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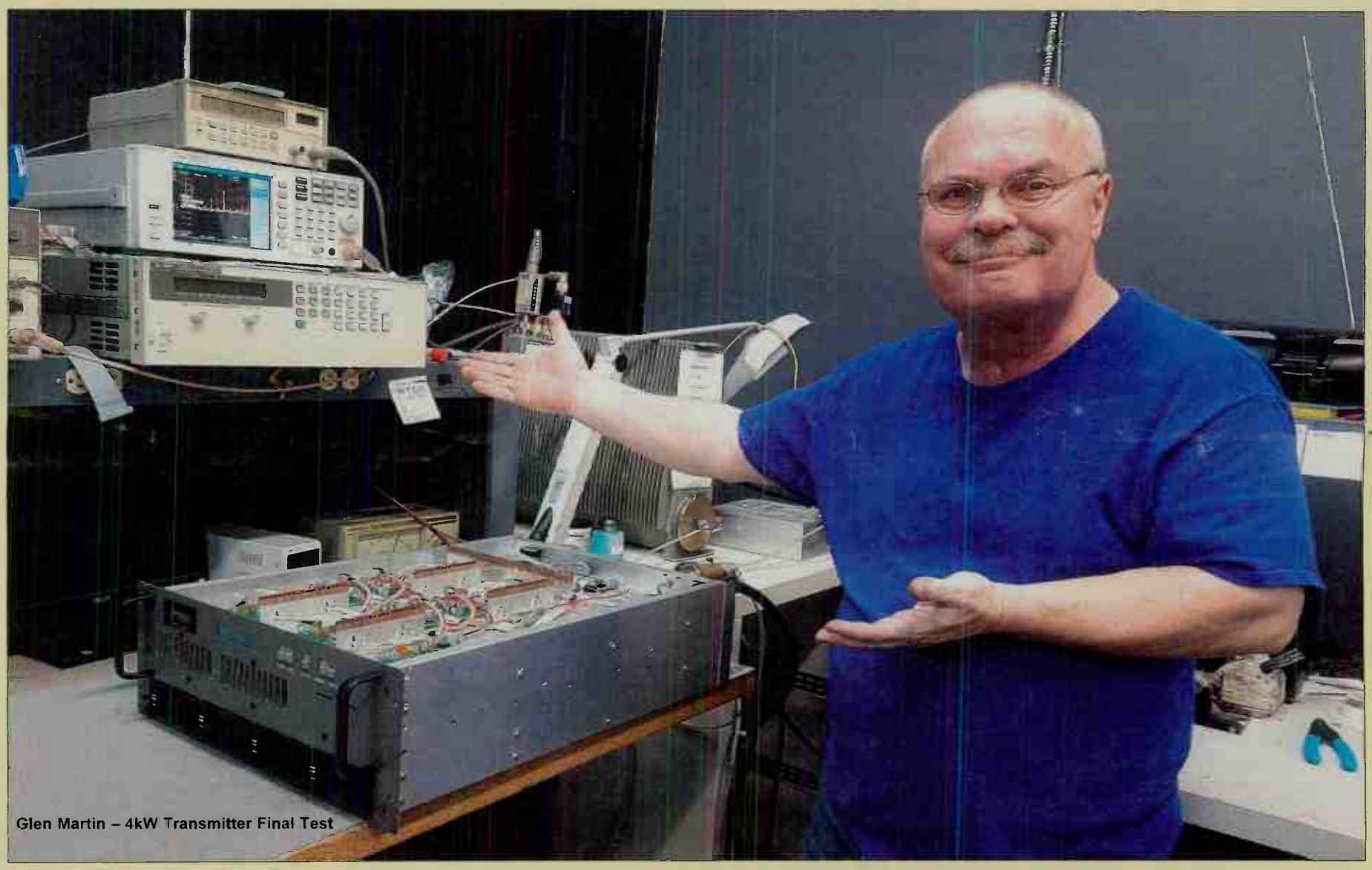
July-August 2020 – Vol. 28, No. 4

PTEK Turns a Page



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In This Issue

Critical Content for Radio

Cover Story – *by Kyle Magrill (page 6)*

PTEK Turns a Page: *"Those of you that have dealt with PTEK, while Glen has been there, can attest to the fact that customer service is now handled in a courteous and helpful manner. Glen's attitude and skills are aligned perfectly with CircuitWerkes core values. Those of you that have dealt with us at CircuitWerkes over the last 30+ years know that we also try to always be helpful. Glen's role will remain the same, now that he and his team are part of CircuitWerkes."*

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

Strike Three... or It's the Little Things: *"The HT-10 ran fine ... until July 5th (another Sunday), when it called mid afternoon. This time I was working alone because both Keith and Heath were out of town for the 4th of July weekend. I checked the readings and found plate voltage running a little high – because there was no plate current (hence – no RF output). I packed up and headed out. When I got to the site, the first thing I checked was that IPA fuse."*

FCC Focus – *by Gregg Skall (page 12)*

Doing More With Less Staff: *"In the new era of staff reductions, doing more with less, and the potential of increased local programming should some amount of translator program origination be allowed, many a broadcaster is asking, how can I get a bit more from my staff and comply with legal requirements for overtime. Since the 2016 Department of Labor overtime order, broadcasters have been both focused and sometimes perplexed over how the overtime rules apply to some of their unique situations. One in particular concerns the regular employee who takes on the additional role of play-by-play announcer for local school sporting events."*

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Cover Story

PTEK Turns a Page

by Kyle Magrill - PTEK & CircuitWerkes

A lot of people have used PTEK transmitters over the years. Many of those users are loyal and happy customers, while some others have had bad experiences in the past that may have turned them off. I had heard of PTEK transmitters, but had never used one or serviced for one before.

While showing products at the NAB show in 2017, I ran across Larry Longhurst, the then-owner of PTEK. As some of you will know, CircuitWerkes makes a lot of Web-enabled remote control products. We were interested in supplying Webservers to add Web-based remote controls to the PTEK line of products. That was the first time that I looked into how the products were made. I spoke to Glen Martin, PTEK's new technical man and was impressed in what he showed me. The product, though not perfect, was made with high quality parts that were, generally, overrated for the job that they were doing.

Larry had spent the last few years improving the transmitters by beefing up the RF sections and making small, but valuable, changes to harden the products. Changes like increasing airflow in certain areas that were known to overheat had already reduced problems. Glen and Larry said that the reliability of the products had improved very dramatically and they were still looking at more changes to make the transmitters more robust. Larry had also moved PTEK from its original Santa Clara, CA home to Spokane. In doing so, he had let go of the staff in CA and hired Glen from the local broadcast engineering pool. Customers noted an immediate improvement in customer service and support with the addition of Glen to the staff.

PTEK Staff L-R: Kerry Lockhart and Glen & Susan Martin

By late in 2017, we had PTEK Webserver prototypes that we began testing. By NAB 2018, PTEK showed the new Webservers at the show. It was there that Larry first mentioned that he might want to get out of the manufacturing business. He wondered if CircuitWerkes might be interested in buying him out. After considering the idea, I initially rejected it for many reasons. However, in working with Glen over the course of the next year, it became apparent that PTEK had a lot of untapped potential.

The main PTEK design was last updated in 2013. Fortunately, the updates involved some very sophisticated emerging technology, such as direct digital synthesis exciters (replacing varactor diode oscillators) for better sound and sonic consistency, and LDMOS amplifiers for greater efficiency and performance. As a result, PTEK's RF design is at the top of its game – even today.

One of the first new additions to the PTEK line are two custom designed Webservers. In the ES series, we've designed a low cost Webserver option that can be ordered installed in the transmitters. A version for a high powered Gamma series of transmitters is also in the works. These internal Webservers can be retrofit into existing transmitters and they will be optional equipment for any customer buying a new transmitter. Those that don't want a built-in webserver can save the cost by leaving it off of the order. Additionally, we have designed an external Webserver that can be economically added to any of the existing transmitters made since 2012. The external webserver also breaks out the analog sample outputs and control inputs found on the transmitter's D-25 connector to screw terminals for easier interfacing.

We've also added a couple of relays for external equipment control as well as a couple of status inputs. Like its close cousins at CircuitWerkes, the PTEK Webservers can keep logs, email or text alarms and have an event scheduler. An audio streaming option is also planned for the external PTEK Webserver. We plan to continue adding features and upgrades to the transmitter line that will be ala carte options for both new and older transmitters.

PTEK Webserver, Main Final

PTEK has a pretty large customer base and we've seen a number of cautionary tales about bad customer service and unreliable transmitters. Although we can't do much about customer service issues that happened years ago, one thing that the former owner did was to hire Glen to handle the engineering and customer service duties. So, for the past five years, Glen's been hard at work building transmitters and fixing problems with older ones, including those from many years ago. Those of you that have dealt with PTEK, while Glen has been there, can attest to the fact that customer service is now handled in a courteous and helpful manner. Glen's attitude and skills are aligned perfectly with CircuitWerkes core values. Those of you that have dealt with us at CircuitWerkes over the last 30+ years know that we also try to always be helpful. Glen's role will remain the same, now that he and his team are part of CircuitWerkes.

Glen has seen a lot of older, oddball, transmitter configurations bearing the name PTEK over his past five years. A lot of "experiments" seem to have been sold in the years prior to Larry acquiring the company in 2014. Some of these experiments may have worked well and are still in service, but others appear to have never quite worked as intended. One of the things that Larry did was to reduce the number of available transmitter types to a handful that could be properly managed and maintained. Designs that had proved prone to problems were dropped from the line. Only the most robust of the designs were kept in the product line. This has greatly reduced the failure rate of transmitters and made it possible to more easily service whatever problems do arise.

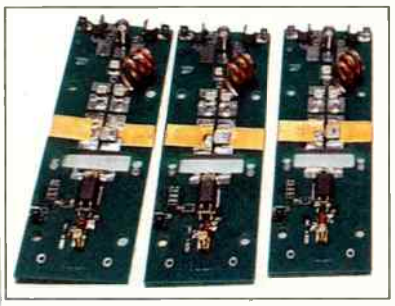
Assembling and Cleaning a 4kW Heat Sink

Additionally, PTEK has a policy of overbuilding the RF sections of the transmitters. It's common to find the final amp of a 500W transmitter is rated at more than 1000W. Because PTEK builds units to a higher level in your transmitter up front, we're making an investment that will help your unit continue to operate much longer.

A few folks have commented on the large and loud fans in some of the transmitters. You may also notice that the products are not quite as compact as they could be. This is intentional because heat is the enemy of electronics. By using bigger fans and adding space, we can reduce the heat load on the parts, thus extending their lives and that of the transmitter. An added bonus is that the larger space makes servicing a little easier.

Susan Martin Testing Button Boards

PTEK competes with other low cost transmitters, primarily from Italy, Spain and England. Many of these products are very good. PTEK's main advantage over our European competitors is that we are the only low cost transmitter designed and assembled – and serviced *entirely* in the USA. When you need help, you call us and we speak English. When you need a part, it's here and available for overnight delivery.



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Kyle is a former broadcast group engineer. He co-founded CircuitWerkes in 1989 after way too many frequent flyer miles.

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Studio Site

Staying "Connected" When We Can't Be

Will the Covid pandemic change radio forever?

by George Zahn

Well, last issue's discussion of creative ways around the Covid pandemic was never intended to be the first of a series, but it seems that the virus has other ideas. As stations have scampered to preserve live broadcasting, even with talent at a distance, we're now hearing in the industry that remote hosts and guests may be the "new normal" even after Covid might become an afterthought.

Granted, there's nothing quite like having face-to-face communication with facial and visual cues, but more broadcasters are having to lean on telephone, platforms such as Google Meet and ZOOM, or codecs to utilize standard phone lines and the Internet to create critical connections every day.

All Things Being EQ

Over my many years, I remember the dedicated equalized phone line you'd order from the local telco and they would create a circuit from a remote location to your station (or vice versa). My first commercial gig at WCKY in Cincinnati included running board for Will "With a Way" Warren who did his nightly show from his home. The lines came with 5 kHz or 8 kHz for talk and sports broadcasts or 15 kHz for music. You'd, of course, need two conditioned lines (same route from point A to point B) for stereo to keep them in phase. So much for nostalgia.

I promised an update on one of the topics last issue, and that was a roughly two hour Zoom chat with about eleven people for our station's annual consumer forum. One agency refused to participate because it was considered "social media." Another didn't like Zoom's supposed lack of security. As it was, we had seven agencies, two co-hosts and it worked remarkably well. One agency participated but, because of its government status, they could not allow the webcam to be used, which was OK in this case as we were not using video.

The biggest problem with Zoom or other group on-line meetings is that every person has differing streaming quality. That's compounded ten fold when everyone is connecting from home instead of an office environment where Internet at least should be more dependable. We were recording for later broadcast, so I had a chance to edit the latency laps between questions and, with the exception of about six instances of asking a speaker to repeat a line for the final edit (a luxury not available when you're live), it worked pretty well.

Invariably the issues with audio breakup or "stuttering," – that annoying repetition of a vowel in mid-word – happened most on those who seemed to have the shakiest connection and/or oldest computers. I did find that cleanup editing on the stuttering sound was fairly easy, and pretty visible in the frequency display on Adobe Audition, for those who really want to fine edit an interview.

I did appreciate the fact that when I set up the Zoom meeting, I set Zoom to automatically record all audio and video to my computer. It saves an m4a file which was easily converted for my version of Audition. The overall experience was pretty good.

The Wrong Mic "Drop"

The second biggest problem (and this goes for anyone using a laptop, tablet, or computer with a basic built-in microphone) is the quality of the audio. I had participated in numerous Zoom events prior to this, but had never listened to what my built-in mic sounded like. No one I ever Zoomed with ever commented about the mic quality, and I'm embarrassed to say that I went ahead and co-MCed the entire thing not thinking at all about how I sounded.

I have a decent brand name laptop and when I went back to listen to the audio file, I was appalled at my overall mic quality on the forum. I tried equalizing my segments after the fact, but never ended up with something I liked. It was really a combination of me being in a conference room and the distance from the microphone on the laptop. After that I purchased a fairly decent USB unidirectional microphone that has helped my audio quality. There are many USB microphones on the market from expensive models by Yeti, Razer, Samson, Audio Technica, Shure and others.

The distance from the mic made me realize I did not want something that clipped on or above my screen. I wanted a fairly nice mic with a stand that I could move closer. I like the dual capability of the Audio Technica ATR 2100X-USB which has USB C connection and can also be used with an XLR cable. It's a basic cardioid dynamic microphone, and I picked it after checking comparisons on line. One vlogger actually edited together short tests of about fifteen USB mics on YouTube and it helped me eliminate some of the cheaper models. Overall models ran from under $50 to over $200, and none, in my opinion, are going to surpass the best of studio microphones which cost much more, in many cases.

My choice was what I felt was the best compromise of cost and quality for something I would use occasionally for chats and interviews. If I were more serious, I could have spent more on the mic or chosen to buy a nice mixer or USB interface with a nice quiet pre-amp XLR input and use my standard Sennheiser MD421. Mixers and pre-amps will range from a small Behringer USB mixer (the pre-amps are pretty quiet) for just over $100 to anywhere from $300 to $600 for the likes of Tascam, Zoom (the audio brand), or M-Audio USB interface boxes that can handle multiple microphones.

The Pitfalls of POTS

Let's look at other ways to create audio connections that sound better than Zoom. Some stations with POTS (Plain Old Telephone Service) copper non-digital lines may still be using variation of the POTS Codec even now. The Codec, short for Encode-Decode, is basically two devices, one which encodes audio from a remote location by compressing frequencies to squeeze them through the limited quality of the copper landline. The second is a decoder back at the studio. It restores the frequencies after they pass through the phone line. The goal is a less telephonic sound and higher fidelity.

POTS Codecs are more rare today simply because they do not "play well" with digital phone services and Voice Over Internet Protocol (VoIP) systems which are using their own encoding and decoding, creating a garbled mess when they try to interact. Two Digital Signal Processors working at once can create audio havoc.

More common devices today, which work best with a dedicated Internet connection, are IP Codecs which allow for basically studio quality stereo audio with virtually no latency. Many stations are using devices such as the Tieline Bridg-IT Pro for their Studio to Transmitter Links. We actually use one for a station that simulcasts our signal and there's no perceivable delay switching between stations. The Tieline Bridg-IT has analog and digital inputs and outputs. Internet Protocol codecs such as the Bridg-IT or the Comrex BRIC-Link II duplex unit, for example, with one box at each end of the connection, cost from $1500 to $2000 per box.

