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May-June 2018 – Vol. 26, No. 3

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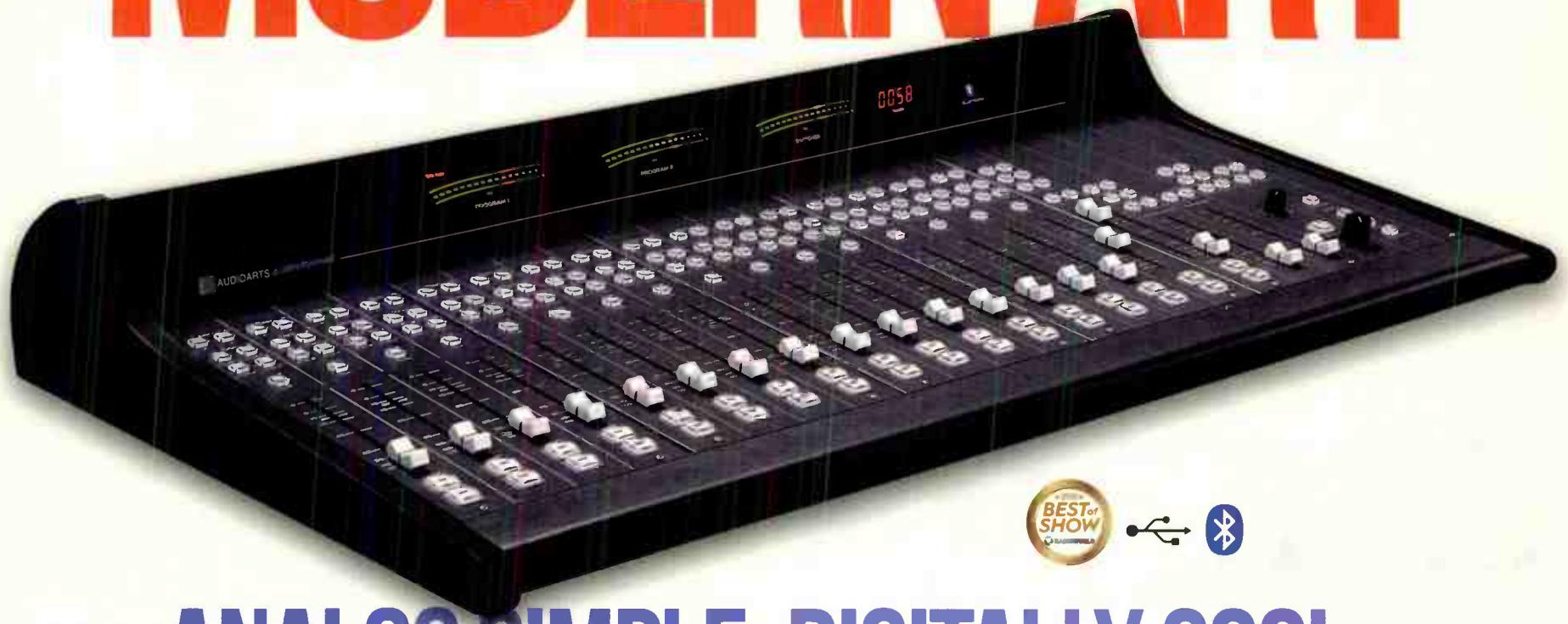

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Watson, We Had No Idea!

by Frank Foti, Executive Chairman, the Telos Alliance

When Alexander Graham Bell uttered that famous line in 1876, "Mr. Watson, come here, I want to see you," he had no idea of the technological revolution that would ensue. His invention of the telephone led to many advances in electronics, as it was the beginning of telephony, networking, and the ability to carry sound from one location to another. Today, a lot has emerged since Mr. Bell's primitive device, but suffice it to say his invention lead to the technological backbone of our world.

At the center of it all is the network. Back in 1876, it was probably beyond imagination to consider a networked world, such as we live in today. We have the ability to click an icon on a wireless device, and within seconds, are able to speak to another person anywhere in the world. This occurs due to sophisticated networks that interface with the telephony infrastructure.

The role of a network (now IP) is at play in our daily lives. At the yearly Consumer Electronics Show (CES) this is obvious, as network connections are available for every type of appliance imaginable. Today, we have refrigerators that can order groceries, all on account of a network connection. Likewise, the automobile is networked, both inside and out. Most current vehicles have a router embedded inside that connects various operational functions, as well as the ability to connect to the Internet.

In the broadcast world, the importance of the network has grown exceedingly over the last 15 years due to the creation and standardization of AoIP (Audio over IP). There was a time when the only network involved in broadcast was either a bank of telephone lines, or a group of broadcast signals brought together as a "network."

Q Radio in Belfast, Ireland, modernizes its facilities with Axia AoIP consoles and virtual and visual radio software from Broadcast Bionics.

The portability of computers and the ability to link them together via a data network brought a major shift to broadcasting. The ability to share information quickly, gather news, and involve the worldwide web was just a scratch at what is now possible today. As network technology became standardized, it paved the way for additional services to make use of it, such as VoIP (Voice over IP). Once again, the telephone was at the heart of another paradigm shift.

Today, basically every phone call made is tied to VoIP, in some form or another. Even the trusted and true POTS (Plain Old Telephone Service) line is usually derived from a VoIP connection. VoIP is an enabling technology for broadcasters, as it brings along a wealth of data in addition to the call itself.

The basis of VoIP and its use within a network, is what gave Telos Alliance's Steve Church and Greg Shay the idea behind the disruptive, innovative technological breakthrough, AoIP, which they named "Livewire." Now, for the first time ever, linear digital audio could be packetized, routed, and switched over a data network using off-the-shelf Ethernet switches. In addition to the audio signals – which could be configured as mono, stereo, or surround – data for control, and ancillary information could now be layered within the signal. This changed everything!

As with any new innovation, there were many skeptics about AoIP's capabilities in the broadcast arena. Fortunately, with the fast-growing popularity of the tech, the industry made an effort to create a standard for AoIP. This resulted in the formal creation of AES67, which is the standard for all Audio over IP networks today.

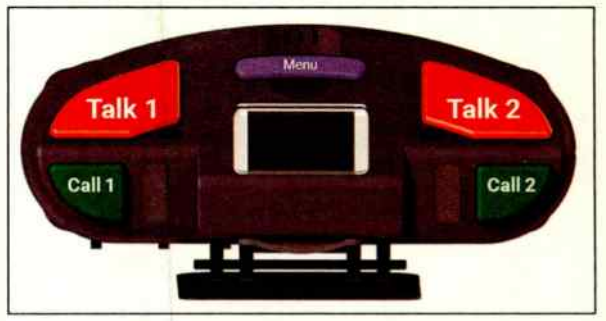
Aside from the enormous flexibility AoIP provides in operation, it actually economizes the technical infrastructure, as most connections consist of CAT-6 cabling, as compared to the hundreds, if not thousands of cable pairs required within a legacy broadcast plant. Also, it basically eliminated the limits for routing and switching of signals. Gone are the large, clunky, and limited matrix switch devices, as they are now replaced with off-the-shelf Ethernet switches for the AoIP network.

The flexibility of AoIP expands beyond studio walls. From the studio microphone all the way to the modulator stage of the transmitter, it is possible to distribute signals among other studios, as well as connect the transmission path for broadcast. Recent network-based designs now enable the FM-Stereo multiplex signal to be routed via an AoIP network. While AoIP created a quantum leap in broadcast technology, it is only scratching the surface of operational possibilities.

The use of data networks in broadcast is not isolated to radio. The world of video and television are now embracing network usage for audio and video. From the equipment and techniques used to produce, distribute and broadcast television programming to the devices upon which viewers consume it, TV technology never stands still. A category of notable exception has been broadcast intercom, which has not benefited from significant advances in technology, efficiency, or reduction in total cost of ownership (TCO) since the early 1990s when the digital matrix was introduced. How audio is distributed and some of the edge technologies have evolved, including the evolution to Audio over IP (AoIP), but the basic working model of an intercom has remained the same: All devices, whether panels, Beltpacks, system interfaces or wireless basestations, had to ultimately connect to a matrix.

This, as it turns out, proved to be the true bottleneck to growth in intercom technology until the Telos Alliance introduced its Infinity IP Intercom – which has a home in both radio and TV broadcasting – in mid-2017. This new family of AoIP solutions delivers a quantum leap in scalability, ease of integration, efficiency, significant reduction in total cost of ownership and complete sharing of all audio sources for both radio and TV facilities.

By leveraging several aspects of AoIP that were there all along but hiding in plain sight, we have advanced intercom architecture beyond its accepted historical role and into a system of distributed signal processing that creates a living, dynamic, self-healing AoIP solution that eliminates the matrix, converges voice communication and contribution audio on a single IP backbone, and completely reimagines broadcast communication.



Telos Alliance Infinity IP Intercom

Before long, the term "broadcast" will be more associated with a networked infrastructure, as compared to the conventional one-way, electromagnetic over-the-air methods. The image of listening to a transistor radio has been replaced by the live untethered mobile connection that supports audio and video.

The emergence of social media has also changed the broadcast landscape. The ability of the listener/viewer to interact with the broadcaster reduces the single direction path of which broadcasting is associated. A network is, once again, at the heart of all this. There are even radio stations who have created formats which are driven by listener activity via social media.

As we peer forward, work is underway to further empower broadcasters through the use of "smart" technology. The smart speaker has found a place in our lives, as well as the broadcast studio.

Conventional wisdom has always assigned the focal point of a broadcast to the studio console. Every part of a broadcast revolves around the operation of the console. With smart technology, there's another shift in thinking. Incorporating smart technology into the studio now enables direct interaction of the broadcaster with the broadcast itself, social media, and facility operations. It will be possible for an announcer to modify a playlist with a voice command, or even adjust the processing! ("Alexa, boost the low end in our Omnia.11 another 2dB!") Broadcast Bionics and the Bionic Studio are trailblazers in this regard, creating cutting-edge tools that work with our Axia consoles and Livewire network, to help broadcasters embrace current technologies and platforms, including smart speakers, radio visualization, and social media.

Just as the Beatles were able to turn the recording studio itself into an instrument used to make records, smart technology further enhances the flexibility of a console for broadcast, as it becomes interactive for both the announcer (presenter) and the listener.

The central function to all of this is a network, and my sense is we're still very much on the front end of possibilities in this area. Applying Moore's Law to network technologies will aid many of the concepts and ideas that are already under development now. Through the growth of network technology in broadcast, we're able to provide direct interaction with the listener/viewer, broadcast multiple languages, and view angles, as well as immersive audio.

Aside from the broadcast itself, associated networks are able to provide listener and viewer information to the broadcaster, for ratings and marketing purposes. This further enhances the strength broadcasting provides as a service to the consumer.

Alexander Graham Bell and Mr. Watson really had no idea what their work had created, but our world is far more beneficial for it. And to think it all began with a simple request made over a primitive device. – *Radio Guide* –

Faces for Radio (and Video)

Engaging Your Listeners With Video Podcasts

by George Zahn

Whether radio broadcasters are ready or not, multimedia and streaming are cutting into, or for those wise enough, being used to augment, our reach. As radio strives to enhance its relevance in an era of "instant everything," it's interesting to see that the "now" medium that took on the print media industry almost eighty years ago, now has to evolve its own product. Technology is available for us to add value to our previously audio-only product.

One could argue that World War II was the coming of age of radio, especially the historic turning point of D-Day, June 6, 1944. Prior to June 6, most people depended almost solely on print for news, meaning that the headlines were often read the next morning. 1944 changed that status as radio broadcasters turned to shortwave and other media to enhance its live coverage as history unfurled before the world.

The immediacy and portability combination of radio continued an exponential growth that helped it draw into similar, and often greater, importance than other media. TV would later add pictures, and after that, satellite distribution of audio and images provided another quantum leap in what broadcasters could accomplish, as well as what our consumers would come to expect.

I mentioned portability, and that's one major factor that kept radio neck and neck with video for news. Even early smaller analog portable consumer TVs were pretty spotty, as far as reception, and running a bright video screen would offer suck more batteries than owners would like. Transistor radios were still a great "go to" for most of our portable live entertainment and information.

Stream Weavers

Just as TV of the late Twentieth Century was challenged by the fragmentation brought on by multitudinous cable channels, both broadcast radio and TV today are being increasingly threatened by streaming options. The processing power of our smart phones is bringing us more and more options every day, and for radio it's no longer a given that audio-only content will be "good enough" moving forward.

This discussion goes beyond just having a basic webcam available on our website for shows, or having video or images of our on-air staff available on our websites or social media. Those choices are a step in the right direction when it comes to engagement, but video content, even for radio stations, may well be a key to adding to our impact on social media, including podcasts.

I've spent a lot of time recently, reading and writing about podcasts and streaming for radio, and that is borne out by wave after wave of information that shows that many stations' revenue sources and engagement are growing most significantly via the Internet, streaming opportunities, and specifically, podcasts. The generation we're in not only bases much of its current and future consumption on the reviews of others, but also gets a more empathetic bond when there's a visual image attached.

A Point of "View"

That's one of the reasons I stopped in my tracks when I saw information on adding video to podcasts for radio. My station has a slightly older demo, and (even despite recent Facebook travails) we continue to have plenty of content and engagement with our listeners via Facebook. It remains one of our main social media connections and we also offer audio podcasts on our website for talk programs.

The technology to add video to podcasts has been out there for a few years, but is now becoming more of a factor. From talk and entertainment shows to sporting events, it's now more affordable and technically possible to add video for us "faces for radio." Keep in mind that we're discussing tech, and music and broadcast rights fees continue to be in flux and may be a significant future cost factor. There's also the concern over privacy, but proper use of the medium and releases for radio/video can avoid some privacy issues. Despite those factors, the tech is fun to think about.

As with most ways to execute any strategy, there is a wide array of options. Some smart phone and tablet apps allow you to use the device's camera to create a basic video feed to accompany your audio – either for podcast or live streaming. Among some options are Periscope and Zcast, and you may have also heard of Meerkat.

Periscope was developed prior to release in 2015 and purchased by Twitter. This app is free and allows you to use your phone or tablet's camera to capture video and stream it live. It started out as an iOS offering, but has just recently been adding Android capability for capture and streaming. Here's the tech catch. While viewers can catch your video podcast live, it is only stored for "on demand" viewing and listening for 24 hours afterward. Then it disappears.

During the live presentation on Periscope, there is the ability to get feedback, as viewers can add comments and text chat as well, also adding "hearts" or other symbolic emojis. Periscope is a good starter to play with if you're dipping your toe in the water. Viewers can check the podcast with the Periscope app or on the Periscope website.

