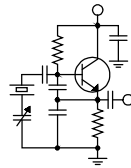


The Local Oscillator



The Newsletter of Crawford Broadcasting Company Corporate Engineering

NOVEMBER 2018 • VOLUME 28 • ISSUE 11 • W.C. ALEXANDER, CPBE, AMD, DRB EDITOR

Gateways

The term “gateway” has been used in all kinds of ways, but with respect to one activity leading to another, it has typically been used in a negative context (as in a “gateway drug”). But in a positive sense, many times a hobby or interest becomes a gateway to a skill or vocation.

For example, in my own career path, Amateur Radio was the gateway to a career in broadcast engineering. As a young teenager, I was fascinated by the glow of the tubes and dial and the strange sounds I could pick up on the huge console shortwave radio that we had, and that led me to an interest in “ham radio,” which I pursued with a passion.

Pretty soon, I was not just listening to those strange sounds but was actually communicating with people thousands of miles away using a telegraph key and a new (to me) language called Morse Code. My first on-air contact, as I recall, was with a guy in Schenectady, New York – at five words per minute, it took him quite a while just to send the name of his town!

It wasn’t long before I got the bug to go beyond the dits and dahs of Morse Code and really talk with other people using single-sideband transmissions, so I studied up and passed the General Class license exam. Within a few months I had taken and passed the Advanced and Extra Class exams, going as far as I could in the hobby, at least in terms of what the FCC at the time called “incentive licensing.”

Somewhere along the line, I got the bug for more power, bigger antennas and hardware. I was fascinated by the multi-tower antenna array of the local AM station, and on a whim, as a 15-year-old, I applied for a job at the station. I would do anything – even mop floors and clean bathrooms – to get inside and learn about the technical side of broadcasting. I

was more than a little surprised when they hired me, not as a janitor but as a board operator, changing tapes on the huge Schaeffer automation system, reading the top-of-hour news and running the board on the FM station. I suppose that because in those days there were few listeners to the FM band, the station owner really wasn’t taking that much of a chance on me.

The chief engineer was a mysterious fellow named Don Freestone, and he had a room behind the transmitters and phasor where he was always hunched over a smoking soldering iron. I watched him every chance I got and learned a thing or two. In the process, I made a couple more trips to the FCC field office in Dallas to test for the Second and First Class Radiotelephone Operator Licenses, passing both on the first try. By that time, I was fully hooked and knew what I wanted to do with my life vocationally, so I pursued additional education and got myself mentored by a number of great broadcast engineers who were generous with their time and patient with a young wanna-be.

The point of all this is that for me, Amateur Radio was the gateway to a career in broadcast engineering. If you ask a room full of guys my age how they landed in broadcast engineering, probably two thirds will indicate that they got there from an interest in ham radio.

Amateur Radio is still a big part of my life. I have stations at both our in-town and mountain homes and keep regular schedules with guys that I have known and talked to for over 30 years. There is some young blood in ham radio – Amanda and her husband Jordon are active, licensed hams – but the mystique of communicating around the world is largely lost on millennials and Gen-Z-ers... after all, they can hop on Skype or Facetime and talk with someone on the other side of the planet in real time – with video! Why would they want to go to all the

trouble of stringing up wire and straining to hear through all the static and interference?

So, what is the gateway to broadcast engineering these days? Amateur Radio is still one choice, but not so much as it was 40 years ago. The obvious gateway that comes to mind is IT – Information Technology. A lot of young people tend to have an aptitude for IT, building their own computer systems, setting up networks (IP) and even writing code, and many pursue careers in the field because they're good at it.

Broadcast engineering infrastructure is quickly becoming IP-based, and at many stations (including all Crawford facilities), just about everything from microphone to antenna is conveyed over one or more networks. (Seriously, I'm waiting on ERI to begin offering an antenna with an RJ45 as its input connection!) So a good, working knowledge

of all things IT and good network skills are prerequisites for engineers working in our facilities.

While we still have big towers, antennas, transmitters that make big power and all that, IT skills are considered primary in this day and age. Rather than taking RF engineers and teaching them IT, we take network engineers or IT people and teach them RF. The world has turned upside down.

I don't think that many young people come out of high school with the idea that they want to work in broadcast engineering. That was true in my day and it's truer today. Broadcast engineering is one of those career fields that really needs an entry gateway. While IT may be the obvious gateway, it can't be the only one. It's really up to us, the graying generation of broadcast engineers, to identify what other gateways that may be out there and help young people find their way through.

Any ideas?

The New York Minutes
By
Brian Cunningham, CBRE
Chief Engineer, CBC – Western New York

Hello to all from Western New York! October was an interesting month, with several "unexplained occurrences" which I will touch on shortly. But first, I was saddened to hear of the passing in late August of fellow engineer Rick Levy.

