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A Lifetime Passion For Radio *"The boy practiced reading out loud every day, carefully enunciating every word. The lad learned everything he could about radio. By age fourteen, he rode a Greyhound Bus alone into Portland, Oregon and found his way to the FCC field office where he passed the Third Class License test. By age fifteen, he landed a part time weekend job on a 1000 Watt Daytime AM station. He was on the air six to midnight at age 17 as a summer job. If you guessed that boy was me, you would be right." - Ron*

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Cover Story

The Challenges of Multiplexing Two, Four-Tower AM DA'S With 60 kHz Frequency Spacing

Tom F. King – Kintronic Labs, Inc.

I want to begin by stating that the content in this article is attributable to Jim Moser, Senior RF Design Engineer at Kintronic Labs; Dave Supplee, Cumulus Media NE Regional Director of Engineering; and Rob Elder, Kintronic Labs field engineer. Based on an offer by a land developer to purchase the transmitter site of WMAL-AM,, located adjacent to the beltway north of downtown Washington, DC, Cumulus Media engaged Stu Graham, PE, with Graham-Brock and Associates to locate a possible existing AM station in the DC market where WMAL could potentially diplex to maintain their station coverage while vacating their existing transmitter site.

An agreement was reached with the owner of WWRC-AM in Germantown, MD, which was a 4-tower, 5kW/1kW DA-2 on 570 kHz. WMAL was 10 kW DA-1 on 630 kHz. In order to proceed with the diplexed directional antenna system design, Dave Supplee established the location of the future WMAL transmitter building and the routing of the transmission line trenches to the four tower bases as shown in **Figure 1** below.

Figure 1: Transmission line routings and lengths for WWRC (red) and WMAL (blue).

Figures 2, 3 and **4** show the WWRC Day and Night patterns and the WMAL pattern, respectively.

In order to accurately predict the mutual impedances between the towers for each station, Rob Elder conducted open and short impedance measurements of each tower at 570 kHz and 630 kHz. A model of the four-tower array was created utilizing Version 4.0 of the Numerical Electromagnetics Code(NEC). A Method of Moments (MOM) simulation for the WWRC day and night patterns and for the WMAL pattern, utilizing the open and short tower impedance measurements, was conducted to yield the tower operating parameters for each pattern.

In reviewing the existing phasing and matching system design for WWRC we noted that the resistive component of the Tower #3 and #4 drive impedances was single digit, and the power to these towers, for both the day and night patterns, was less than 0.25 kW. These low resistance towers typically have a negative impact on the common point buss impedance, resulting in a less than desired common point impedance bandwidth. A tower "T" pre-match network was installed at Tower #3 and #4, between the tower feed and the diplexing filters, to raise the tower drive impedance and compensate for the effects of these low drive impedance towers on the common point impedance bandwidth.

Single stage series diplex isolation filters were utilized between each respective station's ATU output and the tower feed, with the exception of Tower #3 and #4 where the tower pre-match networks were inserted between the diplex filters and the tower feed. Separate shunt isolation filters were also placed at the output of each transmitter, due to the 60 kHz frequency spacing, to assure adequate isolation between the two transmitters. An overall network design topology that resulted for the WWRC Day pattern and for the WMAL Day pattern was produced with the Kintronic CKTNET design software.

With the software we are able to predict the common point port-to-port isolation between the two transmitter outputs and the common point impedance bandwidth for each pattern in the antenna system. Based on the 60 kHz frequency separation, the goal was to achieve a minimum of -60 dB isolation between the two transmitters in all possible diplexed operational modes while yielding a common point VSWR for each pattern operation of < 1.5:1 at Fc +/- 5kHz and <2.0:1 at Fc +/- 10kHz.

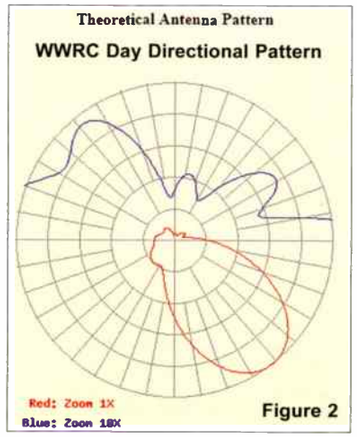

Figure 2

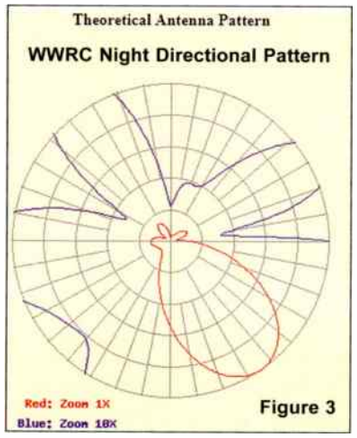

Figure 3

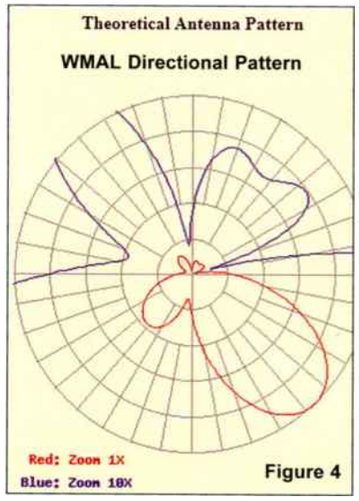

Figure 4

The measured rejection of each series and shunt filter in the WWRC / WMAL antenna systems is shown in **Figure 5.** You will note that if you add the dB rejection contribution of the input shunt filter to that of each series trap filter the total rejection in all cases is > -60dB.

A comparison of the predicted and measured common point VSWR values for the WWRC Day and Night patterns is shown in **Figure 6,** and the common point VSWR values for the WMAL pattern are shown in **Figure 7**. You will note that all of the design goals were met with the exception of the WMAL lower 10kHz sideband SWR that was > 2.0:1.

A table of the measured intermodulation products that were possible between the two frequencies is shown in **Figure 8.**

WWRC (570 kHz) System

1.	Shunt Filter (located near phasor input):	-27.4 dB
2.	Tower 1 series filter:	-40.9 dB
3.	Tower 2 series filter:	-39.9 dB
4.	Tower 3 series filter:	-40.2 dB
5.	Tower 4 series filter:	-36.6 dB

WMAL (630 kHz) System

1.	Shunt Filter (located at phasor input):	-26.8 dB
2.	Tower 1 series filter:	-45.4 dB
3.	Tower 2 series filter:	-39.5 dB
4.	Tower 3 series filter:	-47.6 dB
5.	Tower 4 series filter:	-46.6 dB

Figure 5: The measured rejection in dB of each series and shunt filter in the WWRC & WMAL antenna systems.

Day Directional Pattern Input Impedance Sweep

Freq. (kHz)	Input Z	SWR	SWR (predicted in KTL design)
555	60.2 – j55.2	2.674	5.259
560	40.6 – j26.4	1.843	1.906
565	43.6 – j0.4	1.148	1.351
570	**50.0 + j0.1**	**1.001**	1.000
575	38.8 + j5.4	1.325	1.221
580	37.5 + j17.3	1.632	1.631
585	34.6 + j21.0	1.852	3.352

Night Directional Pattern Input Impedance Sweep

Freq. (kHz)	Input Z	SWR	SWR (predicted in KTL design)
555	26.7 + j0.8	1.871	1.510
560	48.3 + j29.0	1.791	2.126
565	74.0 + j7.6	1.509	1.525
570	**50.0 + j0.1**	**1.004**	1.000
575	38.6 + j15.8	1.551	1.474
580	36.7 + j27.1	1.995	1.340
585	30.4 + j42.4	3.119	3.645

Figure 6: Measured (left column) versus predicted (right column) common point input SWR for the WWRC Day and Night patterns.

Directional Pattern Input Impedance Sweep

Freq. (kHz)	Input Z	SWR	Kintronic design prediction
615	53.3 – j79.9	4.159	5.259
620	29.3 – j28.0	2.416	1.906
625	37.1 – j3.6	1.366	1.351
630	**50.0 + j0.1**	**1.004**	**1.0**
635	52.6 – j2.9	1.078	1.221
640	52.5 – j0.0	1.050	1.631
645	65.4 – j16.8	1.486	3.352

Figure 7: Measured (left column) versus predicted (right column) common point input SWR for the WMAL directional pattern.

Freq. (kHz)	Origin	Meas. (mV/m)	Isolation (dB) (Rel. to 570)	(Rel. to 630)
570	WWRC carrier	339		
630	WMAL carrier	451		
510	2 x 570 – 630	.0162	-86.4	-88.9
690	2 x 630 – 570	.0334	-80.1	-82.6
1080	3 x 570 – 630	.0159	-86.6	-89.1
1140	2 x 570	.0387	-78.8	-81.3
1200	570 + 630	.0198	-84.7	-87.2
1260	2 x 630	.0160	-86.5	-89.0
1320	3 x 630 – 570	.0460	-77.3	-79.8
1770	2 x 570 + 630	.0108	-89.9	-92.4
1830	570 + 2 x 630	.0120	-89.0	-91.5
2340	3 x 570 + 630	.0091	-91.4	-93.9
2400	2 x 570 + 2 x 630	.0092	-91.3	-93.8
2460	570 + 3 x 630	.0092	-91.3	-93.8
3030	2 x 570 + 3 * 630	.0082	-92.3	-94.8

Figure 8: Measured intermodulation products referenced to the WWRC and WMAL carrier frequencies.

The only intermodulation product, that was only 0.2dB above -80dB threshold, was an unidentified station on 1320 kHz. These measurements confirmed that the goal of -60 dB port-to-port isolation between the two stations was sufficient to meet the FCC intermodulation product requirements for diplexed AM stations. – *Radio Guide*

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Studio Site

An FYI on HD Audio

CLEANFEED™ – An alternative platform for remote HD audio in radio.

by George Zahn

Coming through the Covid pandemic seems like three steps forward and two steps backward. We're making progress at returning to normal operations. but depending on where you are located, there is an ebb and flow of regaining full staff and technical functionality at stations. It was only a matter of time until the tier of remote audio options such as Microsoft Teams, Zoom, Zoho Meetings, Google Meet, and many others at our disposal would be improved upon to make audio better.

In past articles, I have expressed my concern about the use of more telephone and some deficient audio quality on connections such as Zoom, starting to "dumb down" what we're willing to live with to continue generating radio programming with possible access limitations to our studios. While TV stations continue to occasionally use Zoom to offer video with their audio, radio is encountering a new set of options. Many radio stations could care less about video content (unless uploading for web use), so if we don't need video, let's use that bandwidth to improve audio.

Who's Zoomin' Who?

Our station has done several Zoom interviews in a pinch (I've discussed some in past articles), and even with decent USB microphones and advanced audio settings, I've never been truly happy with the overall audio from that platform. Early in Covid, it was the old cliché of "any (computer) port in a storm." The audio in most recordings was a mixed bag of quality, with some interviewees sounding worse than telephone audio. Many radio hosts were intrigued, and some disheartened, by being able to be seen by, and to see our guests after years of phone interviews.

This time around, I want to pass along a new trick I learned (please hold your "old dog" comments) from one of our new hires at WMKV. After struggling through with various Zoom and other video meeting sites for interviews we couldn't do in-studio, our new morning voice Russ Heltman, introduced me to what he calls "seamless HD audio quality based on the user's microphone." It is Cleanfeed, (a free and also available as a paid Pro option) that he was recently using with Cumulus in Toledo and also with a podcast he produces.

Cleanfeed Radio Tools

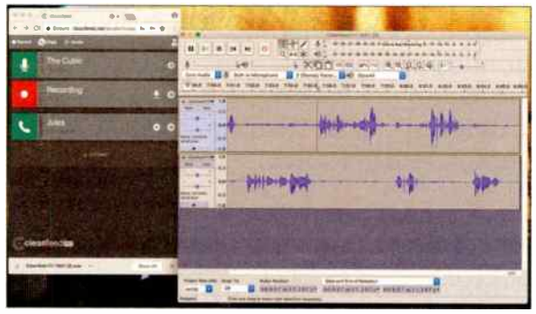
Heltman adds, "In Toledo, we had to quickly learn it during the start of the pandemic because our weekend talk show hosts couldn't come in to the station." From there it became a go-to for remote recording and is even used by voice-over professionals today.

I was skeptical, but the results I've been hearing of Cleanfeed are far superior to my recordings on other options I've used. There are a few caveats, both of which will also help your quality no matter what meeting platform you may be using. What fuels Cleanfeed's low latency HD success is the fact that they use the complete connection to pass through audio – a tremendous gain because ,as we all know, video can chew up a lot of bandwidth, leaving less for audio.

Quality In=Quality Out

So the crucial needs for decent Cleanfeed include at least a decent microphone and a set of headphones. There are some decent affordable microphones, from the $100 range up to a really nice option the Shure MV7 in the $200 area, and even more expensive mics. Some hosts actually use a console as the USB interface to their computer to add processing or EQ to their mics. The microphone will be a major plus to the HD sound. Just about any basic headphones will do for monitoring without any slapback from speakers caused by some latency. Some USB microphones also have built in headphone jacks. The Cleanfeed platform currently works on Google Chrome.

Shure MV7 Podcast Microphone



Cleanfeed Recording Screens

In today's world, many professionals in media or performance are adding their own professional microphones (and lighting for video). Early pandemic Zoom had probably 95% of those talking likely being picked up by the sub-professional microphones on their laptops, tablets, or phones. The investment in a decent USB microphone is money well invested and fairly inexpensive for the return of quality.

The Cleanfeed platform is found at **Cleanfeed.net**. The free version does not compromise on quality, but does limit to mono audio and recording. You can choose audio settings for speech or music, plus input and output options based on what you have connected to your computer. The free version seems to have no limit on time or number of participants. The host can mute any participant at any time, and the Cleanfeed platform allows you to record each person in the conversation on a different track to allow for later editing and volume correction. After the recording, you simply download the files.