Zcast is also free, and started largely as an audio-only and live-only Apple compatible podcast-generation product. Although like earlier versions of Periscope, Android and desktop users can at least check the podcasts through a their web browsers. Zcast has been working on adding recordings and is offering landing pages for podcasters, but is not yet video-capable. The company, located in Scottsdale, Arizona, seems to be responsive to users' requests, so it may come to pas that an Android version and the ability to stream video could be added.

Meerkat also began around 2015 and quickly discovered that users were not doing regular video podcasts on its service. Many tried it a few times, then moved on. Meerkat evolved into something called Houseparty, which allows friends to video chat, rendering it less likely to be used as a platform for regular video podcasts.

Raising the Stakes

If you're more of the "all in" type, there are software/hardware and service bundles that create a more turn-key video podcasting environment for your radio station or standard podcast. Among the options is HDV Mixer, which includes a variety of flavors, from Insoft out of Miami, Florida. The systems are designed to live stream on YouTube Live or Facebook Live (including both simultaneously if desired), giving it a wide compatibility. They are marketing the products as "Visual Radio Made Easy."

The packages range from annual fee software downloads in the $600 range to complete sports broadcasting bundles that can run as high as about $17,000 with robotic cameras. The software-only version allows broadcasters to use their own USB camera and provides a more robust starter than the free software which utilizes a phone or tablet camera.

In an interesting marketing approach, the company offers a trial offer in which you pay roughly $250 for a one month trial of the software and purchase a refundable group of three 720p HD cameras and a basic camera switcher for about $900. You supply your own PC (at least an I7 with specific video card specs—check for more details before purchasing) and the most you're theoretically out is the one month fee if you don't like the results.

There are multiple price point bundles that can be purchased in the HDV Mixer family, but it may only be a matter of time before more of these devices are readily available. Whether you're investing hundreds or thousands of dollars or just trying a free app, it can be a fun and buzz-worthy event to talk up on-air. The key is to have a decent plan for roll out and to try it in house before actually getting the word out.

A New Frontier

So here we are crossing the threshold of a new multimedia world for radio broadcasters. Will we ever step back to a "simpler" time? Who knows? Ironically, some small studies in the last few years show that young readers prefer the paper in their hands when reading and some state that memory retention is better from hard books over e-readers. This is hardly conclusive, and there's always the argument that "theatre of the mind" is still a major plus of radio. Most of our listeners make personal conceptions of what we look like, and are sometimes shocked when meeting an on-air talent in public.

The bottom line is that we all have unique air talent and adding video might be a nice value added for your listeners. Keep in mind that as you look toward any podcasting, it's very important to consider the privacy, and maybe even more importantly, content/music rights for content you're podcasting that we've mentioned here. If you're video podcasting or live streaming with video, I'd love to hear your stories of success or "valiant efforts." Please contact me at gzahn@mkcommunities.org.

George Zahn is a Peabody Award winning radio producer and Station Manager for WMKV-FM at Maple Knoll Communities in Springdale, Ohio. He is a regular contributor to ***Radio Guide*** *and welcomes your feedback. Share your stories with others by sending ideas and comments to: gzahn@mkcommunities.org*

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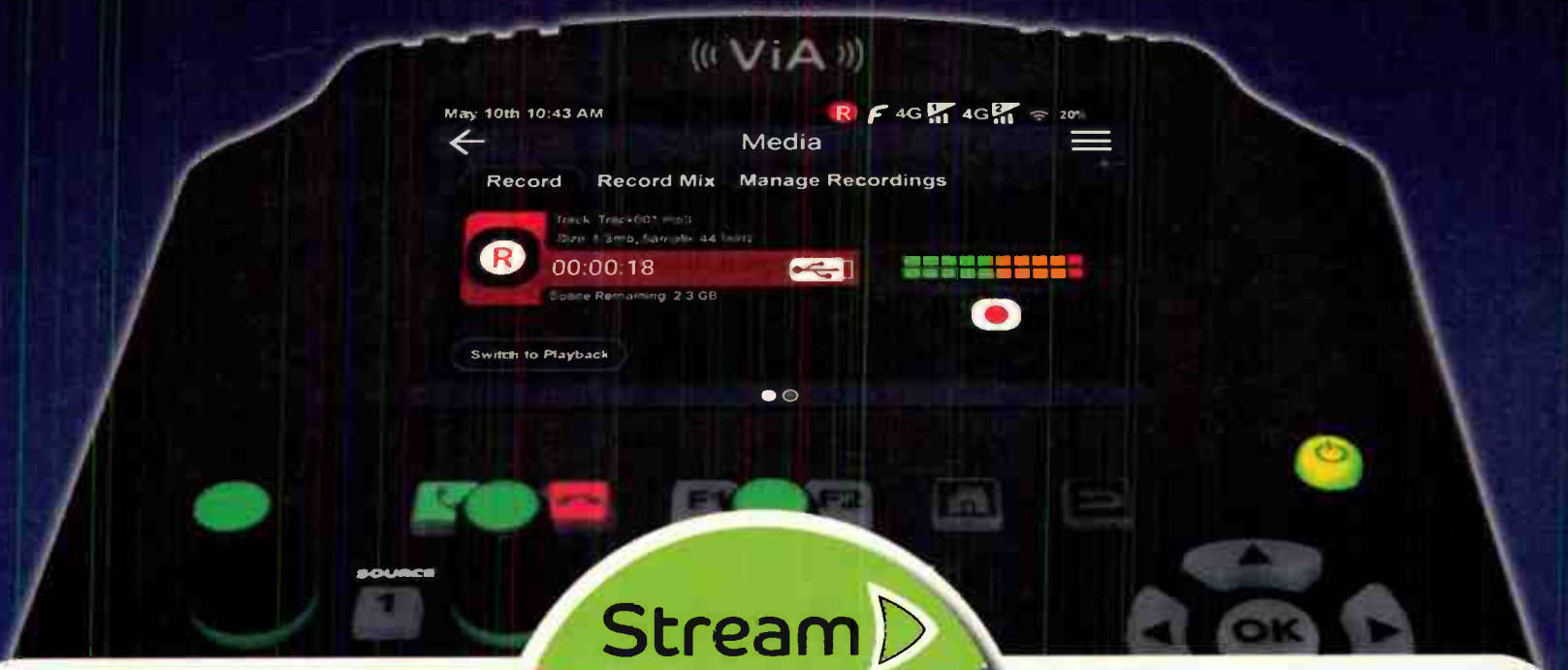

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Chief Engineer

Forcing a Non-Default Browser in Windows 10

by Scott Schmeling

Before I start this issue's article I'd like to thank Gary Peterson from Rapid City, South Dakota for his e-mail. He had a question regarding an article from a few years ago. Gary retired from full time engineering in 2012, but he still has his fingers in the business working on *his* schedule. I had worked in Deadwood, South Dakota, which is in the Rapid City market, between 1983 and 1986. Gary and I exchanged a few e-mails and found we both had started in radio at about the same time. Gary has had quite a career and seems to be enjoying his well-deserved retirement. Thanks for the e-mail Gary.

OK, now down to business.

I was able to attend the Nautel User's Group as well as the afternoon AUI (Advanced User Interface) session at this year's NAB. AUI is what Nautel calls the display on their touch screen (see **Figure 1**). You see the same things if you log on to the transmitter – either on your in-house network or remotely over the Internet. In fact, logging on to the AUI gives you virtually the same control and information as you would get if you were standing right there in front of the transmitter. It really is pretty amazing.

During the AUI session, Nautel's Matt Herdon talked about how their current AUI uses Flash technology (lovingly referred to as the "F-word") and he told us that big changes will be out sometime next year. On the way back to the hotel I started thinking about something.

Some time ago I updated my laptop from Windows 7 Professional to Windows 10 Professional. For the most part it was a pretty uneventful change – with at least one exception.

I have a number of Nautel transmitters out in the field and have been logging into them from wherever I am using the AUI. Rather than typing the IP address each time manually, I have shortcuts for each transmitter. Those shortcuts are nested inside a folder on my desktop. Since some sites have more than one Nautel transmitter, each shortcut has the IP and port (http://nnn.nnn.nnn.nnn:ppppp/) for that transmitter. The port depends on how you have port forwarding set up in the router at your transmitter site. Everything worked swimmingly – until I updated to Windows 10. I'm referencing Nautel transmitters, but this tip will work with virtually any remote device with IP access. I also have a couple Broadcast Tools remote control systems (they use Java) and this works for them as well.

I had always used Internet Explorer as my default browser. If you have updated to Win10, you know that Internet Explorer was replaced with Microsoft's new Edge browser, which is now my default (even though those "in the know" suggest using anything else).

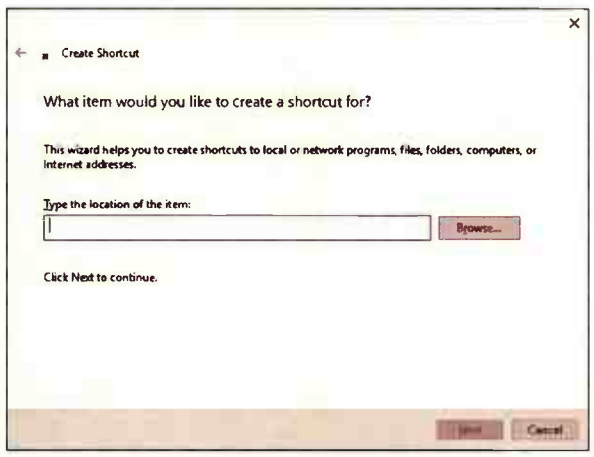
When I double-clicked on any of my transmitter shortcuts the operating system starts my default browser (Edge) and goes to the address. Herein lies the problem. As mentioned, the AUI is built using Flash technology, but Edge does not support Flash! So to connect, after I double-click the shortcut and Edge starts, I have to click on the three horizontal dots in the upper right corner of the screen, then scroll down and choose "Run with Internet Explorer." It gets me there but there are some unnecessary steps.

What I was thinking about, during my walk back to the hotel, was – if there is a way to force my shortcuts to use a NON-default browser. A little research on Google provided the answer. I had to put the path to Internet Explorer (or *your* preferred browser) in double quotation marks ahead of the address. Like this:

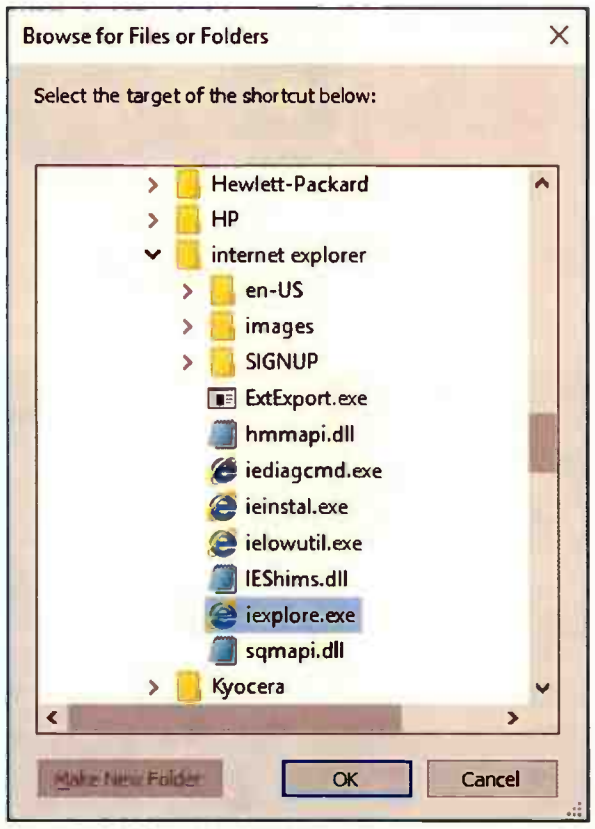
"C:\Program Files\Internet Explorer\iexplore.exe" http://nnn.nnn.nnn.nnn:ppppp/

I tried to manually edit the properties of my original shortcuts but they didn't work. I checked – *no typos!* But here's what I found that *did* work properly.

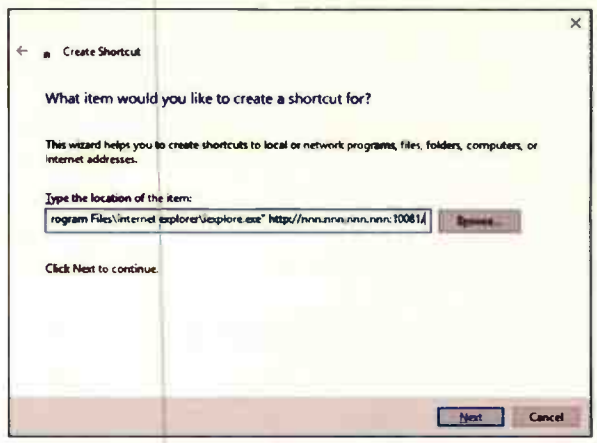
Find a spot where you would like your (first) shortcut to be and right-click, select new then shortcut.



Then <BROWSE> to the program location and click <OK>.

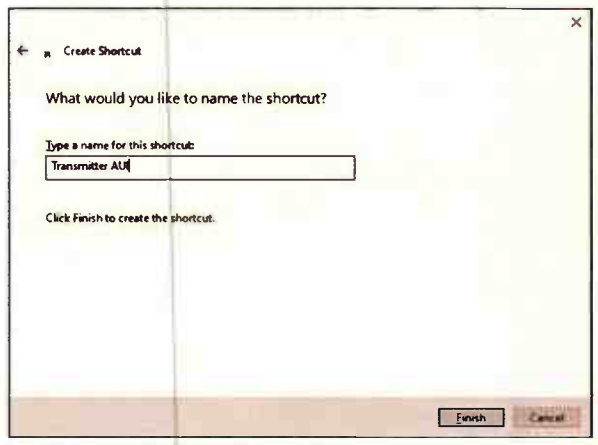


Once the path to the program is in the address field, place the cursor *after* the second set of quotation marks, press the space bar and add the IP address of your transmitter like this: http://nnn.nnn.nnn.nnn:ppppp/ . Your port, of course, depends on the port forwarding settings in the router at your transmitter site.



Click <Next>.

Choose a name for your shortcut



By default, iexplore.exe will be in the field. Change it to something more descriptive and click <Finish>. I like to name the shortcut with the call letters and transmitter model.

You will see the shortcut placed where you started. The shortcut will have the Internet Explorer Icon. If you want, you can right-click the icon and click on <Change Icon> to change to something else if you would like. Also, if you have a number of AUI shortcuts, you can put them in a folder so your desktop isn't as crowded.

That's it. Easy as pie and works like a charm!

Figure 1 – The Home Screen of Nautel's AUI

One other note – summer is here. If you haven't already, it's a good time to check your air conditioners if you have them, and be sure any air filters (either for incoming outside air or on the transmitters themselves) are clean. And cleaning any blower blades will make a dramatic increase in the blower's ability to blow air into your transmitter room. When it's hot outside, those transmitters need all the cool or fresh air they can get!