Rick was a unique individual; those who knew him would have to agree with that assessment of Rick's character. I first met him while contracted from Harris Corp. to perform a rather large facility build in Boston at Emerson College sometime in the late 90s... there have been so many projects the last 27 years or so that each one tends to run into the next one. But not this time!

We were into the third day of the build-out when a seemingly homeless man entered the main studio area we were working in and stood in a corner, just looking around, not saying a word. After a short time had passed, I went over to the man and asked if he needed anything, and mentioned that this was a work area, and he shouldn't be there. After what seemed like several minutes, this "homeless" man

looked me straight in the eye, smiled and said that he was the chief engineer of the station!

I was taken aback with this turn of events, and contacted Bill Bingham, who at that time was heading up the project for Harris. When I told Bill about this homeless looking man who showed up claiming he was the chief engineer of the station, Bill let out a hearty laugh and muttered something about how he forgot to warn us about Rick. This was my first encounter with Rick, mistakenly taking him for a homeless man, living on the streets of Boston. We had a good laugh over that one, and many more followed through the years.

There was something about Rick that made you feel as if you'd known him all your life. He was quiet, often times reserved, but had a sense of humor that would immediately put you at ease. His engineering knowledge was superior, he was always ready and available to lend a hand or offer a suggestion to a problem that had you stumped, and he would make your problem priority one, regardless of





Figure 1 The renovated WLGZ-FM control room.

what was going on with him at the time.

While broadcast engineering paid the bills, his other love was astronomy, and he could tell you anything about the stars and planets you wanted (or didn't want) to know. I was surprised that Rick wasn't working with NASA as a space engineer or something along those lines – he was that smart.

I did not know too much of Rick's personal life. He kept those kind of things to himself, always focusing his attention on you or the situation at hand.

I know I am a better person for having known Rick Levy, and will miss talking with him from time to time, but I learned one important lesson from him: not to judge someone by appearance only, for the next "homeless man" could be CEO of some big corporation or a broadcast engineer looking in on his latest project. Goodbye Rick, and Godspeed.

I mentioned above that we experienced several "unexplained occurrences" last month, the type of things that you cannot explain why they happened. The first involved our Burk ARCPlus Touch at the WDCZ transmitter site. It was late Saturday night, and the board operator phoned and said that he could not take readings on the AM transmitter site. I tried from my home computer, and it kept telling me that the connection was refused. I phoned Verizon tech support and opened a trouble ticket thinking this was an internet delivery problem.

After hearing back from Verizon the next day that the line was good, I went to the transmitter site to investigate the issue further. I found that I could access the remote control via AutoLoad Plus, but not through the web portal. I phoned Burk tech support and worked with Mark and Miguel for some time on this issue.

Mark tried to log into our system after I change the port to another number, thinking that something was blocking port 80. Port 90 worked, for about 20 minutes, and then access was again denied. I went through all of the configurations for the Burk network and could not find anything out of the

ordinary; everything was just as I had first programmed it. I even went as far as resetting the FIOS modem and reconfigured all of its settings, thinking it could be blocking the access port. Still no access.

On a hunch, I changed the web port in the Burk to a number in the 4000 range, opened that port in the FIOS modem, and success! We have not experienced one single issue since, and Burk tech support has no clue as to why it is refusing to connect at lower port numbers. I even went as far as reloading the current software from Burk, but that made no difference either. (The original software version was an earlier release that came with the unit.) So I can rule out a newer software flaw. Any ideas, anyone?

Another unexplained occurrence takes us to the WDCX-FM transmitter site right after the power failed on a perfect fall afternoon. The sun was shining, no inclement weather to be found, but we were losing power from NYSEG on a frequent basis. Each time the power went off, the generator would immediately kick on and restore power to the transmitter plant, but this time, the generator was shutting off immediately when power was restored, not running for an additional period of time after power restoration, as it is programmed to do. The remote control indicated six times the power went off, and the generator started up, and shut down immediately when all three phases were available without any additional runtime.

The generator issue was not the unexplained problem; the problem was our HD-2 signal not coming back up after the power was restored. I tried several times to restart the HD-2 importer, but to no avail. It showed no faults or warnings in configuration mode; every one of the modules would load and run, but there was no audio. A check of the importer's control panel > hardware showed an issue on the sound card. After clicking on the soundcard icon, it indicated that there was no sound card installed, so I reloaded the drivers.