For those on more of a budget, doing standard phone line broadcasting with guests or hosts (or both at the same time) beats running repeats in many cases. For timings and cues for breaks, we've even used something as simple as Facebook messenger to let hosts know how much time is left in a show, when to take a break, or a caller's name and topic.

Get Onto My Cloud

If you're not worried about live contact and your hosts can create shows on their own, with station-provided equipment, and it's simply a matter of them getting the audio file from their location to the station, there are tremendously expeditious ways to do this. For short form material, many will simply e-mail an attachment.

For longer form or higher quality audio files, there are more free options. Dropbox has become a favorite. You simply share access to a file on the cloud with the appropriate people and you can upload and download files at will. There are space limitations to the free service, but a little cleanup and deleting old files makes this a nice choice. A decent mp3 at 44.1 kHz sampling rate and 256 mps will generally yield excellent fidelity to the original audio.

In addition to Dropbox, our station also uses Hightail.com to send files. In effect, you upload a file to the cloud and it sits there for a week. When you upload, the recipient gets an invitation to listen to it or download it. There's no bulky attachments, and if I'm sending an audio file of an interview that I know a client or guest will be posting on the Internet, I often save them the hassle of down-converting the mp3 and send them a version that's usually mono for voice only and much more compressed 16 kHz and 32 bps to make the file smaller for them.

One dilemma with Hightail is that if the recipient doesn't check their e-mail or dilly dallies for more than seven days, you may have to put the file back up on Hightail. It all only takes a few minutes anyway, but you have some straggler re-sends on Hightail.

I'd love to know how your station is creatively using technology to keep your sound vibrant and relevant. Have you tried variations on any of these or other ideas. Please share your thoughts and we can learn together!

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

Strike Three ... or, It's the Little Things

by Scott Schmeling

First, I was *amazed* at the number of you who responded to my *We've Come A Long Way, Baby* article in the last issue of Radio Guide! It seems many of you started very much the same way I did – way back when.

Fellow Minnesotan, Maynard Meyer said ...

Hi Scott:

Thanks for the memories in your article. We were on pretty similar paths. I started back in 1968 at KBMO-AM in Benson. First full time job was at KMRS-AM in Morris in 1974 with a Gatesway board, matching turntables, PT6s and a BC-1J. Here we both are, over 50 years later still ticking along! LOL. I got my First Class ticket through home study courses. I failed it a couple of times but eventually nailed it. I'm trying to stay on top of the new technology but it gets tougher with age – but if you're not willing to learn new things there's not much point in staying in the business.

How true, Maynard. It seems sometimes that nothing happens faster than change.

And this from Louis Brown in Texas ...

Hello Scott:

I'm writing to let you know how much I enjoyed your "walk down memory lane" piece in the current issue of Radio Guide.

You and I had very similar starts to our careers in broadcast engineering. I began in 1963 at AM daytimer WNOS in Winston-Salem, NC. We, too, had a Gatesway console, Gates transmitter, three turntables and no cart machines. I worked mainly on weekends. Live music on Saturdays and preachers on Sundays. Most commercials read live. Filled out the "as run" log on a typewriter as we went. I always had a soft spot for transmitters with 833s. They seemed to last forever – at least much longer than the 4-400s did in later 1000 Watt transmitters I worked on.

I had quite a checkered career after the early days. I got my BSEE in 1976 and my P.E. in 1984. I spent time with ABC and Radio Free Europe among others. Now I'm thoroughly retired and have time to fool around with vacuum tube amplifiers again.

Thanks again for the excellent article and for letting me reminisce a bit.

Keep safe.

Thank you, Louis. Congratulations on getting your BSEE and P.E. And I can only imagine the great stories you can tell from your time at ABC and Radio Free Europe!

From Bob Mayben:

I really enjoyed your writing in the current edition of Radio Guide. It reminds me of my start in 1963. And yes we have come a long way.

After getting into the selling equipment side of the biz in 1999, there is no way I would go back.

If it is a tube transmitter problem, then I might be your man.

Thank for the memories.

But this was my favorite ... from Dude Walker:

Hi Scott! I thoroughly enjoyed your article (We've Come a Long Way Baby!) in Radio Guide. You're a little ahead of me – I started radio in Sept. 1970. I too was at a 1000/250W AM – mine in upstate Maine. I think we had the same board and transmitter too. You might find this amusing:

I was the morning man, so I was tasked with warming up the plates on the Gates transmitter, ripping off the overnight AP wire copy (which was rolled in a big pile on the floor – if the printer hadn't jammed overnight) and playing the first song of the day after reading that news copy. That's where the problem arose. The announcer who left at midnight sign-off was told to turn the thermostat down to 60° overnight. By the time I ambled in at 5:30 a.m., that's about what room temp was. The two huge Gray Research transcription turntables had to be warmed up since the lube in the gears had also reached 60 degrees, and couldn't attain anything close to correct speed. So, the usual procedure was to put them both in 78 RPM and let them run for at least 5 minutes. One day I was running late (outside air temp was probably -20) and didn't have time to do the turntable warm-up. So, after reading the first newscast, I hit the turntable where some god-awful Al Hirt song was cued up.

It...Took...For...Ever...To. Get...Up...To...45...RPM. I can still hear that awful sound!

50 years later, memories of that little station are some of my best. Thanks for bringing them back!

Regards, Dude Walker

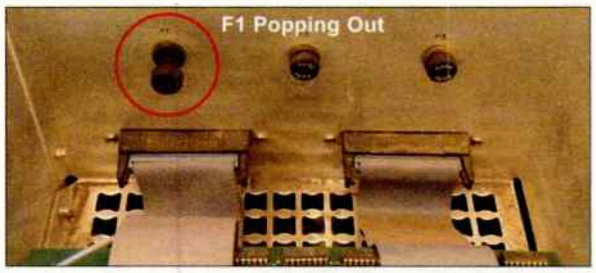
Dude! Thank *you*, Dude. I laughed *so hard* when I read about the turntable not getting up to speed! And did any of you notice how many started their careers using the Gatesway console? It must have been the defacto standard of the day. Thank you all so much for writing. Now to the business at hand.

Three Strikes or ... Sometimes It's The Little Things

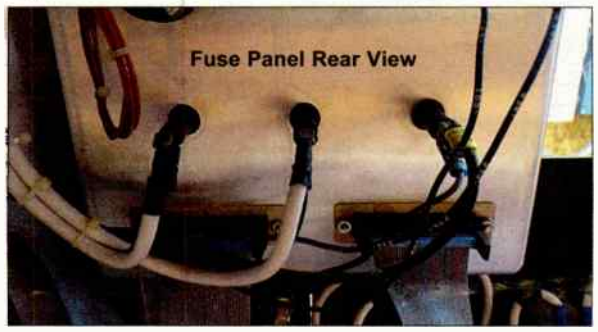
Most of my articles are regarding some "issue" I've been dealing with. In preparation for this edition's article I took a glance at my Inbox ... in the past couple months we've searched for a line leak on a thousand-foot tower, done directional boring to run 160 feet of 4-inch, thick-walled tubing *under* an AM ground system (soon it will hold two runs of 7/8-inch line for a translator and an STL), replaced an IP radio that was hit by lightning, and replaced the burned-out output coupling in a CCA transmitter – in addition to all the day-to-day stuff that goes on. You may be hearing about some of those in the future, but for this article I wanted to relate an experience with a Harris HT-10 transmitter.

This transmitter has, overall, been very reliable. But on May 3rd (a Sunday, of course) I got a call from Heath Radke, at our Marshall group, telling me the transmitter was off. Since Heath lives much closer than I do, he went to the site. We checked some readings and found there was no output from the IPA. This transmitter has a solid state IPA and Harris has included an adaptor that allows you to by-pass the IPA and drive the PA tube with the output of the THE-1 exciter. I talked Heath through that procedure and he got the transmitter up and running. I made a trip out the next day and replaced the 20 Amp IPA fuse. Everything was good and we were back up to full power. **Strike one.**

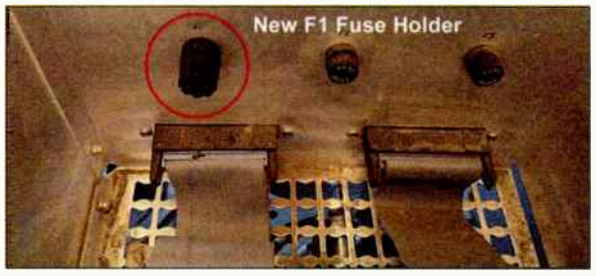
The HT-10 ran fine ... until July 5th (*another* Sunday), when it called mid afternoon. This time I was working alone because both Keith and Heath were out of town for the 4th of July weekend. I checked the readings and found plate voltage running a little high – because there was *no* plate current (hence – *no RF* output). I packed up and headed out. When I got to the site, the first thing I checked was that IPA fuse. Surprise ... it wasn't blown. But it had "popped" out of the fuse holder – that is to say, the spring had physically thrust the fuse out of the holder. Don't think I had ever seen that before. I bent the little metal tabs out a bit so it would lock into the holder better. **Strike two.**



On July 11 (a Saturday this time – but still the weekend) it went down again! This time Keith Wright was there and went out to check it. Again, it was the IPA fuse, but Keith couldn't get it to run up properly, so he bypassed the IPA again. ***Strike Three!***



Let me mention here that this particular fuse holder felt "chincy." It didn't have a good solid feel to it. After the second failure, I had ordered more "standard" replacements. When Keith and I arrived on July 13th, we wasted no time. We shut down and replaced that fuse holder right away. Interestingly, as I was pulling the quick-connect lugs off the holder in question it literally fell apart in my hand! And the metal pieces that grip the fuse showed definite signs of overheating. All that trouble from a little bitty fuse holder. Sometimes it's the little things!



I can say with a fair amount of confidence that we will not have any more trouble created by that bad fuse holder. By the way, I did order enough to replace them all.

That's all for now. I hope and pray that you all are making it through the Corona Virus Pandemic alright. Take care, be safe, wear your mask, and ... be positive, but test NEGATIVE!

And until next time ... keep it between 90 and 105!

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

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FCC Focus

Doing More With Less Staff

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

In the new era of staff reductions, doing more with less, and the potential of increased local programming should some amount of translator program origination be allowed, many a broadcaster is asking, how can I get a bit more from my staff and comply with legal requirements for overtime. Since the 2016 Department of Labor overtime order, broadcasters have been both focused and sometimes perplexed over how the overtime rules apply to some of their unique situations. One in particular concerns the regular employee who takes on the additional role of play-by-play announcer for local school sporting events.

In 1938, President Roosevelt signed the Fair Labor Standards Act of 1938 ("FSLA"), creating the right to a minimum wage, and "time-and-a-half" overtime pay when people work over forty hours a week. While the law is relatively easy to understand in the customary employee situation, many roles in broadcasting are anything but standard. Two particularly vexing questions are how to treat employees and others who do local play-by-play announcing for the station and salespeople paid by commission – we will treat salespeople in a separate memo.

Play-by-Play

While the COVID-19 pandemic has limited all spectator sporting events, including local ones, they *will* be back. Already announced, in fact, next season some professional sports will play their games without spectators but with live media – some local schools may follow that model, which will make local broadcast play-by-play all the more important. Given the need to keep costs down and a trim staff, how can broadcasters pay their regular employees who make those broadcasts?

How is it done? As one broadcaster recently put it: "Stations use a variety of payment methods on play-by-play. It's definitely not "one size fits all."

Here's a list of some ways play-by-play gets done:

1. Pay someone not connected with the stations on an independent contractor basis.

2. A current hourly employee does the games and if they work a total of more than 40 hours in that week they get overtime. This can mean revising work schedules.

3. Play-by-play is included in the employee's regular job duties.

4. No overtime is ever paid because they are an exempt salaried employee.

5. A current employee, who loves sports, volunteers to do the games for free so he/she can get into the games for free!

6. The owner of the station does the games and doesn't get paid anything!

Let's Look at These Examples:

The Independent Contractor: This, of course, would implicate paying someone not otherwise connected with the station as an independent contractor. This would not implicate the overtime rules, since they are not an employee and therefore not subject to the employee overtime rules. They are a contractor, performing a service for a negotiated price.

The "Fluctuating Work-Week" Standard: An alternative approach that could work is known as the fluctuating workweek method. This method can be used for employees whose hours vary from week to week, where there is a "clear and mutual" understanding that the employee will be paid a fixed salary as straight time compensation for whatever hours the employee is called upon to work in a workweek. If overtime hours are worked the employee is paid overtime compensation at a rate of one-half the regular rate for that week. The regular rate is determined by dividing the number of hours worked in the workweek into the amount of the salary. Because the employee's hours of work fluctuate from week to week, the regular rate must be determined separately each week based on the number of hours actually worked each week. On May 20 the DOL revised its regulation to make clear that employees who receive some form of incentive pay in addition to their fixed salary can be covered by the fluctuating workweek method. As a general rule, the additional bonuses or premium payments must be included in the calculation of the regular rate to determine how much overtime pay is due.

So this method could work if the play-by-play employees regular position is one where hours are flexible, requiring less than 40 hours in some weeks, more in other weeks, but when all hours are counted, it averages out to 40 hours on a weekly basis. Essentially, the employee is paid a fixed salary that is understood to be compensation for a variable number of hours worked each week, whether few or many, as opposed to a specific number of hours. In weeks where it runs over, overtime is paid. That example would satisfy the fluctuating workweek standard. Note: this is a complicated and confusing concept. It should not be attempted without consulting legal counsel.

In an attempt to make the test easier to use, the department listed five conditions that must exist:

1. The employee works hours that fluctuate from week to week.

2. The employee must receive a fixed salary that does not vary with the number of hours worked in the workweek. But, because the employee's hours of work fluctuate from week to week, the regular rate must be determined separately each week based on the number of hours actually worked each week.

3. The fixed salary satisfies the minimum wage.

4. A clear mutual understanding ... that the fixed salary is compensation (apart from overtime premiums) for the hours worked each workweek, whatever their number, rather than for working 40 hours or some other fixed weekly work period.

5. Overtime is still computed under the Fluctuating Workweek Method: This one bears some explanation. While the regular pay rate will vary from week to week since it is determined by dividing the salary plus any non-excludable additional pay by the number of hours worked in the workweek" and time over 40 hours in the week must be paid at not at least another one-half the rate, since the overtime hours have already been compensated at the straight time rate by payment of the fixed salary and non-excludable additional pay.

Exempt Salaried Employee: "Executive," "Administrative" and "Professional" ("EAP") employees are exempt from overtime if they are paid at least $684 per week (equivalent to $35,568 per year), or as a "highly compensated employees (HCEs)" they are paid $107,432 per year; (employers may use nondiscretionary bonuses and incentive payments (including commissions) that are paid at least annually to satisfy up to 10% percent of the standard salary level. Each of these categories carries specific job description characteristics.

Small-Market Radio and Television Station Exemption: Since 1961, the Fair Labor Standards Act has a special exemption for small-market radio and television station employees. To qualify, a Station's major studio must be located in a city or town that, as determined by the Census Bureau, has a population of:

a. 100,000 or less, provided that the city or town is not within a larger metropolitan area that has a population greater than 100,000 ... or

b. 25,000 or less, even if within a larger metropolitan area ... provided

c. The smaller city or town is at least 40 miles (by air) from the principal city in the larger metropolitan area.

d. The employee must be employed as an ***announcer, a news editor, or a chief engineer.***

Conclusion.

So, while it's a little more complex than we would like, there are a number of ways to cover the play-by-play announcer salary, and as radio renews its commitment to their communities, and if the FCC were to allow limited translator origination so that multiple local school athletics could be covered by one station, it will become more important for local stations to master the use of these arrangements; once we conquer COVID-19, of course.

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

Gregg Skall is a partner of the law firm Womble Bond Dickinson (US) LLP. He frequently lectures on FCC rules and regulations, represents several state broadcaster associations and individual broadcasters and other parties before the Federal Communications Commission in their commercial business dealings.

