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September-October 2021 – Vol. 29, No. 5

Broadcasters in the Post-Pandemic World

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Contents

September-October 2021

Cover Story 6
Broadcasters in the Post-Pandemic World

Studio Site 8
Station Automation Lessons

Chief Engineer 10
Stuff You Can Do For Free (or almost)

FCC Focus 12
Station Website

Tower Topics 14
Migrating to Tower Lighting LEDs

Safety and Security 16
Arc Flash and Arc Fault – Poorly Understood Dangers

IT Guide 18
The Linux Connection - Arduinos Galore

State of the Station 20
Honey ... I Shrunk the Radio Station!

Tips From the Field 22
Prepare Yourself – and Your Tools

Network Management 26
Improving Network Security Posture

System Solutions 30
Take Command!

Shop Talk 34
Misc. Tech-Tips and Thoughts

Small Market Guide 38
The Small Market Landscape After Covid

Transmitter Site 40
Combiners in Solid State Transmitters – Part 2

Service Guide . . . . . 44 & 45
Radio Equipment, Products, and Services

The Final Word 46
Inovonics SW300 Two-In-One AM Mod Monitor and FIM

Final Stage 47
Convention, and Event Register and Advertiser Information

Radio Guide

Volume 29 – Issue 5

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In This Issue

Critical Content for Radio

Cover Story – *by Alex Hartman, Nautel (page 6)*

Broadcasters in the Post-Pandemic World: *"More codecs were added, Internet pipes upgraded, VPN systems deployed, remote portals, zoom meetings, Teams meetings... After 18 months, we finally seemed to have a stride going! It worked! We had overcome one of the biggest global disaster recovery goals never thought about! We always think about how to recover data in a Ransomware situation, a fire, a flood, but nobody had "global pandemic" on their bingo card for disaster recovery ... but we all do now!"*

Chief Engineer – *by Scott Schmeling (page 10)*

Stuff You Can Do for Free: *"I know it can be difficult to see if the bulbs are all lighting up. If your tower lights are the incandescent type, you can check them using a clamp-on amp meter. Each beacon fixture has two 620 Watt bulbs which draw roughly 10 Amps when lit. If your meter only shows 5 Amps, one of the bulbs is not lighting up. The side lights (or obstruction lights) are three 116 Watt bulbs at each level which draw roughly 3 Amps."*

Network Management – *by Chris Ark (page 26)*

Improving Network Security Posture: *"Not a week goes by where you don't hear about cyber-attacks on both private and government infrastructures. Attacks are becoming more sophisticated and stealth in nature. Operating in this new reality requires businesses, both large and small, to take an honest inventory of their cyber security shortcomings and develop a plan to keep their networks secure. This article discusses actions you could take to improve your network's security posture."*

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Broadcasters in the Post-Pandemic World

by Alex Hartman – Customer Service Representative, Nautel

In late 2019, nobody had any idea that the world was about to change drastically, from the grocery store to international travel, to even doing a regular air shift on the radio or a newscast from your kitchen table. In the past 18 months the broadcaster's job got drastically harder to accomplish, from news gathering in the field, to even putting music into the automation system the way we have been doing it for decades prior. The engineering and IT staff, quite literally overnight, had to come up with solutions to allow the broadcast facility to function with a skeleton crew to zero staffing inside the facility. Who knew that the cleanest place to be soon became the transmitter site because only the engineering staff goes there?

The "new normal" was DJs doing their thing from a spare bedroom, kitchen table, family room, etc., and nobody knew for how long this was going to happen. We have spent a lot of time, money, and energy securing our facilities from doing exactly what we now needed to do: let the outside world into our very sensitive computer systems. Now the engineering staff and IT staff had to work together to accomplish what seemed impossible – let the people do their jobs, without compromising security, get audio from that kitchen table into the automation system or even live shows from that same kitchen table, by any means necessary, again, all without compromising the security that we have strived to build up.

Talk about the bumpy ride! A lot of stations already had some kind of remote equipment, but most had only a few codecs or IP links sized for people inside the building, not outside coming in. IT staff quickly figured out how to get VPN services running if they didn't have it before, setting up "crash boxes" to be left on front steps of peoples' houses so they could remotely do their thing with minimal direction and interaction with station technical staff. More codecs were added, Internet pipes upgraded, VPN systems deployed, remote portals, zoom meetings, Teams meetings… After 18 months, we finally seem to have a stride going! It worked! We had overcome one of the biggest global disaster recovery goals never thought about! We always think about how to recover data in a Ransomware situation, a fire, a flood, but nobody had "global pandemic" on their bingo card for disaster recovery… but we all do now!

So now that we have achieved this seemingly impossible goal, now what? Where do we go from here? A lot of station owners and management are asking, "do we still even need the studios and offices?" I can't answer that one here, but the technical staff has, in short order, proven we can do this remotely if we must. But what did come out of this was a lot of workflow improvements in the facility. AoIP started proving how nimble it is compared to an analog facility; IP radios and their reliability were tested daily; public Internet connections were pushed to the limits. We all got to learn new IT policies very quickly and it really forced the broadcast industry to get current in the computer world. AWS, Zoom, Teams, etc. all became very integral, and even today where we *can* go back to the office in most parts of the country or world, we still opt for these platforms versus an in-person meeting.

And… what about that transmitter site? A lot of the deferred maintenance prior to 2020 got even more deferred, and in some cases proved to be a little too overly deferred – the transmitter stopped asking for things and started *demanding* things – in a down revenue situation for the station. Everything from entirely new transmitters, to maybe a few new fans, HVAC systems, and multiple discrete STL paths, regardless of where the "S" was, needed to be addressed. The transmitter site had to get as nimble as the studios, because while it wasn't too difficult to put a codec on the air, moving the transmitter is right out the window. In some cases, we had to allow direct connections into the air chain from station staff from multiple locations; the transmitter site became the switch block in some cases and the studio itself was just closed. With multiple links at the site now, what do we do with those? It's always nice to have backups that we all argued we needed – now we have them – but maintenance at the transmitter just got a few more chores added to its already long list of things to maintain.

In the middle of all the insanity, Mother Nature remained relentless, and now we can't do what we do best: come together in a time of need. Stations mostly were prepared for the latest rounds of hurricanes, floods, and fires because of these newfound backups we all had to endure over the past 18 months. Backup transmitters that the southern U.S. had on hand to get something going at a moments notice, extra codecs to get the news on the air to help those in need, backups of our data to pick up the pieces and get back on the air as quickly and safely as possible and cut days off that process with these new processes and workflows… they just keep proving themselves over and over again, don't they?

Through all this, The DJs rather started enjoying working from that spare bedroom, and questions quickly rose of "return to office" dates that management really wants, but staff has gotten accustomed to working from home and want to keep doing it. Luckily, we work in an industry where we can have that option should management allow it; it's not off the table, so to speak. But what if the management or ownership does decide that we all must return to the office at the end? Well, we certainly can, but what do we do with our new infrastructure that proved itself invaluable during this time? Do we allow options for people to "vacation work?" It opens the doors for remote VT scenarios for new talent and new workflows for management to discover. For example, moving key portions of the air chain to the web (via AWS and other services) has recently been explored by Nautel in association with Telos Alliance. The results of our tests look very promising.

Of course, with this new normal come new things on the engineer's checklist of maintenance items, including working in tandem with IT providers or in-house IT departments. Among the things that should be on your maintenance list these days are checking codec updates for any improvements or security issues that crop up, checking with satellite providers for similar things, keeping tabs with remote staff using ticketing systems (the big guys use things like Jira and Confluence, or Office365 collaboration suites, though there are many out there), security camera maintenance (which became quite important because all the buildings were empty!) Of course, this is the perfect crime time! Make sure those entrances and exits are covered with cameras. And the elephant in the room, the one IT practice we all hate: Update your passwords regularly. Ask your IT staff if things like password manager apps (LastPass Google, Bitwarden) can be used and if so, use them! There's nothing worse than having an off-air emergency but you can't remember the password or even the door lock code to the site!

We here at Nautel were not immune to these drastic changes in workflows either. We had to learn how to build transmitters with only a skeleton crew in the production lines to keep the team safe, following regulatory guidelines and everything else that goes with it, just like the broadcaster had to. Our engineering teams could not go in and draft up a replacement power supply in person on the white boards; they had to learn how to do this virtually. The hands-on support of going down to the test lab to diagnose a customer problem had to be done by remote workers at the request of a customer service rep. It made things just as difficult for us as it did you. But we learned from it (and still are); our IT staff especially had to learn it in very short order!

Even Jeff Welton and the marketing team kept you informed with the *Transmission Talk Tuesday* sessions (and still are!) with relevant information for the here and now. We were here for those phone calls, long nights, and problem-solving skills that you rely on for your business. We had to learn how to do a lot of the interfacing to third-party equipment we never had to do before. But we will be here, like you will be there.

We aren't through this yet – the article title is "post-pandemic" – but as we enter more variants, more lockdowns around the globe, these systems are going to most likely be used again for the foreseeable future. We don't know what the post-pandemic world looks like, because we're still in the thick of it. There might be another technological leap we require that we haven't discovered yet, and no, nobody wants to relive the three years that was 2020!

Be safe out there as always, take care of you and yours first, a lot of IT and engineering folks forget that part because we want to put our skills to work and help any way we can. Sometimes it's just by staying at home and watching what's happening before applying that skillset the best way you can. – *Radio Guide*

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Meet our latest audio codec...

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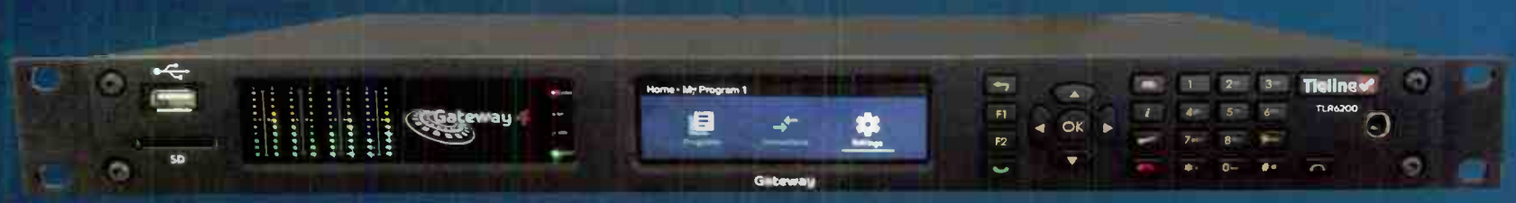

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Studio Site

Station Automation Lessons

What's in Your Computer Room?

by George Zahn

Aside from purchasing a station facility in total, possibly one of the most expensive line items on a budget for any radio station may be its automation system. Stations are far more dependent than ever on a system that is dependable, able to be easily coordinated and scheduled for content and revenue-generating spots, and even able to run long term should we ever face anything like a quarantine again.

One thing that can make a manager wince is the anticipated dead date on an automation system. Depending on the number of studios you have, you may be dealing with multiple computers, a server upgrade, and possibly new office computers or operating systems that may need to be upgraded for the ability to work with a new automation system.

As a manager, I swear that the minute we installed a new Wide Orbit automation system to replace our old Scott Studios system, our WMKV DCO and Operations Guru, Dave Schram placed an Outlook tickler five, six, and seven years out from the install date to remind me of the need to start planning for an upgrade or replacement of the system. He bases the plan on the expected maximum life of the computers involved.

Wide Orbit Automation for Radio

This is critical. After all, the automation represents a massive amount of your sound at a time you are most vulnerable – likely when no one is available to troubleshoot in short order. A failed system is time off the air and unaired, and likely unhappy sponsors and listeners lost at a time we can ill afford to lose listeners to any other stations or media. Even small stations running homemade systems can run into issues.

Your automation system is working away in the background and one of the things that is so easy for managers to take for granted. On-air talent may only think of it as they play a file from a touch screen or load audio for future use. What's happening behind the scenes is important for someone at every station to monitor.

Whether your audio delivery system is one of the major flavors like AudioVAULT, Wide Orbit, ENCO DAD Pro, DigiLink, Smartcaster, or any of about a dozen more, you as an engineer, operations manager, or station GM, should know some things about your system. From fifteen years of working with Dave at WMKV, here are some of the lessons I've learned, so far proactively, and not too painfully due to planning.

Life Cycle

It really is vital to anticipate the eventual end date of your system, even though that can be a really hard thing to do right after installation of a new system, or a complete upgrade of a current automation package. Unfortunately, there are many who, like me, want to push our desktop or laptop beyond the end of its useful or efficient life. Don't do that with your automation system.

A good rule of thumb for the life of a system is about seven to eight years, which really is about as long as any of the hardware should be extended in heavy use. Keep in mind that if your system is running on HDD drives, they are likely working and spinning 24/7. Solid State drives in the future may well create more durability, but they are still some time from truly affordable large capacity storage.

Know your system's anticipated life cycle and plan accordingly. Budgeting for a partial system upgrade or a whole new system can be costly and will take some strategic planning. Public stations often have to start planning for budgets and/or grant writing to help cover such costs. Raising that kind of money for any entity is not for the faint of heart.

OS S.O.S.

Sometimes you don't have a choice as to how long you can push a system beyond its anticipated shelf life. Many automation modules may not always be compatible with changes in Operating Systems for the computers running them. Even with some generous notice from Windows, it still seems that new OS releases are getting closer and closer together. Don't you love planned obsolescence?

Sure, you can run your system past an OS date, but keep in mind that once an Operating System technically has expired, the software manufacturer is not going to support it. This brings us to another consideration for automation systems.

While it is generally accepted best practice to keep your automation system totally isolated from the Internet to prevent hijacking or ransom situations, where someone can hack your automation, take you off the air and hold it hostage for payment to (maybe) get access to your system returned to you after a sizable cost. You add to your risk if you are connected to the Internet with your automation system, and exponentially raise the risk if your OS is expired, meaning that security updates for the Operating System are no longer made available.

Backup, Backup, Backup

No matter the system that you have, how is your data: music, spots, formatted files and schedules backed up? If you don't know that answer, you need to have a meeting. Many systems will have a mirrored array that provides a regularly done duplication of files. Some stations use cloud backup, while some will schedule a backup to other external drives. How often are they scheduled? Can you afford to spend a day or more recovering material if the system has a failure?

The other key to backing up data and programs is to have one backup in a separate place. If your backup is sitting in the same rack as your main system drive or server, you are vulnerable to anything from a sprinkler system going off, potentially damaging both original and backup if they're near each other, to heat damage from a failed HVAC system in the same room for an extended period of time. The goal here is not to instill paranoia, but as we get into more digital content, it's far easier to lose massive amounts of data with one mistake.

As an example: at the dawn of MiniDisc, a station I worked for took all carted spots, recut them, and placed them alphabetically on one MiniDisc. We backed that disc up every day because content changed regularly. Why backup often? The likelihood was that no one with their studio chair would accidentally roll over and crush all the carts on the wall, *But* one swift roll over a MiniDisc could wipe out all the recorded spots. Think about recovery for more peace of mind.

Compatibility and Training

Before buying a brand new automation system or doing a large upgrade to an old system, do plenty of homework. Find out if the new or upgraded system will also be compatible with all software interfacing with the system traffic, audio insertion and recording, and reporting and affidavits. Do not assume that just because your existing software interfaces with the earlier version, it will automatically be compatible with the latest version, even if from the same company.