Next it complained that the sound card's model/serial numbers were missing, so I had to pull the importer out and obtain the card model/serial number to activate the license. After entering this information, I was able to get the importer up and running and the HD-2 programming back on the air. I have no clue as to why the sound card suddenly went stupid and all drivers related to this card were completely deleted from the system. I am so thankful that I had a good copy of the drivers on my thumb drive, as I looked on the manufacturer's web site for the drivers and found that this card is now obsolete

and no driver information is available.

As to the issue of the generator cutting off immediately after commercial power was restored, I found the problem to be a bad 25k carbon linear pot in the timer circuit. The pot had basically dried up, and caused the timer circuit to bypass any additional runtime after the switch from generator to commercial power occurred. I don't understand why the manufacturer would use this type of pot in a circuit that would be exposed to extreme heat/cold/moisture for extended periods of time. I am looking into replacing all of the carbon linear pots in the controller with sealed 25-turn pots, to alleviate this problem from ever happening again.

Also last month, I began and finished a new studio build out for our sister FM in Rochester, Legends 102.7 WLZG. Their studio had been in place since 1999 and was in dire need of a makeover. The cabinets they had were in bad shape with the laminate popping up in several areas and the countertop sagging around the console area. I designed the new cabinets and had Brian Francis from Hi-Tech Laminates build it for us. I have used Brian's services many times over the years and his work is second to none. He and I figured that we have done at least 50 studio projects together over the years, and he boldly stated that this would be his last, as he plans retirement at the end of the year. I'm so



Figure 2 Another view of the renovated WLZG-FM studio.

glad that we had the opportunity to work together on one last project, and that project was WLZG. They wanted it, needed it and deserved it, as the station is doing remarkable in the Rochester area, going in rating from the bottom of the list to tied with 4th in the marketplace! Thanks go out to Don Crawford, Jr. for making it all happen, and seeing to it that we have a studio in which we can be proud to show off and work comfortably in.

That about wraps up another month here in the great northeast, and until we meet again here in the pages of *The Local Oscillator*, be well, have a Happy Thanksgiving, and happy engineering!

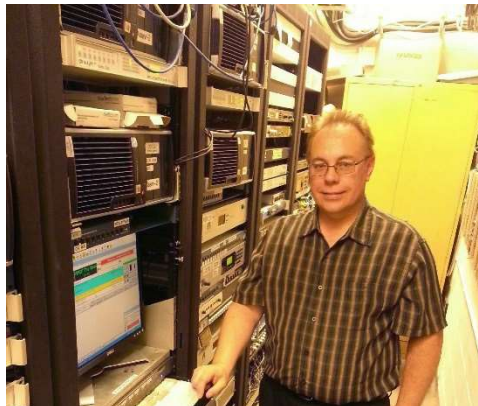
The Motown Update

by

Brian Kerkan, CBTE, CBNT
Chief Engineer, CBC – Detroit

Hello from Motown! October was another busy month for u here in Detroit. We ordered a 30-yard dumpster and completely cleared out junk and debris at the WCHB site, much of which had been left by our landlord and their predecessors, in preparation for the new WRDT translator. The building was full of items from years back. It is so nice to have usable space. I can't believe we completely filled it.

We also took the time to straighten up the cabling from the tower to the building. The cabling out to the ATUs was not properly secured, and just didn't look too nice.



We fabricated a tower mount for the Kintronic isocoupler since the FM antenna will be installed on a hot AM tower and terminated the cabling and installed the equipment in the new rack. We should have the new translator on the air soon.

On a recent visit to the WRDT day site in Monroe, we noticed someone had run into one of our tower fences and bent two of the posts. The time has come for security cameras and stepped up security at this site. We have been adding security to all of our sites. This site has been



a particular problem with neighbors riding ATVs all over the property, despite warning signs.

We have been working on improving

Isocoupler installation on WCHB's tower #2.

documentation for our computer network and automation systems. My assistant, Steve, has been doing a great job in tracking down valuable information. It is so easy to let this go, and when you most need it, you have to figure things out as stuff happens.

The national EAS test went well. All of our stations received and sent the test without issue. The audio was much better than previous tests.

There has been interest from cell providers in leasing space on one of our towers at Radio Place. With the build out of 5G, tower space invaluable. We hope to have a new tenant soon.

We have been putting together backup audio to load into our Omnia.9 processors in case we have a major failure on both STL paths. The Omnia.9 has a directory where you can upload backup audio that can play out of the processor directly as files. This feature is one of the many reasons I really like the Omnia.9.

It's hard to believe that almost one year has gone by since we put WMUZ AM 1200 on the air. The NX50 has worked out great, and so has the pattern controller for the 10-tower array. We make sure to keep the site maintained to keep it that way.