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Radio Stories

Annual Proof of Performance

and Other Memories of Times Past

by Michael Bradford

I shall begin this episode with an apology. In my article from a few months past I captioned a picture with the words, "Lead Free Solder." Radio Guide reader Steven Karty pointed out that there is no "lead free solder" used anywhere in the known world of electronics. He's right of course. The manufacturer of the solder I use refers to this type as "reduced lead content" solder. Normally we engineers would use 60/40 tin/lead solder. The solder pictured in my article is actually 63/37 tin/lead content. I regret using "lead free" in the description.

I enjoyed the articles, *"We've Come a Long Way Baby"* by Scott Schmeling and *"Mystery of Radio"* by Dave Dunsmoor," in the previous Radio Guide May/Jun issue. I always find it interesting when fellow engineers from other regions of our country share memories that parallel my own. In the above articles, I was thrust back into 1961 when I got my first taste of "engineering" at WTCM in Traverse City, Michigan.

Our high-school speech class had an arrangement with WTCM wherein several students would write and produce an evening program on the station and our instructor would listen (along with fellow students) and grade our performance as part of the class assignment. What fun we had! This was "Live" radio; we selected records to compliment our dialogue and enjoyed the challenge of back-timing up to network news. The actual "engineer" cued the records for us and turned our mics on and off, using hand signals to alert us to how much time was left before our next dialogue.

During one such evening, I learned that the engineer had encountered some questionable potato salad at the beach earlier that afternoon and was now "challenged" with remaining in the control room for more than two minutes. I came into the control room with our planned script and record selection and he told me to, "Sit down right there and get ready to start your next record! See that button on the console? When this song ends, turn that pot down, turn that one up to 10 o'clock and push that button!" With those instructions, he left the room and dashed down the hall to the necessary-room. Well, I began to sweat immediately and my heart raced. I listened to the final few notes of the record that was playing, turned that pot down, turned the adjacent pot to 10 o'clock and pushed the "start" button on the Gates 16-inch turntable for the next song. What a thrill when I heard that song over the huge Voice of the Theater speaker in the control room. I even heard the muffled cheers of the other students in the studio behind the double glass window. Well, that was "*It.*" From then on, during our evening programs, I got to shift between live talent in the studio and "engineer" in the control room for a few records, and even a commercial ET now and then. I was hooked on "Radio" and never looked back.

When I entered 10th. Grade I had the opportunity to audition for a real job at WCCW in Traverse City. I rode my bike to the audition on a Saturday morning. I'll never forget that aroma of records, tube-type equipment, and coffee and cigarette smoke, as I walked into the studio building for my audition. The program director greeted me and handed me a script to read and three forms to fill out for the procedure. I asked if there was a typewriter I could use and the PD asked, "So you can type?" Now those hours in typing class, with virtually all other female students in the room, paid off. I finished the forms in record time and was escorted into the Prod Room for the audio audition. The text I had been given was a news story from the Le Mans Race in France. Again, the two years of French I had endured paid off and I was able to glide through the news story. I even managed to hit the 30-second mark dead-on. I discovered that I needed an FCC Third Class Radiotelephone Permit with Broadcast Endorsement before I could actually start work. My Dad drove me to the Federal Building in Detroit to take that test. I remember being in the classroom with 20 other applicants for the various classes of license then required by the Commission. I was the youngest by far and probably the most scared. I still have that little card in my drawer as a souvenir. Thus began my real career in Radio in 1962.

I started, as some of you readers most likely did, working the Sunday morning shift. We ran mostly recorded programs and 16-inch LPs from the Air Force Band and other PSAs, along with commercials on the Fidelipak tape cartridges and the Gates cart machines.

I had one harrowing experience while reading the weather and road report on one Sunday morning. I turned the lever switch on the Collins board to "on" and turned the pot up just as the MSU recorded program came to an end and began to read ... then nothing! I was frightened and my heart almost leaped out of my chest. I never felt so all alone before and started back-tracking my movements – lever switch to program, pot up to about 10 o'clock, my mouth moving and words actually coming out – but no VU meter movement and no audio in the headphones. A quick glance at the Rust remote control confirmed that the transmitter was indeed "on."

I quick called the CE and blurted out my story. He told me to calm down and look underneath the counter-top beneath the Collins board, over to the left side. I bent down and looked underneath and saw a masking-tape "X" under that left corner of the counter. I told him I saw the mark and he said, "Now, sit down, take careful aim with your left foot and give that X a swift kick! Now take a breath and turn your mic on and read the weather." I did as he said and, voila, I was back on the air! That Collins board used plug-in pre-amp modules and I learned that ever now and then a module would get loose and just quit. For whatever reason, the main mic module was the most likely to fail. From then on, every Sunday morning I would tilt the Collins front-panel down, reach in and slide that module in-and-out a few times – just to be sure.

The chief engineer, Ted Jones, asked me via phone one Sunday morning if I would like to assist him in the Proof of Performance measurements that evening at midnight. Wow! A chance to do some real engineering. I was thrilled. I met Ted at the studio at 11:30 that evening and was introduced to the Gates "Gain-Set," an audio oscillator and a little box of assorted plug-in audio "pads" for the Gain-Set. Ted said he would travel to the transmitter on the outskirts of town and call me to direct me on setting up the Gain-Set and oscillator. The instruction manual made perfect sense, so I started to connect the oscillator and Gain-Set to be ready when Ted called. It seemed intuitive to me and when Ted called, I told him I had the basic connections done and the initial 60 dB pad installed.

I think he was impressed. He told me the assistant he had the previous year took fifteen minutes just to open the box of audio pads. He said they didn't get done until 5:55 on that Monday. I was on the way to becoming his assistant in many projects for the next years at WCCW.

Figure 1

Things have come a long way since I used the B&W model 410 distortion meter (Figure 1) and companion audio oscillator for Proofs. I still have that old 410, along with boxes of assorted tubes, rotary attenuator parts and replacement lever switches. I rescued the B&W meter when I left WCCW in 1978. I used it until I bought the Potomac Instruments 51 series of audio oscillator and "automatic" noise/distortion meter (Figure 2) for Proof measurements, set up of telephone line EQ, tape machine alignments and adjusting of EQ in cart machines.

Figure 2

The FCC-required annual audio Proofs were called "EPMs" more recently, meaning Equipment Performance Measurements. Section 73.1590 of the Rules of the Commission detailed what measurements were required and how often. The requirement for such annual Proofs has been deleted by the FCC, as have many other Rules that were judged to be obsolete. Judging from what I hear on the radio these days, that passes for "programming," it's too bad that audio Proofs aren't still required. I'm sure many of us Old Timers can recall many long nights of such measurements, especially when a bad cap somewhere in the audio chain kept your equipment from making a "passing" grade.

I was listening to the Bob & Tom show several years back and heard Christi Lee tell of a recurring dream she had where she was in front of the board in a large, empty room and a song was ending but she didn't see any records or any tape carts or any reel tapes to replace the song that was ending. She felt real panic because there wasn't anyway to get something "on the air." I have had a similar dream (nightmare would be better) and wonder how many of you have had the same experience?

I hope you all are staying safe while keeping your stations on the air throughout this Covid-19 dilemma. Remember what Sir Winston Churchill said during WWII. "When you're going through hell ... keep on going!"

Michael Bradford began his career at WCCW in 1962, A CPBE since 1984, and currently a contract engineer. You may reach him at: mbradford@triton.net

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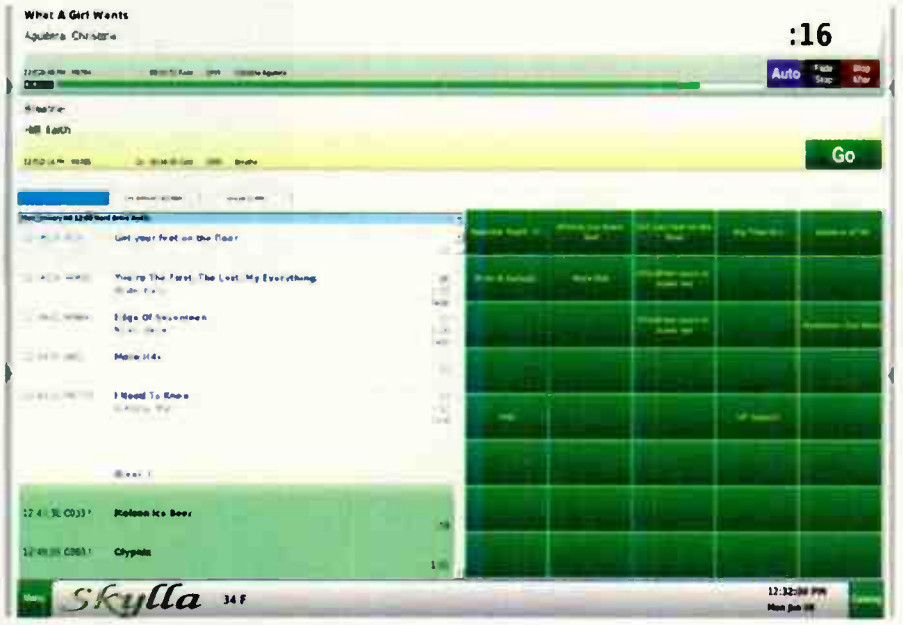

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User Report

The New Nautel

by Wiely Boswell

The Nautel FM 8 transmitter's little brother, the NV7.5LT, twenty years the younger, will now take over!

After caring for the FM 8 for over 15 years, it's going into the reserves. It has been a tough life, getting hit with surges. Changes have been going on at the site for years, to improve lightning protection. I even have a ground well system to work with grounding improvements. Jeff Welton at Nautel has always been out there, carrying the protection flag, and I like to go back and forth with him about it. Nautel always pushes grounding principles and require a real surge protector. They walk the talk, providing toroids of various sizes. It's in all our best interests.

So it's always great to be blessed with a brand new transmitter ... and here comes the learning curve. As for the FM 8, I got to know him and his ways – such as PA circuit breakers that not only trip in an over current event but also a controller-generated remote trip command fast enough to protect a PA. Power SCRs that take a large socket and ratchet to replace and a large transformer as part of the power supply, are interesting features. Now it's time to start all over learning about a new transmitter. The now common powering scheme involves multiple low voltage power supplies. The control paths in the NV system are advanced now as well. The RF path involves large enough amplifiers, that when mismatches occur due to an amp failure, directional couplers are used with a reject load.

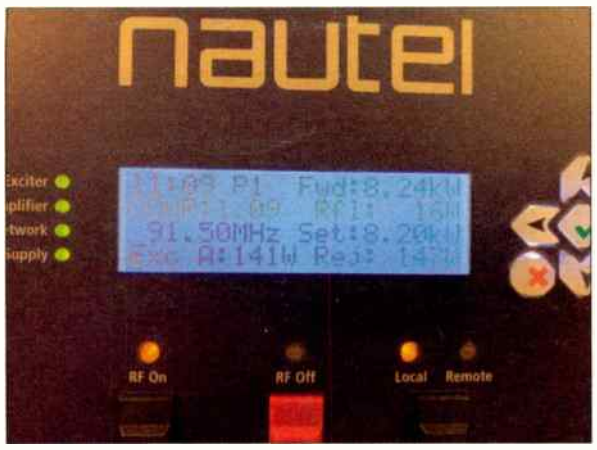


Figure 1 – LT screen (No B Exciter)

The FM 8 was an early generation, all solid state transmitter, making better than 8 kW into 50 Ohms. There was no output tuning anymore. The FM 8 RF chain: Exciter > IPA > Power splitters > PA's > Combiner > Filter > Antenna. The PA's each fed appx 400 Watts down mil spec BNC cables to the combiner. The bulkhead BNC connectors were terminated on a round copper disk which went through the filter to antenna. The combiner did get hot but it was all mil spec. Over time, lightning hits burned and or welded BNC cable pins into connectors and it took out fuses and dual FETs. It was likely from one major strike, that occurred after a lightning protector on the primary side of the power transformer was blown off and then got hit again (you have to inspect your power company pole). The big brother is so old you can have parts availability issues – his twin brother FM 8 is doing well at a much better site. Not sure how long it may be the backup, He may need some parts transplants, you know how that goes. So our TPO is 8 kW which means the original transmitter was running at full tilt. I looked for a 10 kW model to give it some slack. The Nautel model NV7.5LT is actually a NV10LT which has been software limited to 7.5 kW (8.2 actual). LT may stand for Luxury Transmitter or Light version – I'm not sure (the LT *is* lighter than the FM 8). It seems luxury but it still has a few options such as backup exciter and alarm display options. The option recommended was an additional 30 VDC power supply. It is mounted in the bottom and it is fed by a separate 120 VAC feed and the 30 VDC gets steered into the main supply buss. A dedicated (customer provided) UPS feeds the 120 VAC. The Main CPU/display keeps running with main display lit and it is better protected, hopefully, with a faster recovery after power glitch. There are three large indicators lit at the rear base of the cabinet. Best I can make out from the schematic, there are options shown for three phase or single phase, so the three indicators would be phase-to-phase for three phase or, in single phase operation, all three indicate 240 VAC no reference to ground.

When you place an order you have to fill out a form to include items like details on power, line size, and options. Site info involves items like entry door size, location logistics, and contact information. It comes well crated and the delivery guys did great with the supervisor even coming to do a pre-site visit because of road and field concerns. You can tell the frame is lighter but there is no massive transformer in the bottom.

One big change was putting the lineup together. Originally the site had the support bay several feet away. This is typically a bad idea with voltage transients able to be developed across the supporting wiring. 4-inch copper strap was run across the floor directly between bays but still not a great layout. I do have real concern about protecting the controller. The exciter and controller are built together with alarm/control connections, LAN connections, and Intra-system control cabling.

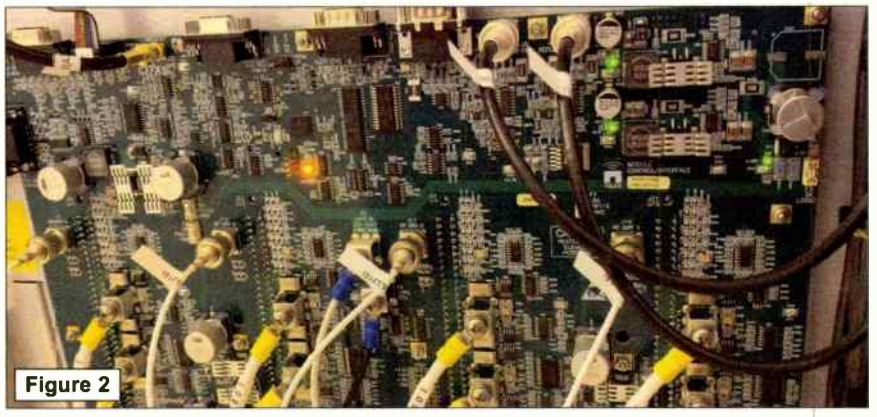
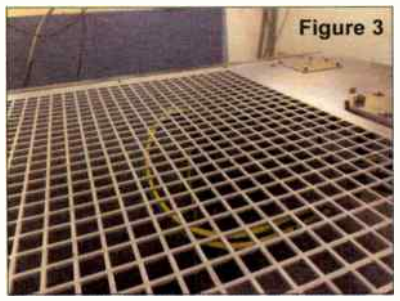
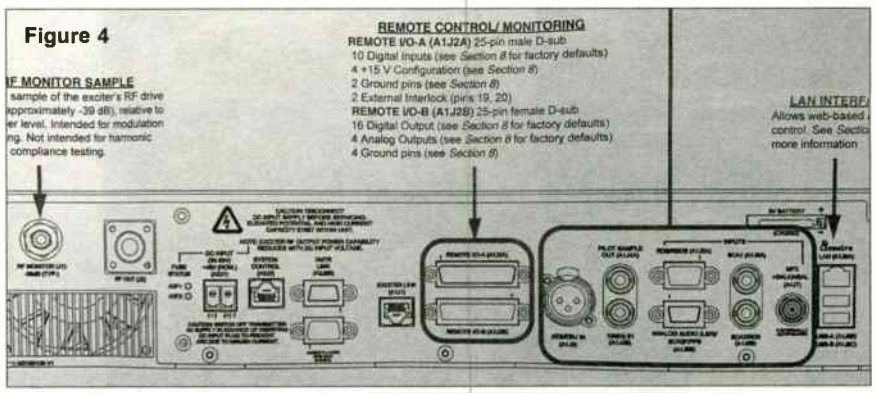


Figure 2 shows a main system PA control board close up, with back door removed. PA backplane connectors can be seen for the four PA modules.