You might also want to spray now to keep the weeds from growing up. It's much easier to do when they're small.

That's it for now. Stay cool ... and ...

Keep it between 90 and 105!

Scott Schmeling is the Chief Engineer for Minnesota Valley Broadcasting. You may email him at: scottschmeling@radiomankato.com

FCC Focus

On Your Mark, Get Set . . . Go?

Are you Ready to Spin the Wheel?

by Gregg P. Skall – Womble Bond Dickinson (US) LLP

Recently, the U.S. Supreme Court hit sports betting with a thunderbolt, releasing *Murphy v. National Collegiate Athletic Association.* The decision that will legalize sports betting in many states sent shock waves through the gaming industry and the businesses that carry their advertising.

Background

For two decades broadcasters have been legally able to advertise for a wide variety of gaming activities, or "lotteries" under FCC Rules. Formerly, the FCC enforced an explicit rule against the broadcast of any information concerning a scheme offering a prize dependent in whole, or in part, upon chance.

One area that remained forbidden in most states was the advertising of gambling based on competitive sporting events. The prohibition stems from the Professional and Amateur Sports Protection Act (PASPA), a pet project of former NBA professional basketball star and later Senator, Bill Bradley. Concerned that athletes would be turned into the equivalent of roulette chips, PAPSA prohibits state-sanctioned sports betting in every state except the few states where it was already legal and those that made it legal within one year of its date of enactment.

New Jersey did not take advantage of that one year option, but much later had a change of heart, leading to the current case so that New Jersey could legalize sports gambling in Atlantic City and at horse racing tracks. The NCAA and three major professional sports leagues sued to prevent New Jersey's new law from becoming effective. New Jersey countered that PASPA violates the U.S. Constitution, taking away rights that are reserved to the states, and the Supreme Court agreed.

What Did the Supreme Court Decide?

Some broadcasters incorrectly concluded that "all bets are on;" that the Supreme Court decision now allows all forms of sports gambling and its advertising all states. Rather, Murphy stands for the principle that there is a limit to federal preemption of state law, and that PASPA's prohibiting state authorization of gambling schemes violates something called the "Anti-commandeering Rule."

In short, the Supreme Court held that the federal government cannot "commandeer" rights reserved to the states. Under the Tenth Amendment, all legislative power not specifically conferred on Congress by the Constitution is reserved to the states. The Constitution did not give the federal government the power to issue direct orders to the governments of the states. Thus "Congress may not simply 'commandeer the legislative process of the states by directly compelling them to enact and enforce a federal regulatory program.'" The Supreme Court decided PASPA tried to unequivocally dictate what the state legislature may do in the area of sports betting. Since the Constitution "confers upon Congress the power to regulate individuals, not states," PASPA went too far.

State Law Still Matters

As a result, any determination of what lottery activities are legal and may be advertised depends upon the analysis of state, rather than federal law. Therefore, broadcasters must examine the gaming laws of their own state. For example, many states explicitly prohibit gaming banked by a house, and many of those same states allow government compacts with federally recognized Indian tribes. Some of those same states are planning changes in their law to take advantage of the nationwide trend to permit gaming, and sports betting now that the Supreme Court has struck down PASPA. *But it's important to note that we're not there yet.*

Casinos & Other Lottery Advertising Prohibition

In the 1997 case *Valley Broadcasting Company v. USA,* the 9th Circuit U.S. Court of Appeals struck down the federal prohibition on advertising lotteries by broadcast stations in the states within its circuit. Two years later, in *Greater New Orleans Broadcasting Ass'n v. United States,* the U.S. Supreme Court held that the law against the broadcast of lottery information, 18 U.S.C. § 1304, "may not be applied to advertisements of private casino gambling ... broadcast by radio or television stations located in [a state] ... where such gambling is legal." In light of that decision, the FCC adopted a policy not to enforce the federal law that prohibits the advertisement of commercial casino establishments *where they are legal.* The FCC expanded the Court exclusion to include lotteries acting legally under State law and broadcast in that State or *any other State* which conducts such a lottery.

The FCC rules now also contain two further exceptions. The first is any lottery conducted by a not-for-profit or governmental organization that is tax exempt under §501 of the Internal Revenue Code. The second is any lottery conducted as a promotion by a commercial organization that is clearly *occasional and ancillary* to its primary business. Thus, the contests run by regular merchant advertisers are unlikely to be considered a lottery even though they contain the three elements of prize, chance and consideration, when clearly occasional and ancillary to the primary business of the merchant.

However, be careful. Both exceptions apply only if the activities are either authorized or not otherwise prohibited by the state in which they are conducted. (Additional exceptions cover most non-profit fishing contests and state lotteries.)

Where the occasional and ancillary test is not met, a question frequently arises whether having to go to a store or other location constitutes consideration such that the consideration element of the three part lottery test is met. Addressing this, an FCC staff letter responding to a request for a declaratory ruling following the *Greater New Orleans* case ruled that, although entrants were required to travel 40 to 90 miles from the New Orleans area to Biloxi to obtain a game card from a booth outside the casino, this travel did not constitute "consideration." Rather, consideration is present when the contestant must pay money or give something of value for the chance to win a prize. Travel a certain distance to appear at the promoter's place of business in order to enter the contest is not "money or thing of value," even if the travel takes an hour or two of the entrant's time.

Indian Casinos

Increasingly, broadcasters are presented with advertising for Indian casino gaming on Indian reservations. According to the website 500Nations.com, Indian casinos are now operated in 28 states by 243 of the nation's 566 tribes. The Indian Gaming Regulatory Act ("IGRA"), 25 U.S.C. §2720, allows advertising for casino gambling conducted by Indian tribes on Indian Tribal lands. Specifically, the lottery prohibition "shall not apply to any gaming conducted by an Indian Tribe pursuant to t1873.00his Act." The FCC implemented that law by making such advertising an exception to the general prohibition in its own lottery rule.

In relying on these Indian gaming exceptions, it is important to understand how the IGRA classifies gaming into three classes and how those classes relate to the exemption.

Class I gaming is defined as social games solely for prizes of minimal value or traditional forms of Indian gaming connected to tribal ceremonies.

Class II gaming includes (1) bingo, including pull-tabs, lotto, punch boards, tip jars, and instant bingo, and (2) card games that are explicitly authorized by the state, or otherwise not explicitly prohibited, including gambling played exclusively against other players and not banked.

Class III includes all other forms of gambling and generally includes banking card games such as baccarat and blackjack (21), as well as roulette, craps, and slot machines.

The IGRA permits the advertising and depiction of casino gambling conducted by Indian tribes under the following conditions:

- Gaming must occur on tribal land and be operated by the tribe.
- The gaming must be allowed by state law.
- State law is not preempted.
- If bingo is completely forbidden in the state, then bingo also cannot be played on the Indian reservation located in the state and, thus, cannot be advertised.
- Class III gaming must be conducted pursuant to a "tribal-state compact" between the state and the tribe, approved by the National Indian Gaming Commission. Broadcasters can search for applicable state compacts at the website of the Department of Interior, Office of Indian Gaming, https://www.bia.gov/as-ia/oig/gaming-compacts

The *Valley and Greater New Orleans* cases did not rule on any state laws restricting such advertising. Therefore, in the case of Indian gaming, it is important to note that section §2720 of the IRGA exempts advertising about tribal casino gambling even if the broadcaster is located in or broadcasts to a jurisdiction with anti-gambling laws and policies. In situations other than Indian gaming, however, broadcasters must still look to state law to assure that their advertisements are legal. Many such state statutes are confusing at best, and at worst seem to prohibit this form of advertising.

What Now? The Supreme Court Case Leaves a Lot on the Table

Many uncertainties remain. Justice Alito's opinion notes that the decision to legalize sports betting is "an important policy choice" that is not for the Court to make. Rather, "Congress could choose to regulate sports gambling directly. Indeed, on the same day that Murphy was released U.S. Sen. Orrin Hatch (R-Utah) announced he would introduce a bill to supersede the states, stating that "a state-based industry would create a "patchwork race to the regulatory bottom." And existing federal restrictions on interstate and Internet sports betting, including the Federal Wire Act, remain in place despite invalidation of PAPSA.

Note though, that Justice Alito's opinion cryptically notes in dicta that the Federal Wire Act and other similar federal laws, "apply only if the underlying gambling is illegal under state law." So, again, we're back to analyzing existing law regarding the specific activity before moving forward on a request for broadcast of gaming or sports betting advertisements.

This column is provided for general information purposes only and should not be relied upon as legal advice pertaining to any specific factual situation. Legal decisions should be made only after proper consultation with a legal professional of your choosing.

Gregg Skall is a partner of the law firm Womble Carlyle Sandridge & Rice, LLC. He frequently lectures on FCC rules and regulations, represents several state broadcaster associations and individual broadcasters and other parties before the Federal Communications Commission in their commercial business dealings.

Prior to private practice, Mr. Skall served as the Chief Counsel for the National Telecommunications and Information Administration and General Counsel to the White House Office of Telecommunications Policy.

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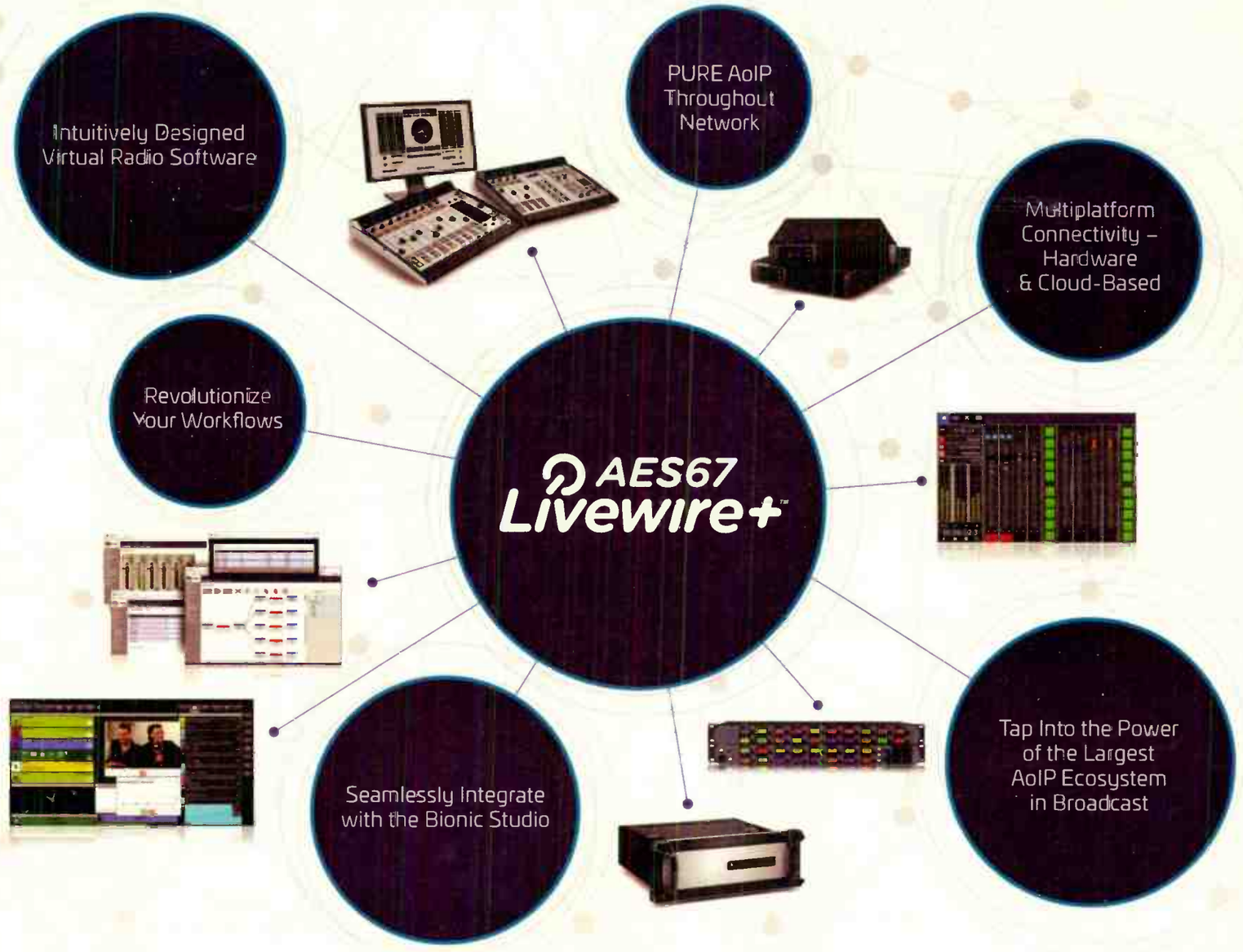

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NPR Satellite System Rebuild

by Mike Hendrickson

One of the projects that occurred when I was at Minnesota Public Radio (MPR) was the installation of a new satellite system. The project was led by Bill Dahlstrom, who is now the chief engineer at MPR.

Bill Dahlstrom and some of the XDS satellite equipment located in the International Control Center.

MPR operates 46 radio stations and numerous translators in Minnesota, Michigan, Iowa, South Dakota, and Idaho. One of the challenges MPR has faced over the years has been how to distribute audio programming to its stations. MPR has three different audio streams for its radio stations: news and information programs, classical music programs, and The Current programming. In addition to the normal programming, there is a commitment to provide emergency weather information for each station's coverage area. MPR also relays the Minnesota EAS information across the state. As if all of this is not enough, MPR is the backup distribution system for National Public Radio (NPR). All of this means that MPR's uplink satellite system must be robust and reliable at all times.

The first MPR satellite system was installed in 1979. The uplink location was located about three miles from the studios in downtown St. Paul. In the early 1990's MPR moved the satellite system to the roof of the Fitzgerald Theater in downtown St. Paul. This location was just a few hundred feet from the studios.

In the mid 1990s MPR changed from an analog system to a digital system. Both the analog and digital systems were single channel per carrier (SCPC). Because MPR had two separate audio programs it utilized two separate satellite carriers. One carrier was for the classical music service and the other carrier used the left channel for news and information and the right channel for emergency weather alerts.

By 2012 MPR realized that the satellite system was going to need replacement in the next few years. There were concerns that were driving the replacement issue. One model of the Comstream receivers that MPR used, the ABR700, was no longer available and MPR was running out of spare receivers. The equipment used on the uplink was obsolete and very inefficient. There was a growing demand to be able to easily add another audio stream. Finally it was discovered that the uplink dish had become distorted and no longer met the two degree spacing requirement necessary for uplinking. The dish was slightly illuminating an adjacent satellite on either side of Galaxy 16.

After a lot of research was completed, MPR decided to install the XDS satellite system manufactured by Pico Digital, now part of ATX Networks. This system used the DVB type of formatting that would make it easy to add additional audio channels as the need arose. Of course, with additional audio streams the bandwidth requirement would increase, but there would be no additional carriers. Another part of this decision was to place the uplink dish on the roof of the MPR studio building in downtown St. Paul.