You may well notice that as you upgrade automation systems, you will experience some hiccups in file transfers or stability. If you're experiencing those issues now, it can be amplified with new automation, or may be totally incompatible. It's obviously far better to anticipate other needs as you are budgeting for the replacement automation system than to have to scramble to make things work as you're initiating a new system.

I have heard of stations that have invested many thousands of dollars in a new automation system, only to have a near mutiny by staff, and at times, the station had to back out of the new automation and return to their old brand. From my experience many years ago, we had a small team (manager, engineer, and operations) visit stations that were utilizing the automation system in which we were interested. It took a few days of intensive observation and questions, but we came away with a very basic plan on how it might fit into our plant.

Training is critical, and having the right people in the right training places and frames of mind is an absolute plus. If you're changing systems altogether, there will almost always be resistance (ohm, my!) from some staff, but given time, understanding, training, and explaining the improvements or benefits of the new system can help turn that attitude eventually.

Talk It Out

It seems the days of traditional transmitter and circuit board engineers are waning like the fall shortening days. Our engineers and Designated Chief Operators, as well as our operations staff are, in many cases, more computer savvy with secondary emphasis on the radio nuts and bolts. It's simply a natural progression as we're dealing more and more in a digital world. Good communication between all involved in gauging the life and efficiency of automation systems is critical to avoid disastrous emergencies cropping up.

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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Chief Engineer

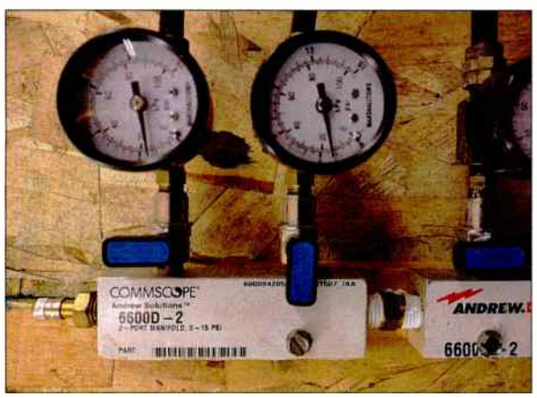
Stuff You Can Do For Free (or almost)

by Scott Schmeling

You are probably receiving this issue of *Radio Guide* in mid October. That means Halloween is just around the corner and winter isn't far behind. In this part of the country, winter brings with it a whole new set of challenges. Remote transmitter sites can become more than challenging to get to. I can think of one of our sites where we literally had to hike in through knee-deep snow, pulling a sled with tools and gear! With that in mind, might I suggest we plan ahead and pay a visit to our transmitter sites now – before the snow flies.

Check your transmitter tubes (except, of course, if you're solid state). If they're getting close to the end, plan a time to change them. It's usually better to change a tube on *your* schedule than it is to have to risk life and limb during a snow storm because a tube has failed and you're off the air.

And take a look at your transmission line pressure gauges and your tank pressure gauge if you're still using nitrogen. I've had a situation where the front panel circuit breaker on a dehydrator had tripped and the lines had lost their pressure. And if your nitrogen tank is close to empty get a replacement now while it's easier to get to the site.



Take a look at your tower lights. Many controllers have a "Test" switch, but that switch bypasses the photo cell. It's a more accurate test if you cover the photo cell with a glove or a can – anything to block the light and simulate night. Does the contactor energize? Are all of the lights lighting up? I know it can be difficult to see if the bulbs are all lighting up. If your tower lights are the incandescent type, you can check them using a clamp-on amp meter. Each beacon fixture has two 620 Watt bulbs which draw roughly 10 Amps when lit. If your meter only shows 5 Amps, one of the bulbs is not lighting up. The side lights (or obstruction lights) are three 116 Watt bulbs at each level which draw roughly 3 Amps.

Sometimes I will also do a resistance check. Incandescent light bulbs are low resistance devices. With the tower light circuit breaker turned OFF, measure the resistance between each of the line outputs (at the fuses for each of the side lights and beacons – same place you would clamp on the amp meter) and ground. You will just see a few Ohms, unless the bulbs are burned out, then you'll see an open.

If you have a few bulbs burned out, chances are more will burn out before spring. I would strongly suggest you schedule a relamp sooner rather than later. Believe me, in this part of the country *any* tower crew would much rather climb *before* it gets cold.

This is also a great time to do a little site cleanup. Bring your "weed whacker" along and knock down vegetation that is growing near the building. You can also spray if you like. The important thing is to take it down as low as you can. Clearing vegetation from around the building will help deter mice, and we *don't* want *mice* in our buildings and transmitters!

If you have a generator, check the fuel and battery. Be sure you have ample fuel for the winter. Check to see if the controller is exercising the engine regularly. Maybe try to be there during an exercise run so you can verify that it's starting up like it should.

And check the air filters. Whether they're the building's air intake filters, air conditioner filters or transmitter filters, check them. If they are metal mesh, washable filters, clean them. If they are paper or polyester filters, replace them. You *do* have spare filters on site, right? If not, you know what to do. If you have a "squirrel cage" blower, you might also want to check the blades – both for a building in-take and a transmitter PA. Once dust builds up on the blower's blades, the efficiency drops considerably. Cleaning the blades can make a tremendous difference.

Dirty Blower Blades

It's also a great idea to empty any garbage cans, even if they're not full – especially if there might be food scraps that could attract rodents. I have a box of heavier gauge contractor bags in the van just for that purpose. I can pack up the garbage, including dirty air filters, and take it all to the dumpster back at the studio.

Speaking of a vehicle, get your oil changed and all fluids topped off. It's also a good idea to have all four of your tires checked (and also the spare). If the tread is wearing down, replace your tires now, before the snow flies and roads become snow packed and slippery. Your payoff is better handling and control and increased safety when the snow comes. And one more thing – try not to let your gas tank get below half. In the event you were to get stuck in the snow on your way to a transmitter site, having a nearly full tank could be a life saver.

Clean Blower Blades

So far, everything we've talked about has been at our transmitter sites. But I'm also going to mention something you can do at the studio.

There are times, at least here in Minnesota, when road and weather conditions can force you to stay home. You may also have more than one location to deal with. There are two computer programs we use that can give you access to the networks at those locations – as long as you have an Internet connection.

I'm talking about a VPN (Virtual Private Network) and VNC (Virtual Network Connection) combination. The first program is **OpenVPN**. It's a free program you can download from **openvpn.net**. The *server* component is installed on your network. The *client* component is installed on your laptop or other computer. Installation and configuration instructions are also available from their website. I should also mention some router/firewalls including Sonic Wall and Watchguard have their own proprietary program for remote access, and some of those devices also support OpenVPN.

TightVNC is the other half of this dynamic duo. The *server* component of TightVNC is installed on each computer to which you require or desire access. Likewise the *client* component is installed on your laptop or other computer. And, again, installation and configuration instructions are on their website, **tightvnc.com**

Both programs are password protected for both the *network* access and the individual *computer* access. I admit that I'm only scratching the surface where these programs are concerned. Full disclosure, I am *not* a trained IT person. There are so many variables in network structures there is no way I could address them all. Our "new guy," Keith Thelen, brought these programs to us. And the more I use them the more value I find in having them available.

I just read through this list of items. HOLY MOLEY THERE'S A LOT OF STUFF! And I'm sure I've left some things out. Needless to say, there's really a lot going on out at our transmitter sites and if you can take time now to prepare for winter you'll be miles ahead of the game!

Well, that's going to be it for now. Take care of yourselves, stay healthy, and... 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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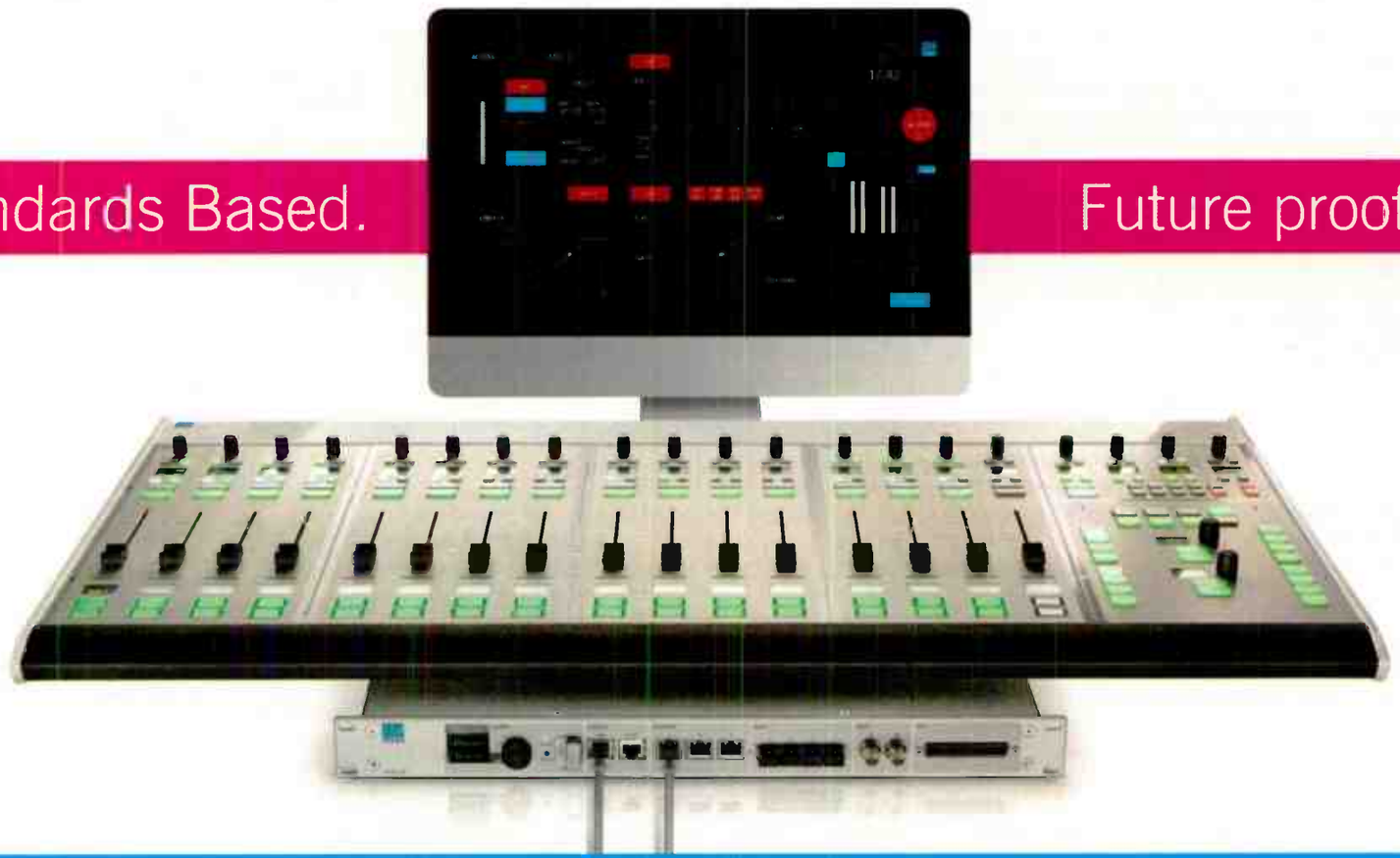

Planning for AoIP? Great! But be careful: not all IP systems are equal. Some claim standards compliance but actually use proprietary schemes that make it difficult to connect and use equipment you prefer.

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World Radio History

FCC Focus

Station Website

Terms of Use and Privacy Policy

by Gregg P. Skall and Ashly Brydone-Jack – Telecommunications Law Professionals PLLC

These days, when nearly every broadcaster has a web page, and the FCC has even mandated that public notice of applications and other filings be posted on station websites, it is important that broadcasters understand they can set the rules for how visitors can use the posted information. This is done by setting the "terms of use" for the website and the posted information. Indeed, it has been recommended that all broadcasters have Terms of Use posted on their webpages. So, here is an explanation of what Terms of Use are, their purpose, and some relevant laws.

What Are Terms of Use and Why Are They Important

Terms of Use are documents that provide the rules and appropriate uses of your website that visitors to your site must agree to in order to use your website. They are not required by law, but they are necessary if you want to exercise control over the content and use of your website. Terms of Use are generally used in four broad ways.

First, Terms of Use provide control over how visitors can interact with the website. This is particularly important if the station site allows people to post comments or other items. The Terms of Use allow for a clear explanation of what sorts of comments and content are permissible for users to share and warn users of what action the station may take should they violate the Terms of Use by posting non-acceptable content. Thus, if someone is posting abusive, harmful, or otherwise unacceptable content, the station can control whether it stays on its site without fearing repercussions.

Second, Terms of Use allow the station to control who can post. Should anyone violate the Terms of Use, for example by posting harmful, abusive, or inappropriate content, the Terms of Use allow you to censor or limit posting privileges by warning the violator of your right to censor or take other action to limit their access to the site by deactivating their account or log-in, or other action as may be appropriate.

Third, when a station website is interactive, Terms of Use provide the right for the station to use the posts and personal content a user may add to the website. This is particularly important if the station desires to use user content to market, promote, or in some other way. For example, if you host a community event and wish to use the pictures or comments from people to promote the station or a future event, the Terms of Use will clearly warn site visitors that any posts or comments to the website may be utilized as you see fit. This permits use of visitor posted content without fearing a violation of privacy, copyright, or other laws. It also warns any website visitors that if they do not want you to use their post, they should abstain from using your website.

Finally, Terms of Use can help to limit a station's potential liability for website content. This is particularly important when sharing information people may rely on, sharing third party content, or when encouraging people to take action on the website. Without clear Terms of Use explaining that the station, its licensee, and employees are not responsible for third party content, posted information is for general guidance only and should not be relied upon without consulting a professional, or whatever other warnings may be appropriate, visitors may be able to hold you responsible for adverse results that occur if they rely on the information on your website. Related to this, Terms of Use also let the website owner select the laws that would govern any potential legal action, thereby limiting the station's need to familiarize itself with the wide variety of state laws and requirements in order to avoid violating them.

There are a variety of forms that can be found with an Internet search, but it is highly recommended that you consult legal counsel to ensure that the Terms of Use adequately meet the needs of your website and station and include all terms necessary to protect you in your state. Once they are finalized and posted, you should ensure that a specific member of your staff is thoroughly familiar with your station's Terms of Use and is charged with responsibility for enforcing the Terms of Use should an issue arise.

Posting Your Terms of Use

The Terms of Use should be accessible from any page on your site, typically by posting the link in your header or footer, so visitors can always determine what actions are and are not permissible under your Terms of Use. If it is possible and appropriate for your site, you may consider including a "pop-up" upon a visitor's first visit to the site, which would include links to your Terms of Use and Privacy Policy, alerting the visitor to the rules and consequences on your site. The pop-up is not required, though it does add an additional layer of security by forcing visitors to acknowledge that the Terms of Use exist and agree to them prior to interacting with your site, making it more difficult for visitors to claim they were unaware of your Terms of Use in the event that legal action arises down the line.

Privacy Policy

Stations should have Privacy Policies posted on their webpages. Privacy Policies serve to notify website visitors how you collect, use, and store personally identifiable information. Privacy Policies are not currently required under federal law, but some states are enacting their own, which include privacy policy mandates and there is increasing attention on Internet privacy.

