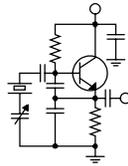


The Local Oscillator



The Newsletter of Crawford Broadcasting Company Corporate Engineering

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One of the hallmarks of a down economy is that we all have to work harder. We have to work harder as a company to get and hang onto business, and we have to work harder as individuals to be more productive and hold the line on costs. That's the situation that most folks in radio find themselves in right now, and CBC is no exception.

While our managers and account executives work hard to get and keep the business, and our engineers are doing more with less, doing things in-house that might have been farmed out just a couple of years ago. We're fixing things that we probably would have replaced, and we're redefining the "useful life" of many pieces of equipment by seeing just how far we can stretch things.

As a result of all this, we're busier than ever across the board. From our chief engineers and their staff engineers in the trenches all the way to our corporate offices we're putting in more hours, managing more projects and keeping more plates spinning. We're truly multitasking.

KCBC Power Increase

Over the past month, we've put the lid on one project, the KCBC night power increase and city of license change. As mentioned in these pages last month, Steve Minshall wrapped up the construction and adjustment of the night phasing and coupling system and I filed the FCC license application, employing moment-method models to determine both day and night operating parameters. Within a few days, we received program test authority and cranked the night power up to 4.1 kW (from the previous 1 kW).

Along with the program test authority, I was asked to supply some additional information and correct a couple of errors (gasp!). We had to get a surveyor out to verify the array geometry, a requirement we believed we were exempt from since

the array had been previously licensed using a traditional proof.

We also had to generate and supply descriptions of the reference field strength measurement locations. That requirement is in the rule, but many applicants (including us) had not been supplying those since we were providing GPS coordinates and datum – arguably a much more accurate means of pinpointing a measurement location. So with Steve's help I got the survey and point descriptions together, fixed the minor error in two of the calibration models and filed an amendment. We expect a license grant within the next month or two.

Steve still has some minor work to do, including rotating the night common point around so that the HD Radio transmissions work better. We have two tee networks in the night common point, so we should have the range to crank the load around. I have also asked him to make a full set of driving point impedance measurements for both the day and night patterns. That information can be invaluable when troubleshooting and repairing a pattern problem.

WXJC Sample System Modifications

For the past few months Stephen Poole and his crew have been working between rain deluges to modify the sample system at the 50 kW WXJC (850) array so that we can moment-method model/license the night pattern and stabilize the daytime pattern. The sample loops are up, the sample system has been calibrated and now Stephen is working on getting the patterns – especially the daytime – tuned up properly.

We rebuilt the WXJC array, replacing everything except the towers, back in 1999 when we purchased the station. This included a new phasing and coupling system from Kintronic Laboratories. We hired a contractor to do the installation and used

a consulting engineer out of Canada who had worked on the array before to do the tuneup. The consulting engineer, Don Williamson, evidently made some modifications to the design of the system during the tuneup, and now we are working to get it back to the original design, plus and minus installed transmission line lengths.

Normally this is something I would go out and help with, but I am still not traveling as a result of my recent back surgery, so I have been spending a lot of time on the phone and trading text messages and emails with Stephen as he works through the problem. Hopefully we will have a good report of another completed project next month.

Relicensing KLZ

We made some progress last month toward relicensing KLZ in Denver pursuant to the moment-method modeling rules. The good news is that we can live with the existing sample system. The anomalies I noted last month in the sample line impedances were indeed determined to be caused by the RG-59 extensions. These extensions connected to the 50-ohm aluminum jacket sample lines just inside the foundation wall of the transmitter building.

My guess is that the RG-59 extensions were added not only for convenience but also to move the phase of tower two away from zero (the nominal phase is 7 degrees, which would have been hard to resolve on an analog antenna monitor). Why whoever installed those extensions used 75 and not 50-ohm line is unknown. It's possible that the original sample lines (which connected to isocoils and tower-mounted loops) were 75 ohms. I hauled the network analyzer into the crawl space under the transmitter building, connected it directly to the sample lines and did a quick sweep. This showed a nominal 50-ohm impedance on both lines, so I knew we were good to go.

I purchased some 3/8-inch sample line and built some new extensions that I was able to trim to make the overall sample lines equal length. We installed these under the floor and connected them up to the antenna monitor. Amazingly, with equal-length sample lines attached, the antenna monitor began indicating parameters very near the model-determined operating parameters.

We pulled the TCT-3 sample transformers from the KLZ ATUs, connected them to a pair of equal length "Superflex" transmission lines and looped an RF conductor through them to check their calibration. With that done, we are now ready to head out and make the requisite reference field strength measurements. The license application and

engineering showing are done except for these few items, so I expect to be ready to file by the middle of May.

Studio/Office Move

The tenant finish work continues at the new Denver cluster leasehold, a portion of which will be reserved for Corporate Engineering offices. We're about done and are now down to the final items – studio windows and millwork and a little bit of painting.

Amanda and I have been spending a few hours at the new location every week working on the technical infrastructure – the TOC wiring, blocks, phone/network wiring and all that. The equipment racks are in place, secured to the floor and fed with dedicated power circuits from the panel (each rack has its own 20A circuit). The cable ladder is also in place overhead and filling up with wires. The blocks are mounted and wired to the Wheatstone bridge router and the 25-pair cables going to the studios. Next, we will begin making, running and punching down individual AES and audio cables from the various rack locations to the TOC blocks. The idea is to be able to pull equipment from the racks at the old leasehold, transport it to the new location, mount it in the predetermined place in the racks and plug it in. This will considerably shorten our move time.

With everything going so well at the new site, something has to go wrong, right? We're not disappointed – something did go wrong. The FCC granted and then rescinded the grant of our 18 GHz microwave applications. The Department of Defense entered an untimely objection to the frequencies we had selected. If it had been anyone else, it's sort of too bad... you have a certain window within which to respond and it's "speak now or forever hold your peace." Not so with federal agencies. Because it was a government agency that objected, the FCC rescinded the grants and sent us letters of return on the still-pending applications.

This is a real catch-22 with the PCN (coordination) process. There is no database of frequencies used by the DOD (in this case the U.S. Air Force), so about all we can do is send them notice (which we did last September) and hope they will speak up within the 30-day window if they have a problem with it. In this case they waited almost eight months before speaking up.

And now we've received more notices of return, the latest resulting from objections from the radio quiet zone up near Boulder. Evidently our little microwave links might get in the way of their spending our tax dollars listening for ET to phone

home.

So... we're looking at our options now, which include 11 GHz links. We have found available frequencies there, but we may need waivers to operate on those frequencies. I'm working on that, picking the brain of a local broadcast consultant who has already been down this road.

The problem is, even if we filed

amendments today, it took the FCC five months to process the last batch of applications; we have only 2½ months before the move, so it is unlikely that we will get grants prior to the move. That means we'll likely have to get short-term T1 circuits to bridge the gap. In the meantime, I have put a hold on all the equipment ordered.

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

Hello to all from Western New York! As the month of April rolled to an end, I had the opportunity to take a few days of vacation time and visit with family and friends in Western Kentucky. It had been six years since I had been home, so I had a lot of catching up to do.

Aside from all the family reunion things going on, I took some time to visit my broadcast friends down there and see what changes had been made since my last visit. It would be safe to say that engineering, or the lack thereof, has played a big part on the success/failure of the stations I visited. The first day I was in town I took a walk to my old AM stations' transmitter site to see how things looked there.

What was once a showcase facility has really run down since my departure almost 20 years ago. The grounds and building were clearly neglected, as the undergrowth had completely taken over the site. Trees were growing within the tower enclosure and ATU, and the field looked as if it had not been mowed in years.

The building didn't fare much better. The wood around the roof was rotting due to the lack of paint, the roof itself was probably five years overdue for re-shingling, and the concrete blocks were in desperate need of re-pointing and painting. The coax feeding the ATU from the building was once supported by 4x4 posts with a steel tag to which the coax was attached. Many of these posts were rotted and leaning, causing the coax to be stretched way out of position. The steel tag was nowhere to be found. I

couldn't even imagine what the inside looked like. The fencing around the tower was in need of repair, with support posts rotting and several vertical slats missing or lying on the ground, giving easy access to the tower and ATU cabinet. I am fairly sure of the fact that if what you can see is not taken care of, what

you can't see is certainly overlooked.