Because MPR is the backup uplink for NPR, MPR had to be sure that a satellite uplink on the roof of the MPR building could see the primary NPR satellite and NPR's two backup satellites. The primary NPR satellite is Galaxy 16 located at 99 deg. W. and the backup satellites are located at 95 deg. W. and 127 deg. W. The major concern was that a building across the street blocked the view of the satellite located at 127 deg. A surveyor determined that there was a location on the roof that would permit viewing all the satellites. After the survey was completed a portable dish was brought to the roof to verify reception of signals from the satellites located at these locations.

The orange lines are the look angles to the three satellites MPR needed to see. The KU dish is the receive antenna MPR used to verify that we could see all three satellites.

As the project moved ahead it was necessary to obtain permission from several government agencies. MPR had to apply to the FCC for permission to construct and license the new system. Comsearch handled both the frequency coordination and the license application. The license includes both the uplink frequencies and the downlink frequencies. The FCC rules absolutely require that the uplink be licensed. While the downlink licensing is optional, the licensing of it provides future protection against harmful interference. MPR also had to obtain permission from the City of St. Paul to install the dish on the roof of a six story building.

Another set of rules that needed to be kept in mind while working on the roof, were the OSHA fall protection rules. The OSHA rules require that anyone on a roof wear fall protection equipment. As a further safeguard against falls, MPR decided to install guard rails on the roof in the area of the dish.

The satellite uplink system consists of modulators, upconverters, fiber optic converters, filters, switches, power amplifiers, and the satellite dish. The MPR audio channels, along with program associated data, relay closures and other information are first multiplexed together to form one stream of data. This is delivered to one of several 70 MHz modulators. The modulator converts this data stream to a DVB formatted digital signal at 70 MHz. The modulators feed a redundancy switch and then a passive combiner. The output is split to feed two separate 70 MHz to L band upconverters. This L band signal is routed to an active L band combiner where the two separate L band signals are combined along with the L band signal from the NPR backup systems. Even though there are two upconverters, only one is active at any one time. The other will not turn on unless there is a failure of the active upconverter.

The output of the active combiner is fed to the fiber chassis where it is converted to an optical signal. The optical signal is routed through various fiber optic patch panels. The output of the patch panels is routed to the Penthouse on the MPR headquarters building. In the Penthouse the optical signal is converted back to a L band RF signal. It is then routed to the dish a few feet away. At the dish the RF signal is fed to a pair of redundant solid state block upconverters, upconverted to the 6 GHz C band uplink frequency and amplified. The amplifiers have a maximum linear output of 80 Watts. At the uplink frequency the gain of the dish is 46 dB. This means that the maximum ERP of the uplink signal is more than 3 megawatts. When all carriers are uplinked, the signals can approach this level. All major components of the system are redundant with automatic switching in the event of a failure.

One of the advantages of using the new XDS system is the ability to continue feeding audio to the receivers in the event of a satellite system failure. There is a backup TCP/IP stream that is provided for the remote satellite receivers. If, for some reason, the receiver loses the satellite signal, it automatically switches to the IP stream. Since the receiver is connected to the MPR headquarters by means of the Internet, MPR receives immediate reports of receive problems at the stations.

Another big advantage of this system is to easily change the programming on the receivers without having to visit the individual sites. The original plans called for just the legacy Classical Music and the News and Information plus emergency weather. Within a few months The Current programming was added.

Once the uplink was completed, there was a period of testing which included NPR switching their programming to the system for a short period of time. The testing was followed by commencement of programming on the new system. MPR did not turn off the old system at this point as the receivers at 25 different transmitter sites had to be changed to the XDS receivers. MPR ran dual systems with the permission of Public Radio Satellite System for a period of three weeks.

As part of making sure the satellite system is robust and reliable, both MPR and NPR routinely test their backup systems. This means NPR switches their programming for a short period of time to the MPR satellite system. MPR utilizes the NPR satellite uplink system in Washington, D.C. as its backup and routinely switches to the NPR system for testing.

My thanks to Bill Dahlstrom for many of the pictures and the time he spent talking with me about this project. Until next time Happy Engineering!

Hendrickson, CPBE, CBNT is the retired Chief Engineer of American Public Media Group. He has been involved in Broadcast Engineering since 1969. Over this time period he has been involved with all aspects of broadcast engineering from the technical to the budgeting. He may be reached at: mikehlakeville@gmail.com

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Battery Power in 2018 – *Part 2*

by Wiely Boswell

Have you noticed when you get new secondary battery powered devices, they show up just about fully charged? Lithium cells have a low self discharge rate compared to other types.

A side note: I just got caught with 3 year old gel UPS batteries that went bad – we had a sulfur smell in the building. Even with inside conditions, never abused (run dead), I found two 9AH batteries very hot, starting to melt, and were venting and emitting the smell. The battery was just a big resistive load with the UPS charging as hard as possible to get to float voltage. When this goes on long enough, the batteries swell up and will damage the UPS.

A lithium cell getting hot is a different situation and can vent flammable gas. All lithium cells are demanding when it comes to charging. The temperature is monitored to prevent charging when hot. The voltage of each cell is critical, with tight specs on upper charge voltage. They are totally unlike lead-acid cells that can tolerate higher cell voltage when charging during an equalization charge on a string of cells.

A single lithium cell native voltage is 3.6 or 3.7 Volts, depending on exact Lithium chemistry. A battery is multiples of the 3.6 volt cell – 5 cells, 18V; 11 cells , 39.6V; and 16 cells up to 60 VDC. There is now such intelligence inside a tool battery it can rearrange cells electronically to allow it to provide either 20V or 60V. The advantage of 60V is less current/heat inside the battery and contacts from the battery to the tool. You can bank these batteries into a charger/power station with a 120 VAC inverter built in to run power tools. (Not saying it is a good sine wave)

Some tools can even use two of these batteries for 120 VDC.

Electronics in the battery are what makes this all possible. They now require a BMS – a Battery Management System. It can be self contained typically and devices can get information from the battery. A laptop, for example, determines runtime and health from a data connection to the battery management system inside the battery.

It does not take much of an imagination to see such a battery cannot tolerate water getting into battery. This circuit has a connection to every cell in the battery. It has a temperature sensor to prevent charging when hot. Even the smallest single cell LiPo4 requires BMS electronics to charge successfully. The charge starts in current limiting mode to about 80% of charge, and then switches to a constant voltage mode to finish charging. It requires a very accurate final voltage of 4.1 Volts, higher than 3.6V, but it will quit charging and drop back to 3.6V It can ruin the battery to be charged past specified charge voltage. This final charge phase takes longer than the initial constant current charge to 80%.

Hobbyists have taken charging seriously with the advent of high power lithium packs, ssince a bad battery can result in a model plane crash. The BMS is external to the battery in this application and is used on the ground. **Figure 1** shows a smart charger.

It is shown charging a single cell, with final charge voltage of 4.1 VDC, that has been charging for 70 minutes and is charging at 200 mA. It has calculated 432 mAH of energy transferred to the cell. It will also discharge the battery to a minimum voltage, based on type of battery selected. In this case it will not let the cell discharge below 2.8 Volts. It can perform repeated charge and discharge cycles, and it will give you a true idea of cell health and capacity. Back in the NiCad days, the memory effect was addressed by charge/discharge cycles. NiMH type cells also have a special charging routine. It is all taken in account in the charger by battery type selection.

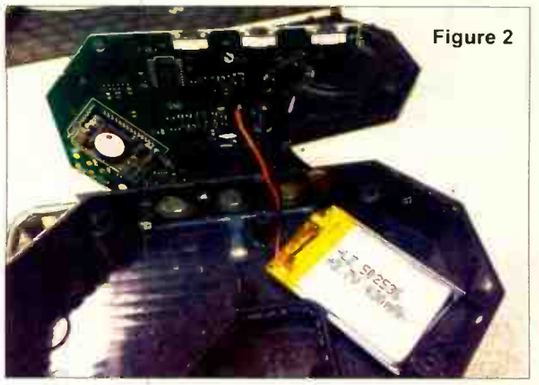
A single cell lithium cell, given the number 18650, is the typical cell used in laptop and tool batteries. They can be spot welded together or have the standard looks of an AA battery (slightly larger) that can be placed in battery holders sized to contain them.

They also are a replacement for the three AAA holders in small LED flashlights.

Internet sales sites' claims of amp-hour capacity are quite over rated. 2200 mA hours is the typical maximum of a high quality cell and a smart charger will reveal knockoffs quickly. Some cells also claim the individual cell can protect from a short circuit or discharge voltage below recommended value. This is typically not true either, but if it does, the cell may be a bit longer. It has protection built in by using a miniature BMS circuit smaller than a dime that is actually mounted on the end of the battery. It has a small, flat insulated conductor to bring the far end battery terminal voltage up the side of the cell so the BMS has voltage to operate and be monitored. FETs are used as switches in BMS circuits. An FET will turn off the individual cell in a low voltage or short circuit situation. This type of single cell protection would be used for a flashlight or other single cell application. A power tool *battery* will turn off when voltage reaches the minimum discharge voltage.

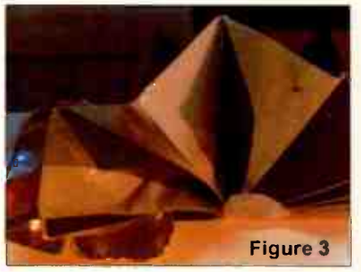
All this said, now you have the reliability of the lithium cell as well as the reliability of the electronics involved so there is a trade-off compared to a lead acid battery.

Figure 2 shows a flat LiPo4 type battery in a very small and loud Bluetooth speaker. This style battery is common in hobby planes, drones, and phones. The structure is plates separated by an insulating material.



The pack will bend as you try to pry it out of a phone. It almost requires an expert just to get the phone opened up. These cells are fragile – you will see a lot of warnings not to dent, puncture, or otherwise abuse the cell. The danger is the insulated sheet material allowing a plate to short to another plate. When I was prying the battery out of my phone, the double sided tape was not giving up. The battery was bending and the engineer beside me backed way up – he had seen one burst into flames. They are not as dangerous if they are totally dead.

Figure 3 shows a LiPo4 cell cut open and shows the gray insulator material that folds back and forth between black plates.



The cell shown came from a drone and is cut open to show construction. It was swelling up, which is a failure mode with this type cell. I have also seen laptops have the keyboard warp up from a swelling battery. The distorted plates reduce capacity. A professional type Lion battery will be encased in a rigid structure in attempt to maintain shape and prevent warping.

You have likely seen a small battery USB charger. The 3.7 Volt 18650 cell is charged by a 5V USB source. The trick here is becoming a 5V USB charger. The circuitry shown will use switching technology with voltage boost ability. **Figure 4** shows a disassembled charger with 18650 cell and electronics to charge the cell and to boost voltage output.

This shows a 3.7V, 8.14Wh battery. 8.14Wh/3.7V = 2200 mAh -or- (3.7 V) (2200 milliamps) = 8.14 Ah . This would be at the one hour rate. Just because a battery has an Amp Hour rate does not mean it will provide that much power in one hour. The battery will heat up and could loose power. Longer time discharge, at less amperage, will more likely meet the Ah rating. One interesting note here, is Lion does have issues in severe cold. Take a Lion car battery, for example. A small current such as headlights would need to be run in order to "warm" up the battery. Then the battery will be ready to take the high current surge with a minimum voltage drop as car is started.

Finally, Lion car or RV batteries have electronics in them. It is required to be compatible with the lead acid charging circuit in the vehicle. So while they are at it with electronics in the battery, they might as put Bluetooth it it. There's an app to look at your battery health

Wiely Boswell is Chief Engineer of Faith Broadcasting, Montgomery, AL; CBRE,CBNE, and SBE 118 Chairman. He may be contacted at: Wiely@faithradio.org

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Is Your SWR Protection Really Working?

by Bob Reite, CBT

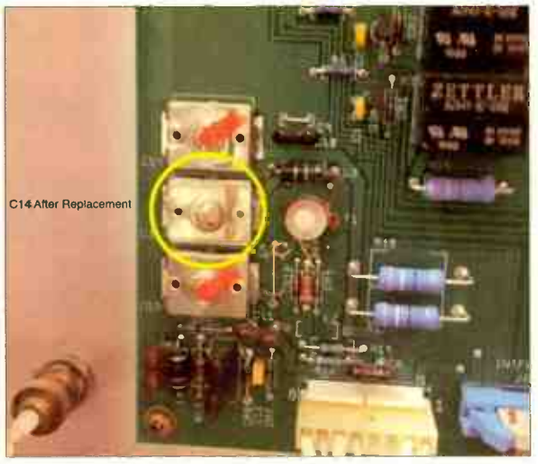
Case Number One:

I had a client with a Gates Two transmitter that would blow output MOSFETs in what seemed to be a random basis. I always keep a maintenance log, even though the FCC no longer requires it, for two reasons. One, in case someone else has to work on the equipment and two, to recognize any trends in failures. There was no pattern at first. I contacted the factory who recommended checking that the static drain choke was intact (it was) and that the impedance was matched. Reflected power read zero.

They also recommended swapping the A1 and A4 boards to see if it was related to the board or the position it was in. It turned out to be the position rather than the particular board. This went on for about two years or so. Since the transmitter only had to put out 1600 Watts we would just turn up the drive until enough MOSFETs and associated fuses had blown that we could no longer make licensed power at maximum drive – then change them all at once and begin the cycle again. I suspected it was lightning damage, since we had more failures during Summertime and only one during Winter.

The clue that the problem was a lack of SWR protection came after a heavy soaking rain. Upon visiting the transmitter site, there were no blown fuse alarms, but it wasn't making licensed power. The output stage voltage and current readings were different, indicating that the base impedance must have changed due to the soaking rain. However the SWR reading was still zero. Changing the tune and load controls had an effect on the voltage and current as expected, but the SWR stayed zero no matter how tune and load were adjusted.

Upon checking the VSWR circuit trimmer, C14 was found to be shorted. This will cause a zero SWR reading as no voltage will be developed across the parallel resonant circuit formed with L3 no matter what the current and voltage sample inputs may be.