The controller-exciter is in a chassis with lots of connections. You just can't let lightning loose around in the cabinet, so Nautel has had this theory that when lightning comes in on the feed line, you take it straight down through the rack to the Isolated Ground point on the rear. (The FM 8 had this layout also.) There are two parallel large conductors that go from near the feedpoint at the top of the transmitter to the large isolated ground connector. The FM 8 had the conductors bolted down right at the feed point, whereas the NV7.5LT ground is tied further away. It is connected before the RF power probe residing in a shielded enclosure just below the feed point. So if you are looking to shunt lightning through the rack, its impedance needs to be low, and short length. I would like to pull the whole top off, take the extra length through the top to reach up the flange bolts and take the serious bend of the cables out. Need some warranty grace here? **Figure 3** (flange base on right, SMA connector above ground connection)



Even with all the fans, it is still relatively quiet and the HEPA air filters are really nice, built into the covers. The alarm/control cables are terminated into the back of the exciter/controller with Db25 M and Db25 F connectors. There are extension cables run up through the frame to a really nice alarm display board that also has a LAN connection. That is an option I wish I could have splurged on for sure and it may even offer more surge suppression.



There are mounds of alarms you can configure, and here is where the GUI comes in also, when querying conditions. It is quite a resource, especially if running HD. I would not connect any LAN to a transmitter if I did not isolate it with a fiber 10/100 interface. **Figure 4** shows so many rear connections available to the Controller-Exciter.

The transmitter went in and came up smooth. I had the UPS running and had the control screen up and going before I applied main power. I am still learning and will likely have more to cover in months to come on the GUI interface, RDS, and other built in features, after all it's an LT.

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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Practical Tech

Three Out of Four Went Well

by Dave Dunsmoor

I've heard it said, "there's the right way, the wrong way – and the Army way." Now I don't know if this is supposed to indicate that the Army's way is a mixture of well thought out correct methods (and just poorly done by muddling about), or whether the saying is merely supposed to be a humorous description of "nothing's done right." But generally speaking, it's taken me quite a few years to learn "the right way" to work with electronic and mechanical gadgets, and even more years to discover that, occasionally, the "wrong" way is actually the right way. Yes, I should explain myself.

I may have been around 12 years old when I received a Weller soldering gun for birthday, Christmas, or ... I don't remember now just what the occasion was. And I don't know what it was that dad saw in me back then that inspired such a gift, but it "hit the spot" with me. No, I did not have any idea how to use it, what the theory and practice of soldering was all about, nor did I have anyone to show me how it was done, but eventually I more or less figured it out.

I spent the next few years tinkering with things and doing various "useful" projects in the garage, all the while learning ... something. Putting dad's tools back the way I found 'em was number one! One day, I gained real appreciation for the power available in the wall sockets when I touched together the bared wires of a wall plug I had rigged up on the desk in my bedroom! I wondered how much of a spark could be generated. Oh, my gosh! *Big* flash, circuit breaker popped, and dad hollering, "what's going on down there?" "Nothing," was my reply.

Eventually, someone gave me an old refrigerator compressor, somewhere I found a small electric motor, and grandpa gave me an old hot water tank. So now I had the makings of an air compressor, useful for filling bicycle tires (and not much else). The best thing I learned from this was to never put the power switch directly on the motor cover plate ... *behind* the pulley!

Cutting D-cells apart and sparking the carbons together, powered by a small transformer, soldering together soup cans to make a "boiler," disassembling and successfully reassembling an old automatic transmission, which I had dragged home from the high school auto shop, were all part of my early informal education. And of course, none of it was actually being done the "right way."

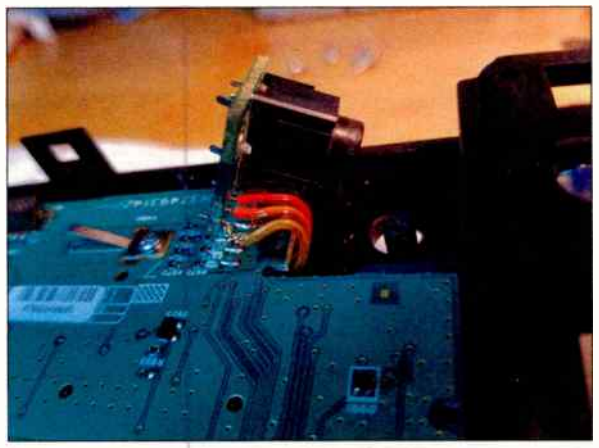
Military service time came and, although there was plenty of formal, theoretical electronic education, the actual mechanical processes so necessary for successful electronic operation were still lacking somewhat. I *still* didn't learn how to properly solder. All the repairs were done by "remove and replace" the faulty unit – pull the card, insert new one, re-test, pack up and send out the door. This was a suitable repair method for the purposes of the USAF.

My first real post-military job was with the Boeing Company, doing electronic and mechanical modifications to missile sites in North Dakota. Now this was the real deal as far as I was concerned. My first two weeks was learning aerospace soldering techniques, assembling connectors, mechanical assembly and so on. Every technique that I had muddled through for the past many years was now being carefully replaced by good, well researched methods. I learned how to solder and why it works, or doesn't, how to crimp pins or terminals onto wire (and why it works well, or not), how to strip wire so that it's integrity is maintained while soldering or crimping, how to wire-wrap and why that is more preferable in some instances than soldering, how to install ring terminals to terminal strips, and a multitude of other more mechanical processes that allow electronics to work – and work nearly indefinitely when "done right." This was, and still is, my gold standard for doing electronic work. Whenever possible, I still follow and use the methods learned from the techs, engineers, and quality control inspectors of the Boeing Company field teams.

So now, lets get back to the "right way, wrong way" conversation. When I first stepped into the broadcast engineering environment as a contract engineer for a daytime AM station, maybe 40+ years ago, one of the first things I noticed was that what appeared to be original construction was well thought out, and carefully done (the right way). And, subsequent to this, there had been many years of additions, and often many no longer used wiring connections, but with no "subtractions." Usually, all the old wires/cables were still in place but either just cut, or more likely, just not used. Some were done to similar standards, and some not. However, it all seemed to work.

And this leads to the second thing I noticed. Coming from the military, Boeing, and government environments, one thing that was to me, conspicuous by it's absence, was the lack of any documentation of studio/prod/equipment room interconnection wiring (the wrong way). However, in general, the original "wiring scheme" was apparent by labels on the jack strips, so that was helpful. From there, it wasn't all that difficult to resolve the purpose and layout of the years of additional technology and additional equipment I found. But I still had to allow myself to become accustomed to the variety of methods used by others to install the variety of things I found. Often the methods used just didn't seem to match what I had been exposed to, and had used when in the employ of the military, Boeing, etc. Often times the plant seemed to be just "rigged" together, but it worked. I was annoyed by the way some so-called engineers put things together to see if it works, and subsequently never "tidied up." OK, yeah, I've done that, but I try hard not to do so anymore. It usually takes only a few minutes longer to do it right than to just hurriedly tack it together.

And this, finally, after much story telling, brings me to what the point of this short article was originally all about. A young woman who I had worked with, and who was about to head off to college to earn her degree in bio-med engineering, asked me if I could assist her in fixing a problem in her car stereo. It seems that a miniature phone cord plug to the "aux" jack, had somehow gotten broken off, leaving the tip inside. I said that I thought that I could help with this. Then she asked, "can you solder?" Yeah, I hear you guys laughing now! She had tried to remove the broken tip by inserting some pointed object tipped with "super glue" in behind the broken plug. When that didn't work, she removed the radio, opened it up and tried to push the plug tip out, but to do that required removing a small circuit board that the jack was mounted to – and 3 of the 4 very small wires running to the aux jack board from the main board had now broken away. And that's what prompted the "can you solder" question.



3 Out of 4 Went Well

I had initially thought, "Oh no, not SMD devices," but no, I just needed to reconnect some small wires. This should be easy enough, I had learned how to do this type of work from the Boeing engineer who ran all of us new guys though his soldering school many years before, and I've been doing it for many years since. So with a magnifying lamp and some solder wick, I soon had the little circuit pads all cleaned up, then began dressing the wires back into the little holes. Those *tiny* little holes! A pin vise with a #73 drill bit got 'em all cleaned up, and the first three went in just fine. But, the fourth was just not going to go! And unless there is just no other way, I just don't want to cut a few strands off a wire so it will "fit." Pragmatism then took over and I cut one leg off a small transistor, attached the wire to it, and soldered the gold lead into that doggoned tiny hole!

So, the whole lesson here is, again, just when is the "wrong" way the best way to accomplish a goal? I guess the answer is "it depends." So, when my young friend stuck a toothpick loaded with superglue into the aux jack trying to coax the stuck plug piece(s) back out of the hole, that would usually have been considered by those of us who know better to be the wrong thing to do. However, if you consider that she learned more by doing so, and learned a few things that will likely stay with her for a career of designing mechanical and electronic equipment, then I'd offer that she had accidentally done the right thing by "doing it wrong."

So there it is – not everything is as bad it may seem initially, and is it actually all that bad? It depends.

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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Radio History

On the Road Again

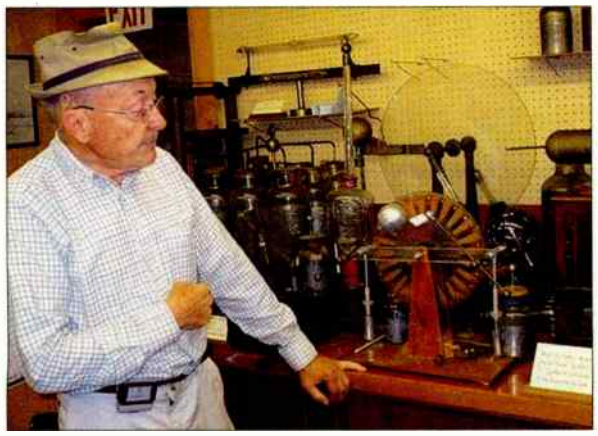
The New England Wireless and Steam Museum

by Steve Callahan

You probably know that I like to visit radio and wireless museums anytime and anywhere I can. We technical-inclined folks are always drawn to unique mechanical devices like moths are drawn to a flame. Read on to learn about a most fascinating place.

The New England Wireless and Steam Museum in East Greenwich Rhode Island is the most interesting wireless museum I have every visited. Even though it's temporarily closed to visitors, I've had the pleasure of visiting the museum twice and every time I see more and more unique and interesting things.

The founder and driving force behind this most unique museum is Robert W. Merriam. Bob's interest in technology and electronics lead him to establish the museum back in 1964 with the purpose of preserving marvels of engineering, especially in steam power and radio.



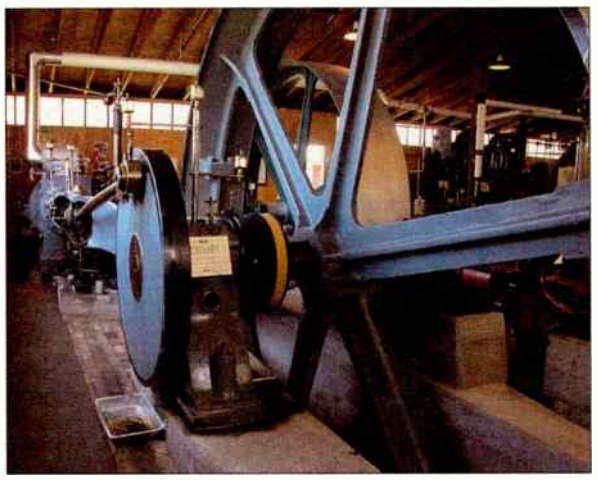
Robert W. Merriam (1923-2019)

In 1998, the Rhode Island Historical Preservation and Heritage Commission recognized Bob Merriam with the Antoinette F. Dowling Volunteer Service Award for devoting 30 years to preserving parts of the state's technological history. In the presence of 400 people at Roger Williams University in Bristol, RI, Bob was congratulated for his work at the museum which is supported and staffed entirely by volunteers.

Just south of Providence, in a rural section of East Greenwich, RI, it's not hard to find Frenchtown Road and it's even easier to find the New England Wireless and Steam Museum. If you're lucky enough to be visiting on a "steam up" day, you'll be treated to their restored massive steam engines, fully operating and belching billows of steam.

The museum is home to the only working George H. Corliss steam engine which was manufactured in Providence and was rescued from a factory in Maine. The Corliss is not your run-of-the-mill steam engine. It is the largest engine that the Corliss Steam Engine Company ever built and was exhibited at the 1876 Centennial Exhibition in Philadelphia. It has a massive 44 inch bore and a 10 foot stroke and was 45 feet tall with a 56 ton, thirty foot diameter flywheel. Now *that's* a steam engine!

The Corliss is not the only steam engine at the museum. Many other classic steam engines can be found in the Merriam Steam Building which was built in 1971. You'll see steam engines in various states of restoration by the dedicated volunteers who lend their skills to make these mechanical monsters come alive.



George H. Corliss Steam Engine

The museum's Wireless Building is filled with communication technology from telegraph to TV and you'll see crystal sets, unique tubes, spark transmitters and a "jigger and spark" set exactly like to one used to call for help on the Titanic in 1912. Be sure to check the museum's website for their absolutely amazing list of radio receivers and detectors presently on display.

The museum is also proud of their authentic replica of a 1920's ship radio room, or wireless cabin, equipped with a 1 kW World War I Navy Standard Kilbourne and Clark Quenched-Gap spark transmitter. The Titanic disaster caused changes in shipboard radio practices such as requiring two, three minute sectors on the radio room clock when it was illegal to transmit anything except distress messages. Also required was an antenna disconnect switch because their receivers at the time were crystal sets with a cat's whisker on a piece of galena crystal which was very sensitive to static discharge. With a storm on the horizon, the antenna had to be grounded and when the storm passed, the antenna could then be reconnected. Transmitting and receiving back in those days was simplex, you broadcast with the transmitter, then switched the antenna to the receiver to listen for a reply.

The museum has a spark transmitter from the Standard Communications Company in Denmark. It was discovered, in pretty bad shape, on the "Denmark," a tall ship that visited Providence. It was restored in Denmark and later sent it to the wireless museum in Rhode Island as a gift. The museum also has an original sonic depth finder which was invented by Reginald A. Fessenden which consists of a solenoid operated hammer which bangs the bilge of the ship sending sound waves to the bottom of the ocean which then echoes back. The time duration for the round-trip determines the depth.

My favorite part of the museum's collection is the Massie Station PJ. It is an original wireless spark gap telegraph station which operated on the coast of Rhode Island at Point Judith. It was used to communicate with the ocean-going paddle wheel steamers of the Fall River Line which operated from Fall River, Massachusetts, past Point Judith, down Long Island Sound and into New York City. The entire building was moved from Point Judith to East Greenwich with all of its original radio equipment except for a rebuilt antenna switch.

The Massie Station, which operates at about 350 kHz, is one of the oldest working wireless transmitters in the world. The theory behind the spark gap transmitter is that a high voltage coil and capacitor are connected in parallel and a helix coil and spark gap are connected in series – and the pair is connected in parallel with the glass plate capacitor. The high voltage coil charges the capacitor and when the voltage on the capacitor reaches the breakdown point of the air between the spark electrodes, the spark jumps the electrodes. The spark is very impressive and very loud. The high voltage components are not located in the safe metal cabinets we have today, but are on tabletops and mounted on walls just above the operator's desk.

The museum has a very rare **Scanning-Wheel Television** from about 1928. It has a series of pinholes in a wheel that scanned a picture about an inch and a quarter by an inch and a quarter and was synchronized with the transmitted signal. It was the first mechanical television system.

As you walk through the various buildings at the museum you'll see exhibits to Reginald Fessenden, Marconi, Thomas Edison, Edwin Armstrong, Amos Emerson Dolbear and Hugo Gernsback. If the last two names are unfamiliar to you, take a look at the museum's website to learn a lot more about them.

Whether it's crystal receivers, induction coils, wire recorders, undersea cable equipment, you'll see it all at the museum. Just their huge collection of various commercial and consumer radio receivers from the 1920's is staggering.

Even though the museum is temporarily closed to the public, it is definitely a place to put on your must-go-to list. They are hoping to open several Saturday mornings during the summer for small groups and possibly to have their Yankee Steam-Up display which is held annually on a Saturday in the Fall. Keep checking their website for updates – **www.newsm.org**

In these days of lightning-fast technological advancement, it's always a thrill to see radio's humble beginnings and the care someone has taken to preserve it. If you have a radio or wireless museum near you, feel free to email me and I'd be happy to mention them in a future article. These little museums are truly a labor of love by dedicated volunteers who love radio's roots. I'd be happy to recognize their contribution to the preservation of radio history. Try to take time out to visit one near you and be sure to allot enough time to truly enjoy their collection. You will come away with a new appreciation of the medium we still call Radio.