About this time last year, we had an unexpected visitor to the transmitter building. On Halloween Eve, we heard a knock at the transmitter building door. Upon opening it, we saw one of our new neighbors with a lawn sickle in hand. It is times like these that it is comforting to have a helper with you. It's a Halloween I won't ever forget.

We have started to prepare each of our sites for winter, testing the furnaces and checking the filters. We have been checking doors and our buildings to make sure they are ready.



Damaged fence at the WRDT day site.

My Winnebago Lesharo project is coming right along. It's running great, and I have been refurbishing the interior, replacing the ceiling panels and cleaning things up. It is my hope that I will be able to take it to Hamcation in Florida. I have had to put some money into it, but it's not a bad investment for \$600.

Having an oscilloscope helped with diagnosing the Bosch L-Jetronic fuel injection system. It has a Renault 4-cylinder engine that runs well now that I have fixed the vacuum leaks.

Until next month, '73 from Brian W8FP.

News from the South
by
Stephen Poole, CBRE, AMD
Chief Engineer, CBC–Alabama

Election years are always fun. It hasn't been so bad here in Alabama; as a deep red state, the real action takes place during the primaries. "Trump loves me better!" "No, Trump loves ME!" "You once said back in 1998 that you thought Trump was dangerous!" "Did not!" "Did too!"

One of the amusing ones right now, though, is Chief Justice Tom Parker. He's running for reelection and will probably win by a wide margin. I don't even know who his opponent is. But his commercials insist that the Liberal Machine is out to kill him, just like they tried to kill Brett Kavanaugh. George Soros *personally* hates Tom Parker. (Parker said so.) This guy obviously has money, because I hear these ads throughout the day. Anyway.

What has been missing this time, though, are the homemade jingles. You know the type: you wonder if the guy is really serious, or if it's a parody. "Vote for Barney! He's not smarmy! He was in the army! He loves Jesus and GUNNNNS ..." The best ones will have a banjo clanging and someone with a thick, buttermilk accent. Ideally, the jingle will feature a kid who couldn't carry a tune if you put in a box with a handle and wheels. I haven't heard one of those this time, which has been a bit of a disappointment. But I shall press on as best as I'm able, knowing that God loves me (and Barney) anyway.

A Tee Stub

We actually ordered a T-section from RF Specialties many months ago, planning to build a shorting section to protect 92.5's new Nautel GV-3.5 from lightning. There was a mix-up, we got busy with other emergencies, and once I finally noticed that we'd never received the T-section, I sent a reminder to Dan Sessler. The thing arrived and we started building.

The AIM 4170 analyzer is amazing. If you maintain an AM (or if you're a Ham), you've just got to get something like this. Cris has the more expensive model out in Denver; honestly, the lower-cost 4170 is plenty good for us. We've never been

able to get the TDR function to work, but everything else is surprisingly accurate.

In fact, when I started cutting a length of 1-5/8" line for the shorting section, I kept getting some odd-looking scans on the 4170. The jumper was apparently just bad enough to diddle the measurements. I replaced it, tried again, and was able to get it nailed right on 92.5 MHz. As proof of this, look at the reflected power in Figure 1. You can't get much better than that!

Because I am brain damaged, I forgot to get a picture of the T-section itself. I'll try to remember that for next time.



More Email Joy

I've mentioned before that our Barracuda Spam Firewall sends an email every evening. This tells me who the biggest senders of spam have been for the past 24 hours, as well as who the top senders have been. I always get a little tense opening that email, because I never know what I'm going to find.

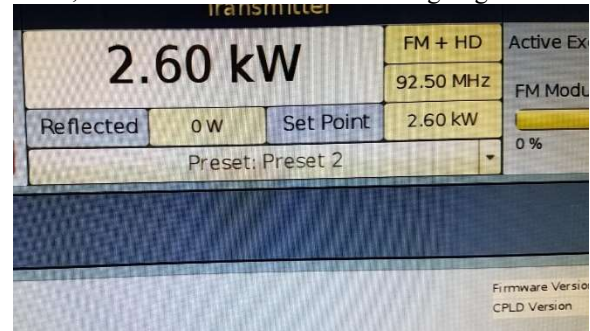


Figure 1 - Heh, heh. Hooah!

Twice now in the past few weeks, we've had a user in Chicago who has been compromised and whose computer was turned into a Spam-bot. We always try to save the account if possible, but if we're getting thousands of emails per minute from that user, we have no choice but to kill the account. This last time, we had to completely retire the old user name and create an entirely new user.

It also involves poring through the logs, looking for the actual spam sender's IP address. In

this case, the spam was actually coming from Palestine, Brazil and Poland. This told me that our coworker's password had been compromised. Rick Sewell's team in Chicago had scanned this user's computer for viruses and malware, but I suspect that some other device was the source of the compromise – a smart phone or tablet, for example.