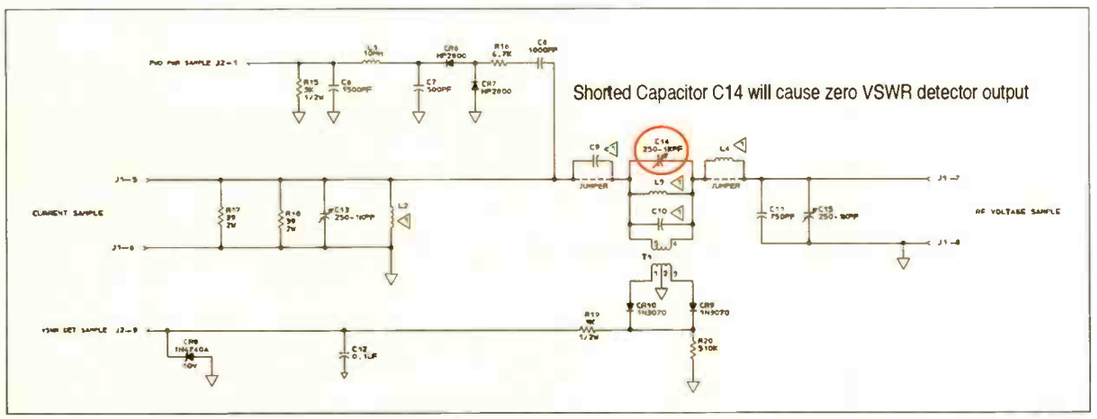


Case Number Two:

A vintage Harris MW-1 (not the 1A, the "1") was losing output devices. After my experience with the Gates Two, I decided to check the SWR protection. In this case, the wire from the SWR board to the logic board had broken off, again giving zero SWR reading, no matter what it may really have been.

Case Number Three:

This one was actually from many years back, during the first few months of operating a new transmitter and antenna system for a grandfathered "Super Power" FM station – 110,000 Watts off the top of Mount Wilson. The station originally had an 8-bay, horizontal only antenna, being driven at 15 kW TPO. It was decided by my predecessors to replace this with a 4-bay, circularly polarized antenna, which would require 55 kW TPO. At the time, the only way to do it was to get two 25 KW transmitters that would "type approve" at 29 KW each, and use 3 dB Hybrid splitters and combiners.



I replaced trimmer C14 and adjusted it for maximum voltage across it. I did not do a full blown realignment of the circuit as nothing else had been changed. Now adjusting the tune and load controls had an effect on the SWR as would be expected. Since the transmitter would now correctly mute its output during the duration of a lightning strike, there were no more random failures of the output MOSFETs.

Due to various circumstances, I was the one assigned to completing this project, which was already running behind schedule and over budget. I pointed out that for full protection, we needed to purchase a Bird "Wattcher" or similar device to monitor the forward power and reflected power as feeding the transmission line. Others on the committee pointed out that each transmitter had SWR protection on it. I pointed out that if one of the amplifiers fails for another reason, the remaining amplifier will be splitting its output between the antenna and the reject load, so if the antenna line should dead short or open circuit, the working transmitter would not see infinite SWR, but a 2:1 SWR. Still, they had no money right then to buy the Bird "Wattcher," so after bringing the system up slowly, we measured 1.05:1 SWR on each power amp, and set them to trip off at 1.1:1. figuring that in the event of an antenna or transmission line fault, the transmission system would totally shut down even if only one amplifier was operating in combined mode at the time of the antenna fault. There was enough money in the budget for the purchase of Thru Line meters for the reject load power and the transmission line power. As far as determining output power on the remote control, we would use the indirect method, based on the efficiency given in the manufacturer's data test sheets and the published insertion loss of the 3 dB hybrid.

I have always said that the most likely time for a commercial station to blow off the air was during a ratings period and for a non-commercial station during a fund drive. Sure enough, during the fund drive for this 110 KW ERP behemoth, I got a call they were off the air. I had the control room operator give me the readings. This was back in the days before telephone remote controls. Power amp number one had zero plate Volts and zero plate current. Power amp number 2 however was running 7.5 KV plate Volts and 4.1 Amps – pretty close to normal, but nothing could be heard on the air monitor or my radio at home.

Upon arriving on site, I found power amp number one dead for an undetermined reason. Power amp number two showed the same readings on the local meters as the remote control. The SWR was 1.09:1. But the meter on the reject load was reading 20 KW and the transmission line meter 5 KW – not the 12.5 KW each, if it had been splitting power evenly. Good thing that it was a 20 KW rated load. As a consequence, the working amplifier was merrily putting 5 KW into a defective line or antenna. I shut everything down and disconnected the transmission line at one of the 6 inch switches. On a hunch I measured the DC resistance between the center conductor and connector body. It was not quite infinite, but high. This antenna should be showing zero DC resistance. When the tower crew arrived, and started taking things apart, it was found that the center conductor was not properly attached at the factory. It was good enough to last a couple of weeks, but that was it. The length of the line was such that the impedance and phase seen at the 3 dB hybrid output was such to cause the power to divide unevenly.

Fortunately, the antenna itself was undamaged. There was an unused 1/2-inch line going up the tower past the antenna. I found a 6 inch to 3 inch, a 3 inch to 1-5/8 inch and a 1-5/8 to N adapters to get me from the 6 inch EIA antenna input to the 1/2-inch line with the N connector, and sent that up to the tower crew. At the transmitter end, I disconnected the Elcom Bauer 625 amplifier from it's 602A driver stage and set that up to run 1 KW TPO into the 1/2-inch line, so I got them back on the air. I guess enough people felt sorry for the station that they raised enough money during the fund drive to purchase the Bird "Wattcher" that we needed – both to make sure that the system was really protected and to enable direct power measurement at the studio. After a bit of haggling, the manufacturer of the transmission line agreed to pay all costs of replacing the damaged line.

Bob Reite operates his contract engineering firm, Telecentral Electronics, Inc. servicing radio stations in Pennsylvania and New York state and may be contacted at br@telcen.com

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Breathing New Life Into an Old Computer

Getting Around the Windows Obsolescence Situation! – Part 2

by Tommy Gray – CPBE, CBNE

In my last article I was talking about my transition from Windows to Linux. As I might have mentioned, I had tried this a few times over the last 10-15 years with mixed results. I tried just about every major distro from the free options, to the more expensive options where you have to buy a set of disks, etc., and do the install that way. As with all popular things relating to the computer, time and development skills have contributed to a much better product, with many different options, all of which are very viable, and I might add reliable.

My Personal Choice!

After having used such options as Red Hat, SuSe, Elementary, Ubuntu, and others, I finally settled on the one I personally like the best, and that is Linux Mint Cinnamon. I am currently running it in the office on several older computers and a few newer ones as well. The one main machine that I use as a workhorse, was one that was originally retired because it was too slow and didn't have the power for easy daily use with the "Windows™ XP Professional" it had on it. It was a 32 bit Dell laptop with a fair amount of RAM, but as with all Windows computers it, of course, got slower with each update until it was a pain to use anymore. It was retired about three years ago and stuck on a shelf. I had kept the battery pack charged periodically just in hopes of preserving it. Finally one day, when Microsoft™ obsoleted XP, and when my Antivirus provider stopped supporting it as well, I said that is all – R.I.P. little laptop!

One day I was getting so frustrated with my new Windows 8/10 Laptop and all the update hassles, so after a couple of years on the shelf, I pulled the laptop out and charged it up, deciding I would once again put Linux on it just to have something safe to browse the web with. I loaded Linux Mint Cinnamon on it after reading all the reviews, and did, as I stated in the last article, what is called installing "Alongside Windows," meaning that it would leave my Windows installation intact and also install Linux, so that I could run either one by simply booting into the desired OS.

For a while, I found myself going back and forth between the two OS's frequently. Then, as I perfected my Mint skills, I found myself using Windows less and less – especially since I was still able to access my files on the Windows partition from the Linux side easily. I could also run many of my Windows applications while in Linux, using a simple utility that is a part of the available software in Linux, called "WINE." These days, I rarely use Windows at all, and have totally fallen in love with my Cinnamon machine. Here is something that you will be able to sink your teeth into. How many times have you had to reboot your Windows computer when an application froze or locked up and was otherwise unrecoverable? My XP machines had started doing that frequently before being retired. I am not a conspiracy theorist, but It seemed awfully suspicious that just about the time they started forcing mandatory upgrades to Win10, that the XP machines started locking up frequently. Every update prior to the XP obsolescense, caused more of a slowdown, and the machine got to be more of a headache. If Apple™ can do it with batteries, the then Microsoft could do it easily with updates. Just saying!

Now I have a tendency to get a little long-winded on some things, so sometimes a few of my comments get edited out because I go over my character limit. So I will try to keep it simple and short – as much as possible.

These days I am using the aforementioned old laptop as my primary office machine for two reasons. First, it has never locked up nor has it required a reboot, even when updating it, since the day I put it into service. It is going on almost three years now without a reboot. I get frequent updates from Linux, but none requires a reboot and none have ever crashed my machine! The laptop is located underneath the desk next to my KVM switch and network switch; I have a nice large monitor, full-size keyboard, and a wireless mouse on it so I totally ignore the fact that it is a little old laptop!

Secondly, since putting Linux on the little baby, it has performed faster than it ever did with Windows, and it can handle multitasking easily. I frequently have 4-5 applications open at once, copying data or text, and or editing, etc., and there is never a hiccup! Do that with your Windows 10 machine! And yes I *do* have a Windows 10 machine which is a recently made Dell laptop with touchscreen, a ton of ram

(Continued on Page 22)

NEW

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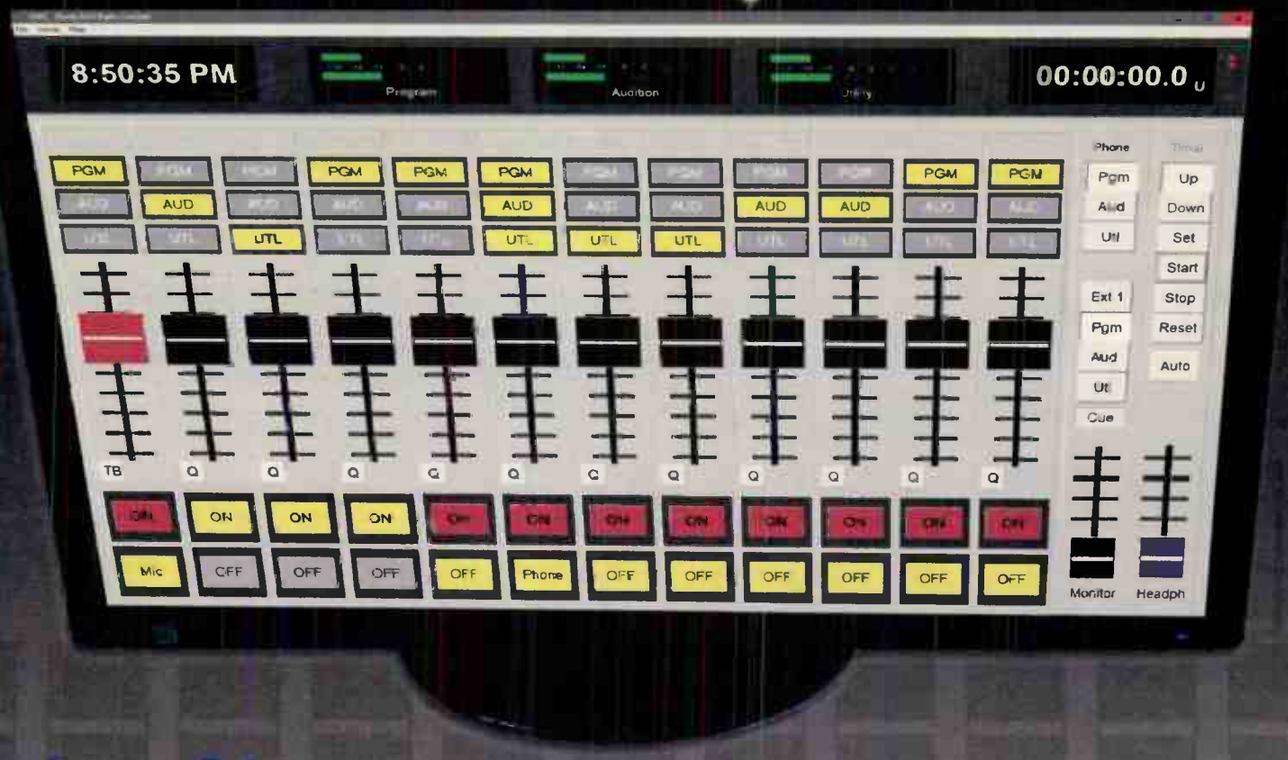

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– Continued from Page 20 –

and a very fast processor. It too has now been "dual-booted" with the latest version of Linux Mint Cinnamon. Linux not only boots much faster on it, but it again performs much faster that it ever did with Windows 10. When it was forcefully upgraded from Win 8.1 to Win10, it was kinda-sorta OK. It was a little slower but not a lot, so I though it might be something I could tolerate even after hearing all the horror stories going around on social media. With every update however, it became more and more of a mess until after several months, it was virtually useless, as they seriously slowed it down. It got so that it was not worth the effort trying to keep updates working, as about half the time I would have to go on the Internet to find out how to get the latest update to work that had just failed. Windows update is seriously broken on this machine and others I know of elsewhere. BTW, some machines have been rendered completely useless just from a Windows Update!

Installing Software and Updating/Upgrading Linux

This brings us to the question of updates and or upgrades, as well as installing software. Linux Mint Cinnamon and others have a built-in "Update Manager," and a built-in "Software Manager." These can be accessed from the programs menu. The Software Manager will allow you to easily install any application they have in the secure repository, which totals in the hundreds or more. Do a quick search by name of the desired app and you will get a list of options. Click on the one you want, then click "install" and it will do its thing. Once finished, it is available for use and once again your computer does not have to reboot first before you can open it. You can also install applications with a command line in a terminal. If you like the old-fashioned terminal method, it is still in there, no problem.

If you are a newbie to Linux and just want a Windows replacement, then this is for you. Use all the easy-to-use tools already available to you and after a while you will forget you are in Linux! Every article, and everything else I have done on the computer since I "Linux-ized" it has been done on LibreOffice, the Microsoft Office™ style "Free" replacement that comes with Linux. It can create and save just about any document format Office can, and more. It has programs that can do graphics, text, publishing programs, presentation programs, and everything else in it – and it doesn't cost you a dime or make you pay for a cloud subscription just to use it. It can also save in both the old and new Office formats, i.e. doc, docx, xls, xlsx, etc.

Updating

My machine has a tray icon showing when I have available updates/upgrades. All I have to do is to simply click on the icon, enter my administrator password, and the update manager will download and install the update for me – once again, no reboot required. The Update Manager gets files from the Linux Repository and they are safe and virus free (as much as is humanly possible).

No Antivirus Program

Let me mention in that regard, that I do not have any AV running on the machines. Linux is, of course, a computer OS and could be hacked, as can anything else, but what makes Linux safer to these attacks are several things. Let me mention just a few:

A virus or rootkit cannot install itself in Linux Mint or any Linux distro for the most part. The main reason for this is that in order to install itself on your Linux computer, a rootkit or a virus of some kind would have to have your admin-level password, and it does not have it unless you give it to it.