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

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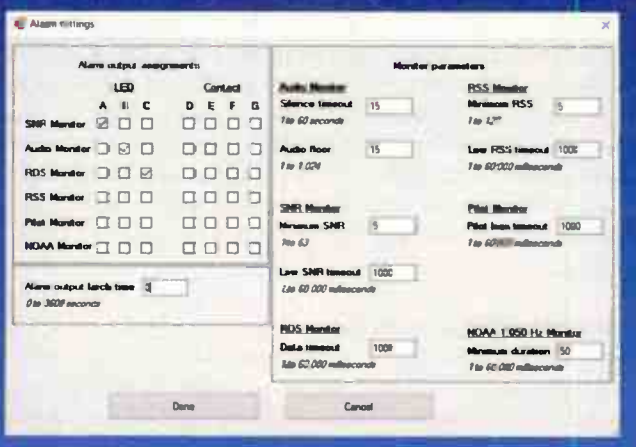

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The Linux Connection, Etc.

Getting Around "Windows Frustration Syndrome" – continued

by Tommy Gray – CPBE, CBNE

Moving on up!

Linux Mint Cinnamon (and Ubuntu as well) are moving fast in updates and development these days. As anyone who has followed my column knows, I use Linux Mint Cinnamon exclusively here in our office and on the road – and have for several years. Until the last few days, the most recent vintage has been 19.3 which has proven very good for us. For several months now, version 20 has been in the works (20.04 for Ubuntu). I recently upgraded all the office machines to version 20 from 19.3. I have not yet seen a lot of differences but one thing that I have seen that I like is a new app that is installed by default with version 20, and that is a program called "Warpinator."

"Warpinator!"

Years ago (way back in Linux Mint 6 as I am told), there was a program called "Giver" that allowed easy file transfer between Linux machines. Later on it went away when the project was scrapped, and we were left with no easy way to do the job other than through external drives, USB sticks, etc. With version 20, the new "Warpinator" (the name is temporary I am told) will automatically show every Linux machine on your network and allow you to easily transfer files from one Linux machine to the other. Now keep in mind, if you think it is not working when you try to transfer, the receiving machine has to grant access first, and there will be a popup on it requiring you to grant access before the transfer can be completed.

Prior to this time I have used a program called "OpenSSH" (just like the SSH many of you are used to, but opensource) which is in the software manager and will allow you to open up a machine in a Nemo file manager just like it is a local machine, and do your file management chores, It has worked well for us and in most cases I will probably still use it. If I want to simply drop a file or folder from one machine to the other, Warpinator works great as I can see every machine on my network in a window and access them with a click. There will be a Warpinator folder on each machine that has it running, and files and folders are deposited there for easy access by the machine(s) receiving them.

The "Bleeding Edge" of Technology

Years ago I heard a friend use that term to describe all the issues you usually deal with on any new software that has not been out for long, and may still have a few bugs. New operating systems are not exempt. Due to the vast number of different kinds of computers and hardware one may possess, it is virtually impossible to write something that will work with every single machine out there without any issues. I can vouch for that, having personally spent many years of my life as a software developer! Every Linux Mint upgrade (An upgrade is a major step up as opposed to an update, which is a simple change to a piece of software, etc.) starts off as a "beta" version which version 20 did a few months back. First, it is put out there for beta testers to work with it and expose any problems that may be inherent in the upcoming "release" version. This is done to try and make the final release version as bug free as humanly possible, and to make the upgrade an easy process. Still with all the testing, and the associated discovery of issues, a few may get through or may not be discovered, and have to be dealt with as time goes on. It is my personal experience that the Linux Mint developer team (developers from around the world all working at a feverish pitch to put out as perfect an OS as can be done), are monitoring all the social media sites, blogs, and forums, to stay on top of anything that pops up and to fix it right away. The great thing about Linux Mint Cinnamon and its little brothers, XCFE and Mate, is that help is easily found in a myriad of places. The Facebook™ groups and numerous Internet forums are helpful, and a simple Internet search will find you all kinds of assistance for just about any problem you might run into, and which problems are usually very simple and not much at all.

All Good Things Must Come to an End!

One thing that is inevitable is the obsolescence of 32 bit computer hardware. Some said 16 bit would never go away but where is it these days? Version 19.3, the most recent version before 20, supported both 32 and 64 bit hardware. Version 20 however *does not* support 32 bit any longer. Version 19.3 is a long term support release which will be supported until 2023, so unless you just want to, it is not necessary to upgrade until that time, as it will receive full support and updates. Version 19.3 is a great OS in my opinion and does not have to be upgraded unless, as I said, you just want to have the latest and greatest. I *would* recommend that you install every update that they put out as soon as they show up, as many will be security updates, and those of us who are in the engineering business are fully aware of just how important security is these days. Another reason to stay with 19.3 is that versio 20 no longer supports 32 bit hardware and is 64 bit only.

If you are not sure what you have, there is a simple way to find out. Open up a terminal and type in the command "uname -m" and press "Enter." This will show not only the machine hardware name in the prompt, but will then show either "i686" or "i386" for 32 bit, or "x86_64" for a 64 bit machine. If your response shows "x86_64" you can upgrade to 20. If not you will need to stay with 19.3. Again, no problems though, as it will be fully supported until 2023 and will continue to run, it just will not receive updates after that.

One thing that you need to know. There are a very few programs that, at this point, will not work with version 20 that you can run under 19.3 One of these is the program called "Chirp" that many of us use to manage communications radios, such as some HAM radios. There is an issue I am told, with Python, that is making Chirp to be excluded in the upgrade. It is deleted during the upgrade and is no longer in the repository, though you can install it on some machines from a PPA, using the workaround. I have not tried it yet but it looks promising. Again, there is a way to find out what will and what will not work in version 20 on your machine without actually doing the upgrade.

How Do I Do It?

I am going to now list the initial steps to upgrading from 19.3 to 20 in brief. By the way, I don't think I ever mentioned that Linux Mint cinnamon can be installed not only on Windows compatible computers but on Macs as well and a lot of folks are doing just that on their Mac.

There is a document that can be found on the Linuxmint.com website or the LM blog that gives you step by step instructions. The beauty of all this upgrade business is that it will tell you if it will work on your computer before you ever do it. Follow the steps from the document I will list below and you can safely explore whether or not you are going to be able to do the upgrade on your individual computer.

Here We Go:

Here is a pared down version of the complete document.

1. First, check your version:

Open a terminal and type in "dpkg -print-architecture".

If the response is "amd64" you can do the upgrade. If is says "i386" you are running 32 bit and cannot upgrade, and stop right here. If you got amd64 (even though you might not be running an AMD machine) you can proceed. For some reason even an Intel machine will shoe up as AMD64.

2. Install any updates that might be waiting on your machine.

Open up the "Update Manager" from the menu or from the tray icon, and then press the refresh button. Install any available updates and repeat the process until there are no more updates – then reboot your computer. I would suggest at this point that if you use a screen saver shut it down until you are done with the upgrade or the check, should you want to wait until later to actually do it.

3. Create a System Snapshot.

This is *VERY IMPORTANT!* Run the program called "Timeshift" from your menu and save a system snapshot off onto an external drive if possible. The system snapshot will allow you to recover everything on your computer at this exact time, and not lose anything, should something go awry in the upgrade. It is simply a complete system backup that can be restored and put you right back where you were.

4. Purge PPA's and other repositories not standard.

PPAs or 3rd party repositories can cause problems during the upgrade if the versions of their packages are higher than in Linux Mint 20. This can also result in unmet dependencies (which I will not go into right now), held packages, resolver or other issues.

From the menu, open "Software Sources." Then open the "Additional Repositories" tab and disable "all" additional repositories. Next, open the "PPA" tab and disable all PPAs. Then Click the button to refresh the APT cache.

Next, open "Maintenance" and click on "Downgrade Foreign Packages". Select all the foreign packages listed, then click "Downgrade". Then click on "Remove Foreign Packages". Again, select all the foreign packages and then remove them by clicking "Remove".

Finally, Reboot the computer and when it's back up, create another "Timeshift" snapshot.

Well I am totally out of space for this issue but if you have gone this far and are ready to continue, here is a link to the necessary document. I listed my synopsis of the document so far to aid you, as the things I mentioned are very important and should be done before you do anything else.

The complete document may be downloaded at:

https://linuxmint-user-guide.readthedocs.io/en/latest/upgrade-to-mint-20.html

We will continue next time and I will share a few things I have gleaned from quite a few upgrades to version 20 I have completed recently.

Until Next Time ...

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

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World Radio History

Practical Engineering

Mirror Mirror on the Web…

by Jim Turvaville

I *know* it's never happened to you, but I've just completed a several month long project, doing a lot of test and experimenting – and having more failures than successes. Along the way, causing havoc to the on-air product of a radio station and spending hours to correct one single mistake before finally achieving success; and that was more likely because I'd already failed at every other method and all that was left was the right way to do it.

Then, upon the enormous sigh of relief that the system finally worked, you meet someone who had not only already accomplished what you just did, but had been doing it for several years with total success! And I think that *I* am always telling my readers the value of professional networking and peer relationships, and then *I* spend months working on a project because I'd not ever reached out to this guy before – and I've known of him for decades, working in his backyard almost, but never made the opportunity to cross his path ... see what that can get you?

So this article is my confession, and I hear that's good for the soul, so let me tell you the problem and the solution that I finally figured out how to make work, and it might be of some value in your work as well. I've always been told, "you have to learn from other people's mistakes because you'll never live long enough to make them all yourself."

The Problem

In momentary lapses of cognitive ability and good sense, my Corporate retirement time has lately become more involved with a "hobby" that has turned all too serious. Those time management classes I had to sit through always taught us that those things which consumed your time and resources, but did not grease your economic engine, was not your work ... they were *hobbies*. A life-long buddy and I started building little hometown radio stations in small un-served communities, beginning with the one in which he lives. That has now expanded to five stations. Then an opportunity came along for a 6th signal which we could lease and program from our meager, but quite busy and messy, central headquarters. That far-away signal was also in a sizable (compared to the rest) market and really did have the potential to become something that *did* grease that economic engine; so the temptation was too great for the risk involved and we began running the station.

Initially, it was as simple as having the automation system at world headquarters, and using a high quality, high bit-rate AAC stream feeding the decoder at the tower site 100 miles away. And for the most part, this was a working operation. Except for an occasional Internet glitch on one end or the other, we thought all was well and good. However, as the station grew in listenership, we began to get more frequent reports of audio disruption from stream loss, and the situation got progressively worse and more critical.

I admit that I was not in the far-away city often enough – well, I was really there a *lot* but it was just not for long periods of time, so even I had not truly felt the pain of audio loss until one afternoon a few months back, when I had to spend nearly all day in town. I then realized first hand exactly how bad the audio situation had become. Sadly, the issues were most often not at the studio, located in one of my really quite rural towns and served by a WISP hopscotched into town by at least 6 wireless links from 50 miles away at the ISP. Rather, the connection failures were most often at the destination tower in a relatively large urban area, and on a tower which was the point of presence and relay site for the ISP to which we were connected. It seems that many ISP's feel that a drop in service for a few seconds every few minutes is not *really* a loss of service. And that might be true if I'm watching a video and there's a lot of buffer already built up, but with only about 2 seconds of audio buffering in my stream, that meant that my audio dropped for a few seconds every few minutes during peak web traffic periods. *Very* un-cool. I had to find a solution real soon in order to maintain and build a listening audience on that station, or it would be another "hobby" and a pretty expensive one at that.

A Solution

So I began to scheme how to mirror my automation system so that the duplicate computer could be located at the tower site, and just be updated via Internet so that the files were always a copy of what was playing back at the studio. There are not any "live" programs on the station,

(Continued on Page 28)

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World Radio History

Mirror Mirror on the Web…

– Continued from Page 26 –

except for the weekly live remotes and shows simulcast from one of my other stations, and those were all accomplished with an Internet stream feed on the play line of the automation. So the computer *is* the station for all intents and purposes, and doing this would make the on-air computer pretty bullet-proof from Internet outages on either end of the chain, as many hours of files are loaded in advance and playout would continue as normal until updating resumed when Internet service returned.

I began by just making a clone machine to see if a copy of the 120 Gb of audio and files would actually run; otherwise, the connectivity issue became quite moot. I bought a new computer, installed the automation software, and duplicated the file structure of the on-air computer exactly. Then just reaching across the LAN in the office, I copied all of the audio and log files and opened the software. Almost to my surprise, it came on first time and started playing just like the on-air computer was in the studio. I even let it run a couple of days to see what happened, and it still just kept on like there was nothing wrong at all. Both systems played all of the music, spots, voice tracks, weather cuts, etc. all just fine. This was really encouraging, so the next step of finding a way to synchronize those machines, when they were no longer in the same LAN, became the driving project.

About that time, one of my bigger stations affiliated with a regional agriculture network for eight short-form reports every weekday. I was excited to have the product on my stations, and quite taken aback when I was told the distribution for the programming was done using DropBox. Really, DropBox? I've used their on-line service for well over a decade, and it had always been a valuable tool for distribution of larger than email capable files, mostly high quality audio. But I was far from a "power user" and had no real comprehension of the features and capabilities of their service to their paying customers. Obviously, the little network was a good paying customer with a professional account, and I was both shocked and relieved when they sent me a link that installed their client on my Production room computer and it immediately began synchronizing with their on-line account, keeping all of their programs current instantly upon being updated by their news team.

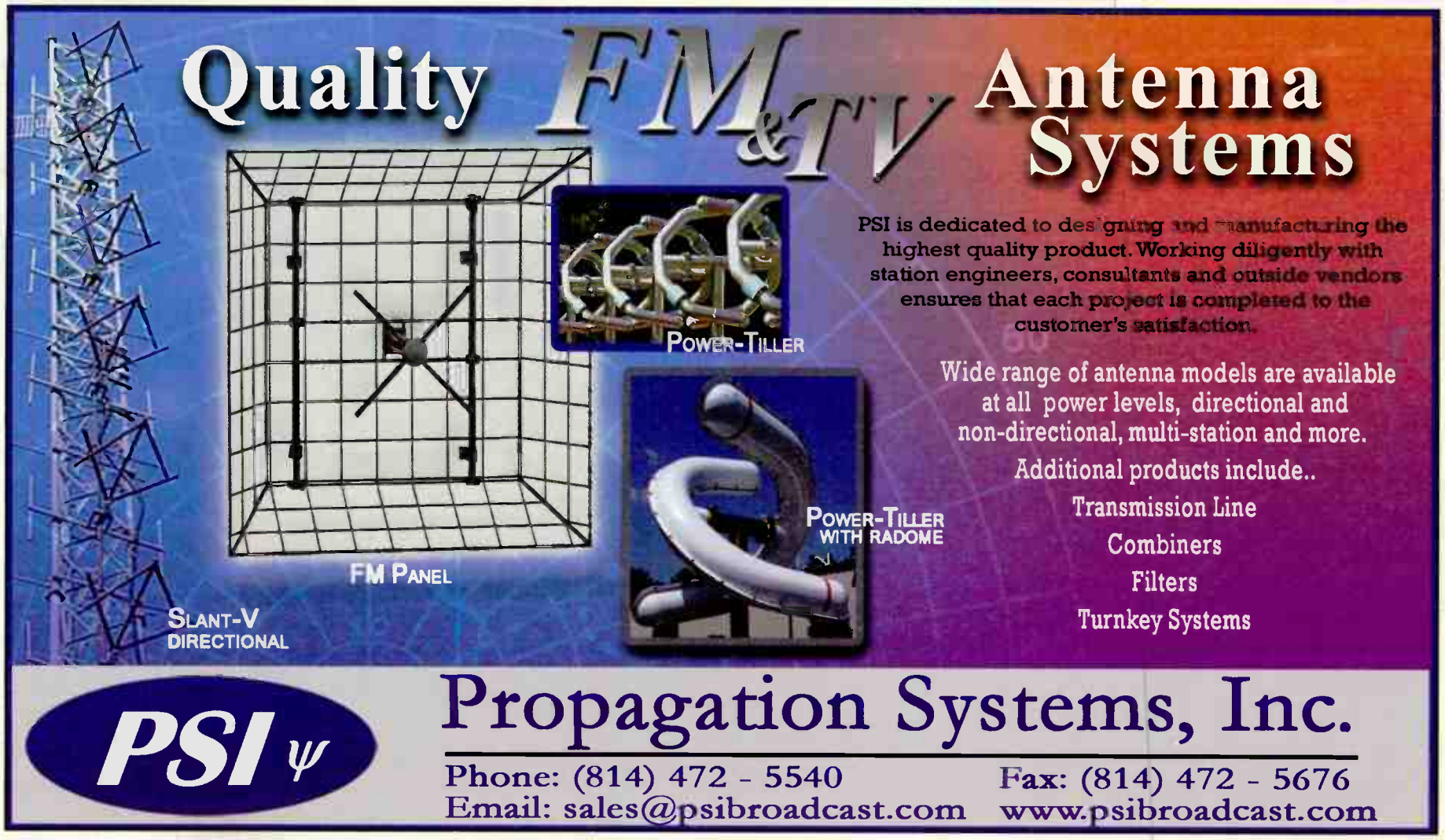
On that particular project, I needed their files to be on two of the on-air machines in my studio, which meant the files on that Production computer needed also to be mirrored to folders on their respective station automation systems. Now that was not hard – I had many years ago discovered backup and mirror software that would keep two folders on the same LAN synchronized, so I quickly bought a fresh copy of Second Copy and suddenly that little Ag-network product was on the air as ordered. Wait ... what if I could use the same system to update that automation computer at the tower? Suddenly I was blinded by the light and I purchased a business account and began to experiment with Drop Box.

