look at a facility that we built four years ago that has five on-air studios and six or seven production rooms — if I built that tomorrow, it may have two or three production rooms," he said. "And I'd have to dive into whether I really need all five on-air studios at this point."

Among others commenting in the ebook are Scott Foster of Salem Media Group, Michael Everhart of Alpha Media, Mike Friedman of VPM, Shane Toven of Educational Media Foundation, Pascal Gélinas of Cogeco Media and Greg Dahl of Second Opinion Communications, as well as representatives of Natel, RCS, Shively, Burk and the MaxxConnect Group.



## After the Masks Come Off

Find the free ebook at  
[radioworld.com/ebooks](http://radioworld.com/ebooks).

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## Disaster NPRM Discusses Backup Power Requirements

An NPRM from the FCC could ultimately lead to a new expense for U.S. radio broadcasters that don't have backup power at their studios and transmission sites.

The commission launched a notice of proposed rulemaking to improve the reliability and resiliency of communications networks during disasters.

The proposal considers changes to the Disaster Information Reporting System used by broadcasters and other communication providers to report service outages. Participation now is voluntary, but the proposal asks if it should be mandatory for participants following a disaster.

The NPRM also seeks ways to mitigate the effects of power outages on communications networks in the aftermath of such events.

The FCC in the proposal asks detailed questions about how backup power can be deployed to reduce the frequency of power-related service disruptions.

The commission raised the possibility of requiring backup power for participants in both DIRS and NORS, the Network Outage Reporting System. That list includes broadcasters.

A comment period on the NPRM (PS Docket 21-346) had yet not been announced as of mid-October.



Jason Persoff Stormdoctor/Getty Images

## The Fall Radio Show Is No More

There will be no more fall Radio Show conventions.

The National Association of Broadcasters and the Radio Advertising Bureau announced that beginning in April, the annual autumn event, a staple of the U.S. commercial radio industry for decades, will be integrated into the NAB Show.

NAB stated, "The integrated event in Las Vegas will feature signature awards, networking events and a comprehensive conference program, including popular sales and marketing sessions presented by the Radio Advertising Bureau."

Details of how radio-focused content will be integrated in the spring, including registration package options, were not yet announced. The spring NAB Show already includes broadcast management, sales and technology content.

It turns out that the final in-person fall Radio Show was in Dallas in 2019. The event in recent years drew about 2,100 reported attendees. Its agenda traditionally emphasized radio management and sales topics, though there was always a technical component and exhibit floor.



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**Writer**  
Randy J.  
Stine

Radio World's lead news contributor wrote about possible changes in local radio ownership caps in the Oct. 13 issue.

**Above** Dave Hershberger is at left with Geoff Mendenhall and Cliff Leitch. They are shown during installation of an MS-15 FM exciter breadboard for on-air testing at WGEM(FM) in Quincy, Ill., in 1977. Mendenhall's left hand is on the exciter breadboard.

# Hershberger honored as a “Renaissance engineer”

A chat with this year's recipient of the NAB Radio Engineering Achievement Award

**D**ave Hershberger's work with exciters and modulators for transmitters and with low-level signal processing is considered legendary by many in broadcast. In fact, he co-developed the world's first digital FM exciter as an experimental prototype that was tested on the air in 1986.

The National Association of Broadcasters presented its 2021 Radio Engineering Achievement Award to Hershberger, saluting his work at Harris Broadcast, Grass Valley Group, Axcera and Continental Electronics.

The veteran engineer even worked on X-band uplink transmitters for the JPL/NASA Deep Space Network. He retired in 2017 as senior scientist at Continental.

Hershberger does occasional consulting but is mostly enjoying retirement life. Radio World asked him about his career, which was about evenly split between radio and television design projects, and his thoughts on current events in the world of broadcast engineering.

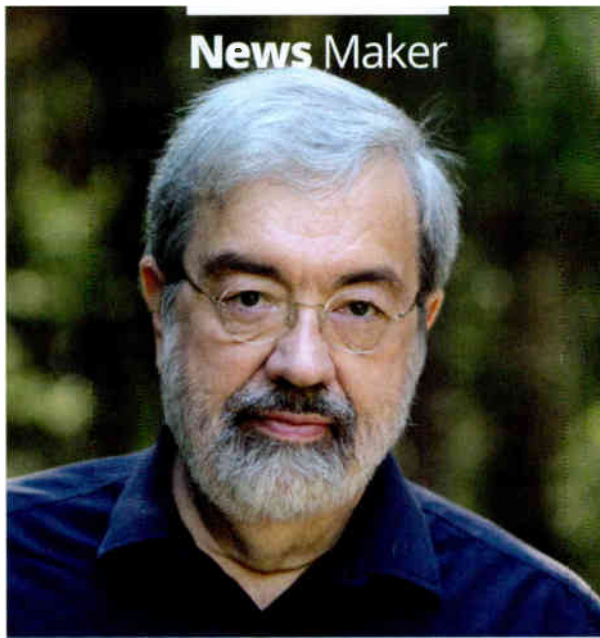
**RW** Where did you grow up and what sparked your interest in broadcast engineering?

**Dave Hershberger:** I grew up in Sycamore, Ill., just west of Chicago but beyond the suburbs. When I was 13 years old I got my ham radio license. After a few years of ham radio, a neighbor suggested that I should look into broadcast radio. That's what got me going.

When I was 16, I studied and got my FCC First Phone commercial license. That was my ticket to getting into broadcast. After high school, at age 17 I got my first radio job at what was then WCLR in Crystal Lake, Illinois — AM 850. They had a directional antenna and needed a First Phone licensee on duty.

**RW** Describe your early days at Harris Broadcast when you started in 1975. What was it like in Quincy?

**Hershberger:** Harris was a lot of fun. Quincy, Ill., less so. But it was where the work was.



I started out in the TV transmitter group, but after talking with Geoff Mendenhall, who worked in FM, we started brainstorming at lunchtime on what we would like to do in a new FM exciter.

The TE-3 was old, expensive to manufacture and had its shortcomings. Geoff worked with management, got authorization to start a new FM exciter development and I got transferred to FM. We added some more engineers on the project and away we went.

We broke ground with a new kind of stereo generator, overshoot controlled filters, improved PLL dynamics to eliminate tilt on low-frequency square waves, and many other features.

**RW** What do you consider your most important contribution at Harris?

**Hershberger:** That would probably be the overshoot-controlled low-pass filters. When we were developing the MS-15 FM exciter, we heard that there was a popular new stereo generator with built-in audio processing being made on the West coast. It was called the Optimod. One of its most important features was its ability to control overshoot in the 15 kHz low-pass filters integral to the stereo generator.

Bob Orban had come up with a brilliant solution for dealing with the problem. He took a systems approach, and the filtering and filter overshoot correction were tightly integrated with the audio processing.

We were also developing a stereo generator option for the FM exciter. But if we did not solve the overshoot problem too, we would not be able to sell very many stereo generators. So my job was to find a solution.