The studios were not as bad but were operating with some difficulty. The board ops had to work around some needed equipment repairs, but they were on the air. When asked who was in charge of the engineering department, I was surprised to learn that they did not have an engineer per se. They relied on a corporate

engineer, who came in only in the event of an emergency, and his response time was anywhere from 12 hours to several days before responding. The station's sound was muddy and slightly distorted, and coverage area was at minimum half of what it used to be.

I was unable to get to my former FM transmitter site, as the road to the tower had been washed out by numerous storms of late. From what I could see, this site did not fare any better than the AM site did.

One interesting thing to note is the fact that there were no stations in that area broadcasting in HD-R. When asked about when they planned on upgrading to HD, the response was; probably never! The stations simply did not have the funding to undertake the added expenditure of installing HD;



they could barely keep the analog signals on the air! It's no wonder why these smaller stations are shutting down completely or selling out to larger broadcast groups. They simply do not have the needed capital to keep the stations in good operating order and the means to hire a competent, knowledgeable and caring engineer to assure that equipment wise, the stations are operating at their absolute best.

Contrary to what most owners think (and the Crawfords are not included in the majority!), engineering is not just an expense. It can be the deciding factor as to whether the station is or is not successful in the business world. We are fortunate that we work for a company that sees the value of a good engineering staff and supports what we do with a generous budget and an eye to the future, always staying on the cutting edge of new technology. Without that, we would be just another station, sitting here rotting away, hoping that someday, someone will show up with enough cash to get us out of this broadcasting nightmare.

WDCX-FM - Buffalo

WDCX-FM in Buffalo has, for over 40 years, carried the Sunday morning worship services of Knox Presbyterian Church. The programming has been delivered to us via a dedicated phone line, which for the most part operated for years without trouble. For most of the past year, we have experienced a hum on this line which would come and go at will. I have spent numerous hours along with the staff at Knox Church, trying to track down and isolate the cause of the mysterious hum with no solution. We have contacted Verizon Special Services to assist us, and they claim that they are unable to locate the circuit, as identification records (i.e. circuit numbers) have been changed over numerous years of record keeping. After several attempts, they did locate and identify the twisted pair and switched the feed over to another copper pair. Unfortunately, this did not alleviate the problem. In just a few weeks the hum appeared again on the new circuit.

To put this issue to rest, I installed one of our old Hotline remote boxes at the church to completely bypass the dedicated line. So far, the broadcast has been problem-free. We had upgraded from the Hotline to the Matrix at WDCX-FM several years ago, which freed-up the studio Hotline box. As the Matrix is backwards-compatible with the Hotline, I figured it would be worth the try to see if it worked any better. So far, so good.

Last month I had reported on a strange mix of FM signals from several different Buffalo FMs

that was affecting the band at 108.9 MHz. The FAA uses this frequency for one of their navigation aids, and pilots were complaining of the audio interference. I, along with the CE of the Citadel stations, went out and performed measurements at various points outside the city. All the measurements we made point to one of Regent's stations as the source of the interference. FAA engineers are scheduled to come into Buffalo on the 13th of May to conduct their own tests. All three engineers of the contributing stations will be on hand to witness the results of their testing and try to come up with a solution to the problem. I'll have more information as it becomes available.

WDCX(AM) / WLZGZ-FM - Rochester

With assistance from Ryan at Nautel, we were able to finally resolve the issue of the WDCX(AM) Nautel faulting out on high RF current and SWR foldback when in digital + AM mode. In order to keep the Nautel from constantly faulting out, we had to lower the output of the Omnia processor to -8 dBFS, which kept the digital peak modulation at about 70% positive and negative and the analog peaks even lower. The problem was that the current limit peak threshold was set too low. The solution was easy enough, only two resistors had to be replaced to get the peak threshold set at the proper level. Since I replaced the resistors, the transmitter has not experienced any additional faults, and the modulation levels are where they should be. After making all the adjustments, I checked the HD spectrum with our analyzer to insure that we are still in compliance. We passed the NRC mask on both patterns.

On the WLZGZ-FM side of things, the NexGen on-air workstation in the air studio started showing some signs of impending failure several weeks ago. It all started with a USB mouse that would suddenly freeze and quit working. The replacement mouse worked for less than a day before it did the same thing. I had Earl Schillinger switch out the USB mouse for a PS-2 style mouse. It worked well for only a couple of days and then it, too, froze up. Once I arrived at the station and began checking out the problem, I noticed that none of the USB ports were working, and now the PS-2 port also was unresponsive. Once the computer was rebooted, nothing would come up; you could hear the fans in the power supply spinning, but there was no video at all. Cris and I determined that the motherboard was the cause of the problem, so a replacement was ordered from Dell. The evening before I left for vacation, I replaced the defective motherboard and

cleaned and checked out the computer to insure proper operation. At this writing it has been about a week since the repair, and reports out of Rochester say that it has been working perfectly.

The only other issue from WLGZ-FM is the failure of one of the BE FMi-201 modules in the HD transmitter. Earl called and reported low readings on the FM HD transmitter, and a shutdown and restart via remote control did not take care of the problem.

Once I arrived on site and removed the affected module, I found the problem only to be a blown 25 amp fuse. I replaced the bad fuse, reinstalled the module and the transmitter came back up at full power. I like those easy repairs!

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 and happy engineering!

The Motown Update

By

Joseph M. Huk, Jr.,
P.E., CPBE, CBNT

Chief Engineer, CBC-Detroit

April has been a very challenging month. We have been implementing equipment to simulcast our afternoon talk show with our St. Louis station, KJSL.

We have also had many issues with our T1 circuits within our WMUZ studio facility. These issues have caused numerous issues with the telephone and telephone dependent communication equipment like our Comrex codecs.

We performed the free firmware updates to our Omnia 6xi FM+HD audio processor. And finally, I took some vacation time and attended the broadcaster's "Mecca," the spring NAB convention in Las Vegas.

WMUZ's Bob Dutko Show Meets KJSL in St. Louis

As I mentioned above, Bob Dutko, our afternoon show host, has joined the "live" programming lineup at KJSL in St. Louis. At our Detroit facility, we needed to implement both the 25 Hz start of break and 35 Hz end of break tones. I used my HP 8903 B to generate the tones and Adobe Audition 3.0 and the SAW audio editor to integrate the tones with our programming beds and stingers. After some iteration, we were able to get the right timing, taking into account the propagation delay of the tone decoder and the KJSL facility, to provide clean programming breaks. Rick Sewell, my associate at KJSL, will be filling you in on the details of the KJSL installation. To provide the needed profanity delay to our Satellite uplink, we chose the

Air Tools Model 6100 Broadcast Delay.

The 6100 was installed so that the dump function of our local Eventide Broadcast delay on

WMUZ would fire at the same time. I installed a laptop to control our Broadcast Tools switcher to allow remote control of the feeds to our uplink if needed.

T1 Trouble

Our station is plagued from time to time with T1 outages. The telephone company infrastructure is very poor in the neighborhood around the WMUZ facility. Most of the communication circuits are carried by copper wire. This wire is old and contains many splices. For about two weeks, we have been in communications with FirstComm, our telephone systems integrator, to try to capture a moment when the intermittent issue occurs and report to AT&T, the owner of the copper infrastructure. My understanding is that AT&T will not work on an issue unless there is a way of capturing the event. Eventually, FirstComm was able to demonstrate the issue to AT&T and a trouble ticket with AT&T was then issued.

During the time that the T1 circuit was going to be repaired, we made clear to all parties that we were going to use lines from our good T1 to make do until the bad T1 was repaired. As luck would have it, AT&T is rolling out its new Uverse Video Service and cut our good T1 by mistake. This totally killed our phone service. This effected many broadcasts we airing that evening. Luckily, later that night, service was restored. The issue with our bad



T1, which was originally the focus of our attention, turned out to be a bad splice that was performed at an earlier time.