The "Cans" Festival

Why headphones? Most people who do regular podcasts with guests via different meeting platforms use headphones as a standard accessory. When I was connected to Kirk Harnack on the *This Week in Radio Tech* podcast (thisweekinradiotech.com), I was pleasantly surprised that my overall quality was better with headphones for monitoring in place of the speakers on my laptop.

"Heaphones are a must," says Heltman, "without headphones you have to purchase the pro version (of Cleanfeed) to make sure there was no echo." There is no way at this point to totally avoid digital latency (the delay in encoding audio to digital form on one end and decoding for playback on the receive end), but I've been impressed so far by the very short delay in Cleanfeed.

Heltman adds that the free edition does not allow prescheduled interviews as you can do on Zoom (the Pro version of Cleanfeed does), but you simply start a session and enter e-mail addresses of those you are inviting, and Cleanfeed sends an e-mail to the requested guest(s) who should be anticipating the message. The guest clicks on the link in the e-mail and they are connected to that session. Each guest can confirm their own audio settings. In place of video you might see in Zoom, the screen shows the participants by name and shows whether each guest is muted. The guests do not need to have accounts with Cleanfeed, just a Google Chrome browser at this point.

Bells and Whistles

The Pro version is available for a monthly charge starting at about $22, and offers advanced interview scheduling, more editing and sound settings, and extra options over the free version. The Pro version is also able to adjust some latency settings for those guests who may not be using headphones, in effect minimizing any latency echo. Pro also allows for HD stereo content and even connecting multiple devices to Cleanfeed on the home computer. You can even use sounders, themes, and jingles. Remote audio bitrates range from a max of 256 kbps in mono and 320 kbps in stereo.

If you're interested, it may be best to just try the free version first. Whether you're lining up an emergency talent link from their home, a podcast or broadcast interview, simple liners or more complex voice work, it seems to me a platform worth checking. In fact, we're talking about it at our station as the backup in case of a double booking of studios or as an emergency mode in the case of losing phone access for guests, etc.

Russ Heltman urges all users to pay attention to settings for best results: "Always check your sound settings tab under your studio name to ensure you are using the preferred mic and shoot for the audio levels to consistently peak right at the yellow bar color."

While many stations and independent producers and voice talent are using Cleanfeed, the company's site also boasts usage by NPR, NBS Universal, Cumulus, Discovery, and the BBC, among others. Some have even claimed that this platform surpasses ISDN.

Heltman wrapped it up: "That (audio quality) to me is the most important thing in radio."

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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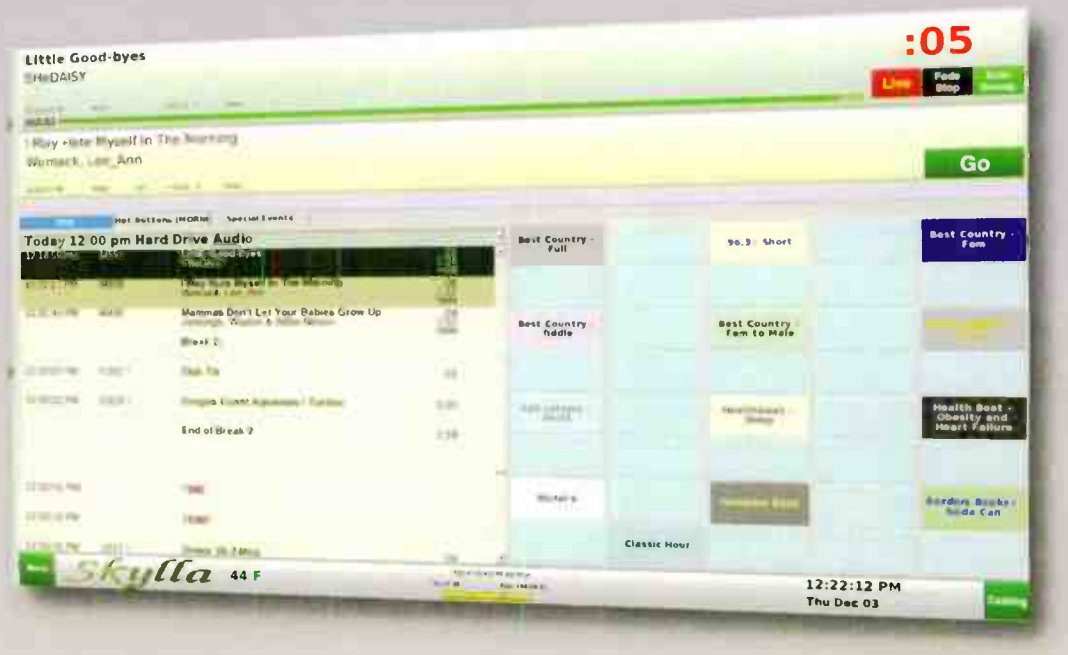

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Chief Engineer

If It's Not One Thing – It's *Three!*

by Scott Schmeling

That's been my Engineering Department motto for a few years.

Have you ever had a project where things don't quite go as smoothly as they should? We recently had a project that illustrated just how true that motto can be. That project had two main parts. The first part was to replace the existing FM antenna with a new one. The current antenna had originally been a 7-bay, end-fed that had been modified at some time to an 8-bay, end-fed. The new antenna is an 8-bay *center*-fed. The antenna was being replaced for reasons that I won't go into.

The second part of the project was to replace the 1994 vintage, tube-type transmitter with a new solid state rig. The current transmitter was working great, but it had a history of some fairly major failures. It was decided that the transmitter should be replaced sooner than later.

We also planned to do some site clean-up. Like so many transmitter sites, this one had started out with one transmitter and one antenna, but stations and translators were added bringing with them more transmitters, and more antennas. And with that comes more coaxial cables. And no matter how clean, neat, and organized a site might be originally, as these things are added, the more it begins to look like a tangled mess.

One quick note: As you know, solid state transmitters are not as tolerant of high temperatures as tube-type transmitters are. In preparation for the new solid state transmitter, a new 5-ton air conditioner had already been installed. Heat had always been an issue at this site. But with the new A/C, things were staying nice and cool.

As I have alluded to, this project had more than its share of "bumps in the road". The new antenna had been delivered some time ago, but I had not been able to schedule my regular tower crew so the antenna remained in its many boxes, completely occupying my building ... to the point where the new *transmitter* could not be delivered after it left the factory. Fortunately, the moving company was willing to keep it in their warehouse until we were ready for it.

After it became obvious my regular crew would not be able to install the new antenna, I contacted a different tower crew I had had some experience with. They were just finishing a job and were able to come up in a couple weeks.

Taking the old antenna down was pretty easy and straight forward. The 2-1/4" heliax was staying in place since it had been installed not that many years before. Likewise, the new antenna went up with nary a hitch. I had mentioned earlier that the original antenna was end-fed and the new one was center-fed. In addition to the new antenna, the order included two sections of 3" rigid line to go between the end of the line and the input to the antenna. That required the rigid be installed first, then the antenna – starting with the input section.

I had forgotten to take into account that the old antenna had a 1-5/8" input. I had not ordered a 1-5/8" to 3" adaptor for the end of the coax. Fortunately, I just *happened* to have one in the van! (If you count the issue with my original tower crew, this is bump-in-the-road #2.)

The antenna came "pre-tuned" at the factory. According to the documentation included, no tuning slug was needed, and it was felt the antenna would provide a good match when installed on our tower – the match wasn't that good. We opted for the "telephone field tuning" option. The tower crew would bring their Anritsu Site Manager the next day and a time was scheduled with the factory. But when setting up for the measurements, it was discovered their Site Manager was not working properly. (Bumps #3 and #4 – but who's counting?)

Scott (from the tower crew) called another antenna tuner he had worked with in the past. As it turned out, he (Eric) was going to Fargo the following week and could stop at our site on the way. For once, something was going our way!

The next week, Eric arrived as planned (with tuning slugs in hand). He set up on a table while two members of the tower crew climbed up to the antenna's tuning section. Within a couple hours we had what could be considered a perfect match!

Next, in preparation for the new transmitter, we started our cable "clean-up." Our goal was to untangle that mess and get the cables under control. Part of that called for mounting Unistrut to the ceiling, then use threaded rod and other strut hardware to construct a system to organize and support the variety of coaxial cables entering the building.

We would also be mounting a new motorized RF transfer switch. I bought some 1/2" hardware, but discovered we couldn't get the socket over the head of the 1/2" lag screw inside the channel of the strut (bump #5). A trip back to town for lunch and we picked up what we needed in 3/8" hardware.

The day the transmitter was to arrive, Justin (the electrician) was there. We disconnected everything from the old transmitter so it could be removed and Justin installed a new power line monitor/surge suppressor.

The new transmitter finally arrived (about 3 hours later than planned (bump #6?) and it was out with the old and in with the new. The physical transition went smoothly. To connect the new transmitter to the new transfer switch, I had about a 15 foot piece of "left-over" Heliax that had been at the site for a few years. I had "harvested" a pair of fairly clean 1-5/8" flanged connectors from various sites. It was when we started trying to put a connector on the cable that we discovered the *cable* was 2-1/4" (bump #7)! ... and my hack saw blade was dull (bump #8)!

It was getting late, and I knew I had a long enough chunk of 1-5/8" at another site. My plan was to go and retrieve it, then bring it back here in the morning. It was a great plan. But when I got to that site I discovered a railroad crew had been replacing ties in the track and my approach to this site was *blocked* (bump #9)!

I was pretty sure I had another piece at a site about an hour away – so I drove there. It was 8-1/2 feet – I needed 12 (bump #10)!

I went back to the blocked site the next morning, walked in, rolled up the cable (about 20 feet) and walked back out to the van. As I was walking, a construction crew from Chicago Pacific Railroad arrived to finish their project and open up my approach! (I don't know ... is that bump #11 or not?)

When I got back to the site we trimmed the coax, put connectors on and bolted it in place. In hind-sight, rigid line would probably have been a better idea!

After wiring the transfer switch to the remote control, we wired in a 12V "wall-wart" power supply for the switch's control relay. Sadly, the supply had high ripple and the switch would not switch (bump # 11 or 12)! I brought a good supply the next day. This one worked like it should.

Our last item was to cover the ground strap on the floor with a product by 3M called Safety Step. Something I've never liked about strap on the floor is all the "stuff" that ends up under the strap. And often, loose strap is a tripping hazard. This Safety Step holds the strap securely on the floor – no tripping and nothing under the strap.

Finally, we were finished. As you can see, there were plenty of obstacles along the way, but we worked our way through them and successfully completed the project.

By the way, we had a component failure in the new transmitter this morning and Keith was able to switch to a 1kW backup transmitter without driving out there at 3:00 in the morning! (He was thankful!)

I'd like to wish you all a very Merry Christmas and may 2022 be all the good you can imagine. I hope you can spend your holidays with family and friends.

Until next time ... Keep it between 90 and 105!

Scott Schmeling is the Chief Engineer for Minnesota Valley Broadcasting He can be reached via email at scottschmeling@radiomankato.com

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FCC Focus

The Local Journalism Sustainability Act

by Gregg P. Skall, Member – Telecommunications Law Professionals PLLC

For a century, we have relied on local broadcasters for quality, curated news and information subjected to the editorial process. We have heard old axioms like all politics is local and others that underscore the importance of quality, accurate local newsgathering and reporting. For many decades, local broadcasters fulfilled that mandate. Some better than others for sure, but still for the most part, honoring the editorial process.

That legacy is in danger!

The Competitive Challenge

Over the last decade it has become painfully clear that new digital technology has captured the public's attention and increasing numbers of our citizens are relying on and trusting it for their news, replacing local journalism. The University of North Carolina Hussman School of Journalism and Media recently reported that in only two decades, successive technological and economic assaults have destroyed the for-profit business model that sustained local journalism in this country for two centuries, leading to fears of an "extinction-level event" that may lead to the collapse of the country's local news ecosystem.

It is broadly recognized that this is a crucial time in the history of television journalism and journalism in general. While broadcasters offer critically important information to local audiences and make crucial contributions to our culture through local programming, broadcasters now face pressures brought about through personal use technologies not imagined a little more than a decade ago. These pressures are most extreme in smaller markets and on smaller, community-based broadcasters.

That digital viewing is making increased inroads into traditional broadcast viewership is not news and not new. Local owners are unable to compete with digital advertising, which is drawing away increasing amounts of advertising revenue, forcing many local owners to cut costs, inevitably resulting in less local programming overall and to less in-depth local journalism. The advent of digital advertising has forced local broadcast advertisers into direct competition with sources like Facebook, Google, and other Internet services that provide targeted, local, national, and even global, outreach, without regard to local boundaries and identities. Small market advertising can now be bought in a bundle with larger markets at an averaged overall cost. Despite their best attempts to compete, local broadcasters are not able to keep up.

Several recent studies comparing local television advertising with digital advertising demonstrate that local television advertising is quickly falling behind. In 2021, local television advertising is expected to account for just 11.4% of all local advertising revenue, while digital advertising revenue will more than triple that of local television. Industry analysts project that local television advertising revenue will plunge to 6.5% in 2023, while digital advertising will expand 8.5% in 2021 and 7.5% in 2023. In 2021, digital advertising spending was responsible for 15% of all advertising spending and is anticipated to capture 35% of all spending within five years.

Compounding the issue, national digital competition can sell at lower rates by averaging its costs across its national audience. Though some local broadcasters have attempted to compete on-line, a move to digital is difficult for local broadcasters. Industry analysts have said that broadcasters attempting to compete on the digital scene must sell 10-15 times the amount of their broadcast sales just to achieve the same margins they would for their broadcast revenue. This leaves far less money for broadcasters to invest in local programming and services.