And it was a difficult problem, controlling both amplitude and spectrum simultaneously. One way to begin to address the problem was to filter, then clip off the overshoots, and then filter again. That would reduce the overshoots somewhat but would not get rid of them completely.

Theoretically the process could be repeated: filter, clip, filter, clip, filter, clip and keep doing that until the overshoots were low enough. Of course such a system would not be practical.

Eventually I figured out that what I needed was something that did more than clipping. A clipper can be analyzed as a gain reduction device, which reduces gain only during overshoot. If I could reduce the gain

“ He turned on the radio and Brian said it was so loud that it blew him into the back seat. ”

Above  
Dave Hershberger

Brian Cox was one of the engineers on the MW-1 AM transmitter. He had left Harris and was working for another company in Quincy. He would leave his car radio tuned to WGEM, and one morning he got in his car to drive to work. He turned on the radio and Brian said it was so loud that it blew him into the back seat. That was the first morning we had the prototype on the air.

more than what is necessary to accomplish simple clipping, then I could make the overshoot controller converge in just one pass of filter-clip-filter.

So the trick was to take the overshoots, clip them off, amplify them with a gain of about two and then subtract them from the clipped waveform. Linear phase filtering of that signal resulted in near complete elimination of filter overshoot, while still providing a sharp 15 kHz cutoff.

The advantage was that this was not part of an audio processor. It was a stand-alone function. So you could use any audio processor you wanted, run it into our stereo generator and the 15 kHz low-pass filters would not overshoot and create overmodulation. Any audio processor could gain the overshoot control capability of the Optimod.

We did our first on-air testing of the MS-15 exciter at WGEM(FM) in Quincy in early 1977. The overshoot control, along with greatly improved low-frequency dynamics, allowed a huge increase in average modulation.

**RW** How about the highlights from Continental?  
**Hershberger:** In general, deployment of digital signal processing in several different product lines: FM exciters, ATSC exciters (including linear and nonlinear adaptive equalization), and VLF and LF transmitters.

**RW** Is there a career project that stands out?  
**Hershberger:** Probably the coolest project was the JPL/NASA Deep Space Network uplink transmitters. They generate up to 80 kW in the 7 GHz range

These were non-broadcast transmitters but it was a most interesting and challenging project. JPL wanted very low phase noise — not for communications, but so they could also use the transmitters for science experiments. Those included searching for gravity waves by detecting phase bumps, and bistatic radar imaging. Bistatic radar

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\* The Gateway 4 codec supports 4 channels only and is not upgradable to support more channels.



**Above**  
Hershberger at age 16 with his ham radio gear.

**Below**  
Dave and his wife Sandy at NAB 1980. She was a software engineer for Harris and worked on remote control systems.

has the signal source on earth, with the receiver on the spacecraft.

So everything we did required attention to low-noise performance. RF amplifiers, the klystron beam supply, focus magnet supply and filament supply, and even the water cooling system all needed to be very low noise.

The first production transmitter was installed at the Goldstone station and was first used for the Pluto flyby in 2015. In addition to communication, it was used for the bistatic radar mapping of Pluto.

**RW** You wrote in *Radio World* over the years about implementations of HD Radio. Can you discuss that work and assess the state of HD Radio in the United States, and where it may go next?

**Hershberger:** I'm rather disappointed. There are interference problems. The audio codec cannot be upgraded to more modern technology. There is no "oh, wow" factor — such as having your radio figure out your preferences, and then find and record shows it thinks you might like — features that are found in some DVRs.

There is little or no ability to provide different commercial announcements and music to different listeners, based on age, interests or location. There is no non-real time transmission and storage capability.

There are many such features that should be part of a new digital sound broadcasting system. As it is, we just have plain old real-time, single-stream radio but transmitted digitally.

**RW** You were an advocate for moving AM stations to TV Channel 5 and 6 below the FM band, which didn't happen. What are your feelings about that now and about the future of AM radio in general?

**Hershberger:** It was unfortunate yet predictable that it wouldn't and didn't happen. But there is a similar opportunity now. ATSC 3.0 includes the ability

to carry audio-only programs. And those audio-only programs can be broadcast with optimization for mobile reception, with robust coding, independent of the modulation and coding for the video signals.

I would like to see AM radio begin simulcasting on ATSC 3.0 signals. A single ATSC 3.0 transmitter could carry all of the AM signals in a market, in addition to TV programs. Car radios could be made to receive at least the audio-only streams in ATSC 3.0. And that would be a solution to the electric car problem, where the drive train makes so much electrical noise that including an AM radio is just way too expensive because of the required EMI suppression. ATSC 3.0 is also a way to make AM programming receivable in homes again.

Meanwhile, I am participating in the AM Improvement Working Group of the National Radio Systems Committee, which is studying ways to keep analog AM viable.

**RW** You thanked Geoff Mendenhall and Dan Dickey for their support through the years in your NAB acceptance video. Any other mentors?

**Hershberger:** Absolutely. There were many. At Harris, there was Hans Bott, Tony Uyttendaele, Terry Hickman, Bob Weirather, Hilmer Swanson, Tim Hulick and there were more. At Continental there was José Sainz, Grant Bingeman, Michael Pugh, Howard Butler and more. And the late Dr. Steve Reyer, an EE professor at Milwaukee School of Engineering, was certainly a mentor.

**RW** If you were chairman of the FCC, what one technical change would you want to make?

**Hershberger:** If I could only make one change, it would be to enforce radiated and conducted emission limits. Don't let cheap noisy power supplies and chargers into the country. Force recalls of products that are in gross violation of the rules. Make AM radio receivable in homes again!





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Right Hershberger is shown installing AM stereo at WLS(AM) in Chicago in 1983.

**RW** What do you think is the most important trend or recent development in the management of technical infrastructure for radio? We hear a lot about centralization of engineering departments.

**Hershberger:** I'm not a manager or an accountant. But I am disappointed to see management make decisions which greatly increase off-air time when there are problems. I am disappointed to hear stations with audio problems that last for years at a time.

Better engineering is sorely needed. And that costs money, but it is well spent.

Letting broadcast infrastructure decay saves money in the short term but not in the long term. You can do the same thing with your car — don't do maintenance — but it will come back and bite you eventually.

**RW** What do you see as the most pressing technical issue facing radio broadcasters today?

**Hershberger:** Interference. Switching power supplies, chargers, lighting, etc. not only affect AM frequencies but also VHF and even UHF. Allocation and regulatory mistakes create legal interference which only adds to the problems.



Also, beware of computer engineering philosophies invading radio engineering. As more and more digital technologies are applied to broadcast engineering, there have been clashes of culture, which turn into real technical problems. Computer engineers are interested in sending the bits in a proper format without errors.

That much is fine. But computer engineers often pay no attention to phase noise in their clocks, or in selection of clock frequencies which are appropriate for broadcast radio, or frequency accuracy of such clocks. And why would they? Data are still transmitted without error, even if the clock is noisy or off frequency.