Sparing the details of all of the failures, this is how the system works. I found that the DropBox synch folder *must* be called "Dropbox," and not being able to program my automation to play everything out of a folder of that name, and not having sufficient drive space to totally duplicate the automation files on the primary drive, I chose to put a USB 3.0 backpack drive on each computer. That drive has a "DropBox" folder, which contains the files that are duplicated from the cloud server. Through catastrophic mistakes in sync designation, I have learned to make "source" and "destination" choices carefully and wisely when setting up software that can delete what is on the air *really* fast if you tell it the wrong thing!

So the local automation in my studio mirrors all of its files to the USB drive DropBox folder, which is then automatically synched to the cloud. The tower automation computer sees any change in those cloud files and copies them to its USB drive DropBox folder – which are then mirrored to the tower automation files that are in use. It is carefully set to synch only in that direction, not from the tower back to the studio at any time. We can upload a voice track (to the studio computer) and in about 2 minutes the mirror-sync-sync-mirror process is complete and that file is at the tower ready to play.

As an epilog: I then ran into a fellow broadcaster two weeks after my system went on-line who has been doing this exact thing for nearly 10 years, using DropBox to synch on-air computers at his tower sites. While I felt really silly for never having met this guy and already knowing how to do this, I am certainly pleased to know his long use of the system can give me cause to believe it will continue to work as well for me. And that's also what networking and relationships can be about sometimes, so learn from my mistake.

Jim "Turbo" Turvaville is semi- retired from 40+ 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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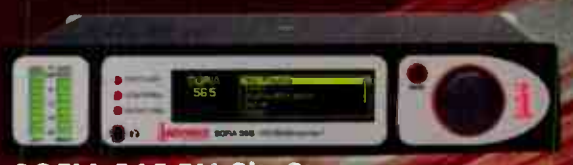

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Rules and Regs

Working with the FCC

by Sam Wallington

When I started in radio, I was terrified of the FCC. I did not want to do anything wrong and somehow risk the station's license – or even my cereal box-top Radio Operator license!

In the 37 years since, I have gained a great deal of respect for the FCC, and I have lost my fear – and I am not just saying that because they might read this! My respect is because the organization is one of the best-run governmental organizations I have ever worked with. The rules are relatively clear, the processes are built in such a way that anyone can become involved in working to improve broadcasting, the rules, or even the FCC itself. Communicating with the FCC can be as simple as a phone call or an email, or as complex as a formal proceeding before the five Commissioners.

I know an Engineer who very carefully applied to move the transmitter site of the station at which he worked. Several weeks later, he received a letter from the FCC asking him questions about the coordinates and elevations shown in his application. This caused him a great deal of angst, even though he had done the work very carefully. In the days before FCC software, the process was definitely more challenging, having to calculate Height Above Average Terrain (HAAT) manually using topographic maps, for example. I think he shared my fears – he did not want a bad reputation with the FCC, and certainly did not want to risk the station's license!

He carefully re-did his calculations and measurements, and submitted a very detailed description and drawing explaining the apparent discrepancy. After a rather suspenseful delay, he received notification of the grant of a construction permit! I suspect he felt like he had just received an "A" on a very hard test.

Perhaps our initial relationship with the FCC is built on our life experiences, such as the fear of failing a test in school or worrying about disappointing a demanding parent or boss. If you find yourself afraid of the FCC, allow me to share some of my experience. Hopefully these observations can improve your relationship with the organization who, in at least one respect, controls the destiny of your station(s) and career.

Honesty and Transparency

When I was a teenager, I was pulled over for speeding (big surprise). My heart was beating out of my chest as the officer approached my window. After asking for my license and registration, he asked me if I knew how fast I was going. In my terror, I denied knowing. Truth is, I knew for certain I had been going faster than the speed limit (between you and me, significantly), and I had a pretty good idea of the actual speed I had been driving.

If the FCC asks for information, either passively as part of a routine application or actively for some sort of investigation, it might be tempting to fudge the truth. But it is critical to answer truthfully. Instead of, "Of course we sent all the EAS tests – I have no idea why they didn't show up in the log," the truth might be the board operator never sent them, and the FCC should get the truth.

Take a moment to think it through. Our relationship with the FCC (like any relationship) must be built on trust. Why would I ever intentionally undermine that trust? I am sure the police officer who pulled me over knew I was not being forthright. In the same way, the FCC will at least suspect a mistruth, and perhaps find very clear evidence. Keep up your side of the relationship by always telling the truth, even if it is embarrassing or makes your station liable for a fine. Upon an honest foundation, a great relationship with the FCC can be formed.

Keep the Rules – or Change Them

Maybe this is too obvious, but if you want to work well with the FCC, it is important to keep their rules. They have been empowered by Congress to make rules which affect what we do. In my experience, many people view rules negatively. But like a sporting event, the game cannot be played without rules. Imagine if half-way through a baseball game, someone decided they wanted to bat from first base instead of home plate (getting a head start). If the game continues, despite the disregarded rules about where the hitter stands, all sorts of things become confusing. Where is the foul line now? Where do the umpire and catcher stand?

Radio is the same way. With no rules, the broadcaster with the most money will win because they can continue to increase their power, like stereo wars in a dormitory. "You have 100,000 Watts? Well, I have a million – take that!

(Continued on Page 32)

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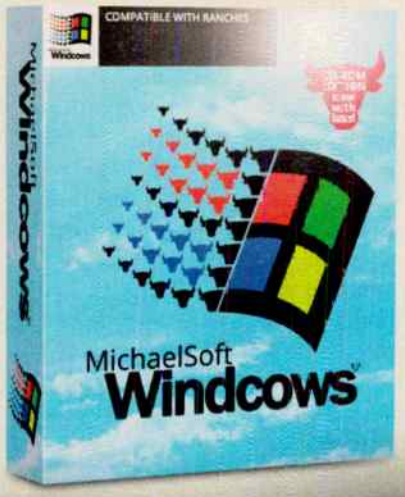

"...but I saved money!"

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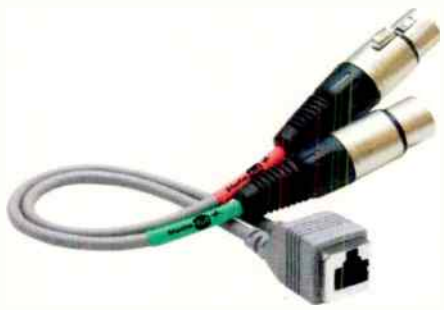

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Working with the FCC

– Continued from Page 30 –

"Oh, and I might as well be on your frequency as well!" Rules make the playing field level so we can all play – and often win.

May I briefly step into some folk's kitchen and say something which will not be popular with many Program Directors (and others?). It is actually possible to have a viable, competitive station while maintaining legal modulation. Having a ridiculous amount of overmodulation may catch a few dial-scanners, but it is the content which will turn them into a listener. Focus on the content. Do great radio, and the listeners will come – and will tell their friends.

That said, it is completely acceptable to disagree with the rules. You may feel some rule inappropriately restricts radio, and you may be right. But rather than disobeying the rule, use the available procedures to appeal a ruling, request that the FCC consider changing a rule, or ask for a new one. If those methods do not provide a reasonable answer, the industry itself can take up the cry, through NAB or other representative bodies.

Finally, if all else fails, Congress has the authority to tell the FCC to make a significant change, as happened with LPFM. Get familiar with and use the FCC's Electronic Comment Filing System (https://www.fcc.gov/ecfs/) where you can read and comment on a number of proceedings.

If the FCC is so accessible, why do I need an FCC attorney?

Fair question, though the presence of an attorney does not undermine the FCC's accessibility. For many years, I have worked closely with our organization's FCC attorneys, and have found them to be a bountiful source of accurate and up-to-date information – certainly earning their fees. Just like asking a specialist in any field, a good FCC attorney can teach a tremendous amount about the laws as they exist, possible barriers to making changes, and even the "leanings" of the current Commission or FCC staff. Perhaps most importantly, they can help you avoid stepping in something ugly and smelly – or extricate yourself with the least possible damage, if you have already taken that fateful step. With attorney-client privilege, you can openly discuss the challenges you are facing, and together work out possible solutions.

Honey or Vinegar?

When my kids were little, I learned a principle about human nature. If you walk up to a young child who is enjoying a handful of M&Ms and ask kindly, "may I have one of your M&Ms?" there is a reasonably good chance you will receive a positive response. If, however, you walk up and just grab an M&M by force, tears or anger will result – maybe both. The principle at work is the idea of "domain." The M&Ms are under their control – within their domain. By asking nicely, the domain stays with them. But if you take an M&M without asking, you have violated their domain. Adults feel the same way. Asking to share a co-worker's food will generally receive a much nicer response than if you just steal it from the staff refrigerator.

Congress has given the FCC domain over radio. If you bring a request with respect, it is my experience the FCC's response will be helpful and, if possible, within the constraints of the rules in play, they will work with you to accomplish your goals. If, however, you approach the request with an attitude of unkindness, disrespect, or arrogance, the human desire to try to work with you to find a workable solution will likely disappear (though you will still receive a fair and accurate response). The old saying is true: You attract more flies with honey than with vinegar.

What About Fear?

I once read an article in a motorcycle magazine which talked about the importance of taking fear as a passenger on every ride. Not a paralyzing fear, but an ongoing awareness of how being indifferent about a motorcycle's risks and rewards can hurt or kill you. In the same way, it is reasonable to approach the FCC with an awareness of the position they hold over radio. Without authority from the FCC, broadcasting in the United States cannot be a viable business.

At the same time, there is no reason to fear approaching the FCC. If, for example, you want to fill out an FCC form and do not understand how to do so, the FCC's website is an excellent source of information. If you need more help, there is no reason to fear contacting the appropriate person within the FCC. They can provide a good answer which can allow you to move forward.

After hundreds of interactions with the FCC in writing, in person, and by phone, I have learned they are not scary. They carry large responsibility and deserve respect, but there is no reason to be afraid.

Sam Wallington is VP of Operations and Engineering for Educational Media Foundation, and has 36 years of experience in broadcast engineering. He can be reached at swallington@kloveair1.com

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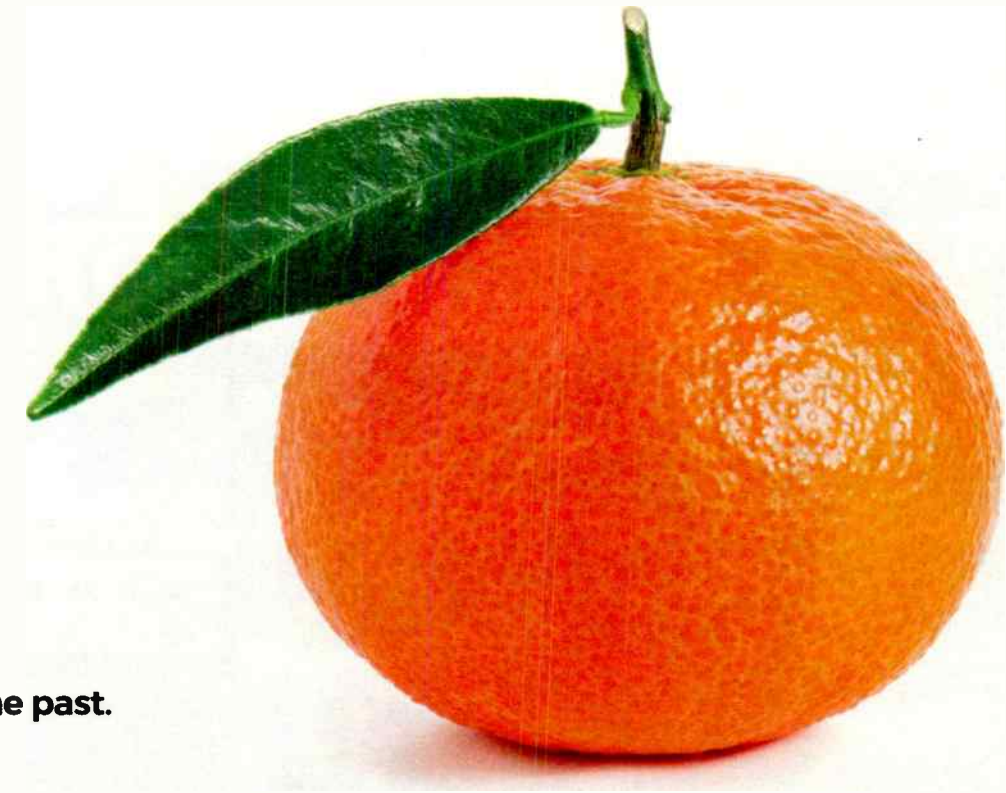
#MisheardLyrics

"Dancing queen, feel the beat from the tangerine."



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Shop Talk

by Steve Tuzeneu, CBT

Misc. Tech-Tips and Thoughts

I always enjoy getting emails from our readers. Some of you have made some very interesting and helpful comments. If you have something positive to contribute, I would love to hear from you. If you have some helpful technical advice or words of wisdom, please contact me at stuzeneu@sbe.org. Your help will be appreciated by the readers, and I would appreciate it as well.

SNMP

SNMP, or Simple Network Management Protocol, is a software-like way of communicating between your state-of-the-art transmitter and your remote control. Introduced quite a few months ago by Burk Technologies, it allows you to connect your transmitter to your favorite network switch, then connect your Burk ARC Plus Touch remote to that same switch.

Once connected, your transmitter is supposed to be able to capture readings which can be read and monitored by the ARC Plus Touch. An engineer is also supposed to be able to control the transmitter as well.

After SNMP is installed on your ARC Plus Touch, you are in business – there is no need to connect a myriad of input-output wires from your transmitter to your remote control. Seems like a great idea to me. You can save a lot of time and money connecting a transmitter and your ARC Plus Touch.

I recently spoke with an engineer that told me of his engineer friend who experienced periodic communication disruptions using the SNMP between his remote control and his transmitter. It seems that the protocol acts up now and then, and refuses to talk to the remote control or the transmitter. This news put a damper on my excitement for using SNMP to simplify connecting remote and transmitter over Cat 5 cable.

Another concern that could happen: If your network switch dies, you will also lose communication between your transmitter and your switch.

I would welcome your thoughts on using SNMP. Is the communication problem between your transmitter and your ARC Plus Touch rare, or have you experienced this as well? How did you fix the problem? Is there a fix for it?

Don't misunderstand, I love Burk products and have used them for many years. I just want to open up a discussion on this and hear from you, the reader.

Free Stuff

If you are like most people, you enjoy free stuff. One of the places I find free stuff is in the Play Store. I have downloaded a number of apps that I find interesting or useful. If, after reading this column, you know of some apps I haven't mentioned here, please feel free to contact me via email and let me know about your favorites.