Local Journalism Sustainability Act – Congress Reacts!

That this digital advertising evolution is having real consequences on local journalism has not gone unnoticed by Congress. Recognizing that without sufficient economic support, good localism and viewpoint diversity cannot survive, the *Local Journalism Sustainability Act* was introduced. It deserves broadcaster support. The House and Senate versions both seek to provide a pathway to financial viability for local news in newspapers and local digital only publications through a series of tax credits in the face of the erosion of their advertising base by digital media. The Senate version adds support for television and radio.

The Local Media Tax Credit for Advertisers

The Act proposes benefits for local newspaper subscribers, as well as benefits to advertisers who advertise on local media. There is also a credit for small business to provide financial flexibility to spend on advertising in local news publishing and media. The Act proposes to offer a five-year credit of up to $5,000 in first year and up to $2,500 in subsequent four years. The credit covers 80% of advertising costs in first year and 50% in subsequent four years. The purpose is to increase flexibility so that small businesses may utilize this credit to advertise with local television and radio stations, in addition to local newspapers, digital-only local news sources and nonprofit news organizations.

Although the House version does not yet include broadcasting, the Senate version would benefit those who choose to utilize broadcast advertising as well as newspapers. The act recognizes that the larger battle is to sustain and retain locally based journalism. In this fight, broadcasters and local newspapers are allies. If passed, the Senate bill would provide advertisers in either a local newspaper or a local broadcast station, a tax credit for small businesses who utilize local media to get their advertising messages to their communities.

Tax Credits for Journalists

To promote local journalism, the Act encourages hiring more local journalists with a proposed five-year credit of up to $25,000 per journalist in the first year and up to $15,000 per journalist in the subsequent four years. In addition, it offers an additional $12,500 for each local journalists who spends at least 100 hours per year on reporting local news.

It's important to let your congressional delegation know to support the Senate version, as the House version has not yet been amended and provides this credit only to newspapers, while the Senate version extends the benefits to broadcasters as well. Therefore, this provision, in particular, has been supported by the Radio and Television News Directors Association, (RTDNA) in recognition of its incentive for local media outlets to hire more news professionals.

Local News Subscription Credit

Attacking the issue from another perspective, the bill would provide a credit to incentivize Americans to subscribe to local newspapers or donate to local nonprofit news publishers with a five-year credit of up to $250 annually to cover 80% of subscription costs in the first year and 50% in subsequent four years. To receive the full $250 credit, a subscriber would have to spend at least $312.50 in the first year, and $500 each of the following four years. Alternatively, the credit can be used to help support a donation to a nonprofit local news publisher.

The NAB Recently Put It This Way

Local broadcast journalists and newspaper reporters are on the ground covering the news that impacts every community, including lifesaving information during times of crisis. Newspapers and local TV and radio stations also provide investigative stories that shine a light on government and hold those in power accountable. Local broadcast stations provide these critical services for free, over the air, to their communities and are the most trusted source of news and reporting in the country. But the sourcing, reporting and production of this news is very costly. In most stations, news costs alone account for more than a third of total expenditures. For some stations that cost approaches half of their expenses. Much of a local media outlet's budget comes from local advertising revenue. But over the past decade many of those dollars are being diverted to and consumed by a handful of massive on-line technology platforms. While these companies are taking the lifeblood of local journalism, they are not actually providing any of the critical local news reporting that Americans depend upon. Instead, these tech companies provide untrustworthy platforms where misinformation runs rampant. By providing a tax credit for the hiring and retention of local journalists, as well as giving small businesses a credit for a portion of their advertising costs on local media, the Local Journalism Sustainability Act would help stabilize local newsrooms during a time when these local outlets are facing the economic impact of advertising dollars going to massive technology platforms, and the pandemic's blow to local businesses that don't have the resources to advertise with local media.

Your Support Is Needed

If your senator or representative has signed on to the Local Journalism Sustainability Act, be sure to thank them. If they have not, now is the time to ask for their support. At this writing, here is are the members who have signed on:

For the House Bill H.R.3940 – the primary sponsor is Ann Kirkpatrick [D-AZ2] and there are currently 63 cosponsors: 49 Democrats and 14 Republicans. For the Senate Bill S.2434 – the primary sponsor is Maria Cantwell [D-WA] and there are currently 14 cosponsors: You can find the Senate co-sponsors here: https://tinyurl.com/LJSA-Senate-Sponsors and the House co-sponsors here: https://tinyurl.com/LJSA-House-Sponsors

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Gregg Skall is a member of the law firm of Telecommunications Law Professionals PLLC. He frequently lectures on FCC rules and regulations, represents several state broadcaster associations and individual broadcasters and other parties before the FCC.

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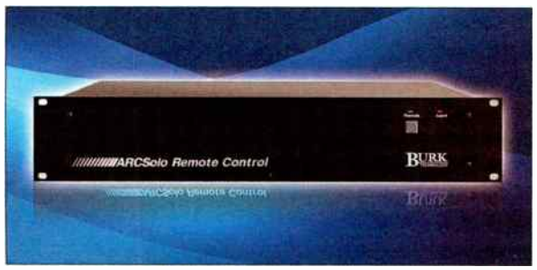
ARC Solo Monitor and Control

by Wiely Boswell

At some point you will need a new alarm/control system. The Burk ARCSolo Remote Control system is now our newest system, so now we once again have the latest and greatest product. It has 16 status inputs, 16 metering inputs and 16 relay control outputs. Our old Burk GSC 3000 out lived the old software used to program it. So when the old dedicated Windows 3.1 laptop was stolen I lost ability to make any changes to the system. Until now, our newest model was the ARC 16 with a LCD display and it has worked well but lacks Ethernet connectivity. The ARC Solo has both dial up and LAN connectivity standard. It also incorporates "RSI" speech with many options of adding your own custom speech besides a standard pre-programmed list. The old systems used to have different function rack mount units all interconnected as needed. The Solo has everything in a two rack space chassis and is about 12" deep.



The "Touch" version has a color touch screen whereas the Solo version saves by not including the screen. It has a quite simple front, a red/green power indicator (red when alarm exists), and a remote push button and LED (red when in maintenance mode). Once you push the maintenance button there is no way to override it. As a safety protection you do not want someone remotely doing things when performing work on a transmitter or other dangerous equipment.

Monitor and control is used in many applications besides broadcast. Some applications include municipal water systems, building HVAC systems, and factory automation systems. Burk also makes a land mobile base station system called "Archer," which monitors the newest digital 2W radio systems today. Manufacturers tend to address the specific needs of a particular industry but they all have the goal of monitoring, controlling, and reporting. Monitoring involves input from simple monitoring such as a status on/off contact closure. For a security example: a magnetic door switch or a motion sensor will advise of site entry. A large part in monitoring is reacting and making decisions. In this example an alarm siren and lights can be operated and all types of alerts send out in texts, emails, and dial outs. It is a custom alarm system and output is based on what the inputs may be doing at any point in time.

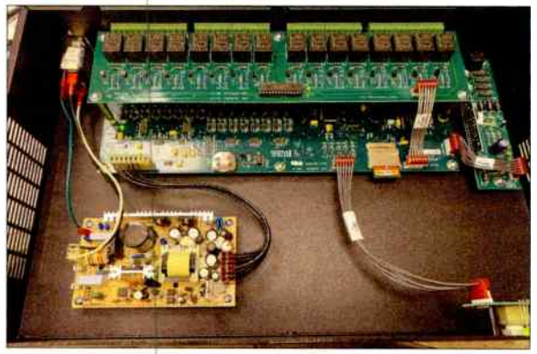
A transmitter has its own monitoring and logic built in. Air flow is important to a transmitter. Air flow can be verified by a micro switch with a small paddle in the air duct or a pressure switch in the cabinet. Newer solid state designs use lots of small fans instead of blowers. In this case either fan motor RPM monitoring and or temperature monitoring will raise an alarm in the transmitter. An air cooled dummy load has an air flow sensor which can be set up to shut down a transmitter during a load test. This is an example of a decision being made by the transmitter based on external monitoring. Likewise, the Solo watches everything. Decisions are made and illustrated by flowcharts and are called "Jet Active flowcharts." This is an easy way to describe and program decisions and is a standard feature.

Status inputs will tell you "on/off" situations, whereas metering inputs will indicate variable voltage readings such as temperature, voltage, or current. Metering inputs can be a voltage input that, through sensors, can represent RF power, line voltage, coax pressure, etc. Decisions will be based on adjustable thresholds and can be classified as Low Critical, Low Warning, High Warning, and High Critical. The metering values are calibrated by entering what that voltage represents. 5 VDC, for example, could come out of a line voltage sensor to represent 120 VAC. To calibrate, you set the channel to read 120 VAC and select calibrate. You also need to know how the measured DC voltage from a sensor will increase – will it be a linear or squared reading? This is all adjustable and the actual sensor data sheet will explain its response to input. Other sensors might include a cooling flow sensor, a temperature sensor, or a pressure sensor.

All of these various connections go all over the broadcast plant and every effort should be made to keep surges out, be it sensors, status inputs, control outputs, line power, LAN or phone connection, or RCA audio connections. Again, extra care should be taken to isolate and protect equipment on both ends of circuits connected. I have an outside generator with four programmable alarm relays with wiring run inside to a transfer switch. I am considering using extra in-line relays inside to provide some isolation. These will be "Generator" status inputs. Traditional phone lines are a common source of lightning damage. I have moved to the VOIP MaxxPhone interface with the MaxxKonnect cell router providing Internet access, and now there is no phone pair coming in to the building – all phone drops have been taken down.

The new transmitters are quite flush with communication options. One newer option is a web page from the transmitter. All this information can be an overload to a large network of sites. Burk has a "Plus Connect" box to interface with these systems, talking to the transmitter and converting certain protocols before going to main alarm system. It funnels all the data down to one point which then can be supervised by "AutoPilot," the large scale network software that is authorized/licensed per site monitored. SNMP is the new management feature that is common with industrial control.

Solo Control is via 16 relays with NO/NC contacts. The relays can be programmed for adjustable time momentary, latching, and pairing. All this is somewhat standard yet has years of experience adding advanced features.



Time to open the box! The photo above shows the top view of the chassis. There is a main board on the bottom with the relay board directly above it. You can also see the switching power supply +3.3, 5, and 12 VDC with a 1 Amp line input fuse. No external fuse is visible on my model. This unit should be powered by a good UPS. I normally have two UPS units – one UPS for the MaxxKonnect and Burk system and another one for everything else in the rack. The goal is to have extended run time to maintain access to Solo and MaxxKonnect. I checked with Burk and a spare power supply is affordable – at $59.30, a great spare (Part # 30350301). There's a lot of room for air flow from the sides and no fans. On the right side at bottom is the dial up modem. It is quite small and has two gas tubes and three Transil diodes for surge protection.

The photo above shows the rear view with a row of phoenix-style connectors. A bag of individual 3 pin plugs is provided with the unit. The RJ25 jack is for a future feature of one-wire sensors. To be clear its not just one wire. Power for sensor and data are on one wire but it is a two wire buss with multiple sensors. The RCA audio jacks are for bringing in/out audio. The grounds are not isolated from chassis. Specifications do not include input or output levels. SAGE cannot warn you enough not to overload audio inputs on the Endec.

You can backup all settings, since the reset button on the rear could ruin your day.

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

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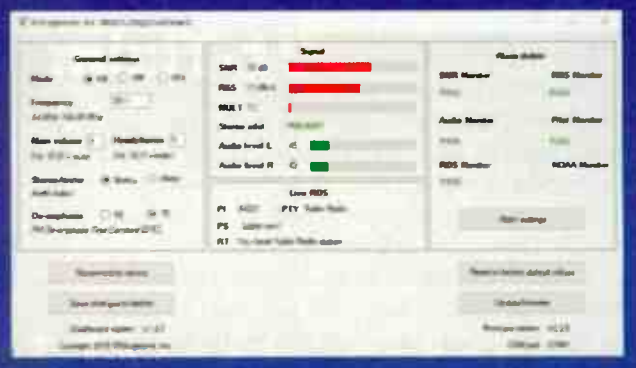

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Arduino Add-Ons

by Tommy Gray CPBE CBNE

Adding Necessities!

If you finally have your Arduino module working and performing simple tasks, you have by now figured out how to add analog and digital inputs and outputs. The Analog inputs are useful for telemetry monitoring of all kinds and require only a small DC voltage to be fed into the input to work. The Digital ones are useful for status and control functions.

Digital Inputs

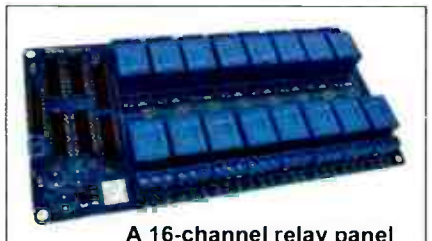
The Digital pins on the Arduino can be either an input, output, or a combination of both, depending on your setup instructions when you configure your pins in the code. Digital inputs are useful for status monitoring of contact closures and relays, etc. Transmitter site alarm circuits can be fed into them by using the built-in pullup voltage that is enabled by the simple word "_PULLUP" added to the digital input's setup string as you can see later on in this article. This will give you a 5V logic high on the pin, that you can use to trigger a function in the Arduino, so that when it is brought low by a closure to ground for example, you can have the code do something for you. Things like triggering an alarm of some kind, turning on a alarm light, turning on the coffee pot, sending out an alert email, etc., are all easily implemented in the Arduino Sketch, and initiated when you bring the input pin to ground. If your tower lights, or your generator, for example have an alarm contact, you can feed that dry closure into the appropriate input pin and then the code will tell the Arduino what to do with it, and Arduino will respond as programmed.