Bottom line, don't assume that digital signals have low enough phase noise and frequency accuracy to meet broadcast standards.

**RW** You and your wife have certainly been together a long time. Any marital advice to offer?

**Hershberger:** I have been married to Sandy for 44 years now. She has been a music teacher, a software engineer, for which she won an Emmy award, and a licensed marriage and family therapist.

As for marital advice, I think I would say to change compatibly. We all change as we age, and it's important to consider our mates as we do so.

Also I think there is some luck involved. I feel pretty lucky. We are blessed to have a gifted 17-year-old daughter who aspires to a career in the sciences.

**RW** Retirement life in California seems to be treating you well. Why do you love it?

**Hershberger:** We live in a log house we built on our rural property adjoining Tahoe National Forest, near Nevada City, Calif. We have deer, bears, foxes, coyotes and other critters for neighbors. My voluntary hobbies include ham radio. My involuntary hobbies include property maintenance — cutting, hauling and splitting firewood from downed trees, and plowing snow with my tractor. We have alternative energy — solar electric and diesel generator backup — for our frequent power outages, but it is beautiful here. **RW**

**“ I would like to see AM radio begin simulcasting on ATSC 3.0 signals. A single ATSC 3.0 transmitter could carry all of the AM signals in a market, in addition to TV programs. ”**

**RW** As you talk to fellow engineers, what are their most common complaints or career challenges?

**Hershberger:** Not many broadcasters want to do things the right way. They want to spend as little as possible, even if performance and the on-air product is degraded.

**RW** What is your advice to younger folks entering a technical field like this?

**Hershberger:** Don't expect to be proficient if your education is digital-only. You still need to understand analog concepts, even if they are all implemented digitally. Learn control and feedback systems, filtering, modulation theory, signal processing and complex math.

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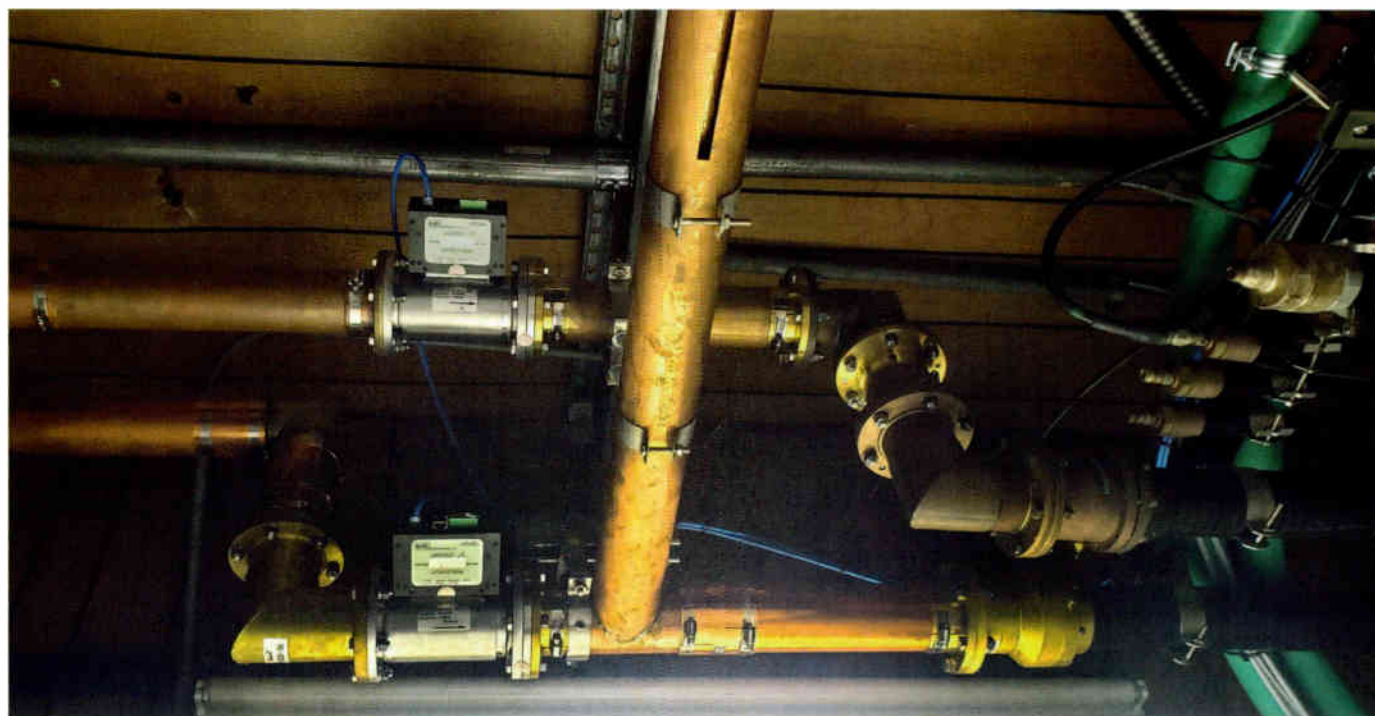
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The author is in his 31st year of the Workbench column. He handles western U.S. radio sales for the Telos Alliance and is a past recipient of the SBE's Educator of the Year Award.



## Send your ideas

Workbench submissions are encouraged and qualify for SBE recertification credit. Email [johnpbisset@gmail.com](mailto:johnpbisset@gmail.com).



# The beauty of a shorted quarter-wave stub

Xenirad calls it "the ultimate in coaxial lightning protection"

In addition to pumpkin pie and turkey, Halloween and Thanksgiving, this is the time of year to focus on budgets. Even if your station is one of the few that don't use a budget process, it makes good sense to prepare a list of physical upgrades that may be needed in 2022.

As you review the equipment that could use an upgrade, also consider acquisitions that can reduce your risk. A surge protector or UPS, for example, can save not only money but headaches, and you can't beat the cost/benefit ratio.

Another piece of protection equipment you may want to consider is a shorted quarter-wave stub. One can be placed on the output of an FM exciter, ahead of a tube transmitter, so that any tube arcing is shorted to ground and will not be fed into the exciter.

Our Radio World colleague Mark Persons has an interesting article on his website [www.mwpersons.com](http://www.mwpersons.com) describing its use.

Select "Tech Tips" and look for "Stub Protector for FM Exciters and Transmitters" under the FM Tips column.

This concept can be used in higher-power applications, though you may not want to cut rigid line yourself.

Enter Fred Francis, an RF consultant, who manufactures tunable shorted stubs in both 1-5/8-inch and 3-1/8-inch rigid line under the company name Xenirad.

The quarter-wave shorted stub connects between your transmitter and your antenna system to short the center conductor to ground. This provides lightning protection for your transmitter. Should lightning strike your tower, the high-voltage pulse travels down your transmission line and meets the stub, where it is shorted to ground.