The closest the Federal Government currently comes to regulating Internet privacy is through section 5 of the Federal Trade Commission Act of 1914, which prohibits unfair or deceptive trade practices. The FTC primarily prosecutes companies that violate provisions of their posted privacy policies, such as selling user data contrary to company privacy policy. The FTC is thus just using the act to hold companies to the privacy policies they have posted.

Though there is not currently a federal law requiring privacy policies, there has been an increase in focus on consumer privacy and the Internet. For example, the House has considered a bill to require Internet access service providers to conspicuously notify their users of their privacy policies and to offer opt-in or opt-out approval rights.

A handful of states have started to enact Internet privacy laws. The most sweeping being the California Consumer Privacy Act of 2018 ("CCPA").1 The CCPA grants California residents four protections with regard to their data on the Internet: (1) the Right to Know, (2) the Right to Delete, (3) the Right to Opt-Out of Sale, and (4) the Right to Non-Discrimination. The CCPA also has the potential to hold businesses anywhere in the world liable if they do not follow the guidelines set forth in the law. To comply, businesses must have a privacy policy on their website that explains what information the website collects, how it is collected, how it is used, how it is retained and for how long, and an explanation of the rights granted under the CCPA with an explanation of how to exercise those rights. The CCPA also requires that visitors to a website be provided with information on how to "opt-out" or "unsubscribe" and, if the data is sold, at the time of collection allow the visitor to request that their information not be sold.

Though the CCPA is a California law that only protects California residents, it has the potential to affect businesses that collect California residents' information through the Internet. There is a trend among many other states to pass Internet privacy laws that protect their citizens due to the lack of federal protections. For example, earlier this year, Virginia Passed the Consumer Data Privacy Act, which will go into effect in 2023 and grants similar protections to Virginia residents. Further, over eleven states, including Nebraska, Utah, Missouri, and Florida, have had Internet privacy bills actively before their state legislatures, several of which mirror the CCPA.

There also are international laws that can apply to United States businesses if their websites are visited by certain international citizens. The most sweeping and comprehensive of these is the General Data Protection Regulation ("GDPR") which was enacted by the European Union in 2018. There are many similarities between the GDPR and CCPA; the key difference is that the GDPR requires website owners to request visitors to the website to affirmatively consent to the collection of their information in addition to the ability to opt-out, as opposed to the CCPA which only requires that visitors be provided with an opt-out option.

This is a continually evolving landscape, which will continue to evolve and change in the coming years. To ensure station compliance with these varied laws, stations should have a privacy policy posted to its website and regularly check to assure it is current with the law as it evolves.

Posting the Terms of Use and Privacy Policy

The station Terms of Use and Privacy Policy should be accessible from any page on its website, typically by posting the link in the header or footer allowing visitors to determine what information may be collected and how to contact the station about it. Consider including a "pop-up" upon a visitor's first visit to the site, which would include links to your Terms of Use and Privacy Policy, alerting the visitor to the rules of and types of collection conducted through your site. A pop-up adds an additional layer of security by forcing visitors to acknowledge that the Privacy Policy exists and agree to the collection contained within prior to using the site, making it more difficult for visitors to allege they were unaware of your Privacy Policy in the event that legal action arises down the line.

Also consider adding a link to the Privacy Policy any time it is appropriate to draw a visitor's attention to the Privacy Policy (such as when they are submitting information to contact the station or registering with your site). This can be easily done by including a phrase like "By clicking submit/registering you are agreeing to our Terms of Use and Privacy Policy" or by requiring the submitting party to click a box confirming that they have read the Terms of Use and Privacy Policy before being permitted to submit their request.

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

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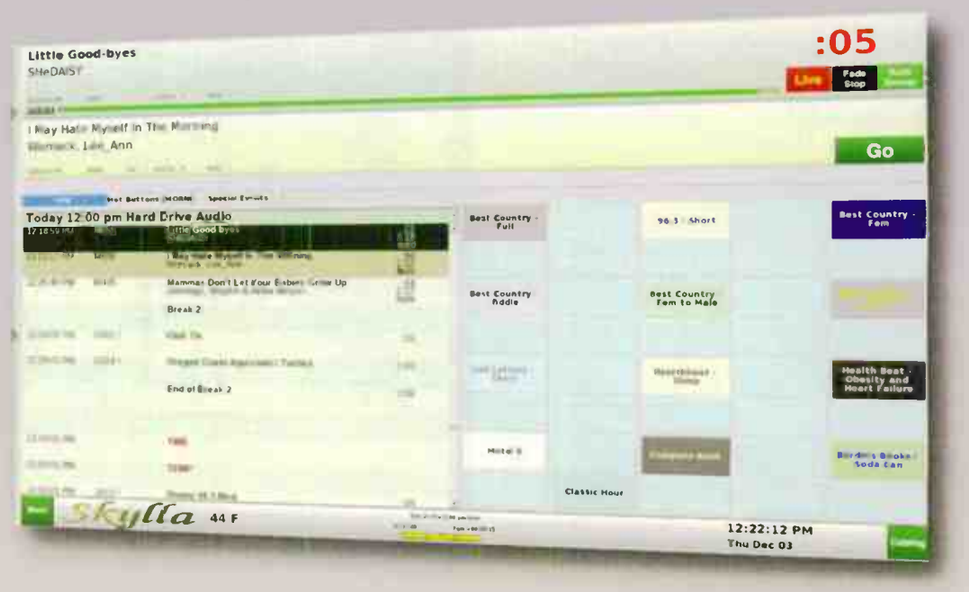

Skylla's Special Event interface, designed with the input of professional sports organizations, makes it easy to air sporting events and remotes, from youth league baseball to the World Series. Because sporting events are scheduled separately from regular programming, rainouts and cancellations require little handling returning to "your regularly scheduled programming" is a snap.

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World Radio History

Tower Topics

Migrating to Tower Lighting LEDs

by Wiely Boswell

Tower bulbs produce more heat and use more power than LEDs. Solid state LEDs generate less heat, have higher efficiency, and typically have a much longer lifespan. This all sounds like a good reason to upgrade your tower lights, and it is. However, this tower light upgrade is on a 20 year old system consisting of three medium intensity strobe fixtures, that reached a practical end of life on our 600 foot tower. Twenty years is not bad! The actual fixtures had become weathered and the plastic lens retainers were starting to crack. The top beacon had to have the lens top externally strapped down to hold it on. With the benefit of reliability and power savings, it is not a very hard decision to upgrade to LEDs.

Tower maintenance climbs are expensive and a multiple tenant tower also requires coordinated powering down of RF. More expenses, like new flash plates or $275 dollar flash tubes, reinforced that it was time to go solid state. Everything inside the strobe tube beacon resides in the high voltage created, ozone rich enclosure. Like being a strobe on the beach, the corrosion is really hard on all components inside. Now we have upgraded from three flash controllers to one PSU/controller. The existing beacon cabling is 10/2, 16/3, with drain wire and shield. These flash head cable runs were reused. requiring only two of the five wires. The cable was in great shape. except when exposed inside the beacon, where things can deteriorate fast. Being out in the full sun is tough on all materials too.

We used the white and black 16 ga conductors which went along with the wire code convention inside the new PSU/C and 16 ga was deemed OK for the application. The new head has a white shade coating on top of the solid high end clear plastic, to shade components. There is no lens molded into the cover. The reflective setup in each facet gives a tight three degree horizontal pattern.

Figure 1

Old Head Right vs New Head Left

Figure 1 shows an old Flash head verses new smaller Drake Lightning G5 LED head. We had a presentation demo on the hardware and various system options at one of our SBE meetings. Drake is located in Mayfield, Ky. Dustin, Justin, and Darren, are a nice helpful group. Technostrobe in Canada builds the units for Drake Lighting. The beacons can operate in red or white modes and include an IR emitter for night vision detection. It has quite a lot of power intelligence that you can almost see through the side.

The PSU (**Figure 2**) is quite a power control as well.There are lots of single element gas tubes, MOVs and inductor coils that can be seen. There could be several PWM power modules under the board that are heat sunk to the frame of the beacon.

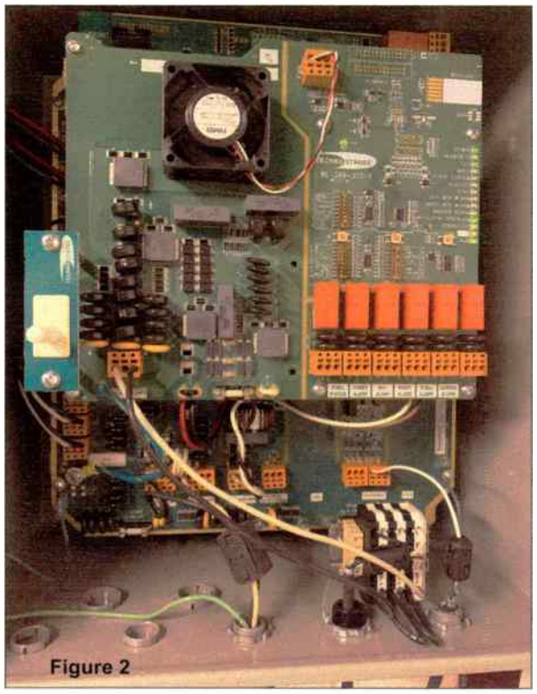

Figure 2

The LED beacon is light enough to be carried up a tower, weighing only 12 lbs. Most of that weight comes from the solid aluminum frame that is also used as the heat sink for the led sections. To haul down and bring up beacons we rigged a little past halfway above the two side beacons and from there the new top beacon was carried to the top. At the top beacon the previous install left us no slack, so at times we needed to be ready to extend the wiring.

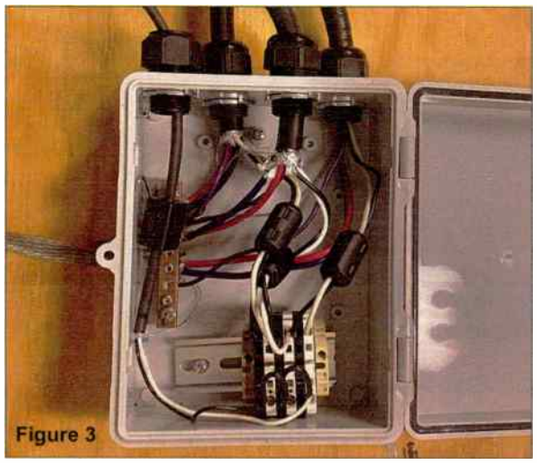

Figure 3

The three lines all come down to one point and were terminated into a Drake provided "drain" box (**Figure 3**). When I first learned the box's name, I immediately thought of a drain wire and it *was* a lightning protection point. After all, an intersection, with any ground protection and divert for strike energy, has got to be a good plan. A primary function for it is to prevent water that may run down inside some armored beacon cables from reaching the power supply/controller. The box is intended to mount at the bottom of the tower and to catch water, should any come down in a cable – then a provided two wire cable goes from there to the controller inside the building. The outside photocell also has a 16 ga cable provided, to run inside to the controller. Here is where it gets interesting. The three strobe heads are wired in series in the drain box. In my modified box I added a ground bar which terminated all the unused wires and sheath drains and is connected to ground, using a braided ground strap. Ferrites were added to black and white beacon feeds and to the feed from power supply. The feed supply from PSU also has a lot of slack to coil up and there are more ferrites on the line. Each head is pulsed with between 180 and 190 Volts DC at approximately 2 Amps. A pulsed LED application is the easiest on LEDs because the actual junction is given a chance to cool off between flashes. It can be run harder/brighter if it is pulsed.

The power supply/controller supplies as much as 570 Volts DC to the "in series" beacon heads. This is another dangerous piece of equipment with a safety interlock on the controller door, and there needs to be a high voltage caution sticker for the Drain box. DC shock makes you grab hard; AC shock is more of a heart fibrillation issue after the power is removed. The voltage has to be divided equally among the heads which is the job of each beacon. The system learns the normal startup current and can take into account small changes over time. If one of the seven facets (reflective section with LED board) has a failure, the system can detect it and produce an alarm.

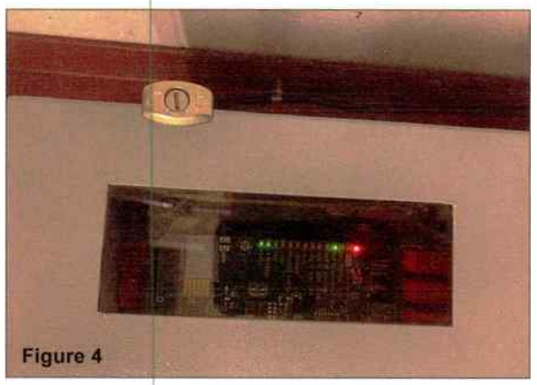

Figure 4

If you do not have SNMP monitoring you need to first read alarm status indicators thru the door panel first (**Figure 4**). When you open the door the safety switch shuts the system down, resets the alarm, and when the system comes back up, the alarm may not return. Optional alarm communication includes an SNMP interface and an optional GPS receiver for plesiochronous synchronization of beacons too far away to practically sync with a cable.

Power input can be 120 VAC or optional 48 VDC. In my application of 120 VAC, the site alarm system has an average AC current monitor. Running the old strobes in the daytime, the current was 6.6 Amps – now it is 1.3 Amps, with LEDs, and at night it is only 0.6 Amps. This is so low that you could put a UPS backup on it. It now is a mature technology.

The white intensity (bright during day, dimmed at night) is controlled by adjusting the current – this appears to be a current regulated system. The red setting is enacted by the PSU reversing the voltage to the beacons. A lot of options are possible using option switches. Drake offers several applications based on tower height. Ours is an E-2 retro fit application, LED-B-HYBRID-G5/3MI. This version only requires one power supply/controller which saves room and power. Nothing is nicer than a pair of 620 Watt bulbs in a huge fixture that comes on/off sort of slow. If I have it right, option SW5 SOFT ON brings that look back! I wish I could test it. Red is the only choice. Perhaps I will get a chance to see the 3 degree beam in the fog some night!

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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Safety and Security

Arc Flash and Arc Fault Poorly Understood Dangers

by Jeff Johnson

Most simply stated, an arc flash (also known as an arc blast) is an electrical short circuit in the air. If it takes place in front of your face, in your electrical panels or in your transmitter, you are in trouble.

How Can Electricity Travel Through the Air?

If enough energy (voltage in this case) is applied across a gap, some of the gas molecules in that gap will be stripped of their electrons – ionized into charged particles. It is via those charged particles that the electrical flow is possible.

An electric arc has an inverse, non-linear relationship between current and voltage – a negative resistance. Once the arc is formed, more and more ions are created, lowering the resistance and more current flows. This goes on until your equipment's conductors melt, the arc is blown out like a candle, or the power source is disconnected.

ARC Flash Danger

How can protection from such an occurrence be established? Protection of equipment and protection of personnel are two separate considerations. If an arc flash occurs, any personnel nearby (you) should be wearing protective clothing.

If a fire is occurring due to the arc, type "C" fire extinguishing equipment, as discussed in previous articles, should be used. *Do not dump water on an arc!* Power to the arc must be disconnected, of course.

What the well protected engineer wears.