Also, if you follow my previous advice and install only from the secure repository that comes with your Linux Distro, you will get clean software. This too is an effective deterrent against viruses, etc. Never forget to always observe good practices however, especially if you are running Windows programs using WINE.

As far as I can tell right now, with the exception of the latest problems with system level malware (which patches have been put out on the repository to protect you from), there are no, that I know of, Linux viruses or rootkits around, with the possible exception of some that are targeting web servers. Follow accepted practices and you should be good to go! Enjoy your "New" old computer with Linux!

Tommy Gray is a retired veteran broadcast engineer currently staying busy doing engineering in the gulf south, through "Broadcast Engineering & Technology LLC", a Louisiana based Consulting and Contract Engineering Firm, serving the US. www.BEandT.com

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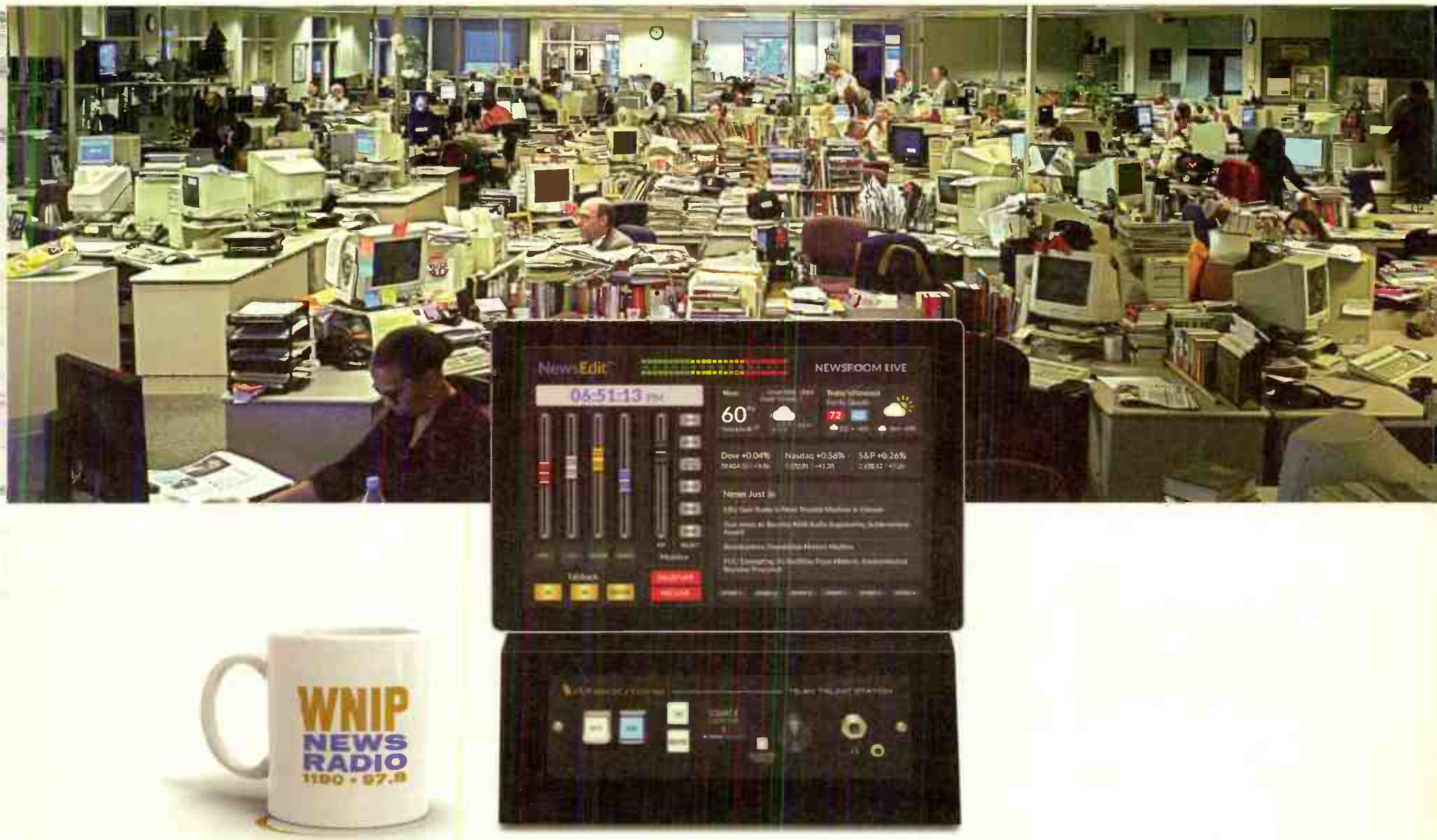

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Engineering Perspective

Networking Power

by Jim Turvaville

English poet John Donne, writing in the 17th century, famously wrote that "no man is an island," comparing people to countries, and arguing for the interconnectedness of all people with God. The phrase "no man is an island' expresses the idea that human beings do badly when isolated from others and need to be part of a community in order to thrive. While Donne was a Christian, this concept is shared by other religions, principally Buddhism.

In spite of the notion that most engineering type people are "a bit strange" or "not like the rest of us," I have found that "birds of a feather flock together" to borrow another colloquialism, and when we find another person with our same "knack" then we tend to come a bit out of our isolated technical lives. It's no question that the closest friends and professional acquaintances I have in my life are mostly attributable to my quirky technical way of life, not just by nature of my education and experience, but my view of life and sense of humor are all interconnected to that foundation. I'm blessed beyond words that I have a wife who is not only a radio girl (35 year career for her, and still going) but has a bit of a technical bent to let her not only understand my quirky technical personality, but embrace it – even if I think it's more often a study in Psych 101 than anything else. It's debatable whether tech-types tend to live a more isolated life because there are fewer of us, proportionally, to the general population, or if there are fewer of us, proportionally, to the general population simply because we tend to live a more isolated life.

It has not taken my 39 year career in Radio Engineering to realize the value of making and keeping connections with fellow engineers in order to learn, grow or even survive on a daily basis. In fact, one aspect that seems to have drifted farther away is the idea of mentoring those younger than ourselves into this magical career of engineering. I applaud the SBE in their efforts to bring students and younger guys and gals into this industry with their various education initiatives and mentoring programs. I can say with absolute certainty that there is a rather lengthy list of great guys and gals that have either mentored me directly or been a great influence on my own education and experience. Though I will make a few references to some of those experiences, I will make no attempt at annotating those names; suffice to say, I would not at all be where I am and know what I do without their collective input into my life. I rarely have the opportunity to thank them personally, but I do often make it a conscious act to pass along or pay-forward that favor, when at all possible, to anyone who is open to my experiential contributions.

Early in my career, I was fortunate to make some close professional associations with 2 or 3 engineers who were only a few years ahead of me in this industry. When I was 19 and they were 23, I thought they were "old," and they certainly had already put a lot more formal education and real-world experience under their belts than I. But with me being from a quite rural area, and they from larger markets, we were able to share some experiences unique to each locale that would not have been available otherwise. When my little rural town got it's first-come first-served FM allotment CP, my mentors were more than happy to come help me out on the project, since their urban area lacked such an available opportunity to build from the ground up. Likewise, when they had the chance to remodel and build new studios, I gained knowledge and experience that would never have been afforded in my small rural radio market world.

I was also especially blessed to have the association of a couple of the real "old timers" in my early career, though they were well over an hour away in a much larger radio market. Our little AM daytime station occasionally needed some "real" engineering help and a couple of the AM guys in that market would have pity on us small-town folks and come patch us back together. I never failed to be close when they came along, and became their shadow when they were on the premises. It was through these guys that I got to see my first high-powered (that is, more than 500 Watts) AM transmitters, directional arrays, phasors and monitoring systems. I even had the privilege of being shown how they worked, and see first-hand more than one installation. On one occasion, I spent nearly a week driving a proof on a 4-tower AM DA with the oldest of the guys, my first use of an AM FIM and the nuances of finding monitor points and calibrating that unit every time you stopped. I also learned the

(Continued on Page 28)

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– Continued from Page 26 –

value of making good notes on your work during that project, since we had a professional consulting engineer who relied upon our field readings to create the FCC Form 302-AM exhibits. That little AM station in Oklahoma still has the same dog-leg, 4-tower DA2 operation, and has recently been brought back into operation by a younger engineer, whom I count as one of those I have had the privilege to mentor just a bit in this business.

Now days, we have technology that lets us keep in touch with our peers much better than back in the days early in my career. If you are an SBE member, then the new "Membership Plus" feature that allows you access to their archives of Webinars and Technical Sessions can be almost as good as a Continuing Education course at college. A day does not go by that there is not something in my Inbox that helps me keep abreast of what is going on in our industry. Even the daily news in Tom Taylor's *NOW Newsletter* or *Inside Radio* can give you a bit of insight on what effect those things have on our little engineering world. Many equipment manufacturers have regular newsletters that come by email which will contain information that can bring some insight on new technology or how to more efficiently use what we already have.

One of the ways that I retain many of those associations, often as a mentor but more so to those who have influenced my career, is the attendance at the annual National Association of Broadcasters (NAB) Convention. This spring of 2018, I attended my 22nd event, though I have not been sequential in that time period since my first show in 1991, as some of my peers are able to attain. I've had the privilege of having an employer at one time who also realized the value of the NAB Show to my position as DOE and not only encouraged me to be a part of it each year, but gladly paid the tab for me to do so. Other years, like now, I have been either self-employed or had an employer who did not realize why NAB was important and I went anyway and paid my own way. No matter in which camp you fall, I've found those gatherings to be very important to me and maybe you should consider attending next year if you do not already plan to do so.

From www.RedsharkNews.com

I've heard lots of reasons not to attend the NAB, and for the most part they are usually valid to those who present them; and I can certainly say that, unless you are in an upper management position in a multi-station organization, the value of attending *every* year is probably overstated. Every other year is getting to be more accepted across the folks I know in the business. Yes, there's always the coolest new toys ... uh, I mean *equipment* to see and touch, and a myriad of vendors who are ready and willing to show you how their widget is the next great thing. But if you're only going for the displays on the exhibit floor, then you'll be quickly bored and wonder why you came. It's become the norm now for the larger vendors to have off-site seminars, demonstrations and training sessions that transcend their specific product line. Watch your email and the industry news beginning several months out from the show and RSVP to a few of those; you'll find an educational and professional networking opportunity that is too often overlooked. And when making that plan, add the weekend prior to the show, since the number of events happening around the NAB is increasingly being slated during that time.

If you're value conscious, then your trip to NAB can be done on a budget. In order to do that, you must plan early. Book your flight and hotel in December, specifically between Christmas and New Year's, and you'll be surprised how good a package deal you can find for an April event. When you're in Vegas, don't overlook the Rideshare services for getting around the town on the cheap, since they don't upcharge for going out in a group. Make a schedule of the events for all of the days you are there and write it down on paper unless you happen to live in the Pacific Time zone, in which Vegas falls in April; otherwise, be prepared for your mobile calendar to mess with your brain on those times you have plotted. That also helps visualize just how busy you will be while there; and fill it up with something to do all the time. Since most of those "to do" things involves free food and drink, your actual out of pocket expenses will be minimal for the experience.

Whether you decide to attend the next NAB, or just want to increase your professional networking, all it takes is some time and effort and you can stay in touch and grow in your career.

Jim "Turbo" Turvaville is semi- retired from 39 years in full-time Radio Engineering and lives in Rural Wheeler County Texas in a "tiny house" where he maintains a small clientele of stations under his Turbo Technical Services (www.jimturbo.net) operation providing FCC application preparation and field work.

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Facility Focus

Dealing With Lightning – *Part 3*

by Sam Wallington

Years ago, I heard a story about a farmer who needed to hire a farm hand. After interviewing several candidates, he decided to hire the one who said, "I can sleep through anything," during his interview. Other than the strange answer, the young man seemed right for the job, and as time passed, the farmer was pleased with the farm hand's work. Eventually, he forgot the odd response.

One night, a huge storm blew in, waking the farmer. He jumped out of bed, quickly dressed, and pounded on the door of the farm hand's quarters. No response. He opened the door, shook the boy and yelled at him to help him prepare for the storm. But the farm hand slept on. Suddenly, the farmer remembered the comment, "I can sleep through anything." With a harrumph of frustration, he gave up and went to try to protect the farm as best he could alone. He could fire the boy in the morning.

As he rushed to tie down the tarps covering the feed, he found they were already tied down. He ran to the barn, finding the door and all the stalls securely latched and all of the tools and equipment safely put away. Making his way around the farm, he could not find one thing incomplete which should have been done to prepare for the storm.

Bent against the wind and rain, he struggled back to the house. Shaking his head, he finally understood what the farm hand had meant: His work was always thorough and complete, so he *could* sleep though anything. The farmer went to bed, realizing he too could now sleep through anything.

Storms – lightning in particular – can pinpoint weaknesses in the preparations for our stations. In this last of three articles, I want to bring together what we have learned, as well as point you toward additional resources which can improve your abilities to sleep through the storm – without your cell phone *ringing!*

We can review by "constructing" a lightning protection system for a typical FM transmitter site. Atop the tower, we install a ground rod extending above everything else on the tower. The ground rod is bonded to a large-gauge cable which runs down the tower, attaching to the ground system. Along the way, the cable only bends very gently. Also atop the tower are a few "star" or "bottle-brush" lightning attractors. Since the current in these is expected to be small, they can be simply mounted to the tower (removing the paint to provide a good electrical connection), but it can be wise to tie them into the ground cable in case they receive a direct strike.

The ground system surrounding the base of the tower is a ring consisting of multiple rods driven into the ground (or electrolytic/chemical ground systems) spaced around the tower. These are bonded together using a large gauge cable. The cable from the lightning rod attaches to this ring, as do several large conductors extending from bonds at the bottom of the tower legs. This ring is also bonded by two conductors to another ring surrounding the transmitter building. The master ground buss in the building is bonded to the building's ring.

During a lightning event, lightning currents are distributed throughout the tower. Therefore, we need to take other measures to ensure all, or most of it, is getting to ground without entering valuable components. With a guyed tower, currents will also be carried down the guy wires. We do not want these currents using the guy anchor concrete as a UFER ground, because the energy could crack the concrete. *(An UFER Ground is an electrical earth grounding method developed during World War II. It uses a concrete-encased electrode to improve grounding in dry areas.)* Instead, each guy anchor cable is grounded before the guy cable attaches to the anchor. This is accomplished by properly bonding a cable to the guy wire. The cable is attached parallel to the guy wire, then gently bent as little as possible in an "A" shape to the next guy wire down, where again it attaches parallel to the cable, and so on, until it is attached to a ground rod or other grounding system located near the guy anchor. (Note: a ground rod at this location is generally not copper to help avoid galvanic erosion of the guy anchor point.)