The stub is virtually invisible to your transmitter and offers 0 dB of insertion loss and an input VSWR better than 1.01. Return loss values are typically greater than -50 dB. Both fixed and frequency-agile models are available.

A real benefit is that the stub is maintenance-free, even after a discharge. There are no parts to replace.

The shorted stub acts as a broadband filter, and in sites where FM is collocated with AM, the latter signal is reduced by more than 30 dB.

An installed tunable stub is shown in the first image. It can be identified by the long slot, which provides fine-tuning across the FM band.

In addition to providing a DC short and broadband filtering, the stub recently was used at Black Diamond

**Above**  
A 3-1/8-inch tunable stub, mounted at the transmitter output (and identifiable by the long slot at center top), diligently guards against damaging voltage spikes.

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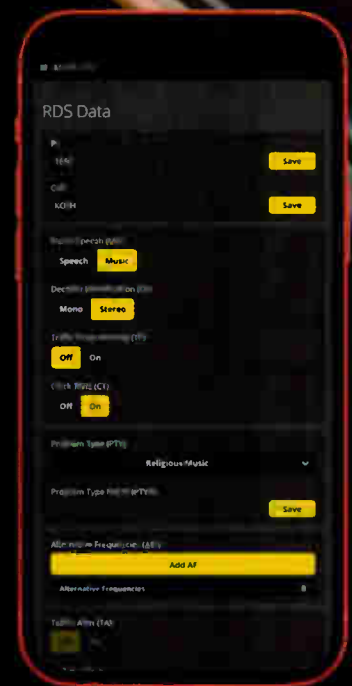
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Broadcasting in Michigan by Del Reynolds, director of engineering, and his assistant Brian Brachel.

Brian was referred to Xenirad by Nautel's Jeff Welton after Brian discovered a spur on their Continental 816R-4 transmitter. The spur was located on the GPS channel at 1.575 GHz. Installation of the shorted stub knocked out the spur. This particular stub was customized using two tunable stubs, one quarter-wave shorted and one quarter-wave open to remove the specific harmonic.

Shorted stubs also can be used on STL RF links and RPUs. The Curly-Q stub shown above lists for \$250; a rigid version for your STL is shown at right. These are available from distributor Broadcasters General Store. All protect the equipment to which they are connected.

**Above**  
The Curly Q stub can be used on excitors and RPUs.

**Right**  
A miniature version of the rigid stub protects the STL.



## An update he didn't want


I wonder how many other readers have experienced this: Dan Slentz writes that Windows 10 shoved another unrequested update down the "throat" of WDNP(LP)'s on-air computer the other night. Unfortunately, he says, the Win10 non-pro version doesn't give you good options to block updates.

Previously a Win10 update had forced the audio card and computer audio to 48 kHz instead of the standard 44.1k Hz. This is a major problem for some software that wasn't designed or have settings to change to 48 kHz.

After fighting with his Simian automation and ASI soundcard for weeks, Dan did find where and how to force the system back to 44.1.

But the most recent Microsoft update did something new. When it forced the update, it apparently decided that it didn't like the licensing dongle or the approval of the software, so it "unlicensed" the station automation — which went into demo mode, timing out every hour. This update took the station off the air for two hours!

Dan can't help wondering how Microsoft can continue to do this. What if we're talking health care equipment instead of radio or TV, he asks. They should not have the right to force any updates without our choice to accept them.

Dan wonders if they realize they had interfered with a federally licensed broadcast facility by knocking it off the air. 

**“ The update decided that it didn't like the licensing dongle or the software's approval, so it 'unlicensed' the automation, knocking the station off the air. ”**

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18

**Writer**  
Mark  
Persons

WØMH, CPBE

The author retired after 44 years but continues to mentor broadcast engineers.



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# Alike, but not alike: Broadcast vs. ham radio

Experience in amateur radio can be a boon to the radio engineer

**S**tarting in the 1920s and through the '60s, almost every broadcast engineer was a licensed amateur radio operator. That has changed a bit, but the importance of being a ham has not.

Both environments involve getting an RF signal from Point A to Point B. But it is interesting to note that radio broadcast and amateur radio are similar and yet so different.

For those who don't know much about ham radio, I'll tell you that communicating locally or internationally, via licensed amateur radio, can be a fascinating and challenging hobby. There are about 700,000 hams in the U.S. and an equal number worldwide.

## Physics

Broadcast and amateur radio operate under the same laws of science. Transmitters, transmission lines, antennas and receivers make up an RF path to convey a message.

Broadcast engineers know that signal propagation on AM and FM bands is dramatically different. It is because our FM band is roughly 100 times the frequency and 1/100th the RF wavelength of that on the AM band. Engineers also know that 950 MHz STL signals are line-of-sight and roughly a 10-times jump in frequency from FM broadcast frequencies. Each band has its own challenges in getting a useable signal through.

Amateur radio operators have about 30 bands of frequencies, with

opportunities to explore from below the AM broadcast band up through GHz and to light. Hams are not limited to amplitude or frequency modulation, but often use single sideband and many modes of digital. A few communicate via teletype and/or transmit television images to friends.

Yes, some hams still use Morse Code to send and receive messages in their hobby. Code proficiency is no longer required for getting an amateur radio license, but it is a fun personal challenge to many.

## Similarities

What I find valuable is applying what I know about amateur radio in my work as a broadcast engineer.

**Above**  
Mark and Paula  
Persons at their  
ham station.

And, of course, it works both ways. Forward power, reflected power, transmission line loss, antenna gain, transmitter power amplifier efficiency and path loss are all dictated by the same rules. The mysteries and science of RF propagation to a new broadcast engineer are facts of life for radio amateurs.

Hams deal with the wave propagation challenge every day. Communicating across the world via radio waves may be lost on the internet/millennial generation, but it

can be a real challenge for those who want more out of life.

International contacts are common during peaks in the 11-year solar cycle. With 400 watts I was able to make contact with a station in Antarctica from home using a good antenna. I made contacts to Europe, Japan, Russia and even Australia with just 100 watts from my car, mostly on 20 meters (about 14 MHz). Talk about distracted driving! Australia is halfway around the world from Minnesota.

The RF path between us was only

open for a half hour. It is always a thrill to be on the right frequency at the right time.

As with broadcast, profanity is not allowed on amateur radio. Don't confuse amateur radio with Citizens Band. CB is a sad story about people transmitting on the 27 MHz band using bad language and unacceptable social conduct. Hams can lose their licenses for that.

### Differences

Broadcasters are licensed for specific frequencies at specific power levels.

Hams might run up to 1500 watts of RF peak power in most bands of frequencies. Good operating practice is to transmit with only the amount of power necessary to reach the other end. Some delight in the challenge of contacting amateur stations worldwide with a watt or less of power.