Be Sure You Are Protected

An arc flash is an explosion that releases a broad spectrum of electromagnetic energy, plasma, fragments, and spray of molten materials. Special Flame Resistant (FR) clothing and face shields must be worn.

The National Fire Protection Agency's (NFPA) 70E is the Standard for Electrical Safety Requirements for Employee Work places. NFPA70E requires employees to wear flame resistant protective clothing wherever there is a possible exposure to electric arc flash. Perform an Internet search for "Arc flash clothing" and you will find extensive information.

A Recommended Addition to Your Tool Kit

In order to avoid inadvertent arcs and shocks while working on live equipment (ill-advised but necessary in some instances), a broad range of insulated tools is available. These will minimize the number of tools in our kits with those telltale burned and melted spots.

Flash-Free Tool Kit

While protection against high energy arcing – arc flash – is generally a matter of safe practices and personnel protection, low energy arcs, arc faults, can also prove dangerous.

ARC Fault Danger

While it has been pointed out that arc flash – sustained conduction of electricity through ionized gas – will commonly not occur in air below a potential difference of 480 VAC RMS, protection against all-too-familiar slips of a screwdriver or wrench while working on "hot" circuits must be guarded against. Lower voltage arcs – arc faults – can be extremely hazardous, as they may be hidden from view in walls or junction boxes.

A tragic example of this was the Beverly Hills Supper Club fire in the '70s, which was determined to have been caused by faulty aluminum wire termination.

Office and Home Fault Protection

In low energy instances, such as a home or office, an AFCI (Arc Fault Circuit Interrupter) is generally used to protect against fire, while a GFCI (Ground Fault Circuit Breaker) is used to protect personnel from shock. The AFCI is designed to prevent fire from series arcs, bad connections, arcs to ground or to common.

The AFCI works at a higher threshold (30 mA) than GFCI devices protecting against electric shock, which operate at 6 mA. However, advanced electronics inside an arc fault circuit breaker detect sudden bursts of electrical current in milliseconds. It is a "smart" device. A new AFCI will commonly be a "combined" device incorporating the GFCI function which trips at the lower, 6 mA threshold.

Smart Circuit Breakers

These "smart" circuit breakers, the AFCI types, protect against what is termed "nonfunctional" or "non-working" electrical arcs. They are able to distinguish between working arcs such as occur in brush-type motors and nonworking arcs, as in a lamp cord that has a broken conductor.

Although specifics of the "brains" in these devices is hard to find and seemingly proprietary to their manufacturers, the author concluded that differences between intermittent and regular patterns of voltage and current fluctuations must be the key.

Other Electrical Dangers

AFCIs are designed to protect against fires caused by electrical arc faults. They provide no specific protection against "glowing" connections, excess current, high line voltages, or low line voltages. Other types of circuit breakers, mounted in receptacles, including PFCI and OFCI, will be encountered for protection against other types of faults.

From a receptacle, a PFCI (Power Fault Circuit Interrupter) can detect glowing connections where there is no arc, but the fault consists of a voltage drop of high current existing in a high resistance junction.

PFCIs are also designed to prevent fires caused by excess voltage across loads A damaging source of high line voltage occurs when a neutral path opens within a two-leg 120V electrical system.

When a neutral wire breaks or opens, voltage can almost double to over 200V with large leg-to-leg load imbalances. This extreme situation can result in almost four times the power and heat in resistive loads. Some loads can reach self-ignition temperature in a few minutes.

A Real Life Experience

The neutral conductor of one of the emergency circuits opened. Suddenly MOVs in plug strips under desks were popping, and smoke was filling the rack room. Flames were shooting from the power supplies of one of the automation servers and other computers. All four stations were off the air simultaneously.

It was a sweaty palms situation with an unknown cause. After circuits were de-energized, the root cause of the trouble was discovered – the open neutral. PFCI breakers would have eliminated a good deal of the damage. A PFCI acts like a "firewall" for unacceptable line voltages. A product called SafePlug is a PFCI device.

SafePlug on Left – AFCI on Right

An OFCI (Overload Fault Circuit Interrupters) is designed to protect against excess current drawn by equipment connected to a particular receptacle. It is logical that OFCIs must be located within receptacles. Low voltage can cause inductive loads, such as motors relying on reverse EMF, to dr0aw dangerously high current. Both thermal circuit breakers and OFCIs are required to prevent fire from excess current.

Jeff Johnson can be reached at: jeff@rfproof.com

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The Linux Connection, Etc!

Arduinos Galore

by Tommy Gray CPBE CBNE

Getting Started

By now hopefully you have acquired at least a basic Arduino module to experiment with.

One of the best places to find help for getting into an Arduino is at **http://www.arduino.cc** which is the primary website for all things Arduino. Now there are a lot of great sites out there with tons of sample code that you can use, and there are blog sites as well. The resources to learn to program an Arduino and to build your desired projects are many and varied. You will find everything from security systems to robots and anything else you might want to get into on these sites. Once we have managed to get you up and running with your Arduino, I will point you to code snippets to perform the broadcast site tasks you may want to do with it. These can include temperature monitoring, tower light monitoring, site security monitoring, Electrical power monitoring, etc., all of which can be done on the cheap with an Arduino module. Just about any Arduino will do all these tasks and more. The number of things you can do with it is only limited by the I/O capability of your individual module. Need more capability? Just get a step up in modules and it will include more I/O ports for digital and analog monitoring.

If you have your Arduino and are ready to get started, the first thing you want to do is to get an Arduino editor, which is an IDE (integrated development environment) to create your programs in Sketches (Arduino programs are called "Sketches"). The editors are free and available in the "Software" section of the Arduino site I linked you to above. If you are getting started and do not have a lot of programming experience just get the editor suggested there as the latest release version. I have many years of experience in several programming languages so I always run the beta version and can live with a few bugs and glitches. However, I strongly recommend the latest release version when getting started.

The editors are available for Linux, which is my preferred computer OS, Windows, and also Mac OS X. Get the one you want to use. Since these articles are meant to help you run Linux that is what I will be using here.

Once you have a working system. Simply use your USB cable that came with your Arduino module and connect it to the computer. In the "Tools" section of the IDE menu you will need to select your Arduino "board." The "Board" is simply your Arduino module. On my Uno setup, which I am using for this example, the selection is found in **<Boards...><Arduino AVR><Arduino UNO>**. Yours will vary according to your hardware and computer setup, but nonetheless you will need to set it to the board that the IDE identified. It will show the serial port such as **"/dev/TTYS0/"** or something like that. If your Arduino is working and connected, the IDE will usually find the board and have it in the selection list so that you simply select it and you are good to go.

Now your board should be connected and powered up (it will receive power through the USB port and there is no need for an external power supply at this point). Next you will need a program (Sketch) to run, to make it do anything. Below is a simple program that will let you see if you are working and ready to do greater things with your Arduino. This is the basic program that most folks run to get started as it simply flashes the onboard LED that most Arduino modules have. I will explain the basic code as we go along. The Arduino I am using for this example of a little Arduino UNO R3. It, in itself, is a powerful piece of equipment so don't think that just because it didn't cost but a few bucks it does not do much, because it does! First you need to create a folder to hold all your Arduino Sketches as you progress in your programming endeavor. I simply drop a folder on my desktop that I call "Arduino Projects." Inside this folder are individual folders for all my projects (Sketches). You need a folder to contain your Sketches that has the same name as the Sketch. If you don't do it this way Arduino will remind you and ask you to do it. Once you have your projects folder created, inside it create another folder called "blink." Use lower case for the folders and the Sketches you will put inside them.

Now keep in mind that you can do all this directly from the menus of the IDE but I am trying to help you get started easier for your first project. Later on you will probably want to create your Sketches in the IDE. Now we are going to create your first Sketch called "blink." The file will have the extension of "ino" not text, so make sure if your text editor we are about to use saves only with a ".txt" or something else, that you go back and change the extension to ".ino" before you open it in the IDE. Again I want to say that you can do all this in the IDE but I want to show you that there is no "Secret Magic" to the IDE. It simply edits things in a text format. To save time we are just going to create a text file and later open it in the IDE to compile and upload to the board.

Code Coming Up!

First there is a basic structure to every Arduino program. Though you can add all kinds of functions to it, there are two that are required and the first is a "setup" routine and then there is a "loop." Both of these are required in any Arduino program. Once you get into building larger and more complex programs, you will add others, but for now these two are all that you need to have to build a working Sketch. Now in the "blink" Sketch you will see a complete working program that, when run, will flash the built-in LED that is on the board at a regular rate which is defined in the code. Our goal this time, is to get you a working Sketch and have your module run it without errors.

The link below is to the public domain program called "blink.ino" which will simply blink an LED on your module to verify everything is working. It is a simple program that you can use to get into using the Arduinos. Here is the link: **http://www.arduino.cc/en/Tutorial/Blink**

The page the link takes you to has a lot in the way of explanation of how it works, as well as the complete code for the Sketch. Code for the Arduino is basically a C code but it is not difficult at all for a beginner. Look at all the examples you will find on the Internet and you will quickly see what it takes to make it do things. Sample code abounds for almost every purpose you might need. Remember this: *You do not have to be a programmer to create programs for the Arduino!*

If you downloaded the program from the Internet and have it on your computer, open it up in the IDE and you will be able to modify it to suit yourself. Let me give you a brief explanation of what is involved in every Sketch. First, in the code you will see the "setup" section which initialized the serial port to your desired baud rate. 9600 is a good speed for a basic program and works well. We also initialized digital I/O pin 13 for an output. The IDE has a serial monitor function in it, which the "Serial.print" code writes to, so that you can see what is going in instead of just having a light flash. You can customize the text in the "Serial.print" line to whatever you want it to be, to play with the sketch.

Just be aware that the commands are case sensitive and where you see caps, keep them. I personally like to use the **"Serial.print()"** function to see what is happening in the sketch while it is executing. Later on, after you are done, you can either delete the lines with the Serial.print statement or just comment them out. This is usually only necessary with a very large sketch that uses a lot of memory and can get bogged down with all the additional steps running. The Remote Site Monitoring program we will ultimately help you to create, is a large program, and after I got it working to my satisfaction I commented out all the unnecessary stuff to help it load the web pages faster and to run faster.

Keep in mind that we are leading up to building a complete and fully functional remote site monitoring and control program that runs on the Internet or your LAN, and will work with virtually any web browser.

Useful Information:

In the setup section you will always see:

```
void setup() {
//code to do something
}
```

"void setup()": This is the initialization section and sets you board up for what it needs to do. For an explanation of the "void" word, I suggest you do a web search and you will see what it means. Space is short for this article and I have things I still need to add.

Then there is the:

```
void loop() {
//code that runs continuously as the program is running
}
```

This is where your sketch does its thing, and in this case flashes the LED every second and writes a text line out to the serial monitor. Once you save the Sketch open it up in the IDE and then compile and upload. Your Arduino's LED_BUILTIN should flash every second and the serial monitor should show your text each time the state of the pin changes. The value in the basic code is set to one second (1000). This value is, as you probably guessed, in milliseconds. To make it faster or slower, change that value everywhere you see it and it will do what you tell it to do.

Well space is gone for this time, so I suggest that you get this one running and your board working and next time we will get a little more involved in more complex programs that will do things that are useful to a broadcast engineer. If you have a problem there is plenty of help on the Internet that can be obtained with a simple web search.

Until Next Time!

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

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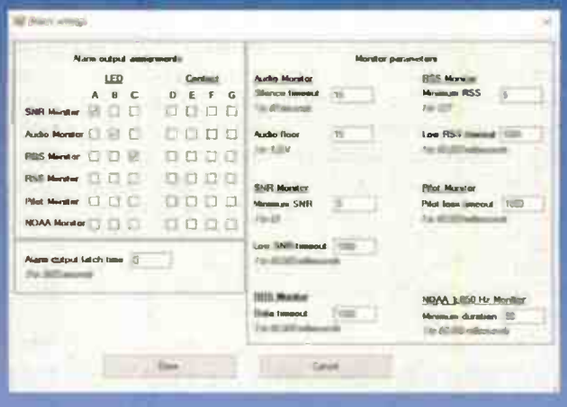

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Honey ... I Shrunk the Radio Station!

by SteveCallahan

I try to keep a pretty good eye on the FCC's Daily Digest. The Daily Digest is a release from the FCC, reporting any broadcast applications that have been received and then later acted upon. It's a good idea to check it, especially if you are contemplating filing an application for a change in a radio station.

One thing that I have been seeing more and more of, are AM stations that are seeking not an increase in power but rather a *decrease* in power. I understand that, in many cases, the land under a multi-tower AM array is worth more now as a subdivision than a radio station tower site. I also know, from being on both sides of a radio station's checkbook for many years, that the power bill for the transmitter site was the hardest to write each month because it kept going up and up.

Once upon a time, it was expected that an AM station would try to improve and maximize its signal or coverage any way if could. Sometimes you could file for a power increase at the existing tower site, or perhaps squeeze in another tower or two at the existing non-directional site to go directional. Perhaps you would have to move to another site or utilize separate day and night sites to accomplish your goal. Either way, it was then unheard of that an AM station would file for less power and less coverage.

I recently saw that a station, that I spent a long time working on to double it's power, has now filed to reduce power from 10,000 Watts to 400 Watts. When I got to the station it was an anemic 5000 Watt signal that sort of worked some of the time. I had the distinct pleasure of working with the late Ron Rackley and Don Crain on this power increase. The first thing they had me do was what I called "allocation radials." There were three co-channel or first adjacent signals that had to be considered before we went too far into the process. This meant I had to measure, on a direct line, the signal strength of each of the three other stations back to the subject station, to determine how much leeway there was between the two contours, if any. Then if there was some leeway, you did two more allocation radials, one to the left of the original and another to the right of the original to accurately fix the signal contour of interest.

Armed with this information, we then generated what was thought would be an acceptable new power level for the AM station, which it turned out would be double their existing power and also a way to modify the existing three tower array with a fourth tower to push the new higher signal in a new direction that was desired by ownership and management.

An application to the FCC was prepared and eventually we got a grant for the increased power. This is when the work really began. The physical construction took months, with a new tower located in a swamp and replacement of one of the old towers because it was badly rusted and damaged. Four new antenna tuning unit boxes arrived on the scene along with hundreds of feet of new transmission lines, sample lines and new control cables. A bright, new, shiny phasor and a new 10,000 Watt transmitter were next to be delivered. These new toys did not come cheap.

When the physical plant was built to the construction permit requirements and the phasor was roughly adjusted, the first of many antenna proofs were done. A proof was a series of measured signal points on radials out to the end of the radial. Some of the radials would measure nulls or minima, while others would measure lobes or maxima of the signal – others would be "measured radials" which would become monitor point radials which I would measure monthly to chart seasonal effects on the array and to determine if the patterns were in tolerance or needed some adjustment.

I must have performed at least 30 antenna proofs on that particular station that summer. Each time a phase reading or ratio was deviated a degree or so either way. Unbeknownst to me, Ron Rackley was getting ready to announce the new Method of Moments process of determining a station's pattern using a computer program rather than running the radials and doing a field proof. I still believe that I was a guinea pig for his Method of Moments testing. All of that measuring and calculating most have cost a fortune.

Higher power for some stations was not only for increased marketing opportunities in new areas but also brought with it some "bragging rights" over the competition.