At any rate, thus far, we seem to be holding. When something like this happens, I'll block the entire range of IP addresses in our gateway firewall. To do this, you take one of the single IP addresses that's sending Spam and run a "whois" on it. This shows you the network, who owns it, where it's at, and how many IP addresses have been assigned to that ISP. For example (this is not an actual spammer's address; this is just an illustration) ...

```
linux-8phy:~# whois 123.8.3.41
... snip ...
inetnum:123.8.0.0 - 123.15.255.255
descr:  China Henan province
```

This tells me that the spammer is located in China, and that the ISP's network block runs from 123.8.0.0 to 123.15.255.255. Therefore, in our firewall, I'll block that with 123.8.0.0/12 (no, I don't calculate the CIDR – the number after the "/" slash – in my head; I use an online calculator!). This blocks that entire group of IP addresses that are owned by that ISP.

I mention this because some of you may maintain servers of your own. Also, it's remotely possible that you have a legitimate sender that could be blocked by this – say, a foreign missionary or something like that. In that case, let me know and I'll look into adding an exception for that person.

Windows 10

I know that Rick Sewell has had his own fun with Windows 10 in Chicago; we've had our share in the past few weeks as well. After the lightning strike that took out so much equipment a few months ago, we had to replace to a couple of our NexGen audio servers. These came from the factory with Windows 10 installed. Windows 7 is no longer an option, Microsoft is serious about getting you onto 10.

The problem is, Windows desktop systems really aren't designed for things like NexGen. They want Internet access (which we strictly control); they want to do their own updates, and – most importantly – they default to settings that will result in the least number of support calls from the average user (home or office). That may or may not work with the specialized software that we use in broadcasting.

Even before Windows 10 came along, we had learned the hard way to just disable Windows

updates. I can't tell you how many times we'd have a machine freeze and stop working, only to pull it up on the KVM and see that it was trying desperately to get onto the Internet. Go in and tweak, rinse, repeat, try again.

Todd has been working with RCS Support to help get rid of the random, annoying issues that still pop up from time to time. Just last week, WDJC's audio server hung several times, taking us off air and causing a mad scramble. RCS provides a script that is supposed to tweak Windows 10 for you, but it apparently misses some things. But as I write this, we've been running all weekend, so I'm cautiously optimistic that Todd and Jack have found all of the bugs and have squashed them.

IBM Buys Red Hat!

Yes, another computer story.

This one was just announced a few days ago: IBM is buying Red Hat, Inc for 34 *billion* (that's "B" billion) dollars. Naturally, this has caused some consternation in the geek community, many of whom hate large corporations just on general principle. (The fact that Red Hat itself has itself been a "large corporation," quote-unquote, for quite some time now, seems to escape them.)

This doesn't surprise me. IBM has been using and installing Red Hat for many years now. They recommend it and help support it. Much of the code for the Red Hat system has been written by IBM's own software engineers. I guess they decided it was time to just get married and be done with it.

This doesn't bother me, either. I doubt seriously that IBM would kill a golden goose like Red Hat. Even if they tried, remember, this is the beauty of open source software: someone else could simply pick up where Red Hat left off and keep improving it. Or, we could switch to Ubuntu Enterprise, or SuSE Enterprise – it's not like we don't have options.

We'll have to keep an eye on this, though, because many of our servers use the CentOS Linux distribution. This is a community build of the Red Hat software. For all practical purposes, CentOS is equivalent to Red Hat Enterprise. I've seen and heard nothing to make me think that IBM would make it more difficult for CentOS to clone that operating system, but I'll be watching just to be safe.

Thanks again to all of you for keeping Sandy in your prayers. We've been going to Emory in Atlanta, and as I write this, they're back to suspecting Multiple Sclerosis (or something like that). We'll see. Until next time, don't forget to vote and keep praying for this nation!

The Chicago Chronicles
by
Rick Sewell, CSRE, CBNT, AMD
Engineering Manager, CBC–Chicago

We have been working recently to move our spare control room into being a fully functional control room that will have everything each station has in its normal control room. Our spare control room, which we call Control 5, also serves as a production room during times it is not being used for a control room, so it has to be able to function in that environment as well.

When I first arrived four years ago, this studio was used as a storeroom. We quickly set about cleaning everything out of the room. And with a leftover mixer, on leftover furniture with an extra NexGen license, we created a dubbing/segue room to keep that kind of traffic out of the full-fledged production rooms.