We are going to investigate all our options



Small UPS units were installed to protect the T1 terminal equipment

to prevent such a catastrophic and costly issue from occurring in the future.

Some of the issues we have are caused by voltage transients on the power mains. We have implemented some small power backup power conditioners as containment measures. I have put together quotes to address more comprehensive permanent power conditioning.

Second, we need to continue to push the phone company to modernize its infrastructure and use fiber if possible.

Last, we are going to investigate using a microwave link from one of our other facilities that has good T1 infrastructure to bring in our telephone communications backbone.

Omnia 6 Exi FM+ HD Firmware Update

Omnia is offer a firmware update on its 6 Exi processor. The upgrade consists of a PCMCIA card that needs to be changed out and an update with their front board flash. The new files and remote software can be downloaded from their web site.

The software upgrade to the front board microcontroller was effortless. I did back up my presets prior to the upgrade. For some reason, some of the input and output settings were not carried over during the upgrade. So, far, based on my notes and some iteration, I am almost back to my previous air

sound. I am going to get some guidance from Telos regarding the upgrade and see if I overlooked some vital step. The software upgrade seems to have fixed the occasional lock-up issues in the remote interface that I had experience with the previous software revisions. My advice is to take good written notes of your current settings before doing the upgrade.

NAB 2010

The NAB trip was wonderful. I must say there was a lot of running around, so I think I may need a vacation from the vacation (smile). When I was at the show I had an opportunity to visit the Nautel booth. Nautel is the manufacturer of the WMUZ main transmitter, the NV-40. During my visit, I had an opportunity to see a new service fix that will be coming out for the NV-40 to cool the electronics on the front door. The service fix will have a plenum and fan to draw the heat away from the electronics.

I visited the RCS booth to learn more about my automation software. I had an opportunity to talk to one of the software writers and learn more about the features. One of the features did not have to use any sound cards. You end up streaming the audio through the LAN rather than using a sound card and going through an analog to digital conversion. Also, you can remotely stream audio and send files from facilities through the Internet. They call these facilities remote or virtual stations. The main focus of my visit was to learn good practices in backing up the system as well as the audio work files. I learned the procedure the back up system files using NexGen's backup utility and other practices for backing up the audio files. Now I need to put what I learned into practice so that we can be prepared in the event of an automation emergency.

I also visited with Jay Tyler at Wheatstone. I introduced myself and talked with him regarding some issues at our Detroit installation. He informed me about a software upgrade regarding our particular bridge router system. He said it was about \$2000.00 plus travel for a technician to come out. In addition, we discussed other issues, and he is very supportive in giving us help with to resolve them. I look forward to working with him and his team in the months to come.

Until next time, be safe, and if all goes well we will be reporting to you from the pages of *The Local Oscillator* next month. Best regards.

News From The South

By
Stephen Poole, CBRE, CBNT, AMD
Chief Engineer, CBC–Alabama

As I write this, more storms are on the way and that giant oil slick from the Deepwater Horizon drilling rig in the Gulf is headed toward Mobile. The prices for seafood are already going up and the talking heads are warning of shortages. Some cities along the coast that depend on fishing and tourism for their livelihoods could be in deep trouble. Keep us in your prayers!

More Power!

If you've ever looked at the help-wanted ads for radio engineers, you've doubtless seen an advert or two that says, "The applicant must have high-power FM (and/or) AM directional experience." There's a reason for that.

High-powered stations are... well... high-powered. Conceptually and technically, there's no difference between a 3kW FM and a 100kW FM. Both use similarly-designed transmitters that follow the same theories, both use coax and both use antennas mounted on tall towers. The 100kW station will invariably have more bays in that antenna to provide higher gain, but the theories, the formulas

and the principles are much the same.

But... the coax and connectors are much larger. The transmitters have a much more energy

passing through them, from the (invariably three phase) AC line to the 50 ohm output. Therefore, the penalty for making a mistake is correspondingly higher: an arc that might cause a "whoa!" and a few nervous laughs at 1kW can be catastrophic at 30 kW.

WXJC(AM) is 50kW day and 1kW night, and there's no comparison between the two systems. On the 50kW side of the phasor, the coils are great big honking things with those absolutely hateful screw-type

clamps that make tapping and setting them such a joy. If you accidentally forget to route a strap away from ground – especially given that we're using the Nautel XL-60, which is a synonym for "RF Welder" – it can be downright spectacular. We were making adjustments at tower 3, which is a couple of hundred feet from the doorway of the transmitter building. The antenna monitor was giving me strange readings; as I headed out the door to go take a look at the tower base, *I could hear the audio in the ATU!* It had a raspy, "Donald Duck" quality, but it was clearly audible. I killed the transmitter and went to check: about 3" of the 3/8" plated tubing to one of the capacitors had *vaporized*. We had left off a screw.

And of course, the XL-60 never even noticed... which is why I call it an "RF Welder." That thing will *ignore* more reflected power than most AM stations use as forward power.

If I ever had to write an ad for my replacement, though, I'd qualify it even further: "The applicant must have experience with electrically-tall, high-impedance towers."

I've already said previously that the current project – converting the WXJC(AM) array to a loop-sampled model-licensed facility – has been a learning experience for all of us here in Birmingham, and it has. But boy, what an experience! Cris modeled the



Todd Dixon moves the tap on a coil in the WXJC(AM) common point network

daytime and nighttime arrays and came up with some phenomenally-high theoretical operating impedances on some of our towers. Tower 1, the lowest-powered in our day array, models to a driving point impedance of $1,210 - j1,167$ ohms. Even tower 5, the highest-powered one, has a projected DPI well over a hundred ohms with a couple hundred ohms of (inductive) reactance. When you have impedances that high, just opening the doors on the ATU at tower 5 will change the readings on the antenna monitor. Routing a strap a different way will affect the tuning. Changing the feed lines between the ATUs and the towers will alter the tuning. It's a beautiful thing.

The Light Has Dawned...

But the good news is, we not only see the light at the end of the tunnel, we've managed to correct some problems that have plagued that array for years. It's interesting that this project was initiated to address long-standing issues with the night pattern, but we've suspected for some time that our day array has had issues as well. My monitor points to the northwest have always been low, while the one to the southeast has always crowded the limit. While we were checking monitor points a few weeks ago, we noticed that the southeastern one was right at the limit; in fact, depending on how we held the field strength meter in relation to a rerediating cell tower across the road, it would creep past the limit. We decided we'd better take a look at that, too.

Dozens of emails with Cris, lots of modeling, lots of measurements and a ton of walking around the soaked field (don't worry, I won't whine about the weather again) later, a picture began to emerge. If you've worked with directional AM, you know that you want to find the "sweet spot" when you adjust it for use. The lengths of the lines and the networks in the phasor and ATUs all work together to give you the phasing that you need, but it's possible to end up at a false sweet spot. For example, if your line is about the right length to give you the needed phase shift, you might put a +90 degree T-network in the phasor and a -90 degree at the tower. They essentially cancel one another out, with a little range to adjust for variations. But it's possible to misadjust the system such that (for example) you have -130 at the tower base and +130 degrees in the phasor. The voltage and current demands on the components (in particular, in the Tee shunt leg) will go way up when this happens. Sure enough, some of the coils in our phasor were turning purple and brown -- another clue that something was wrong.

We decided to re-measure the line lengths and discovered that the consultants who'd installed

and tuned up the system in 1999 had badly underestimated a couple of coax runs. Cris took the numbers that we got from our plug-in toroid tests (more on that in a moment) and calculated the correct lengths for us; I confirmed them with the GR bridge. We then generated all new numbers for the phase budget and started adjusting the entire system to the new numbers. The results thus far have been astonishing. The signal is audibly better in south Birmingham, the monitor points look good, and all of the components in the ATUs are nice and cool. It's a beautiful thing.

Incidentally, if you have to troubleshoot an AM directional array, don't forget that the antenna monitor makes a splendid test instrument. When we were troubleshooting, one of the tests that was most revealing was to take a couple of toroids with matched-length cables to check the actual phases at different points. For example, put one toroid on your reference tower's output in the phasor, then move the second one to the other tower outputs. Look at the antenna monitor and you'll see the actual phases that are being fed into the coax lines at the building. You can then move the toroids out to the tower bases and compare number. One toroid in the building and a second one at the ATU can help you determine the exact electrical length of a coax run, too. All of these tests are extremely useful for determining if you're at a false sweet spot.