Even though we have taken steps to strip off a lot of lightning energy, currents will still exist in and around the tower. Some of those currents will travel via our coax cables, particularly in the outer conductor. Again, our goal is to remove as much current as possible before it gets to our equipment, so we will install several ground kits, typically one every 100 feet along the coax run. Ground kits are installed by stripping away the outer jacket of the

(Continued on Page 32)

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Remote Broadcast Setups and Strategies

by Chris Ark

Introduction

This article is a small insight to the approaches I take when planning a remote broadcast setup and is written with the young broadcast engineer in mind; someone who has a basic understanding of audio theory, signal flow, and broadcast equipment. The ideas and strategies in this article apply primarily to large remote broadcast setups but can be applied to small remotes as well.

A Remote Broadcast Setup

Pre-Planning

No matter the duration or complexity of a remote broadcast, two questions must be answered: where's the power and how am I getting the audio back to the station?

Power

A single 15 Amp outlet should provide more than enough amperage to power your broadcast equipment. Although, I recommend using a 20 Amp circuit when possible. Chances are you will be sharing the circuit with someone else and you want to plan for unexpected equipment additions. You also don't want to draw amperage near the breaker's max rating. One small transient could trip the breaker then you're "off air." When distributing power to equipment, I prefer power conditioners over power strips. They help protect equipment by smoothing out spikes in voltage. Plus, power conditioners can be rack mounted.

Avoid running power cables across doorways. It looks bad, it's a trip hazard, but most importantly, the door can cut the cables' insulation and expose the conductors, potentially electrifying the door. Also, never use a power plug or cable with the ground pin missing. In the event of an electrical short in your equipment, the ground pin is needed to route the extra current to ground. If the ground pin is missing from the plug, your equipment could become electrified. No broadcast is worth someone getting hurt or killed due to laziness.

Station Feed / Backhaul Options

IP Audio Codecs are becoming the most common way to execute a remote broadcast. Such devices include Comrex Access and Tie Line. These units utilize the Internet to send audio to the station and back to the remote broadcast site. Most venues will have a hardline Internet connection for you to use. Coordinate a site check with the IT administrator of the venue, well in advance of the broadcast. There may be firewall or port restrictions preventing you from connecting to the station. It's up to you and the IT administrator to identify and fix these issues as soon as possible.

For remote broadcasts, where a hardline Internet connection isn't available, you can use a wireless 4G card, but consider the following. During the site check the signal strength on the wireless card appears strong. You leave the site check, thinking everything will work smooth the day of broadcast, but once hundreds or thousands of people show up to the venue, each of their wireless devices uses up bandwidth on the wireless network. Will there be enough bandwidth left for you? You may consider having wireless cards for different networks, but that can get costly and may not help you in the end. If you're setting up at car dealership or smaller venue bandwidth probably won't be an issue.

Larger bandwidth is always better, as it allows you to use a lossless codec, but you may not always be provided with a fast connection. If you have a slow connection, choose an audio codec created to work with that speed. There are codecs to accommodate almost any connection speed you come across. On networks with poor performance and fluctuating bandwidth, some audio codec devices have built-in options that allow you to allocate a specified amount of bandwidth to error correction and auto-relegation of codecs, all in order to provide a jitter free feed.

A second backhaul option is ISDN. ISDN is an aging technology but is still in use today. This service is stable, has dedicated bandwidth and provides good audio quality. Most communication providers are no longer installing new ISDN lines and it's getting to where providers are not repairing existing lines. As IP Audio Codecs are proving to be more reliable, I would start to phase ISDN out of your broadcast plans.

(Continued on Page 36)

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Production Requirements

Production requirements for single or multiday remote broadcast can be quite different and demands careful consideration. Identify your "must haves" and "wants."

- How many mics?
- Audio editing & playback/ import field audio?
- Cameras requiring audio feeds?
- DI box and mic stand for artist performances?

Talk with your program director and digital department to see what their needs are – they may have a unique request you haven't thought of. Answering these questions usually dictate the size of audio console you will use. Typically, a radio station isn't going to have a "broadcast console" for a remote broadcast. Odds are you'll be using an audio console that is meant for live audio applications. If you have the option of selecting the console of your choice, choose a console that has plenty of inputs and outputs. This will allow for maximum flexibility of signal routing. Audio requirements can change at a moment's notice and you need a console that can accommodate the change. Depending on the complexity of the setup, a 12-channel / 2-aux audio console should work fine. Use a 16-channel / 4 aux console if you are running multiple broadcast areas. An example of this would be a main broadcast area and a separate guest interview area. Here are some inputs and outputs to consider when planning your setup.

Console Inputs:

- Microphones
- Station Return
- Laptop & Effect Audio Playback
- 1/8 Cable for Smart Phones
- DI Boxes for Artist Performances

Console Outputs:

- Station Feed
- Headphones & Cue Speaker
- DAW Software
- Camera Feeds

Microphones

In the past, I have used Shure SM58's, EV RE20 / 27's, Rode Broadcasters, and even Neumann TLM 103's for remote broadcasts. What microphone you choose comes down to what's available to you and on-site variables. In dusty, damp, or windy environments, I use dynamic microphones. Dynamic capsules can withstand a lot of abuse whereas condensers capsules cannot. Condenser capsules are extremely sensitive to environmental variables due to their construction type. They may stop working if it's too humid or dusty, and they pick up a lot of ambient noise. In controlled environments, condenser microphones can be wonderful to use due to their sonic clarity and presence. As for combating wind interference, you can use a wind screen. I personally don't care for the sonic quality of a microphone when using a wind screen, but you may have no choice. You can also roll off some low end to reduce the wind's affects.

Microphone Processors & Dynamic Control

I like to use broadcast quality outboard microphone processors for remote broadcasts. These processors have built-in EQ, compression, and aural exciter controls.

These controls give you the sonic flexibility that onboard console dynamic controls cannot, at least on less expensive consoles. I like to use Aphex Channel Strips or the more affordable DBX 286s. If outboard voice processors are not an option, and they're usually not, don't worry. There are affordable audio consoles that have a one size fits all compression knobs on each channel, as well as EQ.

Regardless of the microphone and processors I'm using, I put a compressor on the consoles output buss feeding th input of the audio codec. Using a compressor on the "program bus" helps smooth combined levels and knock down peak transients that could distort the input of your codec. Distortion of a digital codec input *will* sound like trash on-air. When using compression, use it sparingly. Over compressing the audio can result in undesired sonic artifacts like pumping and breathing. Compress the local audio only to prevent peak transients and smooth over-all levels. Remember there will be more audio processing back at the station.

Racking & Ventilating the Equipment

Now it's time to put the equipment in to road cases. You need to ask yourself "does the equipment have proper ventilation to suite its broadcast environment?" Maximum air flow over the equipment is essential to prevent overheating. If possible, leave 1 RU spacing between each piece of equipment to allow air flow in the rack. In addition to the 1 RU separation, install a single RU fan at the top of the rack to pull air across the equipment. If you don't mind putting a hole in your road case, use a hole saw to cut a hole in the top of the case for the fan exhaust. Be sure to install a grill to prevent debris or fingers from getting in the fan. If you have rear rack rails on your case, you can install a fan on the back to help draw heat away from the rack.

Conclusion

There are plenty of areas where we could have expounded on topics such as maximum audio console utilization, gain staging, redundant backhaul ... the list goes on and on. I just wanted to give you some food for thought for when you're planning your next remote broadcast.

Chris Ark, CBT – CRAAudio.com

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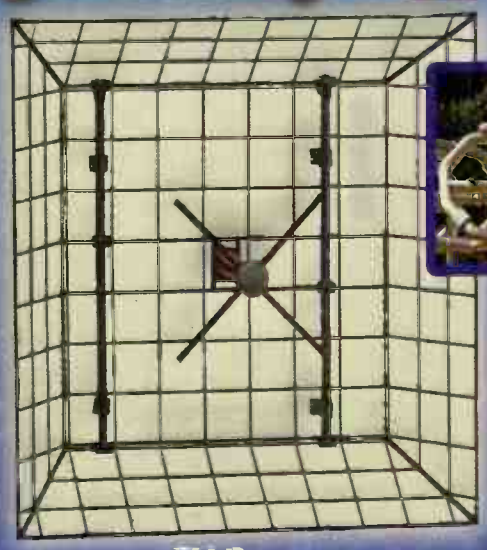

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Station Stories

Strange Stuff

by Steve Callahan

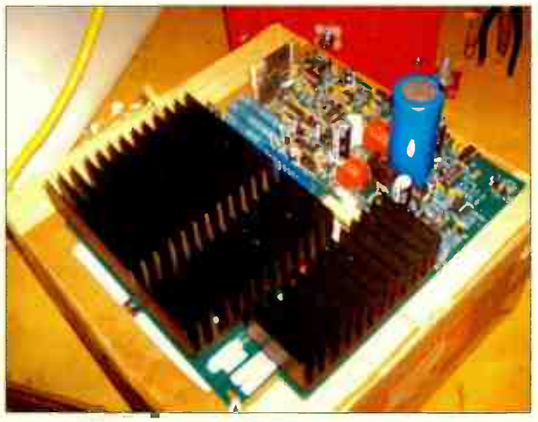
Yes, I admit it. In the 46 years I've been in radio broadcasting, I've seen some pretty strange stuff. Some of it good ... and some of it not so good. However, recently I've had several instances of strange stuff that surprised even me.

The Invisible Problem

A couple of months ago I got called to an AM station that operates with a Broadcast Electronics AM-5E transmitter of recent vintage. I personally like that transmitter and think that the AM-5E is the best AM transmitter on the market today. Years ago I learned that box inside and out by taking care of a 10 kilowatt version at another station.

When I arrived, I saw that the transmitter was operating on only half of its four power modules. The top two modules are fed from the right power supply and the bottom two were fed from the left power supply. This was a quick clue that one of the two power supplies, the left one, was not operating. However, the power supply fault indicators on the front of the transmitter were not illuminated.

A quick swap of the power supplies showed that, yes indeed, the left supply was toast. A quick call to Broadcast Electronics customer service had a new power supply winging its way to me. A week later, when it arrived, I installed it in the left position and turned on the transmitter, expecting instant positive gratification. But, the gratification was not to be, as the bottom two power modules were still not operating.



A BE AM5E power supply. These can burn up fast.

I was pretty sure that I now had two good operating power supplies, so my attention turned to the two dead power modules. I swapped them with the two good power modules and the problem followed the bad modules, so another call to Broadcast Electronics and the two dead power modules were soon headed back to the Mother Ship for repair.

Another week passed and the two repaired power modules returned from BE, all fixed and ready to go. I slid them back into the transmitter and then pushed the "On" button. Still no joy, and no RF, from this normally very dependable transmitter.

I called BE customer service again and they thought I might have an issue with the backplane. This is not what you want to hear because the backplane replacement is not for the faint-at-heart ... it's a big job.

I took a moment to recap everything that I had seen, checked and measured, while working on this transmitter. There is a small fuse board adjacent to the power supply which distributes four low voltages to the power modules. I had checked the four fuses on the board early on and I found one of the fuses had blown, so I replaced it and it didn't blow again – I didn't give the fuse board a second thought. The four voltages on the fuse board had checked out normal with one VOM probe to the fuse and the other probe to the ground of the transmitter.

A little voice in my head said to take a closer look at that small fuse board. Since it was easy to remove with just four screws and two multi-pin connectors, I popped it out and gave it a thorough examination. On the back of the board, invisible to my previous examination, was an overheated board trace which had lifted right where it connected to a plated-through hole on the board. That trace was a ground common and without that plated through hole, there would be no ground A quick soldering job with a piece of wire through the plated-through hole and the transmitter came back to life. Morale of the story: You might have voltages, but do you have ground?

(Continued on Page 40)

It's Time to Get Into the Mix

ProMix 4

The ProMix 4 is a compact full-featured monaural audio mixing console perfect for almost any broadcast studio, while excelling in remote broadcast and podcasting applications. It features three combination microphone/line inputs and a dedicated fourth input that may be switched between a balanced line input and the built-in USB audio interface. Other features include: switch selectable program limiter, XLR program output, monitor output with muting and volume control, mix minus output for connection to an external telephone hybrid, on-air light relay output, and three 1/4" stereo headphone outputs with individual controls for volume, mix, and pan, allowing custom headphone mixes.

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Strange Stuff

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To Crank or Not to Crank

I got a call to a three-tower AM station recently, that had a sudden change in antenna monitor readings. Usually in spring and fall there can be a change in ground conductivity in New England, which will manifest itself as sudden changes in the ratio and phase readings of directional stations. I arrived at the transmitter building and saw that the antenna monitor was off a bit on both day and night patterns so there was a problem that was common to both patterns.

The changes in the phase and ratio were small enough that I could have compensated for them with an adjustment of the cranks on the phasor, but a wise old engineer once told me to keep my hands off the phasor until I had checked everything else.

I took a look in the phasor and nothing looked burned or damaged. All of the inductors and taps looked like they should. All of the caps looked good without any cracks or leakage. I went to the left tower and everything there looked normal. From the base of the tower out to about 50 feet, the close-in ground radials at this station are supported by 10, seven foot tall telephone poles in a circle. This station was built at the time when it was popular to build the close-in ground system suspended about six feet above the earth. It was an attempt to lessen the effects of the earth on the part of the ground system with the greatest circulating currents, to try to keep the base impedances stable.

I tugged and pulled on all of the the ground straps to make sure they were tight and still copnnected to ground. The center tower was the reference tower and all seemed completely normal there. When I got to the right tower, I immediately saw the problem. Behind the ATU building, one of the telephone poles had rotted and fallen over carrying a portion of the ground system with it.

Suspended ground system as it should *not* be.

The replacement of the teleohone pole involved pulling the stub of the broken pole out of the hole and putting a new telephone pole in its place. A come-along winch brought the ground system web of wires back up to where it should be and some quality time with a torch and silver solder made everything good as new. So remember to thoroughly examine *all* of the directional array before you do something that can make the problem worse.

Morale of the story: Look first before you crank.

Suspended ground system as it *should* be.

A Most Revealing Transmitter Site Visit

In almost every story I write, I preach the benefits of visiting your transmitter site on a regular basis. Recently, I had the good fortune of visiting a mountain top FM site that is pretty inaccessible during the winter months. I hadn't been to this site since last October, so I picked the first warm and very sunny day to make the first trip of the year up the mountain. You have to take a long, narrow, steep, straight road that has a 45 degree incline to get to the tower. On a weekend, you can see some hikers on the road but I was there in the middle of the week around midday so I didn't expect to run into anyone. As I headed up the road, I saw way ahead what I thought was a deer lying by the side of the road. As I got closer, it saw that it was not a deer but a female hiker enjoying the day's warm sun ... topless. I checked to see if she was injured or not, but she just smiled and I continued on up the hill to the tower.