I once worked for a 50,000 Watt daytime station that had a six tower array of two parallel lines of three towers. Unfortunately, that much land, along with the FCC rule in effect at the time regarding blanketing interference, required the station to be located far from the metropolitan area. The owner's intent was to be the most powerful AM radio station in the state but with the two other dominant AM stations, each operating with 5000 Watts from inside the metropolitan city limits, his claim that his 50,000 Watt station was more powerful was hard to prove ... and hard to hear in the metropolitan area.

Right around this time I was noticing that it was getting harder and harder to hear AM stations when there were some fluorescent lights nearby. I later discovered some appliances, spewing hash from their switching power supplies, also negatively affected AM reception. This was the start of the growing noise floor that would affect all AM stations.

AM stations were in trouble and every station owner knew it. Radio listening changed and audience preferences were not toward AM but to FM and later to on-line listening. Docket 80-90 had filled the FM band to overflowing in some areas – which put still another nail in AM's coffin. The FCC, after granting FM translators to FM stations for many years, decided that it would help preserve the AM service if they too were allowed to operate an FM translator relaying their AM programming. No AM licensee objected to such a rosy opportunity and many quickly made a deal to move an existing translator in from 250 miles away.

This station that I worked hard to build up filed for an FM translator and got an available frequency. They plan to reduce daytime power to 400 Watts and knock down two of the four towers, thereby reducing their electric bill and allowing for some other profitable use of most of the tower site's land. I don't fault their decision because, like I said, electricity costs money and what's the sense of bragging rights if no one is listening. However, it was the FCC's intent that the new FM translators would compliment the AM station's efforts and not replace them. Some AM station owners were ready to turn in their AM licenses because they now had an FM signal, but the FCC had already thought of that and it was not to be allowed under the current rules.

There are some steps that AM stations can take to slow the fiscal bleeding each month. I had the pleasure of speaking at length with Kurt Gorman of Phasetek and he told me that he's been more than busy designing and building AM diplex and triplex facilities. If you have a tower site that is getting long in the tooth and the land might be worth more as a housing development, you might want to give Kurt a call. If you can strike up a deal with another friendly local AM station whose frequency is far enough from yours, then a diplex might be the way to go. I'm working on a new diplex project with Kurt and you'll see more about it in a future *Radio Guide* article.

If you have a 5,000 Watt or more AM station, you really should consider adding MDCL or Modulation Dependent Carrier Level. When I first learned about MDCL, I admit that I was a bit skeptical and had to learn more. It's a bit unnerving to look at a remote control and see the output fluctuating more than it normally would. Very basically, the transmitter carrier is turned off between audio peaks thereby saving you money. The first concern you might have in mind is "Doesn't this stress the transmitter with the constant on and off activity?" Obviously not, as I have maintained several MDCL-equipped transmitters and the transmitter doesn't seem to suffer because of it. Just remember to turn the MDCL off if you are out in the field doing monitor points or you are trying to read the base current.

I'd like to send a shout-out to Kirk Harnack who produces a very informative show called *This Week in Radio Tech* which is available on YouTube or **thisweekinradiotech.com**. It's become a weekly habit for me to see who his guest is on *This Week in Radio Tech* and where in the world is Kirk and what radio station is he visiting. Kirk has the right blend of information and humor to make the show move right along and keep you entertained while slipping in some valuable tip and tricks. I especially recommend that you take a look at TWIRT show #547.

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

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Tips From the Field

Prepare Yourself – and Your Tools

by Dave Dunsmoor

I've been doing broadcast engineering for about 45 years now, but it's always been intermittent duty – a second responsibility. But at the same time, my primary job (FAA navigation/communication/RADAR tech) paralleled the broadcast industry in a general manner. The work environment was very similar in that I was required to travel to remote sites 24/7 summer and winter, callback at odd hours, working alone and so on. I've been retired for nearly a decade now, but most of the lessons learned at both occupations are still applicable today, even though the technology has changed. Particularly now that I'm aware of far fewer available, capable personnel in my immediate area, within maybe 150 miles. I know of just two: myself and a full time position for iHeart. So what follows is a generalized, yet random collection of thoughts that might be good conversation starters for the "new blood" among us.

I was visiting with my rancher buddy the other day and he relayed a story to me about the Wildlife Refuge personnel who were doing a prescribed burn a while back, and it nearly got away from them. Their burn came quite close to burning his brother's crops and some of his out-buildings. The next morning, his brother called the refuge manager to advise that there were some hot spots that were threatening to again burn his fields. The manager replied that his crews would have to re-fill the firetruck tanks as they had not yet done so following the previous days activities and they would be out as soon as they finished that. I think the conversation turned a bit more terse about then.

So what does this possibly have to do with broadcasting? Don't wait to get your gear into working order – it could be needed sooner than you think. It's time to start winterizing the work truck. Of course oil and coolant are the normal things to check. I mean it's time to check the condition of the battery, the tires, the brakes, power steering and brake fluids, transmission fluid, and so on. The first real cold morning really isn't the time to find out that the battery connections are loose/corroded (or worse, that the three year old battery has failed, and won't successfully turn the engine over) – immediately after the station manager calls about an outage and you have to reply that you'll have to get the truck battery problem resolved, *Then* you'll go see about why he's off the air. Even confirming that the engine heater still works is a good idea (vehicles in the northern climates usually have a 120 VAC heater installed on the engine to facilitate starting in very cold conditions). Even if your engine *will* start at -35 F, a cold engine wears more on startup than a warm one.

Another area of importance in vehicle care is finding the source(s) of little noises or other clues which often times may be intermittent. You should become adept at hearing and identifying which noises are important to resolve and which probably are not. I'll relay an example. My secondary 4x4 is a Dodge Durango, and this past summer I would occasionally find fluid on the garage floor under the car – I first thought air conditioner condensate. But then it occurred even when the A/C was not being used. Then I checked the radiator overflow, and sure enough it was over full. I had topped off all fluids earlier in the spring and apparently had over done it with the engine coolant. When the engine coolant quit dripping, I then noticed a different drip, so to the dealer it went, and they replaced the steering unit. A couple weeks later I began hearing an occasional creaking sound. Back to dealer and they found something which had not been tightened. A couple weeks later I heard it again, but from a different apparent location. Back to dealer again, and this time it took two days to find and fix the problem, which was loose motor mounts that the first guy missed. Now it's solid, and I can drive cross country, in snow or heat with confidence.

And the same concept applies to your transmitters, STLs, audio/data paths, PCs, servers, all equipment under your responsibility. Notice carefully how they sound and react when new and working correctly, and be very attentive to slight changes that may indicate a problem developing.

As long as you're checking things, check the batteries in the DVM, check the test leads, your various cables for the scope, the counter, the power meter and so on. A cold garage is an unacceptably miserable place to be checking all these things. Especially when one of your clients stations is off the air and the clock is ticking. And while you're at it, just before you put the truck away for the day is a good time to fuel up.

As a side note here, if you sign up for Shell Oil's frequent fueler program, they offer anywhere from $0.05 to $0.80 per gallon discount on each fill. The nickel discount is the most often offered, but for whatever reason, I occasionally am offered the higher discounts. Don't know why, or what the event trigger is. It's not a big deal in the grand scheme of things, but it always seems like a bit of a "win."

And this item probably won't seem to be an important one, but this is also a good time to wax the car/truck. I guess it depends on the condition of the work truck. I don't buy vehicles often, so try to keep 'em in as good condition as I can. It's that Scot ancestry, I guess. That and it looks a bit more professional.

I also use this time to run the winch cable all the way out and attach it to an anchor I've drilled into the garage concrete footing. I run the winch cable all the way out, the truck being at the end of the driveway, then I wipe it down with cable lube as I'm pulling the truck into the garage with the winch. Yes, I use leather gloves. No matter how careful I may be when using the winch, it seems that eventually there will be one cable wire that breaks and sticks up like a thorn.

A winch anchor point in the garage can be useful.

This will only be pertinent to some of you, but I also put the winter survival bag in the toolbox about now. It contains a snowmobile suit, winter boots, socks, gloves, hand warmers, a couple types of warm head gear, candle in a can, and so on. Snow shoes, tire chains, winch chains, steel shovel, extension cords, a small battery charger all get stowed in the toolbox as well. A piece of old carpet might be useful when changing a tire, or investigating a noise under the vehicle, etc. And for winter driving, I usually carry 800-1000 lbs of sand bags in the back of the pickup for better general traction, or to break open to use on snow/ice if necessary.

An item that may not be immediately apparent, but needed, is an external heat source – and not only for northern climates. I suppose that those of you who are experienced at working in mountaintop locations already carry a propane heater. Occasionally, or more often, the transmitter provides much of the building heat in the winter months. But if the transmitter is off, so most likely then is the only heat source. And as with the truck's fuel tank, the propane bottle(s) should be re-filled as soon as they're empty.

Portable Propane Heater

And about every time we have the first snowfall, I have to re-learn how to drive on snow and ice again. When the friction coefficient between the tires and road surface is nearly non-existent, the techniques used for driving change completely. Along with this, is remembering to watch out for other drivers who don't "get it" when the pavement is icy. You have to watch for them coming from a much greater distance now!

And, I suppose that driving in deep, dry sand of various desert environments is much the same as trying to drive in snow up here, but for the temperature differences. I'm guessing that one advantage there is that you'll be driving in sand year long instead of just a few months each season, so the re-learning isn't as necessary.

All these items should seem like good common sense, but occasionally, I have to remind myself to check off all these items before it gets really cold out. Warm footwear is a lesson I learned the hard way about 50 years ago. I had a miserable hike one time. I don't recall what went wrong, but I do remember vividly how cold my feet were before I got back to the pickup.

Finally, here's a topic I've not seen much, if any discussion about on any forum, and these may be hard questions to ask yourself: how's your health these days? Keeping the weight off? Getting regular physical check-ups? Are you taking time out to "de-stress" yourself? Are you taking time to be with family, friends? Do you let someone know where you are late at night when working on some transmitter/STL, etc? Not just, "I'm at the KXYZ transmitter," but *where is* the KXYZ facility, and how does someone give emergency personnel accurate directions about how to get there quickly if necessary?

Before I retired from a (mostly) desk job, I realized that I needed to find something to do to keep me busy. I picked up recreational rock climbing, and some occasional mountain climbing. This has been quite beneficial as I've dropped (and kept off about 30 lbs, my blood pressure has stabilized to a younger man's level and I've finally realized that if I let stress get to a point where I'm laying in the E/R, the job really doesn't matter *at all!* Be careful out there ... and don't allow things to get to that point.

Take care of small problems before they heat up to the point of destruction.

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

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Network Management

Improving Network Security Posture

by Chris Ark – CBT

Not a week goes by where you don't hear about cyber-attacks on both private and government infrastructures. Attacks are becoming more sophisticated and stealth in nature. Operating in this new reality requires businesses, both large and small, to take an honest inventory of their cyber security shortcomings and develop a plan to keep their networks secure. This article discusses actions you could take to improve your network's security posture.

User Privileges

Standard Users

Cyber terrorist prey on network environments with laxed standard user security policies, in hopes that a distracted end-user opens a malicious file. With elevated privileges, this code may now have the ability to install software or have a deeper reach into your network. Standard end-users should never have the ability to perform administrative tasks within your network environment. Consider performing an audit and revoke elevated privileges for any user that does not require them to perform their assigned duties. That includes your PD, GM, and Sales dept. I know their heads will explode but the benefits outweigh the inconvenience. Plus, you will make it harder for the end-user to accidentally delete critical system files and "blue screen" their computer.

Admin Users

Network administrators need to be cautious too. Administrator accounts (a-account) should only be utilized when making administrative changes to endpoints, servers, or appliances. Network administrators using their a-account to perform non-admin daily tasks poses the same risk as a standard user having elevated privileges. Sure, IT professionals are more cautious than most, but are still human and make mistakes.

Isolating Networks

Most large companies have informational security (infosec) policies that act as the framework for how devices are configured and isolated from one another. This isolation is achieved by placing divisional devices onto their own network. This is done in part to restrict access of unauthorized users and to slow the proliferation of malicious code, in the event of intrusion. If your station is on a single network and divisional devices are not segmented, you instantly increase the scope of business impact.

Simple example: a sales rep clicks on an email attachment from an unknown sender titled "KXXX-FM Ad Buy." The attachment actually contains a malicious executable. Depending on the state of your user privileges and antivirus, the executable begins to run in the background and tries to propagate and infect your entire network. It would be bad enough if your enterprise network would be held for ransom, but it's made 100 times worse when your broadcast network is too.

Some smaller broadcasters say they cannot afford, or simply do not need to increase their security posture. That it costs too much to implement or think, "why would a cyber terrorist attack me? They couldn't extort enough money to make it worth their while." I say they cannot afford not to. And the why? Just because they can. Smaller broadcasters are very much a target by cyber terrorists and become more vulnerable every day. You need to minimize your risk and exposure by isolating your divisional devices onto separate networks.

There are many cost-effective routers that allow you to create VLAN subnets with built-in firewalls. I have the Cisco RV340 router on one of my client's setups. For about $250, and a weekends worth of work, we were able to isolate office, broadcast, IoT, and security device traffic onto completely separate networks. Of course, network segmentation is not a silver bullet to fighting bad actors. However, it is an important piece of the puzzle.

Antivirus Software

Enterprise Networks

We can all agree that it is standard practice to deploy antivirus software on enterprise network servers and endpoints. They are typically Internet facing and constantly exchange data from external sources. They pose the greatest risk to your network environment and should be monitored for malicious activity. Most large to medium broadcast outfits purchase 3rd party antivirus software. In part so they can leverage additional features and offerings such as Roles-Based Access & Control and enterprise class support. Smaller broadcasters in the Windows environment tend to rely on Window Defender.

(Continued on Page 28)

Coaxial Dynamics
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– Continued from Page 26 –

Windows Defender has come a long way and has a relatively high success rate with threat detection. However, if using Windows Defender, make sure that it's actually enabled. Too often I see folks assuming it's enabled, but it is actually *disabled*, poking one more holes into your network. Regardless of your antivirus solution, if you do not have a central dashboard showing the status of your antivirus agents, go around to every server and endpoint to ensure it's antivirus is enabled and has the latest security definitions.

Broadcast Networks

Installing antivirus software on broadcast servers and endpoints, well, that can split a room. As broadcast engineers and IT professionals, it is our responsibility to keep the station on air 99.9% of the time. When something threatens that up time, we tend to proceed with an abundance of caution. Unfortunately, antivirus software has been known to incorrectly flag and stop system services and processes. Depending on the service or process stopped (and the program impacted), this has a real potential to take you off air. One school of thought is that, if a broadcast network is isolated properly – meaning that it does not have direct access to or from the outside world – you should not need to install antivirus software.

Although I agree with this in theory, I would ask 1) how strong are your firewall policies? and 2) have you considered the human element? because you may not be as secure as you think. Schedule time with your IT firm or firewall team to perform an initial review of open ports on your firewalls. Ensure that only required ports are open. I encourage you to make a spreadsheet of required ports and perform annual reviews. Port requirements change and you need to minimize your exposure. As for the human element, if your IT staff uses jump drives to transfer files and software updates to broadcast servers and endpoints, you need antivirus protection. Your "isolated network" isn't so isolated after all.