Broadcasters modulate AM, FM and/or digital as per their license. FCC rules mandate tightly controlled

**“ Amateur operators have about 30 bands of frequencies, with opportunities to explore from below the AM broadcast band up through GHz and to light. ”**

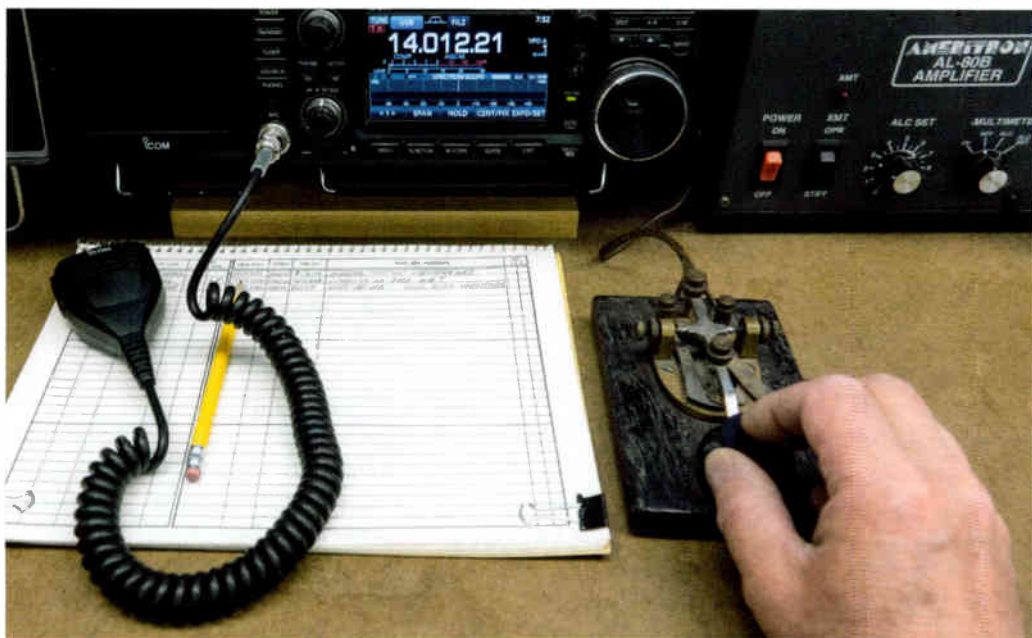
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Because there are so many hams nowadays, new call signs in the United States look something like KF2XYZ. To be clear, broadcast stations have call signs, but broadcast owners do not. An amateur call sign is assigned to an individual person.

Hams use their call signs to identify every 10 minutes and at the end of a conversation. Broadcast stations, as you know, are required to ID once an hour. A broadcast ID has a call sign and city. Hams only use their call sign. They might be mobile, on the water or even airborne.

## SBE

The Society of Broadcast Engineers has a "Chapter of the Air" meeting on amateur radio the second Sunday of each month on 14.205 MHz single sideband. Net control is Hal Hostetler, WA7BGX in Tucson, Ariz. It starts at 2400 GMT. That is 6 p.m. Central Time in Minnesota during the winter and 7 p.m. in the summer. Hams check in and tell what has been happening in their lives, such as attending an NAB convention or SBE meeting. This group has participants from coast to coast.

## Morse Code

While walking into the engineering room of a station, I heard the Morse Code letter B (Dah-Dit-Dit-Dit).

It didn't take long to realize the sound was coming from a Best brand Ferrups uninterruptible power supply. The "B" was telling me that its battery needed replacing. The letter H is a high temperature alarm. Very clever of them.

Knowing Morse Code also comes in handy on 450 MHz transmitter/studio links with Morse identifiers. Those who are Morse-challenged might call a local ham and play the sound over the phone to learn the answer.

Morse Code is another way of speaking English. It is not that difficult to learn. If I can copy code

**Above**  
Some hams prefer communicating by Morse Code.

occupied bandwidths. Hams select one of many modulation types, although the bands are divided into segments for each modulation type, just to keep order.

Broadcast transmitters are required to maintain a tight frequency tolerance. Hams can wander up and down authorized frequency bands looking for a clear spot to call CQ (calling anyone listening who might want to talk). They can and do easily converse with hams in foreign countries. That is far more fun and challenging than just listening.

Hams don't "broadcast" to a city or the world. They don't play music or run programs as you will find on the AM and FM broadcast bands. Instead, amateurs communicate with other hams one on one by voice, digital or Morse Code.

Sometimes hams participate in "nets" where groups meet on frequency to share ideas. The net control operator turns the frequency over to one at a time for the rest of

the group to hear.

In broadcasting, almost anyone can buy a station, a construction permit or a license. It just takes money. Amateur radio is different. For a fee of about \$35, a person can write an exam to prove his or her knowledge of electronics and FCC rules. With a passing grade, the FCC will issue a license to that person, good for 10 years with a cost of only \$35 to renew. Try that in broadcasting!

Amateur radio currently has three levels of licensing: Technician, General and Extra. Climbing that ladder with examinations gets hams more privileges and operating frequencies. Many thousands have done it and so can you, especially now that proficiency with Morse Code is no longer required.

## Call signs

Amateur radio operators and broadcasters are issued call signs by the FCC.

Each call is unique and recognized worldwide. There is only one WGN in Chicago, only one W0HA for my wife Paula and only one W0MH for me. The (0) is zero, not O.

Call signs in other parts of our country use numbers 1 through 9 separating the prefix from the suffix.



## More Persons!

For more articles and resources from the author visit <http://mwpersons.com>.

# Amateur Radio

with a severe hearing loss, you can too. (I was a U.S. Army sergeant in Vietnam 1968–69.) My wife Paula passed a 20-word-per-minute code exam to get her Extra Class amateur license.

As mentioned, code is not required nowadays. Many hams find it a preferred mode of operation because it cuts through the noise so well. Many hams refer to Morse Code as the original digital communication mode.

## The ham hobby

Some radio amateurs like to design and build equipment. Many like to work on antennas. Most like to chat with friends on the radio. Some chase DX (long-distance contacts) to stations in foreign countries. They proudly stick a pin in a world map at each far-off location.


Astronauts are licensed amateur

radio operators. It is a real thrill to talk to a ham aboard the International Space Station. That can be done with just a few watts of power on VHF or UHF. The old adage is true: If you can see it, you can talk to it.

## Conclusion


Broadcast engineers who are licensed amateur operators have a better handle on the world of electronics. Having a ham license is one more way of showing their peers that they know something about RF. It is another feather in their cap.

For more information on amateur radio, go to the ARRL, the National Association for Amateur Radio at [www.arrl.org](http://www.arrl.org).

And learn more in a video at [youtube.com](http://youtube.com), search key term "W1AW ARRL Station Tour." 

“ Amateur operators have about 30 bands of frequencies, with opportunities to explore from below the AM broadcast band up through GHz and to light. ”

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A contributor to RW since 1997, he has reported for CBS News Radio, the Associated Press, BBC World Service, CBC Radio and American Forces Radio.

Twitter: [msrpk\\_com](https://twitter.com/msrpk_com).