Digital Outputs

The Digital pins, when programmed as an output, can do things like turn on a relay, send an alarm to other pieces of equipment, start equipment, stop equipment, turn on a transmitter, turn on a fan, etc. The uses are many and varied. Many remote control systems for example may be limited as to the number of inputs or outputs, and you can supplement their functionality with a little Arduino and save literally thousands of dollars in expensive equipment. There are inexpensive relay panels that can be controlled by the Arduino and used for all kinds of things around the broadcast plant.

The little relay panel below is one such inexpensive example. They can be easily obtained from Amazon, eBay, etc., for just a few dollars and can do things that you would normally pay a lot for with major vendors.

This relay panel has 16 relays that can be used to control or trigger things around your operation. The great thing about the Arduino and almost everything that is available to work with it, is that it is quite "cheap." This particular panel is one I found on ebay for just over $15! Add this panel to your system, and couple that with your digital outputs and you have a lot of versatility at your disposal.



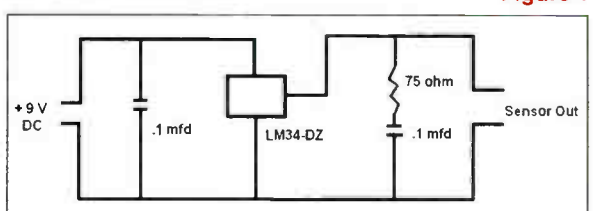
A 16-channel relay panel that will work with the Arduino.

Analog Inputs

In addition to all the Digital Inputs that are on, say for instance, the Arduino Mega 2560 I used, there are also a lot of Analog Inputs. You can feed small voltages samples into them and you have readings for functions in your plant, such as for instance, monitoring building temperature or AC line voltage. In the schematic below (**Figure 1**), I am showing a simple temperature sensor circuit that uses the very common LM43 IC to monitor temperature. This particular one is the LM34-DZ, which is in a small TO-92 transistor style case with just three leads. There is a supply voltage of +9 VDC, which in my case came from a leftover 9V wall wart power supply. There is the ground from the supply, and then there is the output which gives you 0.1 VDC (point one volt) per degree Fahrenheit. Should you, for some reason, desire Celsius temperature monitoring, simply swap the LM34 out for an LM35 which is the Celsius equivalent. As you can see from the schematic below, it is a very simple circuit, and the few additional components help with RF immunity in case you are using it near a transmitter for instance. **Figure 1** is a very rudimentary schematic as my CAD schematic did not come across clear enough for the article.

In my circuit I have used a couple of 0.1 mfd (point one) ceramic capacitors and a 75 ohm, 2%, 1/4 watt resistor. The tolerance probably is not critical but I had these on hand in the shop and that is what I used.

Figure 1



Simple Fahrenheit Temp Monitor Circuit for Arduino

When I designed this circuit, I went one step farther and made up a PC board pattern and etched several small boards to use at some sites that needed them. Commercial temp sensors, sold by one popular transmitter remote control system manufacturer we are probably all very familiar with, sell for about $65-70 each. I made these, including the components and the PC boards, for under $10 each, and they function just as well as the commercial units.

Programming "Stuff"

I am at this point, going to drop in a few items from the Sketch I created, that is a Transmitter Site Monitoring and Control program. You may remember that I showed it to you early on in these Arduino articles. It is accessed and controlled through the Internet VIA an HTML Web page. I can access it from a computer, or thorough my cell phone with just an IP address. In the pictures below you can see some code snippets from my Sketch for the Arduino Mega 2560. You can use a "UNO R3" but it is limited as to the number of inputs and outputs. The first picture shows the "Setup" section of my sketch, which has to be in every Arduino Sketch. It gives some detail as to how to configure the Digital inputs. The second picture shows the Analog input setup for the web page I use to monitor it with.

```
96  // The setup routine runs once when you press reset or Power up:
97  void setup()
98    {
99      Serial.begin(38400);                  // initialize serial communication at 38400 baud:
100     pinMode(inPin2, INPUT_PULLUP);        // Initialize pin #6 for Tower Light Alarm
101     pinMode(inPin3, INPUT_PULLUP);        // Initialize the #7 digital in for Silence Alarm
102
103     //Output pins for control commands
104     pinMode(filaments, OUTPUT);             // Output 4
105     pinMode(plates, OUTPUT);                // Output 5
106     pinMode(power, OUTPUT);                 // Output 6
107     pinMode(remote, OUTPUT);                // Output 7
108
109     //Display Setup
110     // Setup of LCD module
111     lcd.begin (20,4);                       // start the 20 x 4 LCD module
112     lcd.setBacklightPin(3,POSITIVE);        // BL, BL_POL
113     lcd.setBacklight(HIGH);
114
115     Ethernet.begin(mac,ip,gateway,subnet);  // initialize Ethernet device
116     server.begin();                         // start to listen for clients
117   }
```

Setup Section of My Sketch

```
119 //---------------------------------------------------------
120 //Begin to load the webpage from the Arduino to Client
121 //=========================================================
122 void SendOKpage(EthernetClient &client)
123 {  // Oeclare the Integer Variables and Read the Input Values On Analog Pins 0-6:
124     int FwdPwrVal = analogRead(A0);       //Transmitter Forward Power Reading
125     int RefPwrVal = analogRead(A1);       //Transmitter Reflected Power Reading
126     int PltVoltVal = analogRead(A2);      //Transmitter Plate Voltage Reading
127     int PltAmpsVal = analogRead(A3);      //Transmitter Plate Current Reading
128     int BldgVoltsVal = analogRead(A4);    //Building Electrical Power Reading
129     int BldgTempVal = analogRead(A5);     //Building Temperature Reading
130     int LinePressVal = analogRead(A6);    //Coax Nitrogen Pressure Reading from transducer
131
```

Analog Input Setup for Monitoring the Analog Inputs on a web Page

```
61
62  const int inPin2 = 2;             //Tower Light Alarm connected to digital pin 6
63  const int inPin3 = 3;             // Silence Sensor connected to digital pin 7
64  int filaments = 4;                //Assign the name "filaments" to pin 4
65  int plates = 5;                   //Assign the name "plates" to pin 5
66  int power = 6;                    //Assign High/Low power control to pin 6
67  int remote = 7;                   //Assign remote/Local control to pin 7
68  bool SilenceVal = 0;              //Initilize the boolean variable
69  bool TowerVal = 0;                //Initialize boolean Variable
70
```

The Variable Assignments I Used in My Dketch

You may have noticed that in the setup section for the digital Inputs, I used names instead of pin numbers for the declarations. To allow me to do that so it is clearer when I look at the code, and to prevent me from having to remember what each input pin does, I setup variables earlier in the code that assigned these names such as "filaments," "plates," etc., to various Arduino I/O pins so that, from then on, I was able to simply use the names instead of the numbers.

You can see above, where each name was assigned to a particular pin on the Arduino I/O pins. Well, we are about out of space for this article but I will give you more next time to assist you in building your Arduino project, whatever that might be.

Until Next Time!

Tommy Gray is a veteran broadcast engineer currently staying busy doing Engineering and IT across the Continental US, through "Broadcast Engineering & Technology LLC", a Louisiana based Consulting and Contract Engineering Firm. www.BEandT.com

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Pass It On

by SteveCallahan

I was at a mountain-top, multi-station transmitter site the other day and I was pleasantly surprised to see an engineer friend of mine showing a younger engineer the ropes. It was indeed gratifying to see how he was passing along his decades of experience to this younger fellow who showed all sorts of youthful enthusiasm.

As many of us approach our golden retirement years, all at roughly the same time, someone has to think about passing along the knowledge and experiences that the next generation won't be able to find in any text book. Yesterday, I spoke with another soon-to-be-retired engineer and he too has found a much younger replacement for himself, who will be taking over the reins at the end of the year. I commend both of them for doing the right thing and passing the baton to the next generation.

Back in the good old days, major market radio stations had a "Farm Club" that they could draw upon for experienced talent, both on-air and off-air. In New England, rookies could start off in Bangor, Maine, work their way to Portland, Maine in a few years and then, at the right opportunity, make the jump into the "Big Time" in Boston. From the west, they would start off in Pittsfield, Mass., then move to Worcester, Mass for a few years and then pay their dues until there was an opening in Boston. From the south, the path started in rural Rhode Island, moved to Providence and then maybe into Boston. It was a system that worked well in that the major market radio station got someone who was trainable, who had some small market experience and possessed a desire to move up the ladder into a larger market radio station.

Well, all that changed with deregulation and the proliferation of automation and computerization in radio. Where once there were five engineers at one station, there is now one engineer at five stations. The "Farm Club" rural stations are all voice-tracked and programmed from a centralized studio many miles, and in some cases, hundreds of miles away. A contract engineer, who is probably on the cusp of retirement himself, stops by that station maybe once a month and doesn't have time to teach a budding engineer, as he's got many other stations to visit on his circuit.

I really think that part of the motivating magic for younger people to work for radio stations was that it truly was a fun and exciting place to work. There was a certain sense of accomplishment to make voices and music come out of the radio. Unfortunately, today we've been successful in diminishing the fun and excitement that used to come with working in a radio station. One station group has already announced plans to do away with local studios and feed all of their stations "from the cloud."

More than fifty years ago, I made my on-air debut as a 5th grader reading a Bible passage on a locally-produced Sunday morning radio show. As I sat in the glass booth with my one page script, I managed to keep my knees from knocking in fear. The engineer pointed to me to start reading and, even though it took two takes, I was hooked! The next week I got up extra early on a Sunday morning to hear my voice come out of my radio. Now, that was truly magic for a 5th grader.

In my previous life as a college professor in a communications curriculum, I was always on the lookout for that natural talent to come walking in my door. One freshman came into the student radio station, volunteered for an on-air shift, sat down and sounded on-air like he already had years of experience under his belt. After graduation he then moved on to commercial stations in Providence, RI, Philadelphia, PA and New York City before coming back to Boston. I'm proud to say that today he is celebrating his 35 year anniversary at the same station and he now works in a studio right down the hall from me.

One of my jobs in the academic world was to arrange internships for my communication students. I guess the dean thought I had a lot of friends in radio in the area and I could call upon them for a favor to take on our students as interns. I took that part of the job very seriously and I did my best to place my students in the right learning environment so that they would gain some practical knowledge while also providing some "free labor" for the station. I would also make surprise visits to the stations to make sure my students were not majoring in "Coffee and Donut Acquisition" and that they were showing up on a regular basis and doing something that really mattered to them and to the station. More than once one of my interns was hired at a station because the internship "opened the door" for them.

Another one of my most promising students went on to become a very respected format captain for a major radio group. Years later I had the privilege of visiting him and I still saw in him what I saw years before. When I was a contract engineer for a small high school station, I noticed one student who showed great promise and took the work he did at that radio station very seriously. I saw years later that he was now a successful executive with Nielsen.

Seriously, when was the last time that a local college contacted you to see if you needed a promising intern to work at your station? Yes, I know that the whole Covid experience has closed the doors to the radio station for interns and visitors. But did you get any inquiries before the pandemic? Have you made any inquiries at your local college now that those doors are slowly opening?

If you also do contract work for small, rural stations, do you keep your eyes and ears open for promising beginners out there that you would like to help move up the ladder?

I found an excellent young candidate working at a local cable origination studio. He was very motivated and was the hardest working high school student that I have ever seen. He would carry a camera, tripod and heavy equipment bag all around town to shoot all sorts of video. He would then go back to the TV studio and edit the shows – and they were top notch quality. I approached him one day and asked him if he'd like to try his hand at radio and he jumped at the chance. Did I mention that he is physically challenged and has a hard time walking but that didn't stop him from taking on a new challenge? I was very gratified when he graduated from high school and told me that he wanted to go to a local community college to major in radio.

One a very personal note, I've been very fortunate to have had the privilege to learn from several very patient mentors in my career. One of those mentors, Raymond Allen Reed, took a chance on a young kid with just one semester of broadcasting courses under my belt. Armed with a five inch reel of tape containing my demo tape, I walked optimistically into the station lobby of a small 250 Watt AM daytimer in the wilds of New Hampshire and was directed down the corridor to the second to the last door on the left which was the on-air studio. Ray was on the air at the time and seemed to express real interest in my desire to be on-air at a radio station. He looked me right in the eye, smiled, and asked if I could start on-air that Saturday at noon until 6:00 p.m. I couldn't say yes fast enough and I thanked him profusely as I left the studio and headed back up the corridor. I then realized that he had offered me a job without even listening to my demo tape.

I have no doubt that Ray helped many others get their first break at the stations that he later worked at. He truly loved radio and he shared that with listeners and co-workers alike and it showed. It broke his heart when he was "retired" from his morning air shift because he was too old for the station's demographic.

Ray and I kept in touch over the years, and then decades, as we both moved on to other stations and other professional challenges. As we exchanged Christmas cards every year, we always promised that we'd get back together again and reminisce about that afternoon when he took a chance on a promising rookie. Unfortunately, his Christmas cards stopped two years ago and I learned that Ray had passed on. I have no doubt that he's doing the morning on-air shift in heaven and is still sounding great.

Steve Callahan, CBRE, AMD, is a member of the engineering staff at Entercom Boston. Email at: wvbf1530@yahoo.com

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Emergency Prep

Do They Know Where You Are?

GPS and FindMeSAR.com

by Dave Dunsmoor

The business of broadcast engineering does involve a lot more than just, can you fix it? A few of the items I'll talk about today are things that I've not given much consideration to in the past, but probably should have. Probably because I'm quite a bit older now, I've seen and experienced more of life's offerings now. I have managed to get into situations which could have turned out badly, but fortunately, did not. We've talked about various technical aspects, and considerations, now let's consider "Care of Self."