I'm not suggesting that you run out right this minute and throw antivirus software on your main playout server. I am suggesting that you consider developing an antivirus strategy in your broadcast network. One approach could be deploying an antivirus solution that allows Monitor Only mode. Here you can create a pilot test group comprised of backup machines or Dev/VM machines. Apply updated security definitions to this group but do not enforce the new definitions. Observe how these new definitions interact with systems processes and service. Add false positive to the exceptions list and, once satisfied, enforce the policies. Observe for another week and if all goes well, push the exceptions list and updated security definitions to your production environment and enforce the definitions. Antivirus isn't a silver bullet but is another component to network security.

IoT Devices

Cyber criminals love to leverage out-of-date firmware on IoT devices. Out-of-date firmware can contain exploits that grant access to entire networks with elevated permissions. Take printers for example. Printer firmware updates probably are not at the top of the to-do list for most admins. The printer works just fine but over time the firmware becomes outdated. This outdated firmware now houses an old version of a protocol that is a known threat vector (e.g., SNMP 1 & 2). Make a list of IoT devices connected to your network and ensure that their firmware is up to date. From there, make checking IoT device firmware part of your maintenance routine.

Internet Facing Appliances

I'll keep this short, as this typically only applies to smaller broadcasters. You should never have a device within your infrastructure be directly accessible from a public IP address. Many smaller broadcasters utilize public facing static IP addresses provided by their ISPs when setting up a new point-to-point STL IP codec or access to a transmitter GUI. It's faster and cheaper than creating a VPN tunnel, but what could it cost you in the long run? Something as simple as not changing factory default usernames and passwords on an appliance could give away the keys to the kingdom. The only public facing equipment in your network should be your modem. If this sounds like your facility, consider the benefits of deploying a VPN solution for remote access and tunneling between sites.

Infrastructure Resiliency and Disaster Recovery

What would you do if your company's network infrastructure were being held for ransom? Would you pay the ransom or rebuild your entire network? For some companies, paying the ransom would put them completely out of business and does not even guarantee your files will be decrypted.

Rebuilding an entire network infrastructure from scratch could take weeks, if not months, and cost tens of thousands of dollars. Plus, broadcast software and appliances can be difficult to configure. In some cases, a near impossible task without the manufacture or software developer.

Some of this pain could have been avoided had a proper infrastructure resiliency and/or disaster recovery plan been in place. For my facility, every database and appliance/software configuration is backed up to both the cloud an offsite hard drive. Same can be said for hard drive clones of my broadcast-critical servers and endpoints. In the event you get hit with ransomware, these backups afford you the option to not pay a ransom and resume normal broadcast operation much faster than if you had to build everything from scratch. If you don't already have plan in place, the time to start planning is now. – *Radio Guide*

The Reporter.

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World Radio History

System Solutions

Take Command!

Using Tried and True System Commands

by Jim Turvaville

I was a bit concerned that the subject of this article would certainly date me, but then everyone who knows me already knows that I'm an old curmudgeon, so then it really doesn't matter <g>. And since what we're discussing is also really cool and helpful, maybe that will compensate just a bit. Yes, we're talking about using your **Command Prompt** to work smarter instead of harder, and be a lot more efficient in your daily routines.

The subject came to mind recently, when I was hanging around one of my clients who happens to be extremely versed in Linux, and even writes customized software for their ministry. He has four blade servers with more than a dozen VM instances on each (some are mirrors for redundancy) with all of the partitions running Linux for their four radio operations. While I claim next to no knowledge or skill in Linux, most all of the administration for the systems are still done on the Command Line, and watching him work reminded me of just how much I still use Command Line actions to work in my PC world – and how many things I do with it that make things quick and easy. So I thought I'd share some of my regular go-to Command Line tips in hopes they will help you as well.

From the inception of Disc Operating System (DOS) in the 80's, PC operations have been based on functions which originate in a Command Line environment. It was IBM who launched MS-DOS 1.0 in 1981, but Microsoft was a co-developer and they were both in unity with the DOS product until 1983 when the 2 companies went in different directions. When Windows premiered in 1985, it was simply an extension of MS-DOS, which ran all of the applications and commands. In fact, Windows 1x, Windows 2x, Windows 3x, Windows 95, Windows 98 and Windows Me all were consumer-directed Operating Systems and were all dependant on the MS-DOS running in the background for most all of the functions of the OS. In the early 90's, Microsoft began developing a non-MS-DOS based OS which was a revamped version of the IBM/Microsoft earlier industrial collaboration called "OS/2" which supported multiple users and multiple processor architectures. That generation of OS releases, which were called Windows NT 3x, Windows NT 4x and finally Windows 2000, demonstrated the power of the new base operating system, and when Windows XP was released to the public in 2001, it was the first consumer release of Windows based on the non-MS-DOS operating system.

However, in all of that time period, there still remained the base of a Command line operating system which could be accessed through the Windows environment. In the Operating Systems, which were running over MS-DOS, it was easy and logical to enter and execute those commands. But even in XP and newer Windows versions, that Command Prompt has still been accessible and functional. In all Windows versions up to and including Windows 10, a simple keystroke of "**Win-R**" (the "Windows" key, usually between the Ctrl and Alt keys on your standard keyboard, plus the "R" key) will open the "Run" box which will allow you instant access to the underlying System Prompt. Then simply typing "**cmd**" and hitting enter will give you the system prompt box on screen.

By default, Windows opens the Command Line in the **C:\Users\[username]** file directory, where **[username]** is your local user name. Generally that is where I want to be for most all of the things I use the Command Prompt for, and from there, the world is at your fingertips. Just remember that this is one of those instances where your High School English teacher would remind you that "spelling counts," since those Command Line functions do exactly what you tell them to do, and a missed keystroke here and there (known as syntax errors) are 100% unforgiving. There are a myriad of complicated YouTube videos out there with a host of these commands, as there are hundreds of them that are still fully functional in Windows. But even in my decades of dealing with PC's, very few of those have any day-to-day function for me. But these I list here are the ones I use most, and most of these are for network and Internet troubleshooting, which tends to be a lot of the root of our problems with computers.

ipconfig

This simple command typed on the prompt line will echo your basic IP configuration on that computer for all hardware network adapters. Mine echoes both my wireless and wired adaptors on my laptop, with the local IP address, subnet mask and default gateway. This is extremely helpful if I'm setting up network connections and need to know the IP address assigned to this specific computer. If you have the need to know even more, then the command of **ipconfig/all**

(Continued on Page 32)

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– Continued from Page 30 –

will echo a couple of pages of extensive detail about all of your network parameters, including MAC address of each, DHCL lease times, Manufacturer of the hardware, etc. Like all Command line programs, the **ipconfig/?** command will give you a list of what options are available.

ping

The **ping** command is helpful mostly in a local network environment, to see if you have physical connection to another device. Although it is a feature in all routers to be able to set to deny ping requests from outside addresses, that is rarely done on internal devices. This makes **ping** useful in troubleshooting network connectivity, say to a printer. At the Command Prompt just typing **ping 192.168.11.30** would tell me if my computer was seeing my network printer connected at that address. If it does not, then I need to start looking at my own network adapter settings, trace a network cable, or check for a problem with a network switch. The **ping** command also works for Internet connectivity testing; specifically I use it to see if the outside world is on the other side of my router. I can type **ping 8.8.8.8** and it will ping the Google DNS server at that address, something I know does not have external ping turned off. **Ping** is also helpful to test your local DNS settings; by pinging a known URL you can know whether your DNS is configured to translate that URL into a traceable IP address. That similar example above would be to type **ping google.com** and see if your selected DNS server can find Google.com at **172.217.1.42** If not, then you have DNS problems, either in your own computer, your router, or wherever you have your DNS settings pointed. This has often told me when my ISP had DNS problems because I could ping an outside IP address just fine, but not the corresponding URL.

tracert

The tracert command is an abbreviation of "Trace Route" which will display the hops that your connection makes to get from your device to the destination. It is often an eye-opening view of just how contorted the "web" is, and how many connections it takes to get from here to there. The command works much like **ping**, in that you can use either direct IP address or URL on the command line to initiate the trace. For example, typing **tracert google.com** will first echo the IP address of the destination (showing that your DNS settings are working) and then begin the trace up to 30 hops between you and Google. In my test at home, that command took only 10 steps from Texas to wherever Google is located (maybe in California?) and did it in 120 milliseconds. Not bad, if I have to say, for living off the grid and on the net <g>. One other cool feature of **tracert** is that I can get the name of the other devices in my local network; when I type **tracert 192.168.11.30** it will echo **"Tracing Route to HPLJ400"** which is the NETBIOS friendly name of my printer.

ren

If you've got a stubborn file that you've downloaded that won't open, then you may want to change the file extension to one which will work for you, something that Windows may be hesitant to let you do just by clicking "rename." This is where the **ren** or "rename" command comes in handy. Since I work off my desktop for anything temporary, it is also my default download location. At the Command Prompt I just type **cd\desktop** and hit enter and it will change the prompt to be at my desktop. Then that stubborn file that was downloaded as **invoce.dcx** that needs to be **invoice.doc** can be easily manipulated. The command of **ren invoice.dcx invoice.doc** and hitting Enter will instantly change the extension on the file, and the icon on my desktop will also change to reflect that it's now a Word doc that I can click and open. If that file happened to be in the Downloads folder, then the command of **cd\downloads** at the prompt would get me to my Downloads folder where I could exercise the same renaming command.

dir

At any prompt, typing **dir** and hitting Enter will scroll the directory listing all of the files there, so you can be sure and know the correct name to type for the rename process. If you only need to see one file type on the list, then typing **dir *.pdf** will list only PDF files in that directory. With any **dir** command, if the screen moves too fast or has too many files to read, adding the page command will let you see one page at a time; with the command **dir /p** and then Enter. And you can combine commands as needed, like **dir *.doc /p** to see a list of all the documents in that directory, one page at a time.

exit

And when you're done, you don't even have to use the mouse to find that red "X" in the top right corner. Just type **exit** at the prompt and when you press Enter the box goes away. Then you can just go on your way, having solved the problems of the entire world, or at least the little part you are working in today; and no one needs to know your secret.

Jim "Turbo" Turvaville is semi- retired from 42 years in full-time Radio Engineering and lives in Rural Wheeler County Texas in a "tiny house" where he maintains a small clientele of stations under his Turbo Technical Services (www.jimturbo.net) operation providing FCC application preparation and field work.

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World Radio History

Shop Talk

by Steve Tuzeneu, CBT

Misc. Tech-Tips and Thoughts

Cisco Switches

For the longest time I have heard many great things about how good Cisco routers and switches are. I have never heard anything bad about them. In every discussion I have had with IT people, these were the products that were considered top of the line. There may be routers and switches that are as good, or better, but I am not aware of them.

It's important to note that I have not had any experience with Cisco switches, and my impression is based on hearsay. You can draw a conclusion on a piece of technology based on what other people say, and carry those thoughts and impressions with you for many years.

While I still think Cisco makes great products, my thinking has been changed a little based on indirect experience. While I have not actually logged in and attempted to set up one of their products, I did have some personal experience listening to my IT guy.

We purchased a Cisco switch for use with our new on-air computer system because they specified a particular make and model that works best with their equipment.

My first education came when I assumed the computer company had set up this expensive switch to work with their equipment. My IT guy set me straight.

It took nearly an entire day of my experienced IT guy to learn he could not configure our new switch. His next step was to go through a couple of levels of support. After three days and several Cisco technicians, our switch was finally configured and ready to use.

If you ever have the opportunity to configure a Cisco switch – don't! Unless you have a certification in the particular switch or product from them you plan to use at your station, get someone to do it for you. You will use up a lot of time attempting to configure it, only to learn it's going to take someone with more experience than you have.

Cisco 24-Port Swtich

Configuring Cisco switches, at least the one we have, is not for the amateur. If you are setting up new AoIP studios and you have Cisco switches as part of your network, put it in your budget to hire someone who is certified on that particular switch. Doing so will save you a lot of time and aggravation.

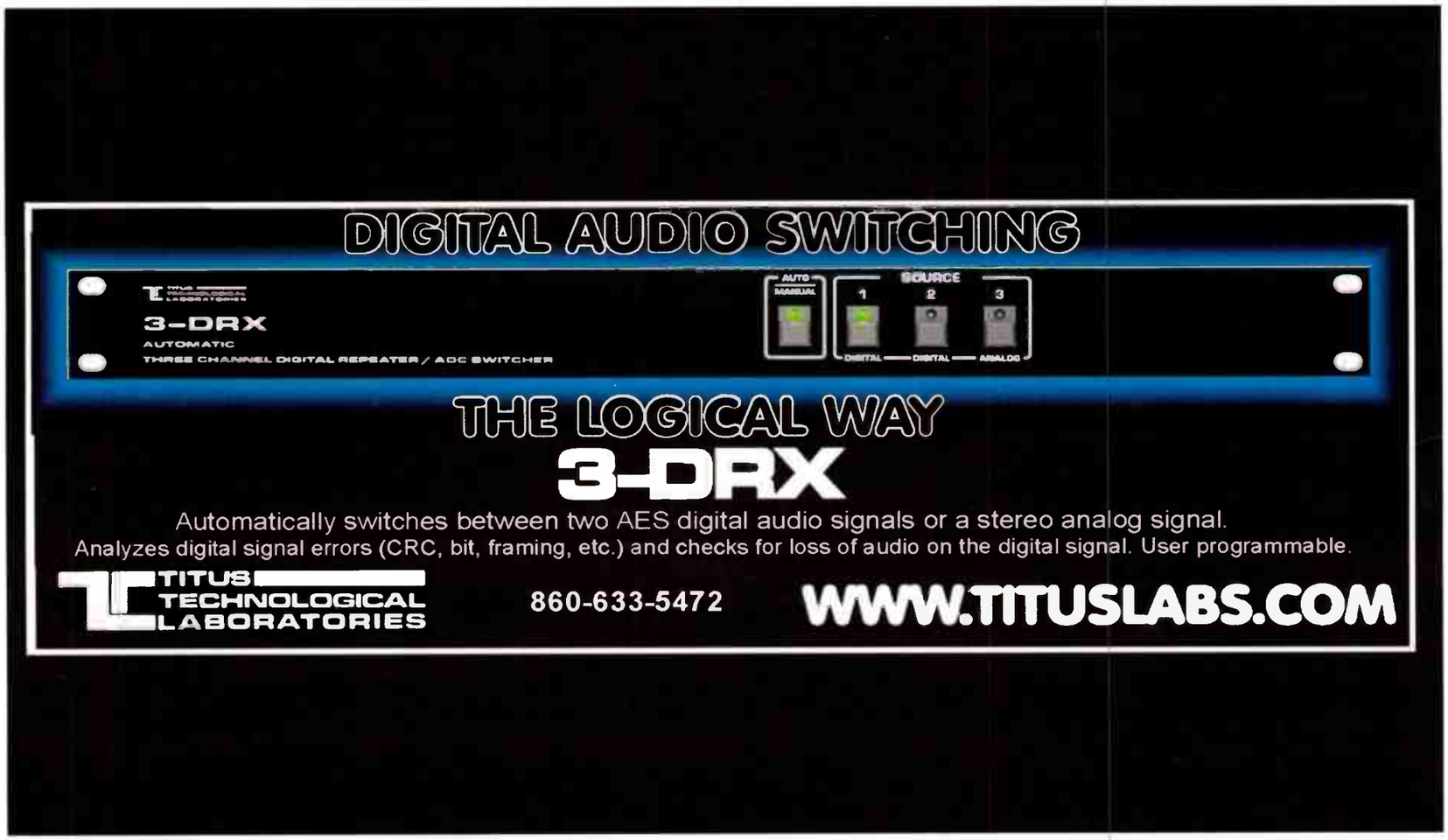
Feed Horn Fix

On at least two occasions, over the last twenty years or so, I have had to clean out the "throat" of a satellite dish's feed horn. As you may know, wasps or bees like to make use of that area to build a nest, and when they do, you will lose your satellite signal. It's amazing how much a wasp or bee's nest can attenuate your receive signal to the point where it is useless.