Using plug-in toroids with the antenna monitor to check phases

And (Of Course) An Editorial Comment...

But this lets me make a point. I have nothing but respect for those old-timers who built the classic directional arrays in the Golden Days of Radio (capitalized out of reverence). To start with, it could

literally take weeks just to design the thing. Before Delta introduced its now-standard OIB to measure the actual driving point impedance of a tower, you had to get creative at times to measure some of the values. I mentioned last time that just trimming the sample lines could take several days using a bridge and a generator.

Take, for example, the simple (in theory) matter of tuning the ATUs in a directional array. The guys who set up our array in 1999 used the time-tested method of tuning the tee-networks in operation for 50 ohms at the ATU inputs. Once they did that, they just *assumed* (an important distinction) that everything was therefore okay. That is not necessarily so and that turned out to be the case for us.

Even though I'm an older guy, I'm a child of the computer age. I love spectrum and network analyzers. I love computer modeling. I especially love software that crunches the numbers for me. Not only is it much faster and easier, I'm notorious for misplacing a decimal point or flipping a phase whilst my fingers fly on a calculator. It's more accurate. I also much prefer predicting how a circuit is going to act in advance and then *tweaking* (another important distinction) to get the desired final result.

Bottom line: even if you're an Old Timer who owns one of the original General Radio bridges, don't despise the new stuff. Network analyzers, computer models and all of the other fancy new toys that are available nowadays make the job much easier... and produce a more accurate end result.

A New Transformer at The Studios

One of the first things any radio engineer learns is that right at the moment that the entire

engineering staff is knee-deep in a project, you'll have a major failure elsewhere that pulls you away from it. A few Fridays ago, I was headed to Tarrant to work on the array when someone called from the station: the power was out and we were on generator. As soon as I arrived at the studios, I saw that one of the line fuses on the utility pole out front was blown. We called Alabama Power.

When AP arrived, they replaced the line fuse, but it immediately blew (and if you've never heard one these things pop, "blow" is the correct term; it can be as loud as a half-stick of dynamite). Not good. As it turned out, the big transformer on the pad in front of the building had gone shorted, requiring replacement. To Alabama Power's credit, they had the replacement transformer in place and ready to go by the end of the day, but it just goes to show you... it's always something!



It's always something...

Until next time!

Gateway Adventures

By

Rick Sewell, CBRE
Chief Engineer, CBC–St. Louis

The month of April brought new changes to the stations in St. Louis as we continue to consolidate positions and make changes in programming that will hopefully set us on a new path to growth. One of the new changes that has already occurred is that we added Bob Dutko from WMUZ to the KJSL lineup via the CBC satellite. Essentially, this will be a live program for three hours a day with a recorded hour tacked on at the end.

From the get-go, we decided that we didn't want to add any board operator hours in the process, so this meant that we needed to automate the breaks in St. Louis. Since we are already equipped with NexGen to automate live satellite programming like this, we at least had a good starting point. We just needed to be able to furnish NexGen with opto closures to signal the start and end of breaks. So we purchased 25/35 Hz tone decoders in order to pick up the tones that Detroit would send when they were going in and out of breaks.

With most satellite programming, such as nationally syndicated programs, you really only need a signal for start of break and then you play a local break that is exactly timed to break of the national program. Once NexGen is done playing the break, it rejoins the satellite source and it's all neat and clean.

In this instance, however, we did not have the luxury of exact timed breaks from Detroit. Bob Dutko does a lot of live commercials and "nurturing" of commercials, so there is no such thing as exact timed breaks in his program. This presented a challenge to us without having a board operator on hand to listen and go back to satellite at the right time.

The easiest and best-sounding course of action was to employ bumper music to make up for some of the smaller time differences. This also had its challenge because Bob already has bumper music playing in his program locally. One way around this was for Detroit to give us a mix minus the bumper music. They could accomplish this using their Wheatstone bridge router system.

They next issue for us was how to fade the

long bumpers we were using in St. Louis to pad the time differences. This was accomplished with NexGen. The last thing in each local break is the bumper music. That will essentially play out unless given a fade command. So after each bumper in the NexGen clock a 20-second fade is scheduled. When Detroit sends a 35 Hz tone down signaling that they are done with their break, the tone decoder trips an opto in NexGen. This opto is mapped to a macro in

NexGen which turns the satellite source back on and then tells it to play the next event, which is the 20 second fade. This all works like a charm. It sounds like someone is running the board.

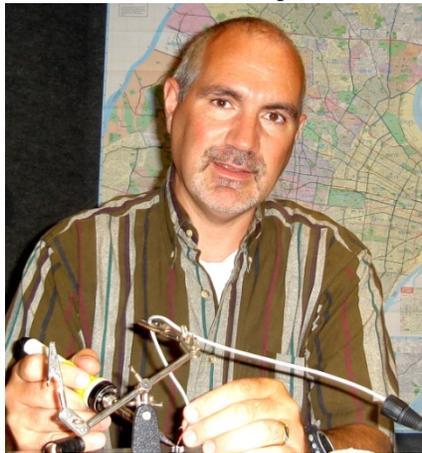
However, we still experienced some problems with breaks that went quite a bit longer than expected. We would experience times where the bumper would totally play out followed by dead air before Bob came back on from Detroit. This is the point where our hero enters the story. By

his suggestion, we are giving Bob's Detroit board operator, Anthony Faletti, a remote login to our NexGen control room workstation. When Anthony sees that a Detroit break is getting ready to go significantly longer than expected, he will grab material from the our fill category and add it to the break (and vice-versa if the Detroit break appears to be shorter).

Anthony does all this while running the board, call screening for the program and sometimes getting Bob's coffee. He handles so many things at once that it would cause a nervous breakdown for most air traffic controllers if they had to what he is doing. So we are thankful for what he is doing to make the program sound good in Detroit and St. Louis.

The other big obstacle was the fact that we needed to record the first hour of Bob Dutko and then tack that on at the end of the three live hours that would be simulcast together. Again, we did not want to have to add any board operator hours to run the program from St. Louis.

We use the tones sent from Detroit to accomplish this as well. We ran a parallel connection



of the tone decoder closures to the DRR workstation in our NexGen system. This is used to automate recordings. In this instance we set up six opto recordings in the hour needed. For this hour, when they send the 35 Hz tone at the end of their break, it causes the DRR recording to start. When they send the 25 Hz tone that they are going to the break, it stops the recording. When the hour is done we have six segments of programming that are set up to run

with our local breaks in that last hour of the program. As long as they are precise with the tones, no local intervention is needed in St. Louis. It works very well and it sounds like a live program that is running from our control board in St. Louis.

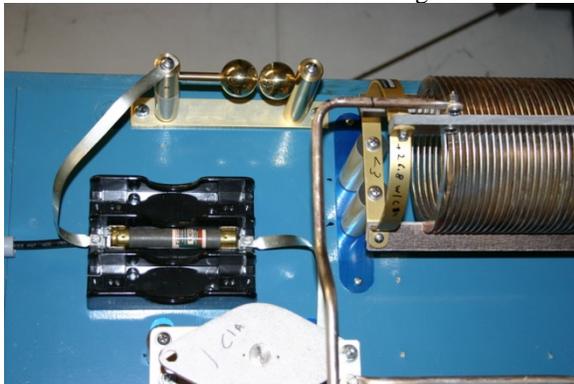
It took a lot of work, but thanks to help from CBC-Detroit CE Joe Huk, Anthony Faletti, Cris and Amanda Alexander plus RCS Works support techs, we are making it work.

Valley Notes
By
Steve Minshall
Chief Engineer, KCBC

Authorization to conduct program tests using the new night pattern for KCBC was received a few weeks ago. The project had gone nearly flawlessly up to the moment of turning it on for actual use. When the station automatically switched to night pattern, things went wrong. The station went completely off the air.