"Well, take care of yourself," seems to be an oft said farewell, as is "see ya," "come again," and "I'll be right back. I often said to Susie, as I walked toward the garage door, going out to do some errand or another, or perhaps resolve some broadcast related problem: "See ya ... if I don't get hit in the head by a meteorite." She did not like that one very much. Maybe she knew, or sensed, something that I did not. Or perhaps that little attempt at humor really did have an ominous ring to it. I suspect that you now think you know where this story is going – but not quite.

So, let's talk about this. When you walk out the door on your way to some remote site, does your wife, husband, or some close friend know where you're going? And I don't mean just "to the transmitter," but do they know *exactly* where is "the transmitter" is located, and how to accurately describe this location, or how to offer driving directions to the 911 dispatch center if necessary? Remote addresses have a different meaning, or description now, as compared to when I first started about 40 years ago. At that time a description would have been something on the order of "U.S. highway 83 south to county road 11, then west 7 miles to the radio tower on the south side of the road." Now, the 911 system generally has a specific address registered for every building, and these addresses make sense to the emergency dispatch centers, but are a bit more confusing to me. I occasionally run into street signs which appear to be out in the middle of nowhere, and will indicate something like 167th St SE, then perhaps a mile east, maybe you might find another sign which states 245th St NW. The SE, NW, etc. reference points certainly seem to be a mystery to me, but they're registered to the dispatch centers, so they know where you are when you call with a need for help and give them your address.

This brings up another point: you *do have* the E911 addresses listed for each facility you attend to, correct? And this information would be essential for your interested party to have quick access to, if they decided that they should call 911. This address description should also be posted on the wall next to the door, or somewhere obvious, for your use or for anyone else who may happen to be working there with, or in place of you. I have recently inherited three more facilities, so I'll have to get that new data and post it at each building shortly. I believe that this is even more important, now that almost everyone uses cellphones in lieu of landlines. Your cellphone's address is most likely your home, or business location, and not necessarily the remote site you are calling from, so without an accurate address location, it's likely that confusion would ensue following an emergency call.

Yes, "they" can ping your cellphone and roughly deduce your location, but that takes coordination with cellphone technical services, telephone and time. Time that you won't have – a day or so perhaps.

And if whomever is waiting for your return does know all the above, do they know whether, and if so, when to call emergency services on your behalf? You could perhaps give them an estimated time of return (and I've done this), but this guesstimate can be a bit problematic, because until you've been able to assess the cause of the problem, and decide on which corrective action is required, how do you accurately estimate a return time? Some alternatives might be that you may ask someone to call you occasionally, to check on you. And of course, it's quite likely that that they'll call right when you're in the middle of deep thought, or with your hands in where you can't quickly get to the phone, or don't hear the phone, which can then cause further concern when you don't answer right away.

Or, perhaps do you want to call occasionally to advise that all's well? That may well be a valid option, but at 3:00 a.m., do you really want to do this? Maybe not. But these are some of the details of the situation which you may want to consider.

All these things (and more), are very much the same considerations as those you would experience on long backpacking, or mountain climbing trips. And yes, the location of the trails and the expected time of return are details which should be left with someone who might be responsible for the initiation of search and rescue efforts if necessary, just as in our situation. And just in the situation of perhaps needing to summon assistance if you were to trip over a log and severely twist an ankle many miles from your car, you may require assistance if you burn yourself, trip in a badger hole, sustain a significant electrical shock or an RF burn, or any of a number of other hazards lurking to snag you.

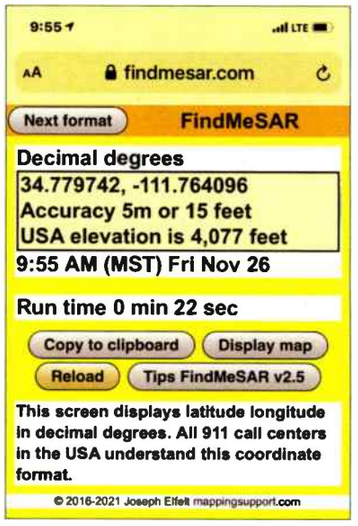
An option, might be to give the 911 operator your latitude & longitude position, and from that they are able (I've been told by our county 911 coordinator) to get a decent location. However, this requires knowing the GPS coordinates, and having them posted. But, this also adds one more layer of data for the emergency services to decipher.

I often have a GPS receiver in the car, and this is mostly to use as a very quick "heads-up display" for vehicle speed. After changing tires, the car's speedometer isn't nearly as close to true, even though the tire size is the same – supposedly. So, I have the data, but if I'm inside the building and truly *do* need assistance, having that out in the car probably won't be much help.

Another option, although one that's most likely to be used in the wilderness, but can be used anywhere, is a smartphone app titled "FindMeSAR," and it can be found at: findmesar.com. This was written by Joseph Elfelt – **https://mappingsupport.com**

It constantly updates with GPS location data on your smartphone, and presents this location to you in 5 different formats which you are able to select from, and then use to describe your location to the 911 call center.

What I feel are some pertinent excerpts from his website are: "Most people that use a cell phone to call 911 are holding a GPS in their hand (inside their phone). The data produced by that GPS will usually be the fastest way to get coordinates for the caller with excellent location accuracy. It makes no sense to ignore that high quality GPS data when it can so easily and quickly be obtained with the FindMeSAR.com browser app.



FindMeSAR.com Display Example

The 911 dispatcher can ask the caller to enter "findmesar.com" in their web browser. The caller simply opens that web page which right away starts using the GPS chip in the caller's cell phone to display their coordinates. Within one minute the caller's screen will display either (1) their GPS coordinates with an location accuracy under 10 meters or (2) a message with suggestions for getting better accuracy.

Color Coded Coordinate Formats

FindMeSAR uses five different colored screens. Each color corresponds to a different coordinate format as follows:

Blue = U.S. National Grid (USNG). (Used by USA land based SAR), **Green** = UTM (Used in Canada for land based SAR), **Yellow** = Decimal degrees *(All 911 call centers in the U.S. understand this format)*, **Red** = Degrees and decimal minutes (Used by the USFS during wildland fires), **Violet** = Ordnance Survey Grid Reference (Used in the UK)

Search teams and other first responders in different jurisdictions use different coordinate systems. The 911 call-taker can instruct the caller to tap the "Next Format" button until the colored screen is displayed that corresponds to the coordinate format used in that jurisdiction.

This simple color coded system will go a long way toward eliminating mistakes caused by confusion over different coordinate formats.

Three Crucial Pieces of Data

Each time a cell phone determines its location it generates three pieces of data. FindMeSAR displays all three and they all should be provided to the 911 call taker.

1. Coordinates
2. Accuracy
3. Timestamp

If a circle is drawn at the coordinates, and using the accuracy value as the radius, then there is supposed to be a 95% likelihood that the caller is inside that circle.

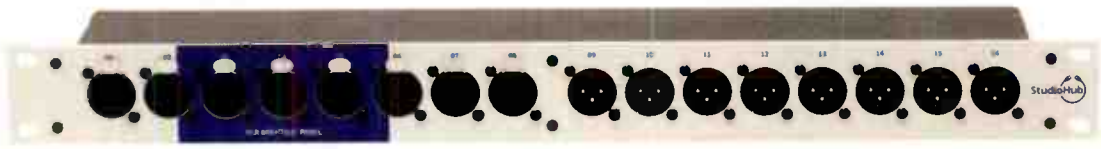
The timestamp shows everyone that the coordinates are current and are not cached coordinates from earlier in the day when the caller was at a different location.

Also when you tap "Stop" then after a short pause your elevation is displayed. This data comes from a federal server and only works (1) if you are in the USA and (2) on-line."

This topic came to mind as I recently took on responsibility for several additional broadcast facilities, and I had to wonder just how do I describe where I am when out in some remote location. At first, I figured that I'll just have to be doubly cautious when working alone, and in remote locations, and at night. That's a given, but there is more to it than that, and this is what I've discovered. So just be careful out there, that's best. But if things DO go wrong, this might just be very useful.

Dave is mostly retired, and does backup engineering for Air-1 and I-heart Media as requested. He can be reached at: mrfixit@min.midco.net

Break Out



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Links and Lines

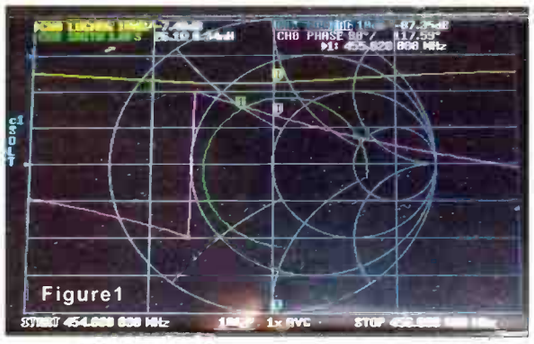
The NanoVNA: Useful for Some Things

by Paul Thurst, CPBE

I purchased a NanoVNA from eBay a few months ago, more out of curiosity than anything else. It was very inexpensive and I figured the least I would end up with was a fun toy to play with. It is actually somewhat more than a toy, but less than a full fledged Vector Network Analyzer. At approximately $150, there is no way that this unit can compete with something that costs upward of $15K or more. Its shortcomings are in the number of sample points (100-200), the output power (<0 dBm), the screen size (approximately 4 inches) and so on. What would you expect for $150?

That being said, however, there are a number of useful things this little device can do. For example, we recently had an issue with a 455 MHz telemetry return link. One of our associates noticed that the transmitter site readings had disappeared from the remote control. Upon investigating with a handheld scanner at the transmitter site, I found no signal on frequency in spite of the transmitter sending its 1 Watt licensed TPO.

An examination with the NanoVNA showed the antenna load looked a little funky (**Figure1**):



I like this display because there are four traces:

1. Yellow – return loss from port 1. This is a measure of radiation efficiency of the antenna. The higher the return loss, the better the antenna is radiating on that particular frequency.

2. Violet – phase port 1. Not really used for this measurement, but can be useful for tuning filters and showing resonant points.

3. Green – Smith Chart for port 1. This is very useful for showing the impedance and resistance/reactance relationship across the measurement bandwidth.

4. Magenta – return loss port 2. Not used for this measurement.

These traces can be set up for several different readings including SWR, delay, phase, reactance, resistance, Q factor, polar plot, etc. In this case, the yellow return loss trace is very low; -7 dB indicates a barely functioning antenna. The smith chart shows it is more towards open with lots of capacitive reactance. I suspected an issue with the jumper or connector at the antenna. When I removed the jumper to put a 50 Ohm load at the end of the transmission line, I found the connector was full of water. I thought that this was the ah-ha! moment. Alas, no. With a 50 Ohm termination on the end of the line, the VNA still showed a problem (**Figure 2**):

With a known 50 Ohm load attached, the transmission line return loss should be flat, with no resonance points.

This is Cablewave FLC 12-50J with a Velocity Factor of 0.88, has a loss of 1.45 dB per 100 feet (30.48 meters) at 450 Mhz and the total length is 142 feet (43.28 meters). Looking at the line with a TDR showed an open section in the directly buried part of the line halfway between the building and the utility pole. I could have measured this with the NanoVNA using the delay function, however, that would have required doing some manual math converting time to distance, etc. Since I had the TDR, it was easier and more expedient to use that.

(Continued on Page 28)

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The NanoVNA: Useful for Some Things

– Continued from Page 26 –

With a little bit of assistance and a lot of elbow grease, the lines were dug up. We discovered that the line had been kinked and the jacket abraded when it was installed 23 years ago (**Figure 3**).


Figure 3

The helpful tower workers had then wrapped the line in black electrical tape (**Figure 4**), perhaps thinking that everything would be fine. Over time, water entered the cable and it eventually went bad.

When the cable was replaced and a 50 Ohm termination load attached to the far end, **Figure 5** was what the line sweep looks like.


Figure 4

Figure 5

This shows a -23.46 dB return loss flat across the measured bandwidth, meaning that all of the power sent is being dissipated by the resistor at the end of the transmission line. That is expected when terminated with a good 50 Ohm load.

The new line was installed in schedule 80 PVC conduit, being careful not to kink the line or nick the jacket. Hopefully, this will never need to be done again.

The NanoVNA was great for this job because in less than an hour, I had the problem figured out.

Type: SSA-2N NanoVNA V2.2
Frequency range: 50 kHz to 3 GHz
Power output: -50 to 0 dB (+10 dB w/ software & computer)
Measurement points: 201 (or 1024 w/ software & computer)
Measurement types: S11, S12 and S21
Screen Size: 4 inch touch screen
Traces: up to 4
Battery: 3000 mAh Lithium Ion
Cost: approximately $150
Includes: small case, calibration terminators, jumpers, etc
Software OS (VNA-QT, VNA saver): Win 7, Win 10, Linux, MacOS

There are several good videos available on YouTube that range from basic to in depth instructions on how to use these things. Search for W2AEW, IMSAI Guy, Andreas Spiess or joe smith.

With any network analyzer, it must be calibrated before it is used. Because there are only 100 to 200 measurement points, depending on the model, I would recommend calibrating for the minimum needed bandwidth required for the measurement. You will notice that the unit is calibrated for 450 to 456 MHz for troubleshooting the TRL antenna on 455.1 MHz. Even that resolution is not great, but it is good enough for troubleshooting in this case.

Paul Thurst, CPBE, is co-owner of Data Wave, LLC. He can be reached at paul.thurst@datawave.us

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Engineering Perspective

It's a Matter of Time

by Jim Turvaville

It's Just a Matter of Time

My wife calls me old and stuck in my ways; I remind here that I was also *young* and pretty stuck in my ways as well. After knowing me for over 34 years, I'd think she'd already know. But I do admit to being an old soul, someone born after my time, or whatever you choose to label someone who can wax nostalgic at the drop of a hat. Having just passed another decade on the old body odometer, I have taken a pause to reflect on how time – and the management thereof – consumes a lot of my daily thoughts and work.