A few months ago, at the station where I am the general manager and chief engineer, one of my staff informed me that one of our satellite dishes was not receiving its signal. When I went out there, I found a nest in the throat of the feed horn. After cleaning the nest out of the feed horn, I looked around for something to allow the signal in and keep the bees out.

What I found and used was a plastic cap from an aerosol can of glue. The can was nearly empty, so I took the red cap and inserted it in the feed horn (see picture). It fit very nicely and I didn't have to use adhesive or tape of any

(Continued on Page 36)



World Radio History

World Radio History

Shop Talk

Misc. Tech-Tips and Thoughts

– Continued from Page 34 –

kind to keep it there. Every now and then I go out and check on it, and it is still there. A few minutes of work is going to save time later. When cleaning out the feed horn, be sure to bring wasp spray.

SSD

Solid State Drives, also known as SSDs, are a great improvement over the SATA drives. SATA drives were great in their day, but SSDs have boosted computer performance greatly. A computer with an SSD is much faster than an old computer with a SATA drive. In fact, SATA drives are quickly fading into the sunset, and SSDs are becoming more commonplace.

One fellow engineer expressed his concern over the longevity of a solid state drive.

I recently discovered an application that is supposed to enable you to check just how much life your SSD has left. If you are interested and have the time, visit this website: **https://crystalmark.info/en/software/crystaldiskinfo/**

Potential Privacy Problem

This portion of my column does not deal with technical issues, but it is an area that all engineers are concerned about: privacy. There is something going on in our government that would require banks to reveal your every financial move to Uncle Sam. Please don't misunderstand; this has nothing to do with partisan politics and everything to do with your right to privacy. If you don't want our government watching your every financial move, then check out this information I learned about from a bank in the Midwest: **https://icba.quorum.us/campaign/IRSprivacy/**

Mentors Wanted

If you have read my column before, you know that I am a member of the Society of Broadcast Engineers (SBE). It is a great organization, and I am proud to be a member. Wiely Boswell, who also writes for *Radio Guide* and is the Chief Engineer of Faith Broadcasting in Montgomery, Alabama, made a statement that was true 20 years ago, and it is still true today. He said, in the July-August 2021 issue: "There really are not enough broadcast engineers to go around."

The SBE is attempting to do something about the lack of enough engineers, and you can help. If you have some time to spare and care enough about the shortage of engineers in our fine country, you should volunteer to be a mentor. A mentor gives a few hours a month to help a new, or even experienced, engineer learn about engineering. While I think the need is greatest in radio broadcast engineering, I believe that television broadcasting needs engineers as well.

Each mentor, or "Elmer" as we call them in amateur radio, answers those questions a new, or experienced, engineer wants to ask someone but doesn't know who to ask. Cathy Oroz, education director with the SBE, places mentors with mentees. It's a great way to help develop a new pool of engineers. We all know the need is great, and if you can help out, please send Cathy an email at this address: **corosz@sbe.org**

Source for Engineers

I often read of people looking for an engineer for their radio station or group. Whenever I see these posts, I suggest that person contact the SBE. This organization helps companies looking for help by listing their openings on the website, and also has a place where engineers looking for work can post a resume. Whether you are looking to hire, or you are seeking employment, start with the SBE. If there are no candidates, or no jobs that meet your needs, you can always ask the staff at the main office in Indianapolis, Indiana, how to contact a chapter near you. That local chapter may be able to help you find an engineer in your area that may be just the person you are looking for, or a job for an engineer seeking work.

Looking for Input

Are you an engineer who has learned something new? Maybe you discovered a cool app that you love having on your smartphone. Or perhaps you found some software that is very helpful. Whatever gem you may have discovered, I would love hearing from you. Feel free to contact me at stuzeneu@sbe.org; your useful information will be appreciated by my readers and me.

Thanks for reading my column. I hope you found something interesting or useful.

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.

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Small Market Guide

The Small Market Landscape After Covid

by Roger Paskvan

The business world has changed and maybe not for the better. Covid leaves no one behind and small market stations have felt this mighty blow.

Have you tried to hire anyone lately? It's like the work force disappeared and doesn't want to come to work. Our station has had a sales opening for two and one half months, and not one applicant has surfaced. We are desperately running ads once an hour all day and even stooping to help wanted ads in the local paper. We posted ads on our web site and with Indeed. It's like no one wants a job. We pay well, with medical and 401K, but no one seems to care. The job just sits there – vacant.

For a while we could blame the current Washington administration for the $300 weekly bonus to the unemployed. Now, that is over and still no one wants to work. Are there too many social programs willing to give free handouts to those who choose to sit home every day and wait for a check? I wish we knew the answer because then we could work on a solution to this problem. This employment thing isn't just small market; it is everywhere including the big cities. If you walk down the street in any major town, large or small, every other store has "help wanted" on the door.

Now let's look at wages. Yes, the current administration has made an effort to hike up wages to a minimum of $15 per hour. Radio, especially in small markets, can't afford to pay a green new DJ $15 per hour and survive. $15 wages have also pushed the restaurant prices through the roof.

The same 17 year olds flipping hamburgers at McDonalds have just moved the cost of Big Macs to $10. So where is this all going? Up ... up ... and away!

In small market, these businesses are especially hit hard since the work pool and the number of customers is limited. Small market radio stations have to make it on a very tight budget and that margin is forever getting thinner. Yesterday, I talked with a restaurant owner/client about his limited hours. They are not happy to have to close in the middle of the day, but there is no help available. He also alluded to the fact that, at 55 years old, he has been putting in 13 hour days for the past three weeks. He said, "I can't keep this up forever. I can't find any help and I'm paying $17 per hour." Of course, this thing translates into no money for ad purchases. This means no income for small market radio stations that are forced to stay on the air, eighteen hours a day by FCC rule. Yes, even if we wanted to, we don't have the privilege of shutting off in the middle of the day or at 6:00 p.m. and going home. Wouldn't that be nice, especially in January?

The so called second wave of the pandemic, if real, is not helping things return to some sense of normality. Scars of vaccine mandates, mask requirements, and just general hysteria, is not doing the radio marketplace any good. The constant political proposals coming out of Washington such as raising the corporate tax rate on businesses during a pandemic can only make things worse. No one needs more expenses when they can't find any help. This just makes it harder for small market businesses to recover. Indirectly, it affects our small market radio station's bottom line and that hurts all of us.

I wish I could offer permanent solutions but the problem is much bigger than small market. There are some that say, there may be an effort to extend this marketplace condition for political reasons but that's a whole new topic for another day.

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

New Stereo FM Transmitters

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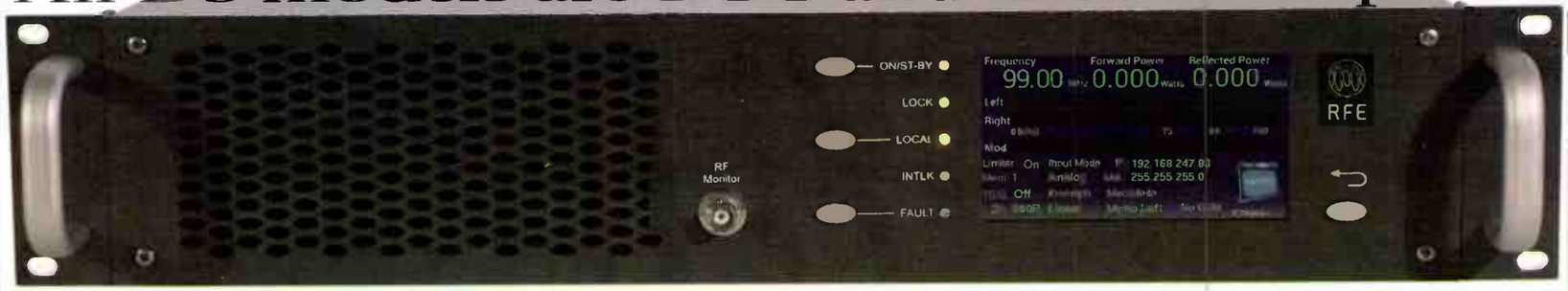

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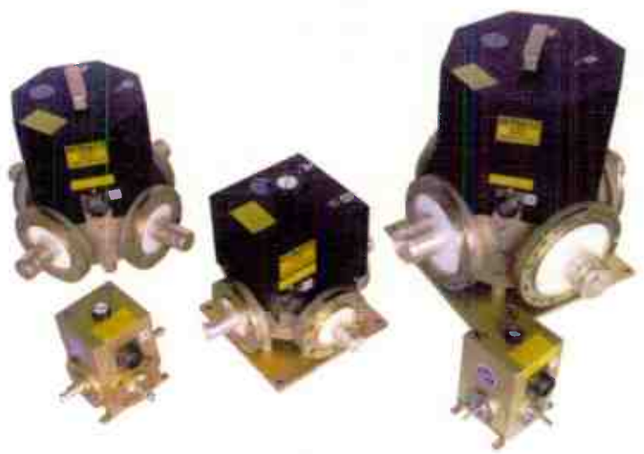

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Combiners in Solid-state Transmitters

Part 2: High Power Combiners

by John L. Marcon, CBRE CBTE 8VSB Specialist

In Part 1 of Combiners (*Radio-Guide*, March-April 2021), I talked about the three most common types of combiners used in Solid-state AM transmitters. In this issue, I will discuss about two combiners, or couplers, that are not as widely used in AM but are used in high power FM transmitters. Combining two signals is not as straightforward as it seems. For example, we may connect two transmitters in series or parallel to get a higher power output. However, doing so may result in fireworks or the transmitters may simply shutdown. There is no isolation in simply connecting amplifiers in series or parallel. Instead of going into the load, the output currents can circulate between the amplifiers. Impedance mismatches between the units can also cause problems.

The Hybrid Combiner

One type that is often used in high power application is the Hybrid Coupler. This is not only used in FM but also in higher frequencies. In fact, in Television transmitters, we mostly find either Wilkinson or hybrid combiners. When we read "hybrid," we often think about two different things fused or joined together. The first thing in my mind when I hear that word is a hybrid car, where there are two sources of drive train – one is the internal combustion engine and the other one is the electric motor. Incidentally, in my readings, I did not find the reason why this is called a "hybrid." However, we will see later a few possible reasons why it was named as such.

There are a number of coupler/splitter that are hybrids and are called different names. There is the *branch line combiner, rat race, Gysel, etc.* The one we are interested in is the 3 dB coupler, also called the 90-degree, or Quadrature hybrid (**Figure 1**). This hybrid combiner is a four-port device. As a combiner or coupler, two of the ports are the inputs, the third port is the output and the fourth is the isolated or ISO port.

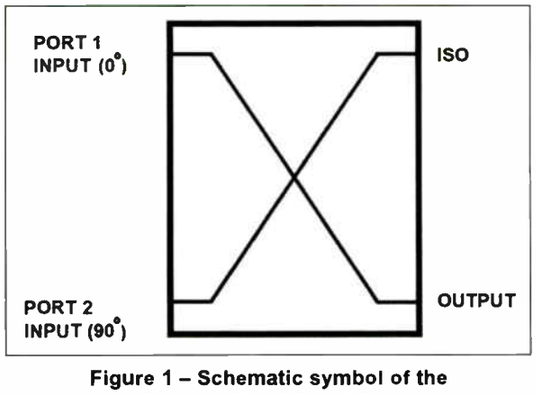


Figure 1 – Schematic symbol of the 90-degree hybrid combiner.

How does it work? When used to combine two identical amplifiers, the output will be the sum of the two inputs and there will be zero power in the ISO port. A load or resistor is connected to the ISO port and this load is called the reject load or the waster resistor. Since the output is the sum, any of the inputs is half (-3 dB) the power of the output. That is why it is called the 3-dB combiner. One important thing to remember is that the two inputs should be out of phase by 90°. When any one of the inputs goes to zero, then the power from the other input is divided between the reject load and the output. In other words, if you lose one of the amplifiers, the power goes down to a quarter of the full power output.

The load also starts to get hot because of the power dissipation. The load is therefore rated a least above half of one amplifier (usually it is rated much higher). A fan blower is needed for the reject load if the other amplifier is not restored or if there is an imbalance in the amplifiers.

Now, I think it is named "hybrid" because the two output ports are kind of "hybrid" in a sense that in normal conditions, only one has power but once there is imbalance in the inputs, both of them have some power. You may also say that it is called "hybrid" because the inputs are of different phase.

In low-level signal FM amplifiers, they often used Wilkinson combiners but in high power combining, they use this hybrid combiner. One application of this device is in co-located FM stations with a single broadband antenna. The combiner system in this configuration also has a system of cavity filters before being connected to the transmission line and antenna. The filters are used to isolate the signals of the two transmitters from each other.

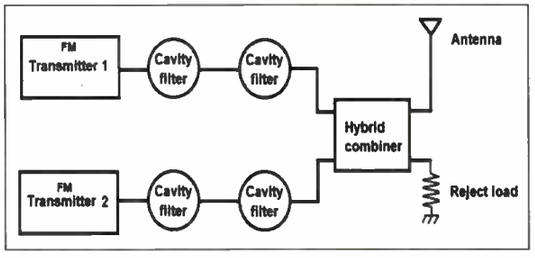
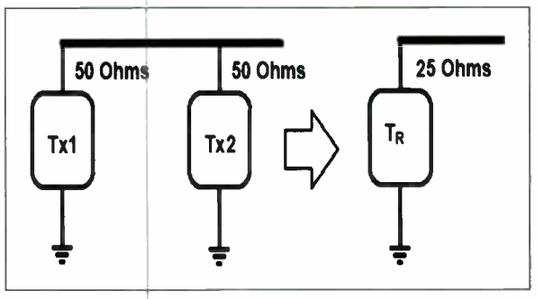


Figure 2 – Simplified diagram of a two-station to one antenna combiner system. Multiple hybrid combiners and filters are used for more than two stations.

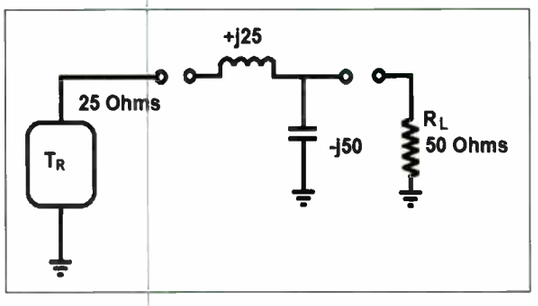
One other example of using this coupler is in the high level combining of an analog and digital FM transmitter. The analog signal is usually a high-power output transmitter while the digital signal is only in the hundreds of Watts level. Because these two signals are not identical, there will be power in the reject load. This wasted power is usually included in the computation of the total power output of both the analog and digital transmitters.