As an extra class amateur radio operator, one of my favorite apps is EchoLink. Once you download it, you will have to sign up with your amateur call letters. This is not intended for unlicensed use. When you get approved by the folks at EchoLink, you're in business. It works over your wifi connection and you can connect to 2 meter repeaters all over the world. It's kind of like a poor man's HF rig. I believe you can also use your cell phone data connection.

Another app that is on my phone is Clinometer. It's a freebee that is useful for the time when you set up your satellite dish. Your cell phone goes up against a horizontal section of the dish and shows what your elevation angle is.

When you are locating "the bird" that carries the network you need to receive, download Satfinder. This handy app needs some input from you, but it will help make aiming your dish a bit easier.

If you need to know your station is on the air, or want to check the audio quality, download FM Radio. I use an Android phone and plug in a pair of lightweight headphones with a mini plug on it. I launch the app and am able to tune around the dial for a station I want to listen to. It's helpful when you don't normally carry a radio with you. There is probably a version for an Iphone. This app may or may not work with your phone.

These are a few apps for starters. What's your favorite app? Have you got one that is very useful? Let me know.

Useful Tips

There is nothing special about the tips I am going to mention here. They are normal things we need to check on. I just think it's good to remind you of the things we need to stay on top of.

(Continued on Page 36)

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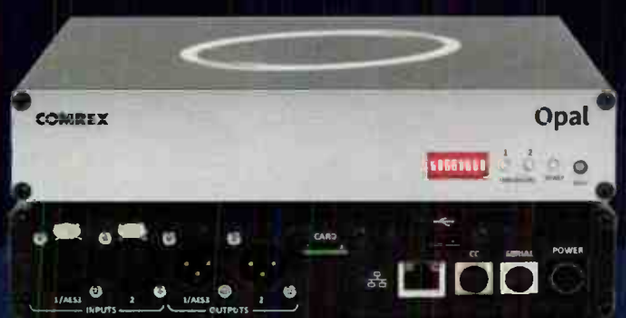

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World Radio History

Shop Talk

Misc. Tech-Tips and Thoughts

– Continued from Page 34 –

Plan your trips to the transmitter. What do you want to accomplish, outside of an emergency trip, that needs to get done? Have you had your central air conditioning unit at the transmitter cleaned and checked this year? Having it cleaned and checked over by your AC service company could save your transmitter from shutting down due to overheating.

Have you replaced the memory battery in your transmitter lately? What about the battery in the UPS that keeps your transmitter's controller operational? I'm told a controller can take about 30 minutes to boot up after a brief power failure, but only a couple of minutes once power is restored to the building if it is connected to a UPS.

What do your building air filters look like? Have you replaced them lately? What about the filters on your transmitter? As you know, heat and dirt are your equipment's enemy. Keep your building cool and very clean year round.

Do you document your repairs or maintenance? With a black marker, you can write the date you installed a new filter on its frame. It's good to know how long it has been between filter changes.

Do you take pictures with your smartphone of repairs? It's good to show management that you are indeed taking care of a part of the station almost nobody sees.

Are you, or somebody on your staff, checking on your EAS equipment to make sure you receive those weekly and monthly tests? Keeping some kind of document of tests sent and received could be very helpful in avoiding a fine should you get inspected.

Have you inspected the exterior of your transmitter building? Is it waterproof and sealed in such a way to prevent insects from getting inside?

What about security? Do you have cameras set up to monitor traffic around and into the building?

And speaking of security cameras, there's a great little camera out now that is very affordable and sends great pictures to your smartphone. It's called "Wyze Cam." This little camera boasts a 1080p video picture and gives a great picture with some room light. In total darkness, it will see almost everything you could see in bright room light.

There is an optional mounting bracket so that you can mount it on your wall or equipment rack. Wyze Cam works through your wifi in the transmitter building. The USB port is used to program the camera, that is, setting up the static IP address and connecting it to the wifi. Once configured, your camera uses that USB port for power through its supplied power adapter. This camera also sends out an email to alert you that there is someone inside your building. If you have one of these cameras outside your building, you will know if you have company. There is some recording capacity as well. You can purchase this camera on Amazon with a starting price of $35.00. Other cameras come with lights, or there's an indoor camera, too – both cost more than the $35 price tag, but are affordable options for security.

Do you have a working flood light outside your building? One that senses visitors and comes on instantly? Check these whenever you make a trip to "the shack."

Speaking of lights, have you checked your tower lights lately? Many modern tower lighting control systems have a test switch. You turn the switch to "test," and your tower lights can come on even in the daytime.

The Wyze Cam

Don't forget to keep documents on the work you do. You may remember this suggestion from a previous edition of Shop Talk. Use the Cloud to keep your documentation available from anywhere. Google Docs or Dropbox are free, or there are other affordable places to keep your documentation.

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

218 Together

A Small Market Idea to Help the Community

by Roger Paskvan

It's no big secret, COVID-19 has really hurt a lot of radio stations and businesses – not only in small markets but nationwide. This is a story of how our small market stations helped our local merchants open up.

Our problem was how to get some of our local merchants back on the air. To make matters worse, the station's income from sales was down 50%. Most merchants had lost so much business and income; they had no money to advertise. This was definitely a complex problem, not only for the station, but also the business community.

In April, our station manager invited local area business owners to informational meetings at the station. As broadcasters we understand that when you get on the radio twenty times a day and broadcast a specific message, you can easily influence a large audience. From these meetings, a new idea immerged, "218 Together." – 218 is our local area code. Yes, we were all in this together and merchants needed a way to let people know they were open.

The country was reporting critical areas, such as bars, restaurants, gyms, and hair salons were areas that could quickly spread COVID-19, we knew that there would be some long term damage on economics for these business categories. We wanted to make sure to present a positive, supportive message for these specific business categories.

218 Together features a website 218together.com with social media as well. We added e-commerce to the site as well as customer comments and recommendations. 218Togther also features a weekly newsletter plus a 15-minute weekly radio show covering all the newsletter information. The radio show is broadcasted every Thursday from 11:45 AM-Noon on all of our local radio stations. The program features classifieds for employment and sales, buy it now and auction items, plus our deal of the week with a featured business of the week. Features are updated to the 218Together concept every month. Each member gains by being a participant in this program.

The 218 Together is a program focused on restarting the economy and getting all industries open and back to work, of course, with personal safety in mind. All the 218 local area businesses are joining together to inform the area of the safety and industry regulations they must comply with, how they give back to the communities they serve, and why it is important to shop local!

218 Together, businesses support each other through testimonials, marketing, and promotional events. 218 Together is a *free* partnership that any local business in the 218 area code can join.

E-commerce products and services are available for sales on the 218together.com website. A "Buy It Now" feature, with participating clients, is available for purchase at 218together.com

Informing area consumers to visit 218together.com will utilize multimedia platforms to educate and invite consumers to interact with 218together.com.

Digital Marketing: As a Google Partner, each member will get a Google Digital display and video ad placement per month to increase awareness and generate demand. We are focusing on our unique 218 area code!

Radio Marketing: Our local stations cover a large portion of those listeners in the 218 area code. Each member enjoys a 218together.com feature business of the day – three minute station interview live or recorded, played three times at 8:20, 12:20, and 4:20. Ten, 15 featured businesses of the day promos on each station. Plus twenty, :30 commercials.

218together.com, three for one ad pack: Purchase three commercials at standard or established rate and receive 4th commercial *free!* Minimum purchase of ten thirty second commercials.

218together.com Newsletter: Each month a digital newsletter publication will be sent to all participating 218together customers and partner business.

Social Media Marketing: Social media posts on Facebook, Twitter, and Instagram will be our primary social media outlets.

Many Merchants took the basic value packed promotion for free and promised to buy ads later when business improves. The idea worked and the loyalty was overwhelming. Others added to the plan with our $218 marketing sales plan, providing more commercials and digital impressions, immediately.

So this is an idea that worked in a small market radio station, bringing the community together to solve a common problem. Possibly this idea may work in your area code, putting some light on your stations while helping out your community to buy local and open up.

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

World Radio History

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World Radio History

Maintenance Guide

Troubleshooting a PWM AM Transmitter

by John L. Marcon, CBRE CBTE 8VSB Specialist

It has been decades since the first high power, fully solid-state AM transmitter was introduced to the AM broadcast world. It fascinated me then and I'm still fascinated today. Who would have thought that switching something on and off would not only represent an analog waveform but in doing so, would also consume less power? Just a brilliant idea. But it did not happen right away because something had to change with the transistor first. In the late 70's, improvements in the Field-Effect Transistors (FETs) became a game changer. One example is the HEXFET, introduced by International Rectifier in 1979. This type of transistor has a very low switching loss at medium wave frequencies. Today's FETs even have lower ON resistance than before, that efficiencies can reach 90%. That is just a fantastic number because very few systems or machines have that kind of efficiency. The redundancy of the modules in solid state is another advantage. Consequently, over time, the tube types were phased out.

Manufacturers already have a number of iterations of their transmitters since the first solid state was introduced. Surprisingly, the basic techniques of PDM, series or parallel combining and switching transistors, are still used today.

Although some brands do not use PWM, they still employ the same technique of sampling the audio and then converting it to switching signals that can be amplified by the power transistors.

If your station has the top of the line brands, then you are in luck because they have complete tech support and their transmitters are well designed. They can even remotely log on and diagnose the transmitter for you.

However, many do not have this luxury and, even if they would like to replace their transmitter, they may not have the budget to do so. In-house troubleshooting and repair are therefore necessary. The next option is an outside contractor that can do a timely repair of the equipment.

Proper understanding of the operation of the transmitter is needed before we can fix it by ourselves. Reading the manual and schematic diagrams is only the first step. There will be circuits and components that seem to be "magic black boxes" and your task is to reveal the magic happening inside them. Once you feel that there are no more "magic boxes" in your equipment, then you have "arrived." The Internet will help but will not answer everything. There is information in some books and technical articles that are just not on the web. One sure way to understand certain circuits is to build one yourself, which is what I did some time ago. It indeed brought out a wealth of knowledge.

With AM solid state, you have to immerse yourself with learning about switching amplifiers, FET circuits and, for the purpose of our discussion, Pulse Width Modulation (PWM) techniques. Knowledge of switching amplifiers will also open the way in understanding other related circuits such as switching power supplies, because these devices also use switching transistors in their circuit. Switching power supplies are in use today in mos,t if not all, electronic equipment.

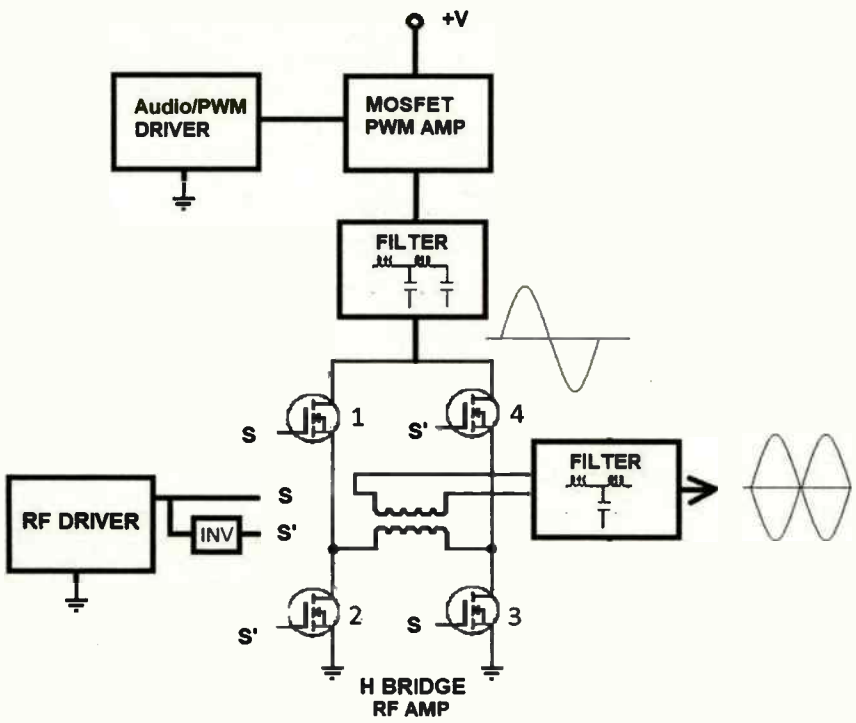

Figure 1: Block diagram of a PWM transmitter with an "H" bridge RF amplifier. Notice that the drive signal is in-phase for the diagonal transistors. The two diagonal transistors are "ON" for half the cycle while the opposite diagonal is OFF. The reverse happens on the next half cycle of the sine wave. This results into an AC square wave output.

Parts of a PWM Transmitter

Tube transmitters usually have a modulator tube, modulation transformer, and RF tubes. Modulator circuits are usually class AB while the RF circuits are usually class C.

In a solid-state PWM, the RF and modulator are both in Class D or switch mode. A Solid-state PWM AM transmitter can be divided into four sections: a modulator, an RF, control and power supply circuits. FETs are used in switching amplifiers instead of Bipolar Junction Transistors (BJTs) because they are easier to drive, have much higher gain, low switching loss and the output circuit is easy to design. A switched class D FET amp simply means that the FET action is like a light switch: either it is fully ON or fully OFF. For this to happen, the transistor is driven to saturation during the ON state and the drive signal goes below input threshold (or zero) in the OFF state. Half bridge or Full bridge topology are often used on the RF side. A Full bridge, also called an H-bridge, consists of four FETs located on the legs of the "H" while the load is on the middle. On the other hand, a single FET can be used for the Modulator, although manufacturers often use parallel FETs to increase current capacity of the circuit. One critical part is the Gate driver IC circuit.

If you noticed on the H bridge drawing on **Figure 1**, the number 1 and 4 FETs are floating from ground while the numbers 2 and 3 FETs are grounded on the Source side. A floating driver drives the upper FETs and this is where an isolated Gate drive IC can be used. Alternatively, RF transformers are also suited for this application since they naturally isolate the input from the output. Usually, the transformers are wire wound toroidal cores. There are many types of cores and it varies depending on the frequency of use.

Familiarity with PWM technique will come in handy when analyzing the solid-state AM circuit. PWM uses a triangle wave and a modulating signal to produce the pulses that will drive the modulator amplifier. The combining of the triangle and modulating signal is done in an op amp. The triangle wave oscillator is usually 70 kHz. although manufacturers use higher frequencies to have a more precise reproduction of the audio waveform. This PWM signal is fed into the driver IC (or transformer) and the driver IC connects to the MOSFET PWM amplifier to produce the high-level PWM signal. The amplified PWM is filtered to recover the "shape" of the modulated input signal. This whole modulator circuit is inserted between the DC supply and RF power amplifier. In essence, the modulator acts like a big variable resistor in between the DC supply and the RF amplifier.

The RF power amplifier output waveform are square wave pulses at RF carrier frequency. Finally, the RF amplifier output is connected to a harmonic filter to reduce the odd harmonics and a matching network to match the 50 Ohm output. The final waveform is an AM modulated signal.

Troubleshooting

There are many things to consider when troubleshooting, but the basic approach, as many are familiar with, is to start with the power supply. Check if the main switch works, check the fuses and check if there is High Voltage DC for the FET amplifiers. The HVDC here is not in the kilovolt range like what it is for tube transmitters. The HVDC can be up to 350 VDC. This is the safe range for a TO-247 packaged MOSFET.

The technician should also learn how to determine if a FET is good or bad. Fortunately, this is easy to do because most of the time transistors in RF or modulator amplifiers that go bad are shorted between Gate and Source (this is where the drive signal is connected). This is the most sensitive junction of an FET. In fact, some FET models have the surge suppressor built in between the Gate and Source. A working FET will have a forward bias (low resistance) between Drain and Source when a positive voltage is applied between Gate and Source. Moreover, the same Drain to Source junction will reverse bias (open) when a negative voltage is applied between Gate and Source. The positive voltage must be at least 5V.