Not only did the station go off the air but we also received a call from the alarm company. My first thought was that there could be a fire that took us off air and set off an alarm. I was somewhat relieved to hear that there was no fire or smoke alarm, but there was an alarm for a broken window. If an intruder had entered and shut us down, that was bad but probably better than a fire.

John Yazel and I both pointed our cars toward the station, but the sheriff arrived first. He found no evidence of a break-in. So it gets weirder.



A fuse used in the night common point turned out to be a very good idea

The station was off the air and the burglar alarm was howling, but there was no burglar. John arrived on



scene next and reported a funny smell in the transmitter room. As an engineer, I don't find odd smells in a transmitter room to be very funny.

When I arrived, there was a slight hint of an electrical smell. I put the transmitter system on night pattern and saw an SWR cutback take place as well as hearing the arc-gap in the phasor arcing. I thought for a moment and then figured it must be the fuse I put in to protect the night pattern from high power.

I was thinking that maybe the fuse was not such a good idea. I cut a piece of tubing to the same size of the fuse and put it in place. After all I have three other failsafes to protect from high power. So I push the ON button and things did not go as expected. The power climbed way past the nominal 4.1 kW and the arc gap fired, but the transmitter did not mind that so much. I hit the OFF button. So maybe the fuse *was* a good idea, a *very good* idea.

The transmitter was not reducing power and it was not going into high power lockout. These functions had worked perfectly in the days before when we did our testing, tuning, and field measurements. After some troubleshooting, I finally found the problem. The "common" connection for the remote control functions was not tightened quite enough. This was the only connection that would prevent both the low power command and the high power lockout from functioning.

So what's with the burglar alarm? My theory is that the transmitter put high power into the

antenna until the fuse blew, and when the fuse blew the full 50 kW went into the arc gap for a moment. I further theorize that the arc in the fuse and/or the arc gap created a strong broadband electrical emission that got into the alarm system, perhaps the window wiring, and created the false alarm.

The lesson here is that multiple fail-safes are a very good thing when much is at stake. Another

lesson is that the simplest protections, such as an old fashioned fuse, are sometimes the best. I have to give most of the credit for the fuse idea to Cris. I had thought about putting fuse in the system but had discounted the idea because I didn't know if an ordinary fuse would function as needed with RF current. Cris said that fuses do work and that he had done the same before.

Catalina Tales

By
Bill Agresta
Chief Engineer, KBRT

Greetings from Santa Catalina Island! This has been an incredibly diverse month for me as on one side my family and I have been under considerable spiritual attack while on the other, God has been blessing me beyond my wildest dreams. What I can say about my family is that we need your prayers. The more God uses my family to do His work, the more people who do not know Christ feel the need to come against us, sometimes to violent proportions.

In the midst of all this, however, God has begun opening doors to some great ministry opportunities that are beginning to reach people in some tough places. I really needed this freshness in my life and have been filled with so much joy since being back in a place with God where I work amongst His miracles every day. He has provided for my needs and defended me through some pretty incredible situations these last couple of months, and I am more in love with Him than ever before.

With all this renewed energy that comes from being filled with such pure joy, I also seem to have a second wind (well, maybe fourth or fifth!) to get our facility cleaned up for the summer. With the harsh environment, this is a job that is never complete and really needs some attention after dealing with other things I have been doing this winter. Now with the added amount of brush clearance needed since weed growth seems to have gone into "turbo" mode, I've got my work cut out for me.

I am working on automating more and more of the transmitter site so we can access it better from

our studios. This will relieve me so I can spend more time away, like actually taking a few days off the



island in the "real world." I have had the blessing of a good friend who has recently graduated and is temporarily back on the island as he seeks permanent employment, covering for me from time to time so I can take a break. Based on all the situations he has had to deal with in the few short times I have been gone, this has seriously reinforced the need for much

better control of our island-based plant from the mainland. Many of the situations he encountered could have easily been dealt with via a remote connection.

KBRT was blessed to receive an APT Oslo digital STL last month. This unit has allowed us to design more remote control and diagnostics capabilities into our transmitter plant here on the island as well as improve our audio quality. Quite frankly, I am very impressed with this Irish-built unit and with the APT-X compression technology that it uses. Our T1 connection here on the island sees extreme fluctuation in bandwidth almost on a daily basis because of microwave dropouts. Where our old QEI CAT-Link would drop-out or many times need to be reset, this Oslo unit just keeps on going, hardly even missing a beat. I am still looking into the unit's routing capabilities, but after hearing from Cris that this unit can even be used as a DA or AD converter, allowing audio to be sent into it as analogue then delivering it as digital AES/EBU, I cannot think of much more I could ask from such a unit. Add to this the fact that it allows for a studio to transmitter site

LAN connection and we just solved a whole bag full of issues with a single device.

With all the cleanup going on here as we prepare for summer, it's picture time here again, so I promise some great island pictures, something to

look forward to for next month.

Until next month, the Lord bless you and keep you; the Lord make his face shine upon you and be gracious to you; the Lord turn his face toward you and give you peace.

The Chicago Chronicles

By

Art Reis, CPBE, CBNT, AMD
Chief Engineer, CBC-Chicago

Project Sheherazade

In our last episode, the question was, "How is the unknown output impedance of a circuit determined?" This was taught to me by Al Antlitz back when he was CE at WFMT in Chicago. I'm surprised at how many folks who do this sort of work, don't know about this.

We're assuming an audio amplifier here, for simplicity. Start with the amplifier operating into an open load. Put an AC voltmeter across the output, along with a relatively high resistance variable resistor, one which can handle the amount of power the amplifier delivers. With the resistance set to maximum, gradually drop the resistance of the variable resistor until the voltage as read on the AC voltmeter drops to *one-quarter* of the original reading. Turn off the amplifier, change the voltmeter to an ohmmeter, and measure the resistance of the variable resistor at that point. That is the output impedance of the amplifier. You will be astounded as to how low the impedance of some of these solid state amplifiers can be. Many of them are designed to operate into multiple loads, or handle high slew rates. That's how they're designed to do all that.

For next month: Oh, this is esoteric! What is the *one* commercial FM channel on which, until now, stations using it had to worry about how close to they were to a station on TV channel 6?

The Fear of Lightning Is Also the Beginning Of Wisdom

As I write the first part of this article, it's about four days since the recent West Virginia mine disaster. I, like most of the rest of this country, are not past grieving the loss and disruption of life when things like this happen to truly productive people. I frankly am in awe of those folks who put their lives

on the line keeping up with our nation's energy needs, despite the promise of the Obama regime (yes, that was a dig, no pun intended!) to end their livelihoods. Despite many of the reports I used to hear, most coal miners love their jobs, which is impressive enough, but the thing which impresses me most about them is that these men (and women), still knowing the risks, fear nothing in their lives except their God. They are not afraid of what they do, though they will fight to keep their jobs safe. That's why there has to be a United Mine Workers Union, one of the few unions which this generally not-pro-union observer sees as at least trying to do good things.

Now, what does that have to do with broadcast engineering? Well, if maybe to a lesser degree than those miners, we who practice our craft have a special mindset which comes across as being unafraid of almost anything. We can and do perform tasks that everyone else in the neighborhood radio station is just scared out of their wits to do. I've observed this in my career for over forty years, and it's uncanny. When it comes to broadcast engineers and fears, I can count the number of them on the fingers of one hand, and most of them are fairly minor ones. Just like those coal miners, many of us, though certainly not all, fear our God. There are exceptions—you know who you are, and I'll just leave it at that. And a lot of engineers don't like to climb their towers, because they do fear heights. Noted, and accepted. And all of us, to one extent or the other, fear lightning, not for what it can do to *us*, but what it can do to the creation we must maintain, our radio facilities. That one had better be a given.

Which brings us to a dilly of an experience we had with lightning here at the Hammond studios on the evening of Easter Sunday, and as I write this, even weeks later, we're *still* dealing with the damage.



Some of the experiences which came out of this one incident are instructive enough for me to pass along.