Steve Callahan, CBRE, AMD, is the owner of WVBF, Middleboro, Mass. Email at: wvbf1530@yahoo.com

A Tale of a Broadcaster's Love of AM Radio

by Roger Paskvan

Well spring has sprung in small marketville and back comes the thunderstorms and all the damage they can do. This is one of those small market stories that are common in the Midwest. One man's passion of AM radio.

It was a normal day at the office, the secretary called on the intercom, "please take line 3." It was a station owner in western North Dakota telling me that his transmitter sustained a hit from a lightning storm, and they were off the air. Their local fix-it guy couldn't get it going and they wanted my consulting help.

I agreed to drive five hours to a little town near Williston, ND. When I arrived, I noticed they had a lighting strike that did some damage to their AM transmitter. The owner was there telling me that his transmitter has been so reliable and now it's toast. I did a visual inspection and noticed some arc spots. Were these from lightening or had they been there for years. This transmitter was older than I was and that's a few years back. It was one of the early Gates models.

After a few hours, I was able to get the boat anchor (didn't tell him that) to actually come on. Maybe I should qualify that – the lights on the front panel lit and things looked encouraging. I could get RF drive from the exciter and power up to the final tubes. When I flipped the high voltage breaker, the whole world went crash. It definitely didn't like that and the smell of burnt transformer winding smoke filled the room. We had a major problem.

About now, as usual, the owner stops in and wants to know how soon, *how soon* before we can get on the air. I hated to tell him the truth but I needed further testing to know what was wrong. Disconnecting the secondary of the high voltage transformer, I bravely pushed up the HV breaker again. Bang! The whole world still went down and the building lights dimmed. Okay, let's take the primary leads off and see if we can blow it up again. Ohmmeter readings on a big transformer are pretty near zero, so there was really no other way to test this animal. Pushing the HV breaker again, all was quiet – the culprit was not in the circuit. We had successfully isolated the problem.

All was not well and good because Gates had stopped making transformers for this relic probably 20 years ago. I had the honors of telling the owner in a delicate manner, there were no parts available for his transmitter. I decided to have lunch so I could break it to him easy. After a few phone calls, I was able to find a transformer company in Tennessee that could custom wind a transformer for this boat anchor, but they wanted $2,800 and a four week lead time. These were not the kind of words that any broadcaster wants to hear. He just stared at the floor talking about all the lost revenue and his listener base. I explained in a polite way that this transmitter was not worth spending $2,800 for one part. Next week, you could have another failure and possibly no replacements either.

I even contacted some used transmitter vendors and was able to locate a Gates 5 solid state for $8,000. He wanted nothing to do with a "new" AM transmitter. "It's just not the same," he kept saying. "The old units sound so much better than the new transistor stuff," he replied. Then, he went into talking about the old days when AM was king. AM stations are primarily local stations, and here lays their greatest asset. Local stations serve local needs. If one listens to much FM radio, it is obvious most programming is not local with much of the programming brought in through satellite. The question that is constantly asked is, "will the AM dial become obsolete in the coming years?" He went on telling me that in his small North Dakota town, his AM is the local hardened station. He also said that in some markets AM stations have moved to rebroadcasting on FM translators and this is something he would like to do.

So, before the lunch was over, he told me to have the transformer custom made and see if I can shorten the delivery time. Driving home, I couldn't help admire the deep passion that this lifetime broadcast owner had for his home town radio station. His love and respect for AM radio was something I hadn't experienced in all my travels through small market radio stations. Maybe AM is not dead?

Roger Paskvan is a Professor of Mass Communications at Bemidji State University, Bemidji, MN. You may contact him at: rpaskvan@bemidjistate.edu

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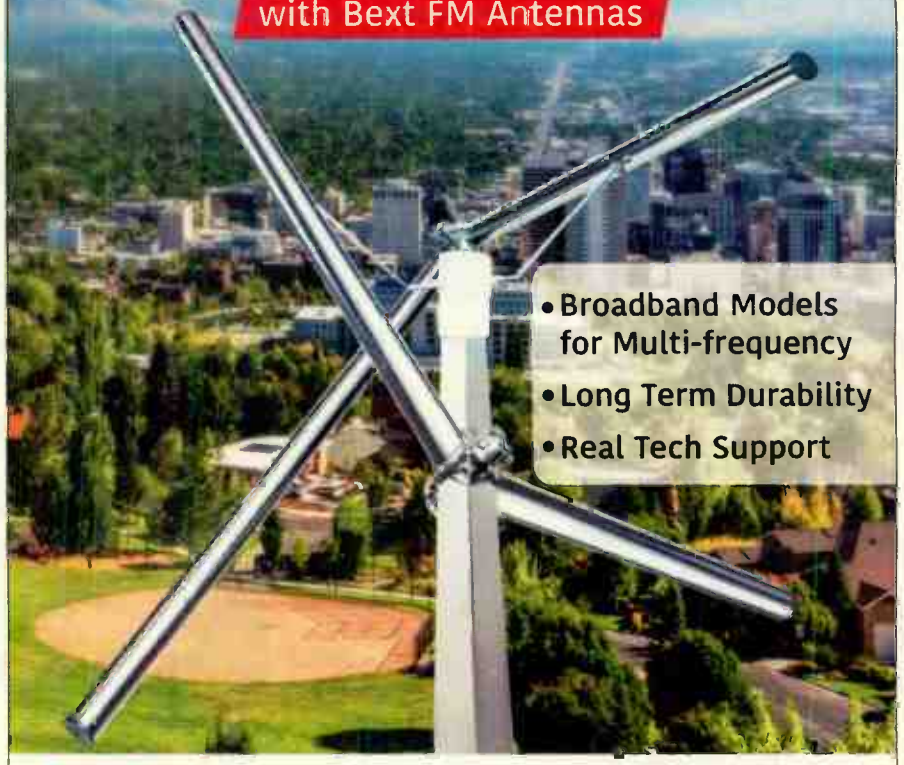

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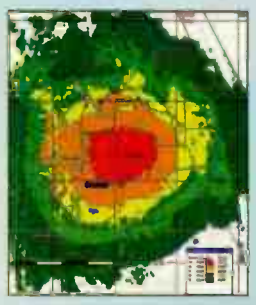

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Gear Guide

"Speak To Me"

A Microphone Review

by Ron Erickson

The first time I heard my voice recorded, it was 1964 and I was about 12 years old.

I remember it like it was yesterday. It was on a Saturday, because I was on a bicycle ride when I happened to stop by a local radio station to look at the DJ through the window. I waved, then he waved and motioned for me to come to the door. He told me his name was Mark and I introduced myself and told him that I had listened to him on my transistor radio. He asked if I would like a tour of the station. It was no big deal for him to take a few minutes to show me around, but it was life changing for me. In that first visit, I learned to cue up a record. I watched as he selected a record that back timed to the ID and news at the top of the hour. It was shift change time and someone else took over the air chair. Mark then asked me if I would like to help him record a commercial. Of course I said yes.


Gates M-5136 Mixer


RCA 77DX

I didn't know it at the time, but looking back at it, it was a very sparse production room. It had a small Gates mixer with two channels and a program level. That mixer I recognize today as the M-5136 (see photo above). There was a giant 16" Gates turntable in a stand-alone pedestal. Mark explained that they had some programs that came to the station on 16" discs so they needed the big turntable. There was an RCA DX77 microphone mounted upside down on a roll around floor boom stand. Then I was introduced to an AMPEX 350 tape deck mounted in a wooden roll around floor cabinet.

Mark gave me a script to read, threaded up the tape deck, and started it rolling. He told me to speak into the microphone. He showed me how to cup my hand around my ear so I could hear myself better. The recording was nothing to write home about and I was embarrassed that on the first take, my voice cracked ... but I was hooked on this business. Mark rolled up and sent me home with about twenty-five feet of news and stuff from the teletype machine. He told me to practice reading out loud. I spent the next three months asking Mom to buy me a tape recorder for Christmas. Yes, I did get it and it was one of those very special gifts that helped me learn to become a radio talent. It came with a crystal microphone that I thought had a cool name – *Astatic*.

If you've been in the business for any length of time you have probably used a number of studio microphones and you've had your favorites. For me, the memorable ones were a Shure SM7, an RCA BK5 ribbon mic, an EV20, and for several years now, my personal studio has had a RODE Procaster in it. While I have enjoyed using the RODE, I was ready to look at some other products.

From their website, I learned that CAD Audio originally took shape as the Astatic Corporation in 1931, founded by C.M. Chorpening and F.H. Woodworth, two ham radio operators who needed a static-free microphone for their transmitters. They worked with local engineers to develop the company's first crystal radio microphone, the Astatic model D-104. (see photo). When I read that name (smiling) it brought back memories of that crystal mic with my first tape recorder.


Astatic D-104

The CAD D-88 was designed to be a virtually indestructible Kick Drum Microphone, but it also could be used for voice recording when you want a deep bass response from a mic. I recorded my voice through the D88 with what I can only describe as bigger than life booming audio. Checking the specs, this dynamic Supercardioid mic has a frequency response of 20 Hz to 17 kHz. What gives the CAD Live series, D88 the ability to record high volume sound is the fact that it is engineered and equipped with one of the largest capsules for a percussion mic. So, if you want a big bass sound in an audio recording or you need to record a drummer, check out the D-88, priced retail at $199.00


CAD D88

Next up, a true studio microphone with a low price tag. The CAD GLX2200 comes with a traditional shaped shock mount that affords the isolation needed for a sensitive condenser mic, and it also looks pretty cool hanging on a mic arm.

The super affordable GXL2200 condenser microphone features a large diameter, fixed cardioid pattern, with high sensitivity and low distortion. The capsule in the GXL2200 features a 1-inch gold vapor deposited diaphragm.

It requires 48 Volt phantom power, so in order to test it, I found a ROLLS microphone power supply in my storage area.


CAD GLX-2200

Of course, as with all condenser mics, you will need a good windscreen. The sample mic that was sent for review did not include one, so I borrowed one from another mic I own. I must say that I was very impressed with the natural sound of such a low cost mic. Note: you may need to put a pad between you console input as the GLX2200 has a high output level. I'd say it could benefit from about a -10 dB pad.

I was only able to pot it up about one quarter on my board. The results of my test? I found this is an excellent microphone choice for close proximity speech. I would say that this is a great microphone for anyone with a soft delivery style. It takes the voice that God gave you and enhances it beautifully. This microphone has a suggested list price of only $149.00. Shopping around I found it for as low as $99.00.

From the CAD website, this description: *The E100S is a Large Diaphragm Supercardioid Condenser, Engineered, built in the USA. The new E100S has the lowest noise floor in its class (3.7 dBA) and the smooth, vintage tone with robust low end is what CAD is known for.*

The CAD E100S features a built in shock mount. It is a bit more expensive, with list at $499.00. It can be found on-line as low as $391.

I used the same Rolls 48 volt supply, put a foam windscreen on it, and with the experience of the GXL2000, I flipped on the -10 dB switch conveniently located on the front of the E100S.


CAD E-100S

From the minute I started recording I knew that this microphone was awesome. It has the clarity found in the GXL2200 but it brings in a deeper bass end, almost like you had run it through a really good microphone EQ. It's been several years since I've been a Top 40 DJ, but the results of hearing my voice in my headphones through this microphone made me want to do a live jock show again. I absolutely *love* this mic. For my voice, I have a new favorite.

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Final Stage

RADIO ROUNDUP

The Radio Guide Event Register

Email your dates and info to: ***radio@rconnect.com***

Texas Association of Broadcsters (TAB)
August 1-2, 2018
Marriot Downtown, Austin, Texas
www.tab.org/convention-and-trade-show

2018 Nebraska Broadcasters Assn. Convention
August 15-16, 2018
Embassy Suites, LaVista, NE
http://ne-ba.org/news_and_events-convention.asp

NAB Radio Show
September 25-28, 2018
Orlando, Florida
www.radioshowweb.com

2018 IEEE Broadcast Symposium
October 9-11, 2018
Key Bridge Marriot, Arlington, VA
http://bts.ieee.org/broadcastsymposium/

WBA Broadcasters Clinic
October 16-18, 2018
Madison Marriot West, Middleton, Wisconsin
www.wi-broadcasters.org/events/broadcasters-clinic

Ohio Broadcast & Multimedia Conference
Novenber 8, 2018
Columbus, Ohio
http://oab.org/engineering/obec/

Radio Guide Advertiser Info – May-June 2018

Advertiser - Page	Website
Altronic - 40	www.altronic.com
AM Ground Systems - 20	www.amgroundsystems.com
Arrakis - 21	www.arrakis-systems.com
Axia - 13	www.telosalliance.com
Bay Country - 43	www.baycountry.com
BDR - 42	www.thebdr.net
BEXT - 43	www.bext.com
Broadcasters General Store - 11	www.bgs.cc
Broadcast Electronics - 26	www.bdcast.com
Broadcast Software Intl. - 23	www.bsiusa.com
Broadcast Tools - 39, 46	www.broadcasttools.com
CircuitWerkes - 15	www.circuitwerkes.com
Coaxial Dynamics - 36	www.coaxial.com
Comrex - 5	www.comrex.com
Davicom - 4	www.davicom.com
Dean Technology - 44	www.deantechnology.com
Deva - 28	www.devabroadcast.com
DH Satellite - 22	www.dhsatellite.com
DM Engineering - 46	www.dmengineering.com
Econco Tubes - 43	www.econco.com
Enco - 4	www.enco.com
ESE - 47	www.ese-web.com
GatesAir - 27	www.gatesair.com
Graham Studios - 47	www.graham-studios.com
Henry Engineering - 2	www.henryeng.com
Inovonics - 1, 31	www.inovon.com
Kintronic Labs - 30	www.kintronic.com
Lightner Electronics - 44	www.lightnerelectronics.com
Logitek - 29	www.logitekaudio.com
Mega Industries/MCI - 38	www.mcibroadcast.com
Mooretronix - 44	www.mooretronix.com
Nautel - 7	www.nautel.com
OMB - 34	www.omb.com/en
Omnia - 35	www.telosalliance.com
Orban - 33	www.orban.com
Phasetek - 47	www.phasetekinc.com
ProAudio.com - 37	www.proaudio.com
Propagation Systems (PSI) - 37	www.psibroadcast.com
Radio Systems - 32	www.radiosystems.com
RF Specialties - 42	www.rfspecialties.com
SCMS - 17	www.scmsinc.com
Shively - 41	www.shively.com
Smarts Broadcast Systems - 19	www.smartsbroadcast.com
Stackley Devices - 47	www.stackleydevices.com
Studio Items - 41	www.studioitems.com
Tieline - 9	www.tieline.com
Titus Labs - 39	www.tituslabs.com
Transcom - 43	www.fmamtv.com
V-Soft Communications - 44	www.v-soft.com
Wheatstone - 3, 24, 25, 48	www.wheatstone.com

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