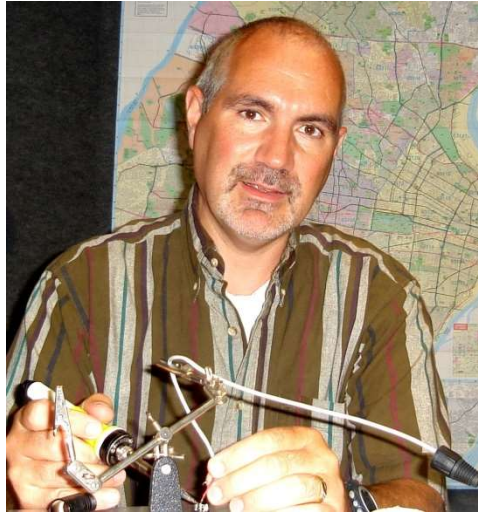
Last year, one of our bigger capex projects was to convert this room to a Wheatnet-equipped production room. We purchased an IP12 control surface with a mix engine blade and a console blade. In the process of trying to find the right cabinets to handle this equipment, I went with our maintenance person, Larry Kaminski, to our boneyard of old studio cabinets. We found some leftovers from production rooms and talk studios.

That's when I got the brainstorm to take parts of both and combine them into a four-mic position control room. Larry did a great job of making this happen, blending the two leftovers into one unit that definitely took the room from just a production room that could serve as an emergency control room in a pinch, to a full control room.

We set salvos in the Wheatnet Navigator software that would change the room's setup to any of our four station's unique needs. Not only did it switch the faders to host the given station's audio server, but it would also switch the faders to accommodate satellite feeds, talk studios and remote studios with the touch of one of the programmable buttons.

The one thing it didn't do was to bring any

of the stations phone lines into the room. We did have a Telos hybrid in the room, but Engineering would have to go to the phone room and cross punch the phone lines into the Control 5 Telos. This certainly wasn't something that could be done on a moment's notice in the event of an emergency. For instance, one Sunday morning around 1:00 AM, I got a call from an operator that their control surface in their control room was acting up and they couldn't change sources or even change the levels. I then talked them through changing over to Control 5 and I remotely put them on the air. I told him they would have to wait until an engineer came into to put their studio lines into that spare room.



Since it was the middle of the night they were fine without phones until later that morning.

Now earlier this year we finished installing Telos Hx6 phone systems in all four control rooms. Since this unit is almost entirely networked, except for its POTS phone lines, I knew we could do some cool stuff with it since its associated phone set, VSet6, no longer had to be directly connected to the main unit. As long as they were on the same network they would communicate. Which meant the VSet6 control/handset could be in a different room than the Telos Hx6 hybrid.

This opened the opportunity for us to quickly move the Vset6 to Control 5. And then with another salvo in the Wheatnet, change the audio cross points in the Wheatnet Navigator software so that the mics in Control 5 are feeding the caller in audio to the Telos, in their normal control room. The salvo also switches the audio from the original control room Telos to the phone fader on the Control 5 surface. Another important feature for the way we operate is to have the Vox Pro machine right channel fed by the phone system, since callers are almost never live on our stations. The Wheatnet salvo will also change the input of the right channel of the Vox Pro to the given station's Hx6 caller out audio.

The Vox Pro recorder in all five control rooms is fed a split feed. The left channel is fed an “Offline” or “Utility” bus that is pre-on, post fader of the mics in the room. The right channel is fed the Telos caller out audio full time. We do this by sending both of these sources to a local Wheatnet blade’s Utility Mixer. We then pan one source hard to the left and then the other to hard right. The Utility Mixer output is cross connected to the Wheatnet PC blade (driver) input on the Vox Pro computer. So, when they hit the button to set the Control 5 surface to their station’s settings, it also changes the right channel input on the Utility Mixer to the Telos Hx6 audio out from the original control room.

I also set up all these functions to run from

NexGen macros. You first have to set up a software LIO relay in the Wheatnet ASERV blade to fire the salvo. Once that is done, you then set up a NexGen relay to be associated with that software LIO. From there you create the macro in NexGen with the appropriate relay.

With these macros, I can remotely move them from their normal control room to Control 5 with just a couple of steps. They can now access their phone lines as they always do by taking one of their Vsets and plugging it into the Ethernet cable that has the POE and network connection waiting for the move. The one thing we don’t have at this point is the ability to fire off their profanity delay dump button, but that will be there soon.

The Portland Report
by
John White, CBRE
Chief Engineer, CBC–Portland

The theme of this month’s column is what we can learn by looking at historic electronic failures and successes.

Over the years, as an engineer approving products for resale and as a broadcast engineer, I have had the advantage of observing from both the production and consumer side of the equation. One problem area that I saw many years ago related to power supplies, in this case “wall wart” supplies powering small accessory products the company provided to support larger turnkey leased computer systems.