The storm was coming through after 9:00 that Sunday night, and the lightning in and around Hammond was pretty heavy. Leon Coleman, one of our account executives who should have been home with his family, was instead, as seems to be his habit, working at the station early Sunday evening. At about 9:15 he was in his car, preparing to leave the station parking lot. The lot is fully fence-enclosed, with two wrought iron motorized gates which guard access to the place. The one fronting Calumet Avenue is about fourteen feet high, and Leon's car was just pulling up to it when a major bolt of lightning struck the north end of the gate, moved right down to the south end and entered into the station building. Only Leon's laundry knows how scared he was by that! Let the record show that there is an eighty foot tower in the back of the building for our microwave STLs but the lightning didn't strike that, thanks to our Staticats and the fact that the tower is so well grounded. However, the much shorter gate, to which very little attention was paid for grounding (the tower, after all, was a mere forty feet away, which put the gate well within the protection area of the tower – or so we thought) took the brunt of it – and, amazingly, survived intact, both mechanically and electrically. It opened normally to let Leon's car out of the parking lot a moment later.

But that was just the beginning. First of all, that one strike took out the electricity for about a quarter of the City of Hammond. No kidding, just that strike! In the building, the strike blew eleven circuit breakers in three breaker boxes, though obviously not fast enough for some of the equipment it was feeding. We lost a large APC UPS, a FAX machine, three NIC cards, two 24-port switches, our Comcast feed, two of our HVAC units (control boards), several assorted printers, and we had to re-set a few of our computers. And, as time went on, I'm sure that more items electronic or electrical, weakened by their experience with that big bolt of local lightning, will also succumb. It never fails. As I write this part of the article, later in April, it's already started to happen. A Mac video card croaked. I'm sure that, for the next couple of weeks, there will be more.

The biggest surprise, however, came with what happened to our emergency power generator, a big honking 80 kW Onan, which was glitched so completely that it tripped on the 'low oil pressure' light. That meant, the thing wouldn't start. Cute. Needless to say, all of our stations went off the air within twenty minutes. When James Kelly and I got

there less than an hour later, the gen became our number one priority. I had picked up some high-quality motor oil on the way in, but when we got there and did an inspection of the gen, we found a large container of a different grade of oil and put in about one and a half quarts. The 'low oil' light went out and the gen started right up. One minute later, the local commercial power came up. Wouldn't you know, right on cue. A couple of days later when the Onan field tech came out for the gen's semi-annual maintenance look, he found the oil to be a half quart *high*. The oil pressure light, he told us, is set to go on when the oil is down by *five* quarts. That was proof, he said, that the gen controller got glitched by the lightning. It's the first time I've ever seen that happen.

With the gen taken care of, we turned our attention to the Prophet System automation. James Kelly and I called in fellow IT maven Brian Bonds, and as I worked on getting breakers reset and assessing the damage to other parts of the building system, James and Brian worked on the automation system for the next several hours. Both LAN switches are now replaced, along with that FAX machine, NIC cards, Mac video card and the APC UPS, which was relatively new and had just come back from repair after being zapped by lightning once before. The old, grizzled but otherwise identical APC UPS in the next rack, the one which was *supposed* to be replaced, came through it all just fine, thank you very much, but it is still going to be replaced because it's useful life is now up. Meanwhile, the emergency replacement UPS, the one we had to put in to get the place back on line at all – that UPS was originally installed in this place in 1992 (!) and has had just one battery change, is still going strong, kept around just for emergencies like this. By the way, the brand name for that UPS is Best. Indeed. You know the company by its current name: Powerware.

No matter how long an engineer works in this business, if he or she wants to be amazed anew, the only thing to do is wait until the next lightning storm. When a big one hits, that's when you find out what you missed, what you were unprepared for, because lightning, when it wants to, will always find a way to destroy the one weak link which you wouldn't think it would hit, and which will take your station down just as sure as sin.

And, in retrospect, we really dodged a bullet this time that could have destroyed us. The Dell file servers in the rack room were unaffected by the lightning strike, but the damage hit very close to them, and it was the analysis which James Kelly,

Brian Bonds and I did in the wake of this storm which revealed to us that the means by which we back up the data on those file server drives is incredibly inadequate. Never mind that the servers are supposedly Raid-5 dual redundant. We've been led down that path before, and frankly, we've learned the fallacy of that situation hard way. That's a major reason which cost Dalet, us. To that end, we have decided that the only way in which we are going to have a truly viable backup system is to isolate it. How? Here's our plan. See if you agree.

First, the backup server should be a unit identical to the file servers it will back up. Second, it should be located away from the main file servers and on a different part of the building's electrical system, and on its own UPS. Third, it should only add and subtract files as needed, not re-write the entire system with each backup (unless manually demanded). In this case, there's nothing like re-inventing the file-writing wheel. If we did it that way, the process would take more than a week at each pass, at which point the system has to start all over again. That's a lot of needless system wear and tear. Finally, the connection between the backup and the Raid-5 *must* be fiber optic, and not Ethernet. Why? Two reasons. First, using a fiber optic link takes the backup function totally off the Ethernet-work. Never mind that we're now running a 1000 MHz system here, at least in the most heavily utilized areas of the network. We've seen it: Adding a backup function to the load slows the entire system down. I don't think

to secure that data, and your gig will be secure right along with it.

Here at Hammond we have the entire project mapped out. All we need now is the hardware. That may have to wait until the next fiscal year. But I hope not. We're just getting into serious thunderstorm season now and we may have to be looking over our shoulders and hoping (and praying) that we make it, if we don't get such a backup system this year.

Fox Hunt!!

The Hammond-to-Lansing STL frequency for WSRB was the same one used for WPWX in Burnham since we acquired the Lansing station. We did it for frequency conservation reasons, and that situation worked fine for a lot of years, but then the transmission technology was changed last year on WSRB from digital modulation of FM (Moseley 6000 series) to digital modulation of Quadrature AM (Moseley StarLink). The station audio sounds a lot better when it goes through the StarLink as opposed to the older 6000. But there's a tradeoff. The StarLink QAM signal is much more susceptible to interference than is the 6000's more-robust FM. And the WSRB STL, the frequency of which was just changed to 944.5 MHz in November, has been under siege ever since early March with intermittent but severe interference from somewhere in the neighborhood.

We found the pattern for the timing of

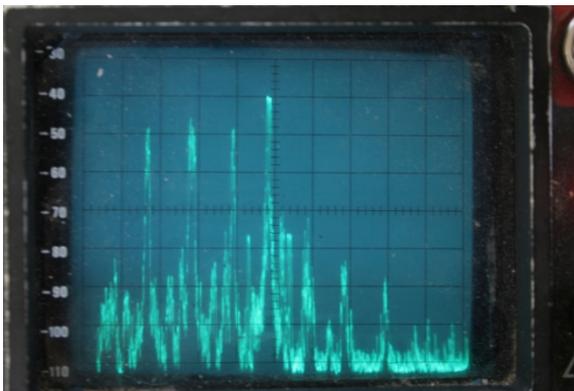


Figure 1 - Normal spectrum

that I need to enumerate the ramifications of that for the users of the RCS Prophet system. Second, fiber optic is 100% impervious to EMP, whether it be from a nuclear explosion (hey, you have to think of these things!) or lightning strike. Remember, the whole idea of backup is data protection. That's a given. The trick is to use all the tricks you have at your disposal

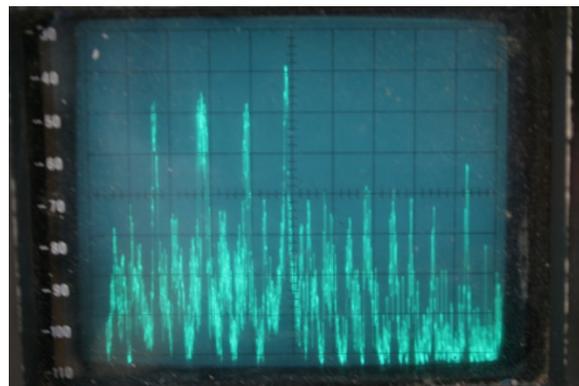


Figure 2 - Spectrum with interference "bloom"

occurrence of the problem fairly early on, and with that knowledge in hand, we were able to change the station audio source over to ISDN feed (which is grotesquely expensive to use) at the most likely times of interference. The station spectrum analyzer was then connected to the STL dish at the Lansing site, with all the radio still connected, and began looking

for the problem.