(Continued on Page 42)

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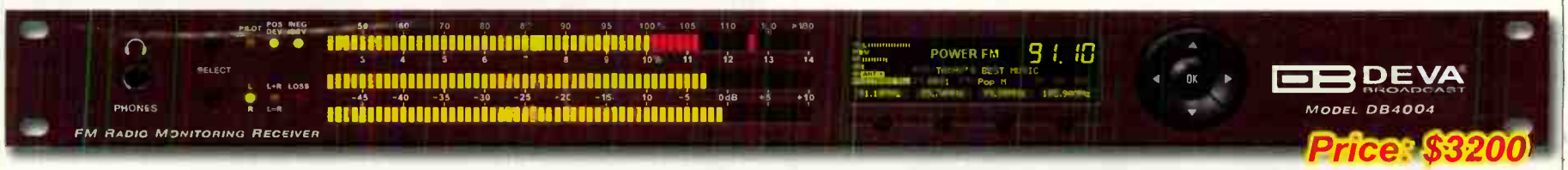

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Maintenance Guide

– Continued from Page 40 –

Some Digital multimeters (DMM) only have 3V on their "diode" test, so this will not work when checking a FET.

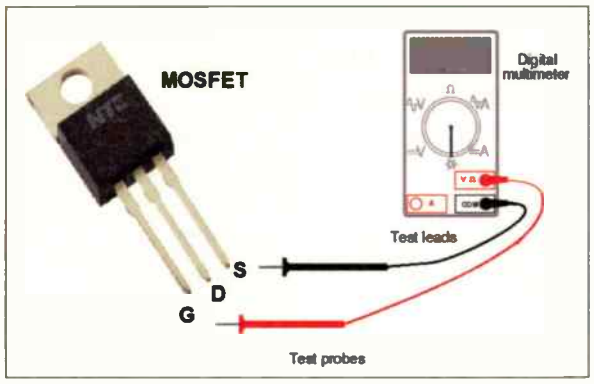

Figure 2: Checking a N-Channel MOSFET using the diode function of a DMM. A positive voltage above the input threshold will forward bias the Drain to Source junction and a negative voltage will shut it off.

The 1kW Transmitter

I recently worked on a 1kW PWM AM transmitter that was off air for some time. The owner said that the problem has always been the transistors blowing up for no apparent reason. Unfortunately, the transmitter is not supported anymore because the factory closed down. As I looked at documentation, I noticed that the manual was not even complete. There were some missing drawings and some of the drawings were not actually in the circuit. **Figure 3** is a picture of the RF and Modulator circuits.

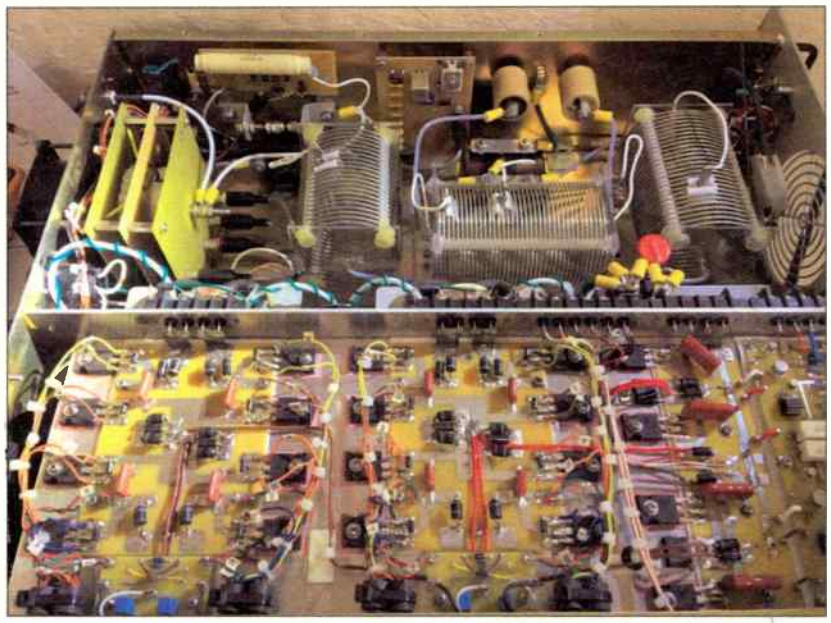

Figure 3: 1kW PWM Transmitter Amplifier box. Shown are the output network on top, two boards of RF amplifiers and the modulator board on the right side.

The transmitter has two RF amplifier boards (left and middle) and one modulator board (right side). The parts on the upper section are the output filter coils and capacitors. The PWM filter and two output transformers are not shown in the picture. As I discussed earlier, the RF bridge amp is arranged into four FETs and, as you can see from the picture, the left and middle RF boards have eight transistors each, four on each side. This means there are two H-bridge amps in one board. Since there are two boards, the total is four H-bridge amps. Each RF board has one output transformer combined in one toroid and they are connected in series on their secondaries. There is another twist in the circuit because the positive side of the 185 Volt HVDC is actually grounded. Designers do this to avoid having to float from ground the heatsink of the FETs. You will also notice there are many diodes on the RF board. These are fast acting backswing diodes. Once a FET is turned off, the collapsing field from the transformers are safely channeled to ground by these diodes.

After identifying the H-bridge on the RF boards, I then checked the Gate to Source reading of the FETs using a DMM. Sure enough, three of them were bad. There was also one bad FET on the modulator board and two busted fuses. The fuses connect the HVDC to the Modulator FETs. I replaced them all and the transmitter was back on-air again. I recommended to the owner that he install a static drain coil in the ATU and use some toroidal cores on the coax to add more protection for the transmitter.

Mastering the basics of switching amplifiers. coupled with experience in troubleshooting electronic circuits, are essential in repairing a Solid-state AM transmitter. This will help keep the equipment humming for a long time.

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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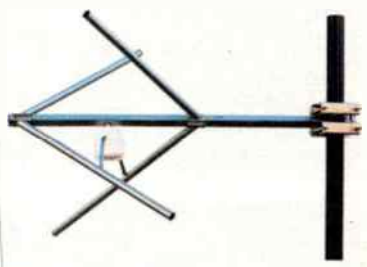

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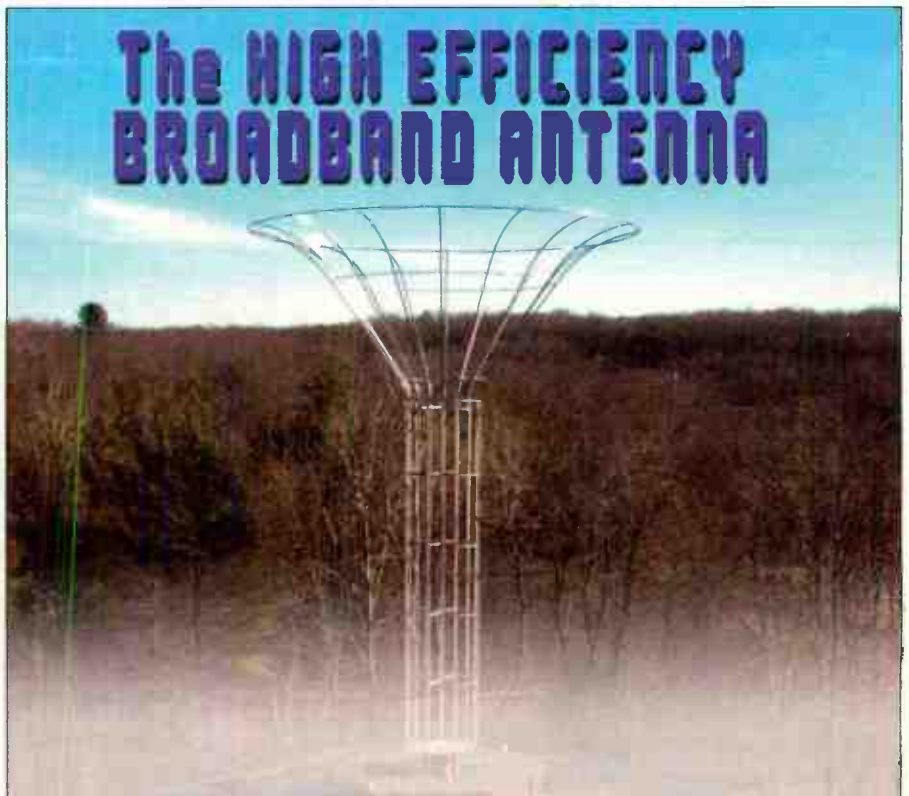

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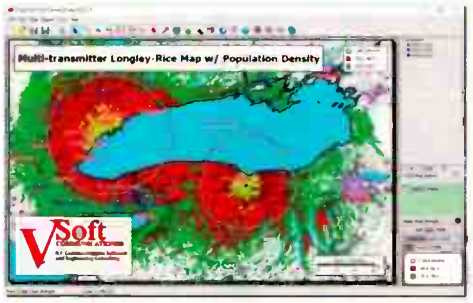

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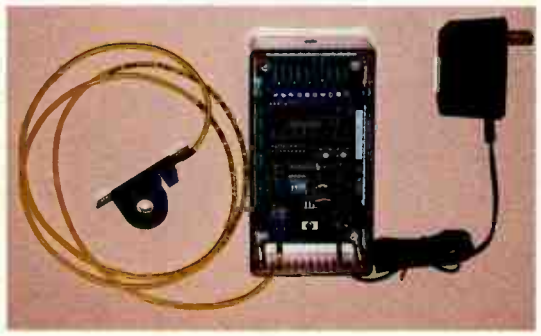

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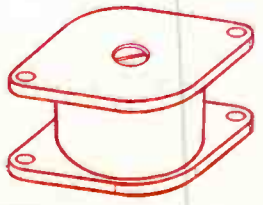

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Radio Station Essentials

By Ron Erickson

Henry Engineering

My title in this issue makes a strong statement: *Radio Station Essentials*. In truth, these products I'm reviewing today do not generate an RF signal and they don't store audio, or even process it, before it goes to the transmitter. So why did I choose this title? Because these "little boxes" solve some basic problems that radio stations everywhere have or will experience – and these products are affordable, even for the smallest of cash-strapped stations, so in my book that makes them rather "essential."

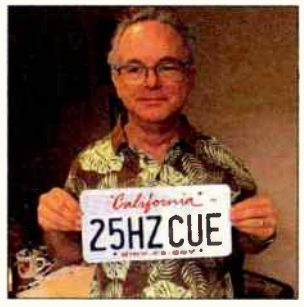
Many, many years ago my family had a small station operating in Central Oregon. I might mention the studio was in our home. I had constructed a not-so-complicated automation system consisting of a step relay, two Revox Reel Machines, a cart carousel and a simple audio loss alarm, with the alert sound routed to the kitchen so my wife could run out to the studio and change the music reels. It's a wonder she didn't divorce me right then and there. Thankfully, we are still together some 45 years now. I really needed this device, but it didn't exist back then. My essential box #1 is The Henry AUTOSWITCH.

The AUTOSWITCH, like other Henry products, serves more than one purpose. With a built-in silence- sense and an alarm function, it can monitor your main audio source and when a drop-out happens, it will automatically switch to a back up source. In fact, if that back up source isn't running yet, the alarm triggers a relay closure to start that source. Way back when, my wife would have really appreciated that feature.

For many years, broadcasters have used simple analog audio. Somewhere, someone decided that analog audio was *not* good enough anymore and we needed to convert broadcast operations to digital audio. "They" argued that by using a digital STL, we can now send multiple signals through one path creating less bandwidth. This may be more cost effective for corporate owned multi-station sites, but for stations still hiring live talent it created a new problem with digital delay in the headphones. The Autoswitch solves the headphone delay problem by automatically switching the DJ's headphones from Air (has delay) to "direct console" (no delay) audio when the mic is on. Just connect it to the Mic Tally logic on the board and it'll switch whenever the announcer is live. Nice!

Most of us know of a station that could benefit from having one of these little boxes. Recently, I was talking with my good friend Bob Anthony Fogel, owner of KOOL 107.1 in Spokane, WA. He was relating problems using the Internet as his STL. I mentioned to him that having a back-up computer at the transmitter site and an Autoswitch might be a solution to the audio drop out. Another friend operates KKHP-LP in Oroville, CA. (Reference previous article: *All They Wanted Was A Studio,* Radio-Guide Jan-Feb 2020.) That new studio was connected to the transmitter site by BARIX boxes, which works great while the Internet stays connected, but since the devastating fire that destroyed the town of Paradise, PG & E instituted frequent planned power blackouts which affects the studio location, while the transmitter can run on a back-up generator. This station really needs a HENRY Autoswitch.

Before I talk about the next essential box, I want you to meet the man behind Henry Engineering, Hank Landsberg. Hank is a new friend and kindred spirit who, like most of us, fell in love with radio.



I've referenced before, my 100 mw Knight Kit AM Broadcaster. Well, at age 12, Hank had one too – in fact, he told me he still has it, and it *still* works. Hank became a HAM at age 13 and radio equipment became his focus. After taking the *Broadcast Controls* course at Pasadena College, Hank discovered that he could actually get paid for "playing with cool broadcast equipment." His radio career really started at KMAX and there is a fun story about this very strange station at www.henryeng.com/kmax. He became the Director of Engineering at Drake-Chenault in 1974 and he started Henry Engineering in 1982. The first Henry product was a series of "upgrade modules" for Collins/Autogram audio consoles. Then the Matchbox came along in 1983. It adjusted for audio level variations as it matched unbalanced audio to balanced audio and vice-versa. To date, around 75,000 Matchboxes have been sold, and about 120,000 total products have sold since 1982.

Back in the 70's I was a part-time jock at 50,000 Watt KPNW AM in Eugene, Oregon. I recall that the control room had a nice, ten channel Autogram console – it may have been one of the consoles destined to be upgraded with Henry Modules. One thing's for sure, it had plenty of inputs for everything. (The console photo is one I found on-line and not from KPNW.) With more and more stations eliminating live talent, studios with nice, large ten pot boards, with multiple switchable inputs, have downsized. Many stations now are using much smaller consoles and with just a couple of computers and a few other audio choices, the inputs can become "maxed out" very easily. This brings us to my next "essential box," the STEREOSWITCH II. At first glance you can obviously see that the Stereoswitch will allow you to add three more inputs to any mixing channel. For most of us, just getting a good quality audio switcher at a reasonable price would be enough. What I'm going to reveal next may seem to be magic – at least I thought it sounded like magic.

It's not obvious looking at it, but the unit's function can be reversed by feeding audio into the output! This gives you a selectable audio router sending audio to one of three directions. Who knew?

Well, it *is* in the brochure, but honestly how many of us really read the paperwork? The features of this "essential" box don't stop with that. Upon applying power to the unit, it automatically comes from the factory set to choose input number one. This could be very useful after a power outage. Use one with your automation system to select audio channels through the remote control connections. You can use a momentary or maintained contact closure, open collector, TTL/CMOS logic or DC switching from 5 to 24 Volts to change sources. Finally, I'll mention that "Tally Outputs" can be connected, giving you a light cue as to which channel is selected. Indeed, it is a most essential box.

Hank Landsberg has a new product that you should see at the Henry website. It is a fail safe UPS power switcher called BackUPS. See it and more at https://henryeng.com/backups/

Ron Erickson is a voice talent, engineer, consultant and writer. Contact him at 541-460-0249 or at ronerickson@gmx.com

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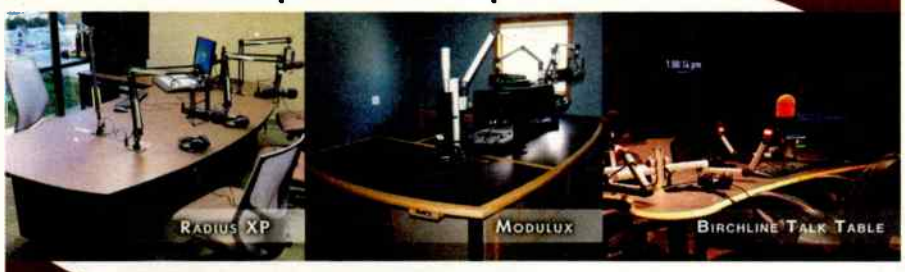

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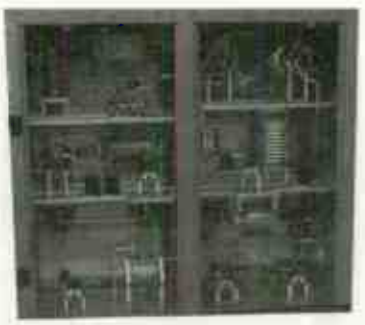

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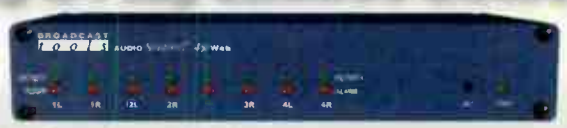

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