It's All We Have

The superintendent at the Christian School where my children grew up was fond of reminding his students that time was the only thing we have to exchange for our life. While the world may revolve around money, the only way we get money is to exchange some of our time for it. His point was to teach them to choose wisely what we do with the time we have, since as they say, "yesterday is gone, tomorrow is not here, so all you have is today." My supervisor taught us, in management classes, that we should only plan 30% of our work day, because the "tyranny of the urgent" will come along and demand some of our time. I can truly agree that there were days that the 30% got bumped because of some last-minute unplanned issue that required taking time to handle. While that number may be true for supervisors, those of us (now me) in the ditches or on the front line do not have much more luxury to plan more than that on most days.

One of those rare days when I got up and realized that I had almost an open slate for my day, came along recently. I took my time getting up and around – it was still fall and the Wednesday morning was sunny, cool and hardly a breeze (a miracle in West Texas) and I spent a good deal of time on the front porch at the Circle-T ranch just soaking in nature's beauty. I had breakfast and casually got in the truck and headed toward the office for a calm morning.

Wrong. Just 15 minutes (almost half way) into my drive, the phone rings – yes, it's the Network Operations Center and we have a full power station off the air – can I go check the site? Well, that would normally be okay if I were at home, but I have to back-track the 15 minutes I've just driven and then 35 more to that tower ... but, of course, that's what I do, so there was a prompt U-turn in the parking lot of the bank and off we go. That two hour distraction for a failed PA blower (which was ordered and a backup put on the air at the site) was done, and I thought that I was just a couple hours behind on getting nothing done that day, which had been my plan.

Wrong. Driving back toward my own office – and not by the same route I had taken to get there – I took a "short cut" to "save time." I played the dial as I usually do while driving, only to find that one of my own stations was not on the air! I would have to go to my office, and then back-track 28 miles to go check *that* site now. Which I, of course, did.

As I got close I realized that the exciter was on the air, and bleeding through the non-working transmitter into the 8-bay antenna. There was sufficient signal in town (2 miles away) that the majority of the audience had not even noticed. Just because I was on the fringe 30 miles away did I pick up on the fact we were not operating at full power. That turned out to be a bad cable between the exciter and the transmitter, and I had a replacement with me, so it was a relatively quick fix. Still it was NOON before I arrived at my office for my planned "lazy day." So time planning requires that we leave enough flexibility for those last-minute things which *will* come up.

We Can't Control it Very Well

So we can plan it, but it's hard to say we can control it. Much like the adage "you can't control what other people do, but you can control how you react to them," the control of time is more about steering while it speeds along at its set pace.

One of the ways I keep trying to control time is making my computers all agree on what time it is at any given moment. Running 6 stations in one operation means that everything in that one network needs to all agree on the current time.

(Continued on Page 32)

Engineering Perspective

– Continued from Page 30 –

And that's an ongoing battle that I only win on rare occasions. If you know me by now, I'm *not* an early adopter, I want someone else to spend their time getting the bugs out of new stuff before I make my efforts to use it. I'd still be using Windows XP if the software I use would function, but I do have almost all of my operations on Windows 7 now. I have two on-air computers running Windows 10, something I was drug into kicking and screaming, but they are not inside my office network. Finding a workable NTP program that will keep my computers on time has been an ongoing project for a couple of years. Just when I think I have it working, one of the stations will be 2 minutes off at TOH.

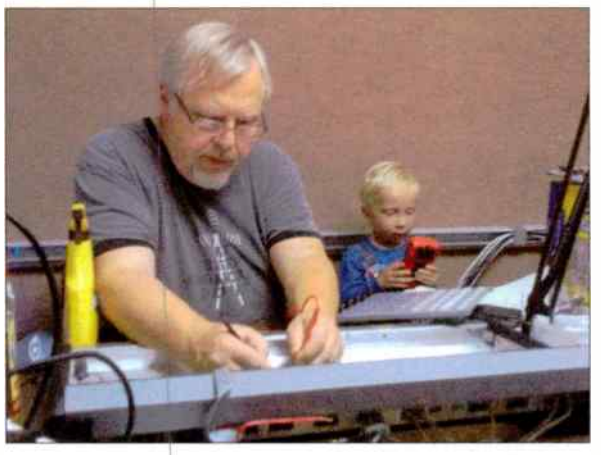
We also can't pick when problems happen, but I'm certain there is a universal rule that most studio and transmitter problems have to occur between 4:00 p.m. on Friday and 5:00 a.m. on Monday. For 40 years I don't think there has been a weekend, or certainly a holiday weekend, where *something* has not broken to demand my time. I'm exaggerating, but I can certainly say that the Wednesday I mentioned above, when I had two fires in one morning, was the exception rather than the rule; and note that I had a replacement cable with me that fixed the situation. In fact, more of my issues have happened on Friday afternoon before a big football broadcast (twice this fall season alone), or Sunday in the middle of church (also twice this year) than any reasonable weekday work hour time. My wife always complains about how much "junk" I carry in my truck; but when I'm out somewhere – not planning to be doing any serious work – and something breaks, at least I know I have a better chance of having the needed pieces and parts to fix something with me than not. I'm not sure *why* I had that 24 inch coax cable with a Type-N male on one end and BNC Male on the other, but it saved the day that Wednesday and got the station back on the air in no time at all.

It Hits Us All

I did not have to pass a decade milestone in my life to realize that there's a lot less of that time in front of me than there is behind me. But the past few months have been the icing on the cake of misery from 2020 it seems. For whatever reason, people are passing from this world in record numbers, and were we not on a firm foundation of our faith in a higher cause and purpose in our lives, we might find ourselves getting quite shaken by it all.

This fall I lost a childhood friend to cancer; he had beaten it several years ago and seemed to be just in top shape again – hiking and bird watching was one of his passions. But in what seemed to be no time at all, he came out of remission and died. A girl that I went to school with, and who was the lead singer in a band that I played in, was found to have died in her sleep, from still unknown causes as I write this article. A client and fellow station owner just died after a horrible battle with a bacterial infection for which the finest doctors in Nashville could not find the cause or treatment. Christ Lash was probably known by some of my readers, and his passion for radio is almost unparalleled with anyone in the younger generations.

And there's a nice tribute to my friend and client, Ron Erickson, on page 46 of this issue, in an attempt to honor a man who lived his life in passionate pursuit of "real radio" that he loved so much. I kept in close touch with Ron, doing the FCC work for him and his clients of LPFM stations – something else he was passionate about helping advance – and his voice still is on my radio stations.



Ron Erickson - 1952-2021 (and Grandson Ethan)

None of my audience knew him by anything but that great voice on some of their commercials, and I just can't bring myself to take his voice off the air. Yes, that ad copy will get rotated out and replaced by some other voice, but I will keep his Top of Hour ID's playing as long as I can, just to keep the memory of a good friend and fellow radio enthusiast alive as long as possible. Thank you, Ron; time will not take away our memories.

Jim "Turbo" Turvaville is semi- retired from 43 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 limited field work.

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Shop Talk

by Steve Tuzeneu, CBT

Misc. Tech-Tips and Thoughts

The New Normal

At first glance you might read the above line and think I was talking about Covid, or as some people call it, the Coronavirus. And you would be surprised to learn I am not talking about how it has changed our lives.

I'm talking about subscriptions. It used to be you could buy a software package, pay their price, and the software was all yours, and it came with limited tech support.

Now we have a new normal. You can't just purchase anything anymore, you have to have a subscription! Ten dollars a month, twenty dollars a month ... whatever the company wants. If you are watching the bottom line as a business, or watching the expenses as a non-profit organization, the idea of a subscription for one more thing is repulsive. It is to me. While this is a great business model for the companies producing the software or hardware, it's bad news for us who have to stretch every dollar at our place of business.

I asked my IT guy to research firewalls. You really can't afford to live without one these days. You used to be able to purchase some sort of appliance to handle that, and you were all set for a few years. Now, even the makers of hardware, that is supposed to protect your local area network, want you to pay a subscription. The price of some of these subscriptions will make you ask, "They want *how much?*"

I was really hoping my IT guy would find a solution where we didn't have to be on the hook for a subscription, but it seems this is the new normal in the software and hardware world of IT and radio broadcasting.

BW Broadcast

The word on the Internet is that you can't get support for your translator or transmitter made by BW Broadcast. My understanding is the owners of the company are deceased.

I'm told that this company is based in the UK and they have representatives in America, so perhaps you have someone to turn to for technical support. Currently SCMS Inc. is offering parts and service (subject to availability) for selected BW Broadcast products. SCMS may be reached at 800-438-6040 or info@scmsinc.com

Planning

By now, you should have prepared your transmitter building for the winter. I have seen pictures of some of your transmitter sites online, and I shudder to think about trying to reach that location in the dead of winter with several feet of snow on the ground. I have worked for at least one radio network and had to access a mountain top site with a couple of feet of snow on the ground. The only way I could get to my transmitter building was with the help of another engineer. We rode together on a snowmobile – it was the only way to get up to the site. While it was fun at the time, I would not want to make a routine of getting there on a snowmobile. I worked for a group of stations out west that had excellent road access to their transmitter building. That kind of situation spoils you.

Both of my backup generators have had their year-end preventative maintenance, and I hope yours have had theirs, too.

This is the time of year that you should be planning your engineering budgets for next year. Are there parts or accessories you will need for the transmitter shack? A spare tube or RF module? Maybe you need to replace that power-hungry old transmitter. Now is the time to get that proposed budget going.

Secure OS

I recently watched a video online for an operating system that claims to be very secure. In this day of hackers, it's nice to know that there is something out there that's a little more secure than the Windows operating platform. In fact, when you visit their website, that's what you will read: *"Qubes OS is a free and open-source, security-oriented operating system for single-user desktop computing. Qubes OS leverages Xen-based virtualization to allow for the creation and management of isolated compartments called qubes."*

I had never heard of it before, until I started watching some videos about software. It claims to be the most secure OS out there. While I have not spent much time checking it out, I have it on my list.

(Continued on Page 36)

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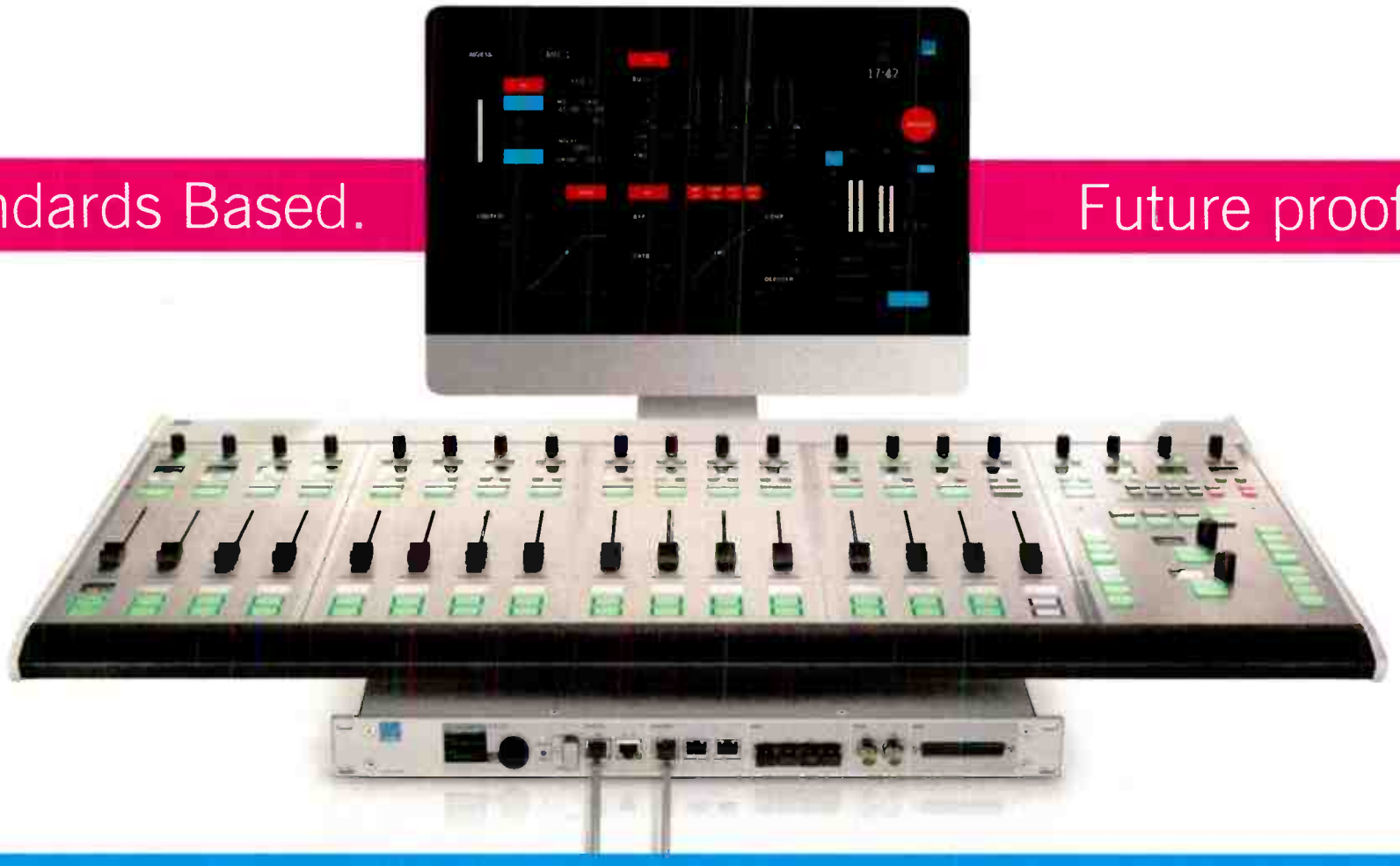

Planning for AoIP? Great! But be careful: not all IP systems are equal. Some claim standards compliance but actually use proprietary schemes that make it difficult to connect and use equipment you prefer.