The symptom was short life spans on average, which resulted in high ongoing replacement costs – in some cases exceeding the maintenance costs for the large computer. These small power supplies are produced by the millions, and yet these small “popcorn” parts were a major ongoing expense.

We started a project in which the failed supplies were returned for analysis. Most of the supplies had molded housings, requiring destructive techniques to obtain access to the interior. This testing found two forms of failure. First, a small cluster of failures was related to current protection links included as part of the step-down transformer. We concluded that some of these failures were infant mortality, while other failures may have been temperature/environment related.



The largest number of failures was due to bad filter capacitors, most often in the form of bloated and bulging capacitor cans. So, the question became, what was causing these failures? We were able to eliminate a number of factors. The capacitors were several different manufactures and different series types, which eliminated the problem being a particular capacitor series or manufacturing technique.

Further research came next, with the invaluable assistance of Roger McCoy, a Tektronix power supply engineer in the medical division. I described the problem to Roger, who commented that it would be a good idea to take a look at ripple current.

This turned out to be the major source of the failures. A power supply filter capacitor is charged periodically (60 or 120 times per second) from the rectified AC. During the remainder of the time the capacitor discharges to supply current to the load. This charge current, known as ripple current, heats the capacitor, which accelerates component aging. The wall wart failure was traced to the use of low-cost capacitors which had low ripple ratings or were not rated for ripple current.

Since then, I have frequently seen other power supply problems. One case involved computer monitors failing one after another. These failures

were traced to bad caps in onboard buck/boost power supply inverters. Another example was the failures with Nautel HD exporters. Both of these failures were repairable by simply replacing the failed caps with a high ripple current part.

I recently had another experience with power supply failures when the power supply in our brand new Omnia.9 failed. I was removing an old unit from the transmitter equipment rack when the failure occurred. I heard a snap like a shorted capacitor discharge followed by an alarm.

The Omnia.9 has a redundant power supply system with two supplies in parallel. If one fails, the other keeps the processor in operation. Later

investigation revealed that the second supply would shut down when any power bump was detected.

I have to say I was pleased with Omnia support when a replacement assembly was shipped without question. When I mentioned the failure to Cris, he told me that the folks at Telos/Omnia had once told him that vendor power supplies were the major problem they had found with production.

I can well believe that based on past experience. Available power supplies are mass produced, often with lowest cost, highest power and smallest space being primary criteria. None of these enhance reliability.

Rocky Mountain Ramblings

The Denver Report

by

Amanda Hopp, CBRE

Chief Engineer, CBC - Denver

Lookout Mountain

I found out the last weekend of September that both our FM stations up on Lookout Mountain were off. I headed to the site that evening once I found out about the issue and began troubleshooting.

It was initially a bit puzzling, as not only do we have our microwave link from the studio to the site, but we also have Comcast internet. My first thought was that the power was out, because that would explain why both methods of us staying on air were down.

When I arrived at the site, all was fine power-wise. My first goal was to get the stations on air. I could not connect to our microwave radio via IP, so I began messing with the Comcast side of things. Normally, I can plug directly into the modem and DHCP. Not this time. I even set my computer up to be on the correct network in case DHCP was turned off. Nothing. I had the info written down, so I know I had it right. And then it mysteriously started working for a few minutes, and from what I could see, all should have been fine. But still, our backup wasn't working. I worked on it for a bit and couldn't get it working. I had to call it a night at dark, mainly because that's not a pleasant site to be at in the pitch-black night.

I headed out there the next day and began

working again. My first goal was to get the stations on, which I did. I was able to get Comcast to start working somehow and moved our WorldCast

Horizons over to an IP address on that network. This allowed us time to troubleshoot the microwave. We found some odd meter readings for the 48-volt power supply, so we brought back the radio and power supply so we could continue testing on the bench at the office. We finally found the radio was perfectly fine, praise God. We had a spare power supply and took that back to the site to get

things back working normally.

We still had to figure out why I had to force things over to Comcast. The short answer is the VPN we have set up quit working properly. All things showed they were working, but it wasn't in reality. We bypassed it by setting up a separate switch for the Comcast network. We knew we needed a VPN, but this was a good temporary fix. We ended up buying a Linksys dual-WAN router and learned how to set up a failover system. This is still so foreign to me, and when I try to understand it, purple smoke comes out of my head. But thanks to the help of the ever so brilliant Stephen Poole, we got it working. It took several trips to the site, but we finally got everything back to normal operation.