# What's in your radio news toolkit?

We'd like to hear from you with the list of tools you use

**R**adio news is a combination of sound, speed and story. The best reports, be they live or recorded, take the listener to the scene where the news is made and tell a story, using the words of the reporter on scene, the sound of the news or the words of a newsmaker.

Network radio reporters, major-market reporters or small-market broadcasters have a tool kit they rely on to make those stories come alive for the listener.

Eben Brown's voice is familiar to Fox News Radio listeners. Brown is a national correspondent based in Miami. One would expect him to be able to send a report from wherever his assignment takes him.

"I'm responsible for transporting and operating my own gear. Going live from anywhere is something I've often considered my big strength as a radio reporter. One of my recurring nightmares is being sent into the field and not being able to send line-quality audio back to the home base.

"Going live over telephone quality audio, to me, feels like a fail — even when it truly is the only option. With more people listening to our product via digital means or even with so many news/talk stations migrating to FM, the sound of a POTS line can be jarring. So, when I'm on my own in the field, I carry with me multiple options for getting high-quality audio, live, back to New York. But it's not just my mic I want live. I want to be able to play my own recorded sound."

Brown rolls with a Comrex Access NX, which allows for connections through Ethernet or multiple cellular paths, and with a second input, allows him to insert actuality with



Fox News Radio

his voice. He also files a copy of his live reports in case the line back to the New York studios drops.

"Nothing is ever 100% foolproof, so filing a backup is always smart."

He'll use workarounds like Zoom or Skype or the smartphone if necessary, but those options won't let him insert actuality. Recording that actuality has become easier, with iOS-based apps

like TwistedWave for short recordings. Brown uses TwistedWave, but breaks out a digital audio recorder for longer news conferences.

"I'd worry too much that a smartphone battery could die if made to record 30 minutes of conference." His choice for microphones: A Shure SM58 and ElectroVoice RE50.

Though smartphone microphones sound good, there's another reason Brown likes the stick microphone: "Walking up to total strangers can be daunting for both parties. I find that having a stick mic with a flag — and a famous network logo — is a way of presenting my bona fides.

"If I say I'm a network reporter, and I try to record them only by holding up a smartphone near their face, they tend to doubt my sincerity or professionalism."

Production in the field for Brown is handled by a MacBook Pro running Adobe Audition.

"Being Apple-dependent means I can record something on my iPhone and airdrop the file to my MacBook Pro. I can lay my own tracks into the MacBook via an iRig-connected mic. I can edit in Audition and can send finished products back to New York via several file transferring methods that are commercially available and not specific to the industry."

He can also use the iPhone to do all of that, using an

**Above right**  
This simple field kit helps KKHJ Radio keep their audience in American Samoa informed.

**Center**  
Eben Brown

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AMB-22-4E	AMB16-4E MINI	HMB-14-4E	HMB8-4E

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## Radio News

app called Ferrite, which is a multitrack editor that allows him to record and mix narration, natural sound and newsmaker actuality, and send the finished product back to New York.

John Sylvester, vice president of Fox News Radio, says "FNR reporters like Brown have been given remote access to Adobe Audition, Amazon Workspace, Slack, Zoom, iNews for writing and editorial newsgathering, and VPN access to our ENCO automated audio systems. In addition, we have provided various other tools and software applications."

Michelle Wright reports for Atlanta's WSB Radio, heard on 95.5 FM and 750 AM.

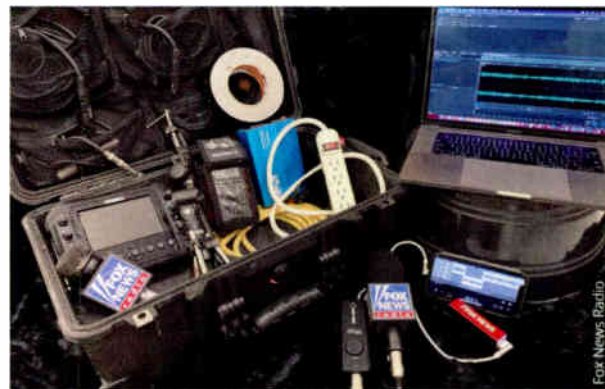
"In my bag, I've got a laptop equipped with Adobe Audition for editing, a microphone, Zoom recorder, headset and a box that connect to the phone to do live remotes, a wireless hotspot and various charging cables for all the above-mentioned electronics. And of course, my phone.

"I also still have the old-school pen and reporter's notebook to jot down notes as well." Back in the newsroom at Peachtree Street, NewsBoss software and email are used to process reports.

Six thousand five hundred miles away, Joey Cummings is the operations manager for KKHJ(FM) Radio in American Samoa.


"We have three full-time news people. Of course, in a small market, everyone is responsible for gathering news. As such, we're all using whatever is most practical and comfortable in the field.

**Right**  
When Fox News Radio's Eben Brown arrives on scene (wherever it may be) he's ready to report.



"If we're trying to capture a speaker at a conference or meeting, we can't always get a full-size microphone in place. In this case, we'll use a small Sony or Olympus field recorder and sneak it onto the table or lectern," he said.

"Otherwise, I like the wireless Samson HXD1 wireless mic. This connects to a small USB receiver. I typically connect this to my iPhone or iPad using the Apple USB to Lightning adapter. For recording and editing in the field, I am quite fond of the TwistedWave Editor app. Best \$10 I ever spent on the app store. Dropbox gets files from A to B."

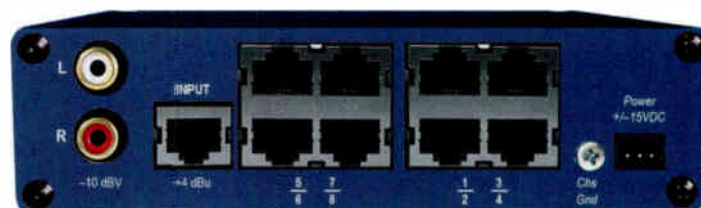
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## Burk Arcturus serves Washington's WAMU

Complex master antenna requires muscular monitoring and control

### Writers

**Rob Bertrand**

Senior Director of Technology, WAMU

**Andy Gunn**

Director of Engineering, WAMU

**E**arly in 2020, WAMU completed its new ERI 1183-series FM master antenna system, the largest in Washington, D.C. It serves WAMU,

WTOP and WPFW, and is an aux for WETA. The tower also holds separate noncombined antennas for WMMJ(FM) and a backup to WPGC(FM). (Read Radio World's 2020 article about the project at [radioworld.com](http://radioworld.com), search "wamu master.")

Senior Director of Technology

Rob Bertrand had been part of the management group for a high-profile master antenna group in another

major market, which had experienced some operational challenges over the course of its history that a modern monitoring system might have alleviated. When Director of Engineering Andy Gunn joined the WAMU team, the two set the goal of building the most robust system they could imagine.