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Shop Talk

Misc. Tech-Tips and Thoughts

– Continued from Page 34 –

You will find it at: **https://www.qubes-os.org/**

If you spend time with Qubes OS, be sure to contact me and tell me how you like it.

Private Browser

Like it or not, there are lots of companies that are watching your every move. If you have free email like Google, your emails are being scanned by a robot, and that information is used to send you advertising.

When you surf the Internet, websites are placing cookies on your computer to track where you go on their website. Some sites are even tracking other places you visit and are using that information to track what products and services you are looking at online. I like cookies, providing they are the edible kind, not the kind you get from websites.

If you like your privacy, you may want to check out the Tor browser. It claims to keep your browsing on the Internet private. You can check it out at: **https://www.torproject.org/**

Purchasing New Equipment

If you are purchasing equipment for use at your radio station, consider the hidden cost. When you purchase that cheaper exciter, transmitter, or other equipment item from a company that is based overseas, keep in mind that the technical support you desire may not be there when you need it. I have read on social media where an engineer was complaining that he was waiting for an email response from a company in another country.

Whenever possible, I prefer to do business with companies that are based in America, or at least have good technical support based here. It is always a good idea to check out the availability of their tech support before making the purchase. Then ask other engineers who have purchased from that company how they like the product and about the support that comes with that product.

To me, the support is just as important as the product itself. I have read quite a few technical manuals only to discover the information I was looking for was not there.

While tech support is much better here in the states, I know of at least one transmitter manufacturer that keeps banker hours. With this company, you can forget about talking to a person after 5:00 p.m. and on the weekends.

Technical manuals can only cover so much, and there is always some detail that doesn't get included. That's another reason to have a knowledgeable tech support staff or person available when you need help.

Supply Chain Dilemma

Since the pandemic wreaked havoc on our world, it seems we have problems with our supply chain. That has caused nearly everything to slow down. Ordering equipment or parts has taken much longer than it used to. I am hopeful that this is only a very temporary situation. Finishing projects on time will be more challenging than it has ever been. Be sure to allow extra time when planning your projects in this coming year and try not to allow this situation to add to your stress level.

Transmitter Site Safety

When working at a transmitter site, make arrangements to bring a friend along. This friend could save your life should something go wrong and you accidentally come too close to a high voltage wire. Yes, I know you will be careful, but some engineers work late into the night with little sleep, and accidents do happen. I heard a story of an engineer who came too close to a high voltage wire and became a statistic. They found him the next day on the transmitter room floor. When my sons were young, I would often take one of them with me to a transmitter site. Should something go wrong, my son would know enough to call for help.

There was an engineer working on a mountaintop site in the snow. He died that day and was all alone. It took many days before anyone knew what happened to him.

Go with another engineer and return the favor when he needs to travel to his transmitter site. Be careful out there. Bring emergency supplies that will insure your survival, and develop a buddy system. Even someone who is not an engineer can make an emergency phone call that could save your life.

Make sure your transmitter site has supplies that will keep you alive while you wait for help. Have food and water, a first aid kit, blankets, and maybe something you can rest on, like a cot. Make sure the vehicle you travel in has been serviced and is reliable. Be safe out there and keep up the good work.

The thoughts, ideas, and opinions in this column are my own, and do not necessarily reflect the views of *Radio Guide* or its publisher.

Steve Tuzeneu, CBT, is the general manager and chief engineer for WIHS 104.9 FM in Middletown, Connecticut. He is a member of the SBE, and an extra class radio amateur and an engineer licensed by the FCC.

Small Market: A Time for FCC House Cleaning

by Roger Paskvan

As the seasons change across the land, fall is upon us and it's time to clean up the station. I'm referring to a time to look into the FCC license and keeping that healthy. In large market stations, there is a full time engineer with FCC responsibilities. In small market, we all wear many hats and pseudo engineering is one of those items that may not always get completed in a timely manner. Every FCC licensed radio station must have a posted chief operator that signs off on everything and verifies the FCC rules.

In the north, before the heavy snow flies, maybe it's time to take those pushed aside, all important field meter readings. Yes, I know you were going to get it done but things got in the way and now it's almost winter. Well before its cold, take that AM19 and get outside proofing your AM field readings. Those monitoring points have been known to change.

All stations are required to keep a transmitter log with readings taken once a day for all of your AM/FM transmitters. These readings must include power output. Another critical area is your EAS system. Every station must log EAS alerts as they are broadcast. Every week a weekly test is received and sent, monitored by the chief operator. Once a month there is a state initiated EAS receive and send test that must be logged. The Commission has very little tolerance for EAS violations. IPAWs (FEMA and Amber alerts via Internet) is part of EAS and frequently requires updates to keep operational. EAS is something that needs a lot of attention in most stations. These alert boxes don't run forever and like all software needs updating. Fortunately, most modern EAS systems log everything on-line reducing your workload.

Since we are at it, let's take a serious look at the transmitter plant for both your AMs and your FMs. It's time to calibrate meter readings and verify the transmission logs that your faithful DJs have been taking for a long time. We have all been to a station or two where the DJs just write down numbers with no meanings. I've seen logs with 240% power output which you would think someone would say "this looks funny." Many just copy the line above and so be it! The numbers mean nothing to some of these radio people but not to the chief operator. This is serious business.

It's also time for checking into the public file. You know that list of manila files that no one ever calls about or looks at. Every quarter, each radio station must show local programming issues aired, that served the general public and the community. Local elections, city meetings and issues in your small market community that were covered in detail with descriptions and dates when the program was aired. This last quarter submission was due on November 10th. In the past, these issues were just kept in one of those yellow folders. The FCC now requires these quarterly issues to be uploaded on-line by the 10th of the following month, each ending quarter. The FCC also has a program that checks the on-time submission date for all stations and can issue fines for not getting this information in on-time. Don't forget, every November, that any political airings must be carefully documented and stored in your political public file.

This December first, opens with the biannual ownership report document that must be uploaded by that date. The FCC wants to know about any ownership changes and verify citizenship. Just a note, this is one of the new FCC chairwomen's (Jessica Rosenworcel), top priorities. All this information is now on-line and anyone can look at your station. Don't be late; it is easy for big brother to monitor your account.

Most stations, even in small market areas, retain the services of a FCC attorney to keep on top of important dates and times that these legal documents must be filed. Also, these attorneys can provide a heads-up on new rule changes and requirements that constantly happen. Good FCC knowledgeable attorneys are not cheap, but they keep you out of jail or at least protect that valuable document – the broadcast license.

Concluding, our stations do a mock inspection every January, just to make sure we are ready for a real FCC inspection. This can be done through the local state broadcasters association or just conducted yourself, from the FCC website. There is one document for AM and FM.

https://docs.fcc.gov/public/attachments/DOC-232862A1.pdf - FM check list

https://docs.fcc.gov/public/attachments/DOC-232861A1.pdf - AM check list

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

Power Principles

The Mystery of the Ground Current

Part 1

by John L. Marcon, CBRE CBTE 8VSB Specialist

As station engineers, every now and then we encounter technical problems in the studio, in the transmitter, or in any other part of the broadcast chain. It is more challenging sometimes when it is component level troubleshooting because you have to deal with circuit diagrams, tiny devices and soldering/de-soldering of components. Maybe a less challenging problem is the electrical supply, where it can be just a blown fuse, tripped breaker or a loose connection. Unlike the printed circuit boards, where you sometimes need a magnifier or microscope to see the connections, troubles in the electrical system are easier to see.

In this two-part article, I'll discuss a problem in an electrical system that seemed to defy the usual laws of physics. It turned out to be more challenging than many of the usual problems in the station. The engineers before me encountered this issue years ago but just left it as it is. We may say it is just a 120 VAC single phase system, so how hard could it be? But sometimes, there is more to it than meets the eye.

Our Studio to Transmitter Link (STL) failed one time and upon checking we found out that the +/- 12 VDC SMPS power supply of the microwave transmitter died. Some fusible resistors and the switching FET on the AC side burned up. This was likely a surge issue but we sort of dismissed this problem and promptly replaced it with a new one. After a few days, there was another power outage and the power supply conked out again. We again repaired the unit and began to think that this may not be a simple power surge. We were not overly concerned because the link has an automatic switchover to the back-up STL transmitter, and will keep us on-air whenever there is a transmitter failure. Also, the power supply was relatively cheap.

After a few days, a power outage occurred again. As you may have guessed by now, when the power came back, the same STL transmitter was out again. This is now the third time, so we have to look more seriously to what really was going on with the +/-12V power supply and maybe there is an issue also with the service entrance ground in the STL shack.

The STL room is small and all-concrete. It houses a single rack and a few other things like a small work table, dehydrator, ACs, etc. All the important equipment are on the rack, including the two, 100 Watt microwave STL transmitters. The room is in a gated area and is 470 feet away from the studio building. The 2,600 square feet fenced area is on a hill and is shared with two telecom companies. T-Mobile and AT&T rented a space from us and each of them erected their own 160 feet self-supporting steel towers. As expected, they installed plenty of ground equipment and antennas. Our microwave antenna is on the T-Mobile tower. Unlike us and AT&T, T-Mobile does not have any enclosed building and their space is full of metal poles, metal trays and equipment in metal boxes. The electric utility transformer supplies power for all three users through underground cables. Each of the towers have their own chemical ground, making a very good ground impedance. Hills usually do not have good ground resistivity, hence the chemical ground rods.

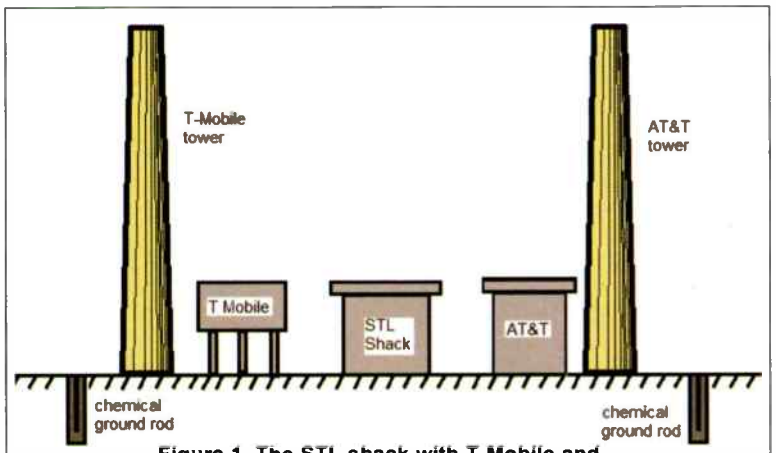

Figure 1. The STL shack with T-Mobile and AT&T. The small area is indeed crowded.

The guys who built this facility years ago thought of having a redundant 120 VAC source beside the electric utility power. However, instead of having a standby generator, they laid out 120 VAC cables from the studio and connected the STL to the studio UPS. The studio has a big UPS and can accommodate all the equipment, including the STL. It also has a back-up generator. As a result, when you get inside the shack, you will see two similar looking but electrically separate outlets: one from the studio UPS and one from a utility transformer. This was supposed to have an ATS as well, but they removed it for some reason. The studio utility transformer circuit (a different account from the same energy company), is different from the utility transformer that is supplying the STL shack.

They decided in the past that the studio UPS will be the main 120 VAC power and the utility the standby power. For some reason, the main STL transmitter was plugged into the utility outlet, while the rest of the equipment is plugged into the studio UPS. The transmitter that failed was plugged into the utility. This is not a good arrangement since any imbalances between the two outlets may cause voltage surges. The two are not balanced all of the time. Add a poor grounding at the service entrance or a defective surge suppressor and things can really get worse. However, since the same power supply always failed, the fault may also be just the power supply itself.

Upon checking the electrical wiring at the shack, I found out that the electrical panel ground is actually a pipe buried on the ground, and no one knows if this pipe is connected to a ground rod or to anything. The surge protectors are also quite old and we do not know if they still work. This problem was actually nothing new because there were a few times in the past that this same STL transmitter power supply had failed. I also did some investigation then. I remember that there were three wires from the studio UPS to the STL shack – the hot, neutral and a ground wire.

The wiring path is longer than a direct route from the studio and, because of that, they installed pull boxes roughly every 100 feet. I looked at the wires in the pull boxes and found out that they were badly corroded. There was also some current going through the ground wire. The ground current I measured in the pull box was about 2 Amps – substantially higher than a usual milliamp-range leakage current. (This ground current seems to be another problem, I thought). At any rate, I suggested using a 120 VAC isolation transformer for the studio UPS outlet to have some electrical isolation between the studio and STL. In the months that followed, we got busy with other tasks and we sort of forgot about this STL issue until it happened again this year.

I was starting to think that maybe the ground current and the voltage surge are related. But nothing can be proven until we do some measurements first. So I proceeded to look at the different currents inside the STL shack.

From **Figure 2,** we can see that the ground block is connected to the tower ground, which is the chemical ground rod. The ground block is connected to the following: waveguide flanges, electrical metal conduits, rack and electrical panel ground. For some unknown reason, the panel ground was not connected to the ground block, but it was connected to the neutral inside the panel, as per code. I think all the ground rods should be connected to have a better grounding system. I later connected it to the ground block, for a reason that we will see later.