KLZ Fence

We finally got the fence at one of the KLZ towers fixed. We had some pretty hefty wind in the early spring, and it somehow caused one side of the chain link fence to somewhat fall over. It was still standing, protecting the tower base as it should have been, it was just leaning a bit – the support posts had broken off right at the concrete. We knew we would have to fix it, so we waited for a weekend when Keith, my husband Jordon, myself and my dad were all available to be at the site as it would take all of us, and then some.



My husband Jordon (l), Dad and Keith (in there somewhere) auguring a hole for a new fence post. The shadow is mine!

My dad and I had already bought the majority of the supplies needed so that Saturday morning, my husband and I headed to Home Depot to rent an auger and buy the concrete needed. Instead of ripping out the old posts, we decided to add some new ones. This fence has barbed wire around the top, which attaches to the old posts, and trying to do a perfect replacement would be nearly impossible as we would have to dig out the old concrete from those posts, so why not leave those in place and install new posts? That is what we did. We are grateful for that auger, too, as the site soil is a hard clay, and it took some time to get the new holes dug. We got the concrete poured, posts set and called it a day, mostly. We still had some minor work to get done at the

building before we left.



The repaired fence with shiny new posts.

Keith, my dad and myself headed to the site the following Tuesday before some weather was to hit to get the fence tied onto the new posts. It took some cutting, nothing that a reciprocal saw couldn't handle, and some force using the tractor, but we got things all hooked up, so we now have a straight-standing fence.

Security Cameras

We decided we needed to finally get some security cameras at the KLZ transmitter site after finding our gate combo lock randomly cut off one day. In discussing with Rick Sewell what he uses, I got the info for the company he bought the items from, and we found what we needed and purchased them. We are planning on doing a remote-zoomable bullet camera that we will mount on the barn to look at the gate, and then we'll have a PTZ on the main building that will allow us to monitor towers and the building. We will be doing the same thing, minus the barn, at the KLTT transmitter site. Both cameras will be on the building there. The systems are ready to go, as we set them up at the office, now we need to plan out what we need in order to mount them and get them ready at the sites. I hope by the next issue I will have an update saying we got it complete.

That about covers it for this edition so until next time... that's all folks!!!

The Local Oscillator
November 2018

KBRT • Costa Mesa - Los Angeles, CA
740 kHz/100.7 MHz, 50 kW-D/0.2 kW-N, DA-1

KNSN • San Diego, CA
1240 kHz/103.3 MHz, 550W-U

KCBC • Manteca - San Francisco, CA
770 kHz/94.7 MHz, 50 kW-D/4.3 kW-N, DA-2

KKPZ • Portland, OR
1330 kHz/97.5 MHz, 5 kW-U, DA-1

KLZ • Denver, CO
560 kHz/100.3 MHz, 5 kW-U, DA-1

KLDC • Brighton - Denver, CO
1220 kHz/95.3 MHz, 660 W-D/11 W-N, ND

KLTT • Commerce City - Denver, CO
670 kHz/95.1 MHz, 50 kW-D/1.4 kW-N, DA-2

KLZV • Denver, CO
810 kHz/94.3 MHz, 2.2 kW-D/430 W-N, DA-2

WDCX • Rochester, NY
990 kHz, 5 kW-D/2.5 kW-N, DA-2

WDCX-FM • Buffalo, NY
99.5 MHz, 110 kW/195m AAT

WDCZ • Buffalo, NY
950 kHz, 5 kW-U, DA-1

WDJC-FM • Birmingham, AL
93.7 MHz, 100 kW/307m AAT

WCHB • Royal Oak - Detroit, MI
1340 kHz/96.7 MHz, 1 kW-U, DA-D

WRDT • Monroe - Detroit, MI
560 kHz, 500 W-D/14 W-N, DA-D

WMUZ-FM • Detroit, MI
103.5 MHz, 50 kW/150m AAT

WMUZ • Taylor - Detroit, MI
1200 kHz, 50 kW-D/15 kW-N, DA-2

WPWX • Hammond - Chicago, IL
92.3 MHz, 50 kW/150m AAT

WSRB • Lansing - Chicago, IL
106.3 MHz, 4.1 kW/120m AAT

WYRB • Genoa - Rockford, IL
106.3 MHz, 3.8 kW/126m AAT

WYCA • Crete - Chicago, IL
102.3 MHz, 1.05 kW/150m AAT

WYDE • Birmingham, AL
1260 kHz/95.3 MHz, 5 kW-D/41W-N, ND

WYDE-FM • Cullman - Birmingham, AL
101.1 MHz, 100 kW/410m AAT

WXJC • Birmingham, AL
850 kHz/96.9 MHz, 50 kW-D/1 kW-N, DA-2

WXJC-FM • Cordova-Birmingham, AL
92.5 MHz, 2.2 kW/167m AAT



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