The "Egyptian Tee" Combiner

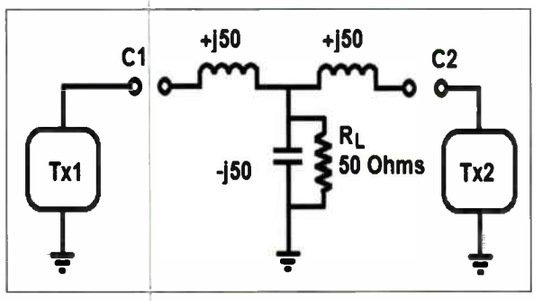
This combiner is also for two transmitters or amplifiers of the same power, impedance and phase. Take, for example, two transmitters, each with a 50-Ohm output impedance. If we connect them in parallel, then the resultant output impedance will be 25 Ohms.



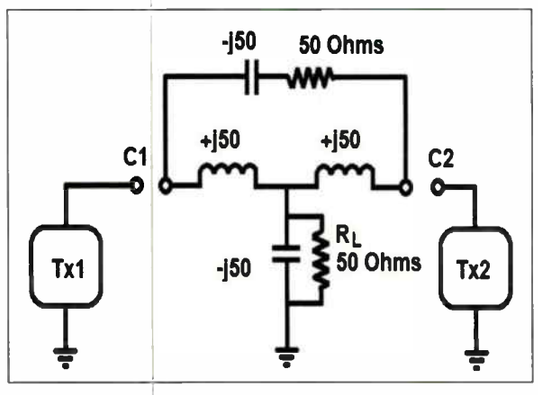
To match this 25-Ohm impedance to a 50-Ohm load, we can use an L-type matching network:



Going back again to the two transmitters, we can split the +j25 inductance for each of them and because they are in parallel, each transmitter will have a +j50 series inductance:



Also, the voltages at C1 and C2 are of equal magnitude and we can actually connect a series resistor and capacitor between these junctions without affecting the circuit. In our example, a -j50 capacitor and the 50-Ohm resistor are used:



If Tx2 is out (open circuit), then the +j50 inductor on the right side of the "Tee" will be in series with the upper 50-Ohm resistor and the -j50 capacitor. The +j50 coil and the -j50 capacitor effectively cancel each other.

– Continued on Page 42 –

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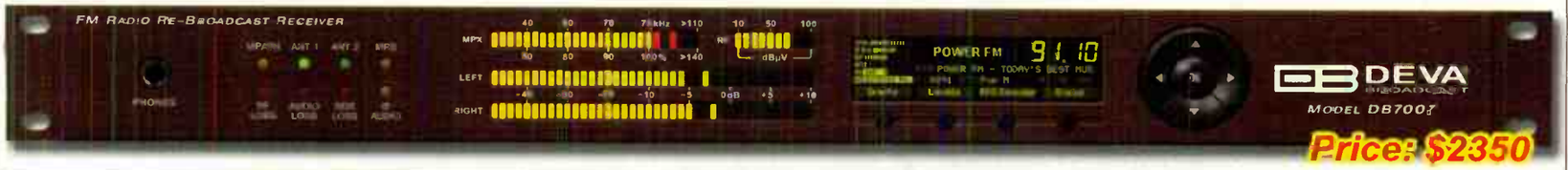

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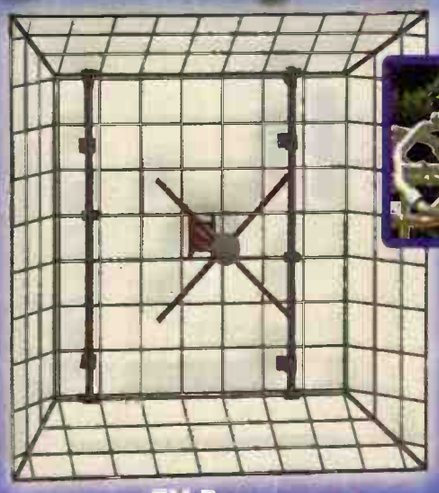

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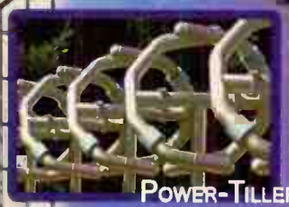

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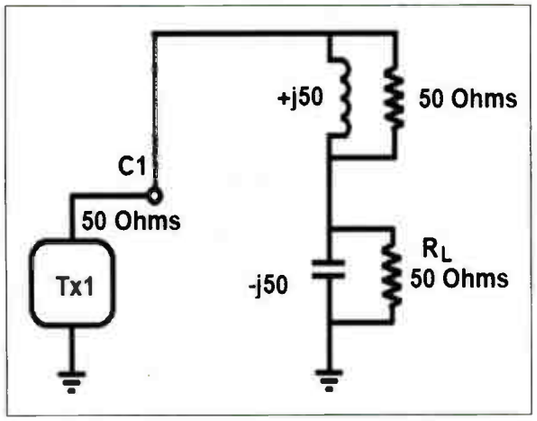
– Continued from Page 40 –

The circuit then becomes:



To get the result for the upper parallel circuit, we multiply j50 (50) / (50 +j50) by (50-j50) / (50-j50). The result is 50^3(j+1))/[2*(50^2)] = 25 +j25. On the other hand, the bottom parallel circuit of RL and capacitor -j50 are equal to 25-j25. The resultant impedance is 25+j25+ (25-j25) or = 50 Ohms. This total impedance matches the impedance of the Tx1. If Tx2 is shorted, Tx1 will still match the load. If Tx1 is open or shorted, Tx2 will also match the load because the circuits are identical. Notice that the power in the load RL (representing the antenna) is only half of the power from Tx1 because of the other 50-Ohm resistor. This means that with this combiner, once one of the transmitters is out, the output power to the load is only a quarter of the full power. This result is the same as that of the hybrid or even the Wilkinson combiner.

The Hybrid and the Egyptian Tee combiners are just a few of the many types of combining used in transmitters and amplifiers. It is up to the design engineer to figure out which one will work best with their product.

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Krytar hybrid couplers primer. https://krytar.com/resources-3/applications/primers/hybrid-coupler-primer/

Mullaney J.H., Gureckis P.V., Colligan, F.S. How to combine Transmitter outputs in phase by use of the "Egyptian tee" Combining Network. Multronics Inc.

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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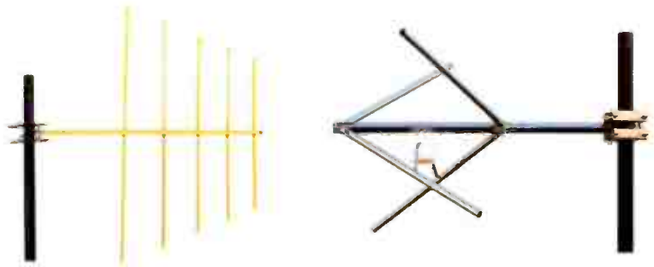
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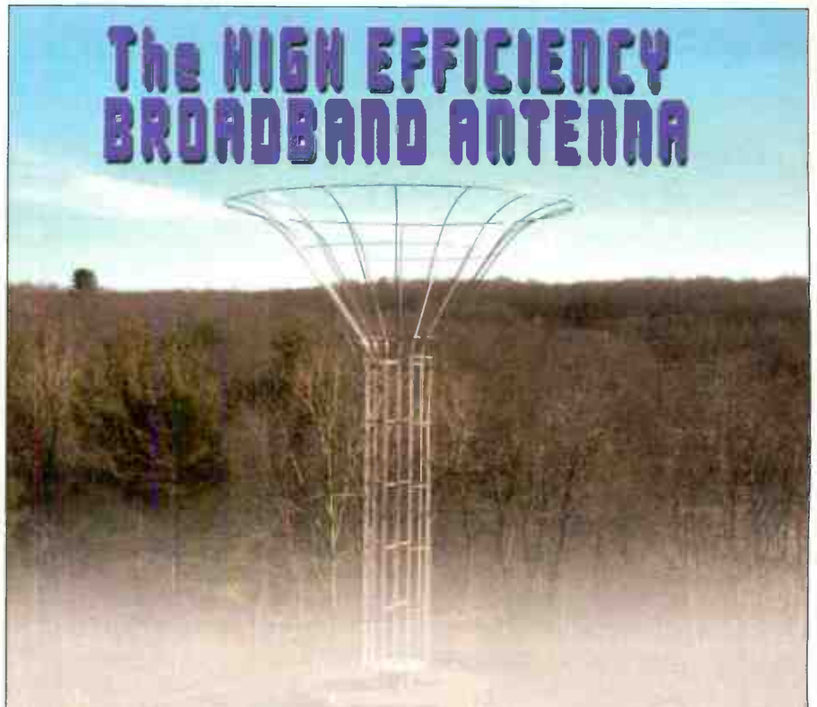

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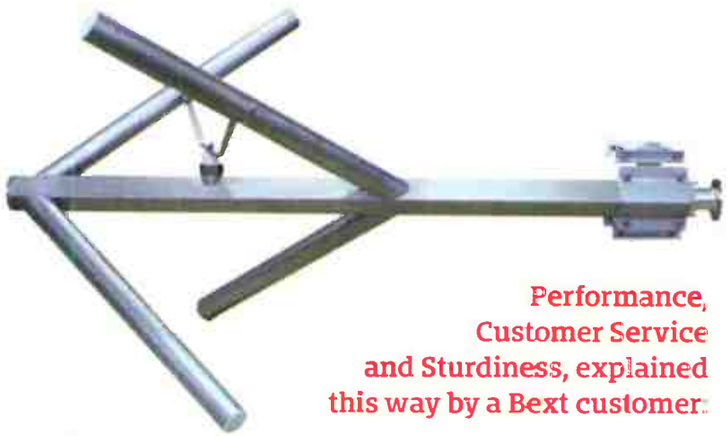

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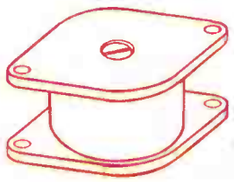

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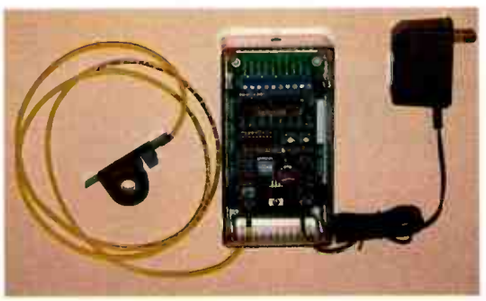

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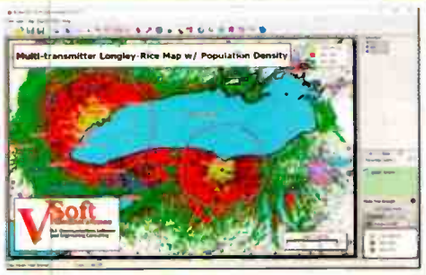

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by Ron Erickson

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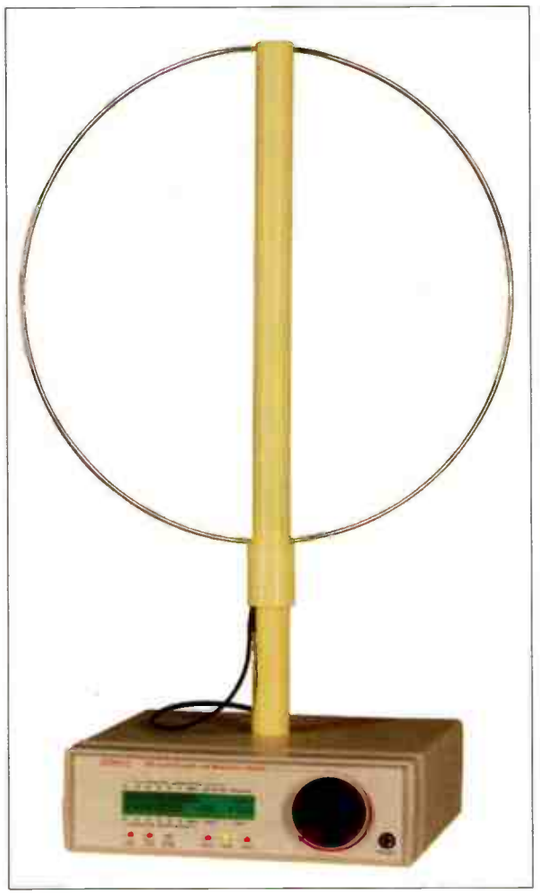

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Originally designed for the Part 15 Hobby Broadcaster, the units were so good that I arranged for two full power stations to purchase them and they are still on the air. As good as it is, the SW200 is now sold out.

The 2021 production run of SW200s has sold out. They normally make only one run a year, but because the last run sold out so fast, they are planning a second one. Look for availability in November, 2021. Jim went on to say that the SW300 is not a DX receiver, but rather needs a good solid AM signal to give accurate measurements.

The sales price-point is not yet set, but if you're interested in owning one, email me and I'll collect a list of interested parties.

Ron Erickson may be reached at ronerickson@gmx.com

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www.nabshow.com

2021 NAB Radio Show - *CANCELLED*
October 13-14, 2021
Las Vegas, Nevada
www.radioshowweb.com

Georgia Association of Broadcasters
October 22-23, 2021
Grand Hyatt Buckhead, Atlanta, GA
https://gabcom.gab.org

Midwest Broadcast & MultimediaTechnology Conf.
November 17, 2021
Columbus Convention Center – Columbus, Ohio
http://www.mbmtc.oab.org

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

Radio Guide Advertiser Info – September-October 2021

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Angry Audio - 48	www.angryaudio.com	Nautel - 5	www.nautel.com
Arrakis - 15	www.arrakis-systems.com	Nicom - 42	www.nicomusa.com
Bay Country - 44	www.baycountry.com	Owl Engineering - 47	www.owleng.com
Besco - 44	www.besco-int.com	Phasetek - 47	www.phasetekinc.com
BEXT - 43	www.bext.com	Progressive Concepts - 38	www.progressive-concepts.com
Broadcast Bionics - 27	www.bionics.co.uk	PTEK - 24	www.ptekpower.com
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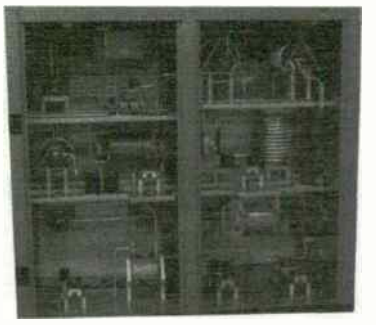

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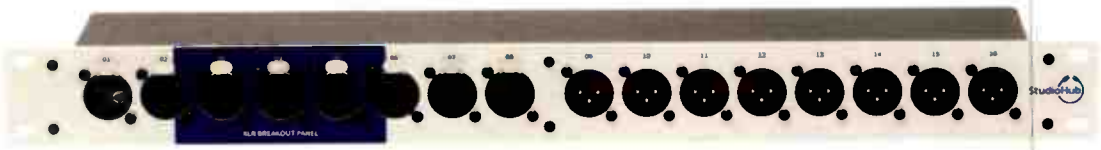
Break Out



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