1) I measured the currents on the hot, neutral and ground wires. With the rack and two small air conditioners as loads, these are the results:

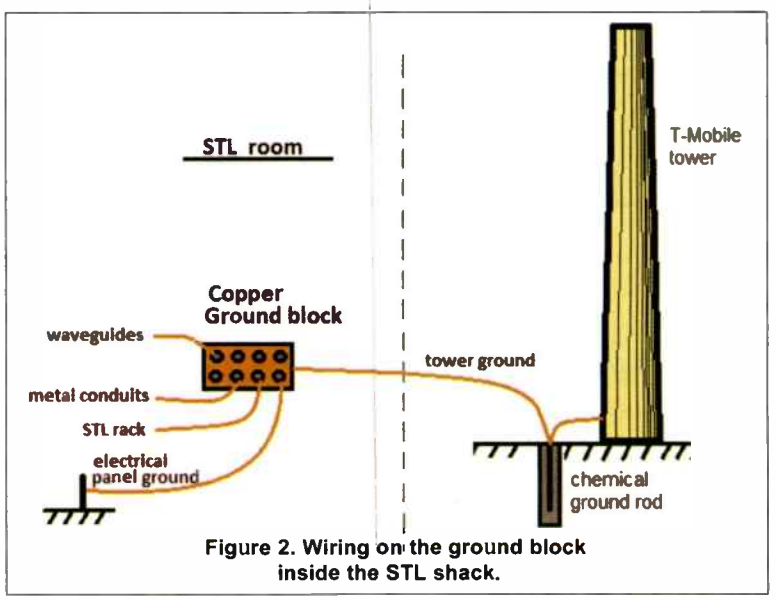

Figure 2. Wiring on the ground block inside the STL shack.

Black (hot) wire = 16.8 Amps, Neutral wire = 10 A, wire from GB to tower ground = 4A

2) I then measured the wires connected to the ground block (GB): Electrical panel ground rod = 0A, waveguides = 1.5A, rack = 0A, conduits = 0.6A

This is simply a head spinning result. Waveguides and conduits have currents? Also, the sum of the neutral and ground current is only 14A. A total of 2.8A is missing! Even if we add the waveguide and conduit currents, it is still short. I tried using different loads (heater, vacuum cleaner, etc.) and it always came out that the hot wire current is not equal to the neutral (or return) current. The neutral current is always 60% only of the hot wire current. 40% is always on the ground.

(Continued on Page 42)

Mystery of the Ground Current

– Continued from Page 40 –

As you can imagine, I tried different things to see what was really going on. Remember that there are two sources of 120 VAC, one from the UPS and one from the utility. On both power sources, there are ground currents in the 2 to 4 Amp range. One possible cause of this is an equipment that is having some really serious leakage current. The other possibility is that the hot wire (be it in the shack or in the other two telecom facilities) was touching the actual ground somewhere and therefore the return current would not all go to the neutral wire but instead parts of it will return through the ground.

The other weird thing is that the 40% are not all from the tower ground – portions of it came from the waveguide, the conduits and even the metal corrugated ceiling of the shack! (This metal ceiling is wired to the metal conduits. It was used when they poured the concrete roof.) There is also no current going into the panel ground rod. This may imply that the pipe ground is not working at all. This may be the cause of the surge because this electrical panel ground used to be disconnected from the tower ground. After the measurements, I immediately connected the panel ground to the ground block. I also installed new surge suppressors for the panel and also for the studio UPS outlet.

While we were analyzing the results, someone suggested calling the electric utility company. The engineer thought that there might be a problem with the neutral impedance and the electricians should check the transformer and power cables. So I called the utility and they checked their electrical system. We actually do not know where the transformer is because it is not on a pole. We found out that the transformer is actually about 50 feet away from the STL area and it terminated into a distribution box inside the fenced area, just a few feet away from the STL shack.

They did find that some connections were loose inside the distribution box but nothing really way out of the ordinary. They tightened all the nuts inside the transformer and distribution box. They were also puzzled on what is causing the presence of the ground current and the imbalance in the neutral current. They returned a few days after and installed another ground rod in the pipe itself. They also connected the meter neutral terminal to the new ground rod. However, all of this did not change a thing – the ground current remains the same. Is the ground current even real or is it just a phantom?

(To be continued.)

John L. Marcon, CBTE CBRE 8VSB Specialist, is the Chief Engineer for Victory Television Network (VTN) in Arkansas, with international experience in both Radio and Television Broadcast, and has an Electronics Teaching background.

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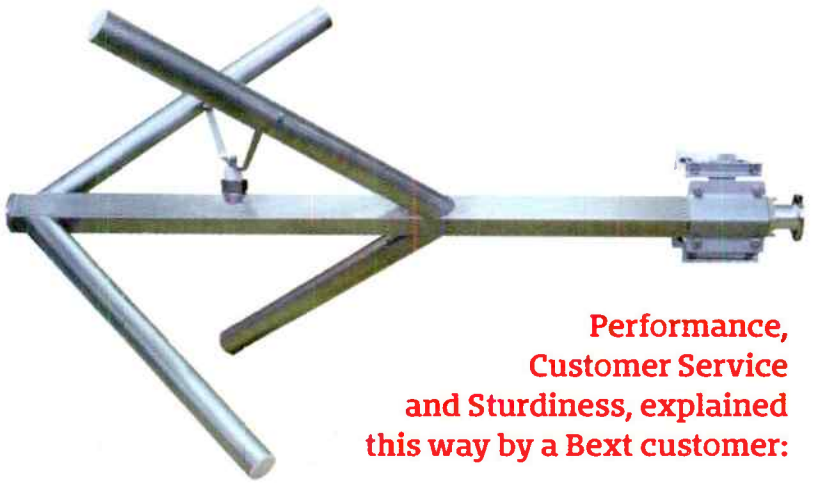

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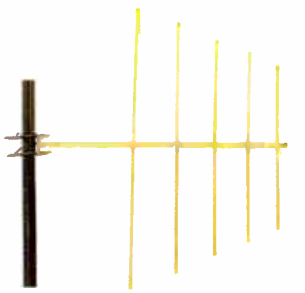

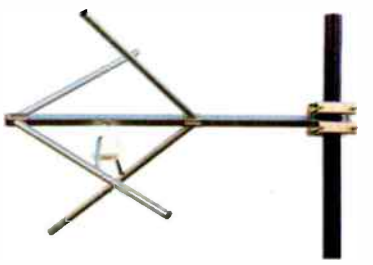

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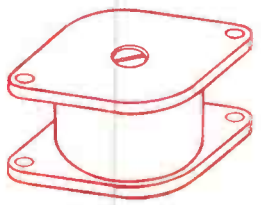

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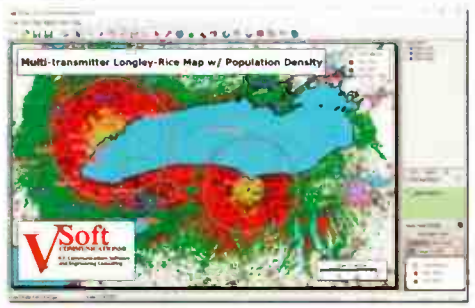

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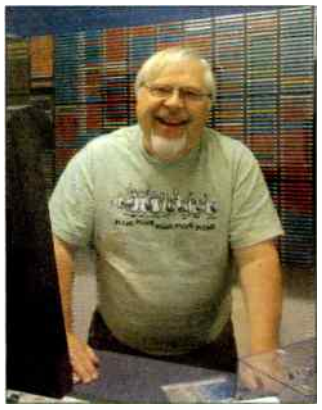

Ron Erickson: 1952-2021

Ron Erickson was admitted to the hospital on Saturday, 09/25/21, and lost his battle with Covid on Monday, 09/27/21.

Ron Erickson was born in Hillsboro Oregon in August of 1952. Recently, he told me the story of his love affair with Radio. He was interviewed by a local radio station about a local ice cream parlor. He got a free ice cream and the skies parted and angels sang. From that moment on, radio was his great love. At 15, he built a pirate radio station in his Grandmother's house that was strong enough to bring the FCC knocking. From then on, he learned the law, but never slowed down his passion for radio. Among the stations that he worked: KUIK, KFLY, KEX, KMCM, KUGN, KUPL, KISN, KCCS, KGAL/KSHO – working as on-air talent, sales, program directing, and engineering, until he started his own LP FM here in Albany, KHJ-LPFM. He also sold broadcast equipment and did voice talent work.

While working in radio, Ron married Elizabeth Hamrick, a fellow graduate of Hillsboro High School. They met Jesus and forged their lives following him. In 1977, they welcomed a daughter, Dena and another daughter, Krista followed in 1980. The little family moved around the state following radio jobs until the early 90s when he taught Broadcasting to students of Lakeridge High School in Lake Oswego. In the summers he was a camera operator and freelance videographer.

Dad never left radio fully, though, and when he moved back to the mid valley, in 2005, Ron became a grandfather for the first time, when Emily was born. In 2008 Lorelei came along, followed by Ethan in 2010. The grandkids were the apple of his eye. He loved playing with them and they are blessed to have had many happy memories of their "Grandpa Bear."

Ron is survived by his mother Lorraine, his wife Beth, Daughter Dena, Son-in-law Lance, their children Emily and Ethan, Son-in-law Clark and their daughter Lorelei. Shortly after Ron's passing, his daghter Krista Fisher joined him in Heaven on Monday October 10th. While we are heartbroken, we are grateful that they are in the arms of their Savior and cannot wait to see them again in Glory.

Dena Crane - Daughter

"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.

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. 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. – ***Ron Erickson***

"The weeks of staying inside, due to the COVID pandemic, offered time for reflection."

By the time I was twelve I had purchased my first Knight AM Broadcaster Kit. I tuned in the large console stereo in the living room and asked my Mom to listen. She indulged me and was always my biggest fan.

As soon as I could, I traveled on a bus to the Portland field office and took my first FCC test. Once I had a Third Class Radio Operators License, I contacted stations but no one would hire me – I was too young. So, I built my own station with technical help from a high school student Ham operator.

I was on the air! Nevermind the "not-at-all-legal" aspects and the fact that my nameless Ham friend failed to design into it any harmonic suppression. That small detail caused a bit of a stir at the Hillsboro Airport. A pilot heard a kid playing music, he called the FAA, who called the FCC. My fun broadcasting daily through the summer came to an abrupt end. I noticed two men approach my little radio shack. I recognized one of them from my FCC test and knew, from the knot in the pit of my stomach, that I was in trouble. The first words spoken were, "We're from the Federal Communications Commission. Do you have a license to operate this radio station?"

I'll admit to playing dumb. I said, "sure," pulling my Third Class License off the wall and handing it over. He looked at it and said, "This isn't a license to operate a station." Continuing the act ... "Oh, it isn't?" The agents asked to speak to my parents. This all happened during the summer when I lived at Grandma's house. When they spoke to her she said, "Isn't it wonderful, Ron never gets into trouble, he just sits out there and plays his records all day." That statement actually didn't help – they informed her that what I was doing was illegal. – ***Ron Erickson***

"The young lad was only 12 years old when he discovered the fascinating world of radio."

It was 1964 and there was a lot to hear on the air. His mother was a professor at a college in Oregon. She went to some night classes and her son went to the campus with her. One night, while roaming around, he discovered the 10 Watt educational radio station. The student DJ's let him into the studio and showed him how to cue records and operate the console. That was when the radio bug bit and from that first night's encounter, he knew he wanted to be on the air. He begged for a 101 Electronic Projects Kit he found in a Allied catalog. Why? Because one of the projects was an AM Radio Transmitter. He built a small radio station in his bedroom with one record player. Most weekends, he rode his bike to commercial stations in town. Local radio announcers gave him tips and Associated Press newswire copy.

One visit in the summer he met a Gates Radio salesman at one station. The boy talked him into giving him one of those very cool hard bound broadcast catalogs. The black & white pictures of equipment fueled his desire to learn everything about radio. He devoured every word of the equipment descriptions and practically drooled over the pictures.

The boy practiced reading out loud every day, carefully enunciating every word. The lad learned everything he could about radio. By age fourteen, he rode a Greyhound Bus alone into Portland, Oregon and found his way to the FCC field office where he passed the Third Class License test. By age fifteen, he landed a part time weekend job on a 1000 Watt Daytime AM station. He was on the air six to midnight at age 17 as a summer job. If you guessed that boy was me, you would be right. – ***Ron Erickson***

Final Stage

RADIO ROUNDUP

The Radio Guide Event Register

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

CES 2022
January 5-8, 2022
Las Vegas Convention Center
https://www.ces.tech

NATE Unite 2022
February 21-24, 2022
Ceasars Forum – Las Vegas, Nevada
https://natehome.com/nate-unite-conference/nate-unite-2022

2022 NRB Convention
March 8-11, 2022
Gaylord Opryland, Nashville Tennesee
www.nrbconvention.org

Texas Association of Broadcasters (TAB 2022)
August 3-4, 2022
JW Marriot Downtown – Austin, Texas
www.tab.org/convention-and-trade-show

2022 NAB Show
April 23-27, 2022
Las Vegas, Nevada
www.nabshow.com/2022/

Dayton Hamvention
May 20-22, 2022
Greene County Fairgrounds, Dayton, Ohio
https://hamvention.org

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Arrakis - 11	www.arrakis-systems.com
Bay Country - 44	www.baycountry.com
Besco - 44	www.besco-int.com
BEXT - 43	www.bext.com
Broadcast Bionics - 21	www.bionics.co.uk
Broadcast Devices - 3	www.broadcast-devices.com
Broadcasters General Store - 29	www.bgs.cc
Broadcast Signal Lab - 44	www.broadcastsignallab.com
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Broadcast Tools - 28, 47	www.broadcasttools.com
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Telos Omnia - 27	www.telosalliance.com
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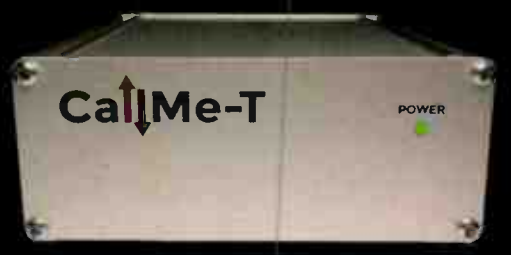

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