You bet, we found it! After observing the spectral scene from 902 to 950 MHz for a few days (a pleasant way to waste a lot of time that you could be spending doing something *really* constructive!) we found the problem to be centered on a really steady carrier centered just below 940 MHz. It seemed to spawn a couple of carriers on either side of it, a few kHz away (figure 1, with no intermod, and figure 2, with intermod).

But then the almost 940 MHz carrier began to bloom. Maybe a dozen carriers appeared for the spectrum going maybe ten MHz either side of the main one, disappeared, then re-appeared, becoming their own game of 'hide and seek.' Both the 6000 and the Star-Link were disrupted by those carriers, the StarLink more so than the 6000, as I said. Thinking that the cause of the interference was local, I contacted Cris and asked him to check the FCC's database for anything local. Cris's response was that there was nothing anywhere within the region of 940 MHz within 5 km of the Lansing site. That meant that the source was likely unlicensed. It was time to call for reinforcements.

Len Watson's name has graced these pages before. As regular readers know, he is one of my best friends, both in and out of the broadcast business. It doesn't hurt that he also has an IFR portable spectrum analyzer and a nine-element, 940 MHz yagi antenna to go with it, and his handy Canon digital camera, which took a bunch of pictures of this. I broached the idea to Cris, whose response of "Gitterdone!" came back in record time. Len was ready to go fox hunting before his cell phone rang with my call. The following Monday he was there with his setup, including a length of two inch PVC pipe going through his sun roof and the yagi atop that. His car is shown in Figure 3.



Figure 3 – Len's "fox-hunting" setup

We checked out the signal on the Tektronix

2710 spectrum analyzer in the Lansing transmitter room so that he'd know what he was seeing, and we set out. The IFR and I occupied the back seat, and Len drove. We tried heading west at first, but the signal diminished, so we headed east.... then north, and east again, then north again. Two things became apparent. First, the 940 MHz signal (actually, we found out, 939.9 MHz) was not local, but rather a considerable distance away. Second, it appeared to be exactly in the same direction as our studio STL transmitter. Turns out, the interference was dead on axis, and co-polarized with our STL. The perfect storm.

To make a long story short, we found the source of the main signal, on a tower in a NIPSCO power substation, just north of the Indiana Toll Road and a quarter mile east of Indianapolis Boulevard, about six miles from the Lansing site. There wasn't one but tower there, but two. See Figure 4. The second is a cellular tower. By this time, we'd observed the signal 'blooming' a number of times, and the place was, according to the IFR, nothing



Figure 4 - NIPSCO substation, the source of the interfering signal

short of 'intermod city.' The spectrum analyzer wasn't showing 'grass' anymore, but rather, weeds! Further observation showed that the carriers which were generated during the 'blooming' were both intermittent, and varied in level, but were very stable in frequency, a sure sign that the problem was not being caused by self oscillation in an amplifier stage of any one of the transmitters. Were that the case, the spurious emissions would be more likely to wander around the spectrum, at least some. Not here. It was plain to us that the two towers were talking to each other, because, close in, pointing the antenna at either tower, or in between, didn't change a thing on the display. Mind you, we were using the internal attenuator in the spec an, and none of the signals were strong enough to peak to the top of the display.

Fine and dandy. Now, what were we going to do about it?

We called Cris, and he found the license for the system in the database in rather short order. He was in favor of dropping a dime to the FCC, but at least here in Chicago, that's a problem: The FCC Office in Park Ridge has an unlisted phone number, and they don't even answer that if you find it. Your tax dollars at work. My preference was to call the folks in NIPSCO's communications department, and try to get their cooperation. The thing is, the folks at NIPSCO aren't much better than the FCC Chicago Field Office at answering their phones. But this time, I blessed out. After calling six different phone numbers and getting either no answer or a disconnect notice, I found someone all the way over in Valparaiso who not only told me who to reach, namely the director of communications for NIPSCO, but he told me *all* of the guy's contact information, which though a clear violation of business protocol, was a gold mine for me. I called the guy's office, got his voice mail, then called his cell phone. He was in the dentist's chair. Ooops!

I got a promise from him to call me back the next morning, and he did. Wow. Thing is, this guy wants more than anything to cooperate. If you're going to talk to him, be prepared by packing a lunch beforehand. He has a rather small crew of technicians under him and he promised that he would certainly order them to investigate this, even though his department is stretched very thinly. He described his entire operation to me, and he agreed with me that a severe case of intermod seemed to be the problem. However, his problem is with the cellular site next door. They *don't* cooperate with anything or anyone, and one can't even get hold of them to deal with such problems. For its part, the NIPSCO site has been there since 1953, the trunking system they use has been up since 1989, the cell tower is almost four years old, and this DOC hasn't heard of any problem

until now. One thing he did suggest is for us to change our polarization, which like his operation is vertical, to horizontal. Since his system services mobile users within his company, that operation cannot change its polarization to horizontal, and because of other h-pol users on the frequency, neither can we.

I'll be leaning on my new found friend at NIPSCO for help in getting the intermod issue dealt with, and I'll report more as the situation develops.

A Special Note

You see James Kelly's name mentioned here in many of the columns I write. I want to mention another something special about this man.

James has two passions in his life: his work and his mentoring of young men. Specifically, James is a Scoutmaster, one of two such leaders in Troop 1791 in the south side of Chicago, not far away from the mean streets where more murders than we want to remember have been committed just this year alone. The fruit of James' work with the teenage young men with whom he works is abundant. This year, three members of Troop 1791 will attain the rank of Eagle Scout. I am in awe of this. Rare is the scout troop which has one member attain the rank of Eagle Scout in a given year. But three? And this is just the tip of the iceberg. James hasn't given me numbers, but he has told me that many Eagle Scouts have come out of Troop 1791, and a lot of that has to do with James Kelly and his work with them. James, if nothing else, is a mentor, and even through his often gruff manor (which is in my opinion is something of a prerequisite for the job), he show his love of his calling and for the young men whom he is shepherding into a meaningful adulthood. I couldn't be prouder of him. James, lead on. We should all be that kind of good.

For this month, blessings! De Art

The Portland Report

**By
John White, CBRE
Chief Engineer, CBC-Portland**

Wow! April is over already. May is here and it snowed last week. It didn't stick, which is good. This is just a weird year.

Last week the paper wasps were out looking for places to build nests, places like satellite dish feeds and other inconvenient nooks and crannies, tuning enclosures and tuning houses. Those I open very carefully, just a crack and then a peek inside. I think the largest paper wasp nest I ever saw was the size of a basketball.

Speaking of critters, we finally received our certificate of occupancy at Mt. Scott. The last hurdle was the landscaping with Arborvitae planted so the parking lot can't be seen. We couldn't plant earlier due to the weather. Now that's done with modifications so that we can access the tower. It's all approved and we have the paperwork.

Now enter stage right, Bambi and family. Mmmmmmm, Arborvitae. Mmmmmmm, Azaleas. Not donuts like Homer Simpson. That's right folks. Deer just love both of our new landscape plants. Now goats of course would eat the weed plants. They eat anything. But deer, they know and go for the good stuff.

Hmmm... how about that patch of blackberry down by tower number 2? I wonder where I can rent some goats. Just down the street a neighbor had a fence line over run with ivy. His equation is two goats plus ten days equals zero ivy ($2G + 10D = 0I$).

The saga of telephone interference has finally been tackled. The last holdout was the Telos telephone interface. For gear designed to work in an RF environment, I found the interference unexpected. The real surprise was how the problem showed. Calls could be put on air with no problems and no feedback, but the call screener phone was a whole different matter. Once off hook, the interference was huge and the phone acted weird with intermittent function. The first thing I tried was filters on the phone lines which produced little if any improvement.