Rob contributed his knowledge from managing the prior system and Andy brought his tenacity, creativity, and attention to detail to the project. The result was an implementation of Burk's Arcturus system of which both engineers are very proud and is a showcase of the system's capabilities.

The monitoring and control project sought to address multiple concerns from the start. Several of the stations have relatively high TPOs in the 20 to 30 kW range, so very solid VSWR monitoring is important. There are unique switching and monitoring considerations to meet some

**Above**  
Rob Bertrand, left,  
and Andy Gunn



of the backup features incorporated into the antenna systems. There was also a strong desire to ensure the system would accommodate the addition of more stations in the future.

Prior experiences with esoteric failures made redundancy a significant design concern across the system. WAMU wanted dual interlock strings for each station operating in parallel so no single wire would cause an interlock issue for stations. They also added dual dehydrators, which automatically rotate duty cycle via Arcturus, and can be switched online in the event of failure.

Multiple safety features were incorporated: U-links on every transmitter input to the system as well as a key switch and controller lockout system to protect climbers on the tower. There is also a centrally located interlock bypass for when maintenance is required on the VSWR monitoring system itself.

The Burk Plus-X VSWR fit the bill for a self-contained VSWR monitoring unit that would be fast-acting, have three-strike capability, and operate even if it lost connection to the Arcturus controller. Additional Burk Plus-X 600 and Plus-X EM32 units provide the necessary I/O to operate additional functions and monitor critical temperatures, fire, and security statuses throughout the complex.

Burk engineers collaborated with WAMU to program many macros on the Arcturus system that gives it the extensive functionality required. The sheer quantity

of monitoring and control points across the system necessitated relatively complex macros, which Burk designed. WAMU also requested the ability to view key system values over the course of a year, so that operating variables across seasons could be tracked. Burk delivered multiple custom pages of monitoring and control in AutoPilot to meet all these needs. Paul Shulins and David Wing of Shulins Solutions provided integration services for the installation of the system. They were vital in thinking through the installation and making sure there were no "gotchas" in this stage.

The Arcturus system has been running reliably for WAMU and its tenants for nearly 18 months. During the initial buildout there were several challenges in ironing out final configurations, but Burk support worked with WAMU as was necessary to get everything as they wanted it to be. The wiring for the system is very complex, and the labeling and documentation for the system is similarly complex. It took a while to determine the best method to label and document the system. The complex macros required extensive testing to ensure they didn't have any unintended consequences — for instance, opening interlocks in the event of power loss to a single unit or loss of network connection between the devices. Thorough testing and final corrective action ensured the platform will be reliable and responsive to the needs of DC's largest master FM system for years to come. 🍷



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## Tech Update

### DAS Adds to EAS Line

For remote monitoring and EAS management, Digital Alert Systems highlights its EAS-Net, Collector and HALO product set.



Using the company's EAS-Net communications protocol, DASDEC emergency messaging platforms can forward both message data and audio to the unique software-based Collector for processing/routing at one or multiple centralcast sites. The company says that whether Collector is hosted at a local server or in a cloud environment, it creates a virtual hub with DASDEC "spokes" receiving and decoding off-air signals, thereby eliminating complex remote radio streaming configurations.

The patent-pending HALO enterprise-grade EAS device management tool enables detailed monitoring of up to hundreds of DASDEC units in a virtual environment.

HALO gives multiple users access to one web-based dashboard to verify monitoring station status and network connections, with detailed logging across hundreds of devices. Users can generate compliance reports for one or any number of devices, without the need to gather and compile logs from individual devices. All the information is readily available, searchable, selectable and reportable at the touch of a virtual button.

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## Tech Update

### Broadcast Devices Has ISC-200 Motorized Switch Controller



The ISC-200 dual switch controller is an SNMP web-based RF switch controller with direct interface for up to two RF switches. The manufacturer calls it a plug-and-play remote control system.

This 1 RU product provides independent control and status of each switch. Independent interlock control for two sets of two transmitters is provided.

The controller is compatible for use with major RF switches on the market. Control voltage is selectable to 12 or 24 VDC for each switch.

BDI also offers pre-made and tested RF switch interface cables for popular RF switches. Other features include RF safe inputs for both switches for interface to BDI's popular DPS-100D series power meters.

Other accessories include a new TX I/O module kit that provides essential connection of TX On/Off, external interlock input and TX On/Off status by Cat-5 cable runs.

GPIO is included to control and monitor position status of each switch for legacy remote control systems or local control/status panels.

The ISC-200 includes a graphical user interface for remote monitor and control via Windows 7, 8 and 10 operating systems

For information, Broadcast Devices at 1-914-737-5032 or visit [www.broadcast-devices.com](http://www.broadcast-devices.com).

## Tech Update

### Broadcast Tools AES Switcher Sentinel 2+1 Update



Broadcast Tools has released a free firmware update for its web-enabled AES/EBU digital audio silence monitor and 3x1 AES switcher, the AES Switcher Sentinel 2+1.

The update adds the option for "dual mono" silence detection on each of the three inputs, useful for mono AES signals or applications where stereo silence detection is not required. It also adds the ability to configure a relay output to provide a contact closure when automatic switching mode is enabled.

The AES Switcher Sentinel 2+1 is suitable for AES/EBU program audio switching and silence/AES error detection at the studio or at the transmitter site. It features two AES inputs and one balanced stereo analog-to-digital input. The inputs feature silence detectors, AES error detectors and stereo phase monitors for detecting out-of-phase audio. When silence/AES error is detected on the primary AES input it can automatically switch to the backup AES input or to the backup ADC input via mechanical latching relays.

The AES Switcher Sentinel 2+1 can be configured and monitored locally and/or remotely over any IP network, including private networks, IP-based industrial control networks, and the internet from its HTML5-based web interface.

Email and email-to-SMS text message notification may be configured to alert up to eight recipients when silence or out-of-phase audio is detected.

For information, contact Broadcast Tools at 1-360-854-9559 or visit [www.broadcasttools.com](http://www.broadcasttools.com).

## Tech Update

### Telos Adds Features to Pathfinder Core Pro 1.8

Telos Alliance has released version 1.8 software for its Axia Audio Pathfinder Core Pro workflow/facility management appliance and virtual machine.

This software update includes support for third-party RESTAPI devices, a new mixing router, enhanced control for the VX family of VoIP phone products, a new dark theme for its user panels and new user panel components for console remote control to assist with virtual studio deployments.

Additionally, it introduces a license for an enhanced scheduling module that adds drag-and-drop calendar-based scheduling of system resources.

Telos also is calling for beta testers for its next evolution of Pathfinder software. Beta features being tested include a security module, with a licensable option to integrate authentication with Microsoft Active Directory and other LDAP authentication servers, floating IPs and improved control of Telos Infinity intercom products. The company also has made improvements to the SapProperty router that allow anything Pathfinder knows about to be used in a router, including raw metadata streams.



For information, contact The Telos Alliance at 1-216-241-7225 or visit [www.telosalliance.com](http://www.telosalliance.com).

## Tech Update

### BE's TX Control Does More With Less

Broadcast Electronics notes that engineers in 2021 increasingly must do more with less. To aid engineers the company has, in conjunction with its siblings Elenos Group and 22HBG, released a new remote-control system called TX Control.



It is designed to provide a complete connected network, distributed in multiple locations, that is scalable and that can control multiple and multi-brand transmitters.

TX Control software is available in a cloud SAAS solution on external servers or it can be located on a server at the user's network operations center. It provides control of the transmitter and third-party equipment via PC, mobile, smartphone or tablet, independent of operating system.

The system is accessible remotely and provides informative graphs and charts, with AI providing suggestions of what might be wrong and what can be done to resolve it.

It is possible to create custom backups on dedicated backup servers and create custom panels and reports as are needed for Service Level Agreements. Access levels are available to grant different actions and notifications dedicated to administrators or view-only users.

For information, contact Broadcast Electronics at 1-217-224-9600 or visit [www.bdcast.com](http://www.bdcast.com).

## Tech Update

### WorldCast Releases Kybio Version 4.0

WorldCast Connect's monitoring platform, Kybio, is available in Version 4.0.

The company says this version brings "more flexibility, security, scalability and ease of deployment" to the monitoring tool.



Among the new features are a customizable Dynamic Multi-Screen Display, Automatic Reporting, an Automation module for RF switch management and compatibility with all communication protocols. It can now communicate with protocols like Ross OpenGear X and Ember+ along with IT protocols such as HTTP Rest API or WMI.

The Dynamic Diagram enhancements now include views beyond the site level to offer views at the root, site and equipment level.

In addition to these enhancements, Kybio's language portfolio has grown to include Portuguese, Korean, Italian and German.

Kybio is available as an On-Premise or SaaS license solution. The company adds that with a straightforward pricing policy for licenses, drivers and associated services, Kybio users are in control of their total cost of ownership throughout the product's lifetime.

WorldCast is offering those interested in a Kybio on-premise license, when ordered before Dec 31, a special deal for up to 25 free licenses.

For information, contact WorldCast Systems at 1-305-249-3110 or international queries +33-5-57-92-89-28 or visit [www.worldcastconnect.com](http://www.worldcastconnect.com).

**Tech Update**

## Davicom Offers Lightning Awareness Products

Davicom's DVLD-1 lightning detector is designed to give warning of the presence and approach of potentially hazardous lightning activity in its vicinity.

It uses its built-in antenna and receiver as well as a statistical algorithm to analyze electromagnetic signals to provide an estimate of the distance to a storm, from as far away as 40 miles (65

kilometers). It interfaces directly with Davicom's Cortex remote control units.

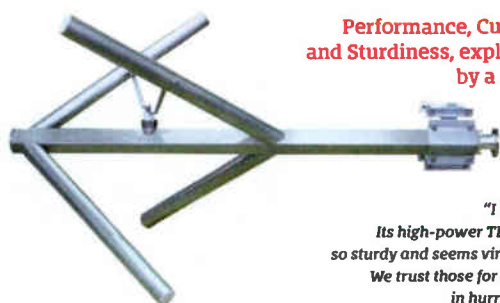
Davicom's DVLC-1 lightning counter complements the DVLD-1, which detects and counts the actual lightning strikes sustained by a transmission tower or grounded structure. It uses a magnetically-coupled current detector to sense and count lightning-induced pulse currents flowing to ground. These counts are sent to the Cortex units via a fiber-optic cable.



For information, contact Davicom at 1-877-282-3380 or visit [www.davicom.com](http://www.davicom.com).

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### AES DA 2x6 XLR AES Distribution Amplifier

The AES DA 2x6, six XLR output, two-input AES/EBU distribution amplifier is ideal for distributing AES/EBU signals or word clock at sample rates of up to 96kHz.

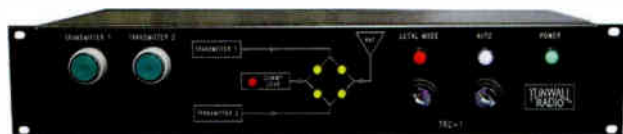
The system's two selectable transformer isolated inputs use a standard XLR audio jack for balanced AES/EBU signals and a RCA jack for S/PDIF signals. The selected input is distributed to six transformer isolated AES/EBU XLR output jacks. Internal AES activity detector provides a LED indicator and SPDT alarm relay.



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# Nonsensical bias about LPFM

The opposition comments attempt to vilify all LPFMs as rule-breakers

**R**egarding the stories “LP-250 FM Petition Draws Lots of Interest” and “NAB Renews Objections to LP-250” (*radioworld.com*, search LP-250):

The NAB has a single goal: looking out for the financial interests of incumbent, commercial, full-power stations.

It is well-known that many LPFM stations are struggling not only with financial burdens but to be heard by the people in the communities they serve.

In most rural areas, LPFM signals at 100 Watts ERP at 30m HAAT are simply not strong enough to overcome terrain and spacing of homes to be adequately tuned in for reliable listening. While this may be quite different for flat terrain metro areas, that is not the norm for the majority of LPFM stations.

The NAB and its members are quite pleased that LPFMs thus far have not had any significant negative impact on the number of listeners they receive for their full-power stations. They know that the LPFM signals are not strong enough or large enough to cause their listeners to seek out noncommercial local alternatives to their ad-bloated and nationally mirrored non-local content.

How do they wish to sway the FCC against any expansion in service for LPFMs? They allege that LPFMs do not and will not comply with FCC regulations.

This is just another ruse, as many LPFMs have been fined for breaking the rules, and when an LPFM causes actual



interference, full-power stations retain their protected status and can force LPFMs off the air.


What they want is even greater protection and monopoly of the dial and to snuff out what they know is a potential problem for them — a potential reduction in listeners and advertiser dollars that have the tiniest potential of being redirected to LPFM underwriting.

The NAB has rejected every LPFM-related proposal for this reason alone. The opposition comments filed with the FCC attempt to vilify all LPFMs as rule-breakers and toss out technical jargon to somehow convince regulators that an LPFM being able to be heard by their communities will flood the airwaves with interference.

The truth is that the NAB thinks it is unfair that a non-profit station doesn't pay as much as they do for listener acquisition, although full-power commercial stations can pay their fees without nearly as much financial concern as the low-power, weak-signal LPFM station that can hardly be heard by any significant audience.

Two hundred and fifty watts is not anywhere close to the average full power of such stations, and to suggest otherwise is ridiculous.

Congress passed legislation authorizing such local community stations, surely with an intent that they could be heard by the communities they serve. Increasing that ability while continuing to limit interference and protecting the very stations the NAB supports would meet the needs of the legislative mandate.

The FCC should consider the NAB objections for what they are: nonsensical bias to further protect their financial interests. 

“**Many LPFM stations are struggling not only with financial burdens but to be heard by the people in the communities they serve.**”

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