The next obvious step was a filter on the

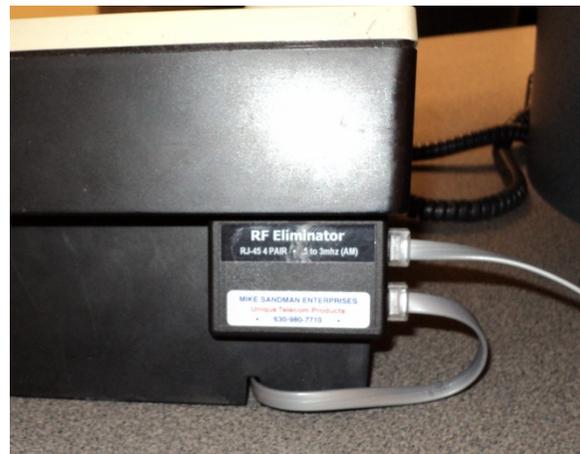
screener phone itself. Guess what folks? That isn't easy. The screener phone uses a three-pair modular cable with a six-pin connector. All three pairs are used for phone line, digital control and power. And

that is where the problem arises. I could not find any three-pair filters. I searched high and low and could find two-pair only.

Then I happened on Sandman Enterprises. They don't make a three-pair filter either, but they do make a four-pair filter for network applications. It's the only one I know of. However, Murphy's Law intervened. The four-pair filter uses an eight-contact RJ-45 connector and six-contact plugs won't fit.

Here I made use of my handy dandy modular install tool. I took a six-pair cable, snipped it near one end and installed two RJ-45s using only the six conductors. Voila! I had adapter cables. Once installed, I confidently picked up the phone only to hear... INTERFERENCE!

In frustration I started punching through the lines, and found that line 4 was quiet. Progress. I started looking at the cables searching for some kind



of connection mistake and found none. But I did notice I had not removed the filter from line 4 in the earlier test. Back in go the line filters on lines 1, 2, and 3.

Now the phone was totally quiet. It works good with filtering on both the phone lines and the phone.

I got the four-pair filter from Sandman Enterprises. Their phone number is (630) 980-7710.

Rocky Mountain Ramblings
The Denver Report
by
Amanda Alexander, CBT
Chief Engineer, CBC - Denver

April has been a fairly quiet month. We made many trips to our new leasehold at the Pavilion Towers with a few side trips to the transmitter sites.

It seems the buildout of the new space is just flying by. The offices which needed to be built are done, carpet has been laid, and painting is almost finished.

Kilgore Construction finished up our engineering room (the Technical Operations Center, or "TOC") first so we could start pulling wire. After precise measurements we were able to hang all the blocks. The next day we began pulling wire. We have conduit going to the four main control rooms and two of the production rooms, so this made pulling the wire

much easier. The way it is at the current building, the wires are just in the ceiling. This will really help with keeping things organized.



I had the "privilege" of putting the wire in place on the block. This became redundant and not fun after, oh, about the first block. It took me a little while for each one, but I got it done. Then my dad checked over it and punched it down while I worked on another block. Currently we just need to install the blocks in the control rooms and punch down the 25-pair

cables in there.

We got our John Deere riding mower back from the shop. We took it in earlier in the month to get general maintenance done as well as to get a few things fixed on it. It took the shop two weeks, but the mower starts and runs better than ever. I have not used it for regular mowing yet but plan on using it very soon, assuming this crazy Colorado weather allows me.

The big generator at KLZ was finally fixed as well. We decided after the 36+ hours it ran during a blizzard it was time to get it looked at (the oil had not been changed since 1992). We got the usual maintenance done on it and then some. I received a call late one evening from the guy working on it and was informed the starter doesn't work and one of the batteries blew up when he tried to start it. This is a unit that I have never had an issue with and it ran great for over 36 hours. Needless to say we were not happy in any way shape or form. The company working on it ended up not charging us for a new starter which was nice of them. We test fired it up ourselves one day while out there and it ran great.

We were able to dig a trench and bury the conduit required for Qwest to run us a new ISDN line at KVLZ. We had to cancel the first time we planned on doing the trench because of rain. It took us about



an hour and a half to get the trench done – with a trencher of course. Then it took another hour and a half to get the conduit in the ground and buried as well as routed up to the building. Many thanks to local engineer and friend Cliff Mikkelson, who came out and spent most of his day helping us. Now we are waiting on Qwest to put in a work order to install the cable in the conduit. For some reason they never put in a work order even though they were supposed to. We need to get this done quickly because Jerry Ford, who leases our land for grazing, wants to put some cattle and horses out at the site and they would undoubtedly get hung up in the temporary telco drop which is presently just running across the ground over the 260 feet from the pedestal to the building.

Jerry has been a great help to us the last couple of years. He spent several weeks mowing out at KLTT for us since there were some areas that the cattle and horses would not eat and because of this the growth was out of control. He also has helped us out with fixing up our Massey Ferguson tractor.

This year he is helping us again. At KLZ we have a problem with the people on the property to the north of our site trespassing. There is not a fence of any kind over there, only remnants of what was there many years ago. The former owner of the land was a friend of ours and knew and respected the property line. The new owner seems to have it in his head that he can bring his horses over whenever he wants to exercise them. It has caused the land to become even more difficult to drive on because the hooves dig in to the mud and form craters over time. And there are the many prairie dog holes on our property and the hazard they present to horses and their riders – a recipe for injury and a lawsuit. We have confronted them on our property and told them no trespassing.

In the middle of April, I had a gentleman and his wife come on over and talk to me. This guy boards his horses on the land next to ours. He informed me that the owner of the horse place has said they are allowed on our property any time. This guy did not feel comfortable with that information and decided to ask me personally. I let him know that they are not allowed on our land at all and they

would be trespassing. We have decided after hearing this to inform Adams County Sheriff's Department and if we see anyone from that property on our land without our permission the cops will be called. Jerry is in the process of putting up a fence for us to hopefully put a stop to this.

Jerry called me one Saturday morning in April because the gentleman from the property to the north wants him to put in a gate for them to come on to our land. What nerve! I informed Jerry to tell them no. They were not happy with him. I am not keeping a close eye on that fence. I have bought several "No Trespassing" signs and will hang them up as soon as Jerry finishes the fence. I am hoping this puts an end to them trespassing.

Over the next few weeks, Jerry will be putting up a fence all around the property. We are allowing him to put his cattle at KLZ also in hopes of making the maintenance – mainly mowing – easier. I love Jerry's horses, especially the ones that take a liking to my car and lick it dirty for me. I am sure it will take getting used to since we have never had livestock on that land. The garage will become a familiar place for my car.

Time is definitely flying by. Less than three months until we move to the Pavilion Towers. Less than three months left to get all the wires run. Less than three months to get the final planning done. Less than three months to get the engineering stuff at our current studios moved to their new permanent home at KLZ. Less than three months. It may seem like a long time, but in reality, it isn't much time at all.

It is spring. Spring is a time of growth. Spring is the busiest time of year. On top of the move, I am going to have to deal with keeping things mowed and trimmed at three of our sites. I have to find room at KLZ for all the surplus and spare studio and remote equipment. I have so much to do, and to be honest, I am stressed over it. I have no doubt it will get done, but the thought of it all is overwhelming.

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

Digital Diary
by

Larry Foltran

Corporate Website & Information Technology Coordinator

Introducing USB 3.0... Obsolete Already

From external hard drives to webcams, everyone who uses a computer even on a semi-daily basis knows where the USB ports are on their

computer. We've gone from computers equipped with two of these small ports to models equipped with 8 USB ports in the back, two on top, and a couple more on the front panel for good measure. Even in those situations, I sometimes find myself needing more ports and end up attaching a 4-port USB hub to expand my options.

Granted not everyone needs to attach a flight yoke, throttles, rudder pedals, virtual-reality headset and another half dozen peripherals to their computer, but I'm sure everyone will agree that those tiny rectangular ports can be very useful. One study shows that there have been over 6 billion USB devices sold as of 2008. Yes, that includes those goofy little USB powered fans.

Since the birth of the Universal Serial Bus (USB) technology, just over 16 years ago, there have been several upgrades and changes to this interface. Aside from the different types of connectors, the most commonly used being the larger rectangular type A connector, we have seen version 1.0 and version 2.0 come along for the ride on our computers. As of this past January, USB 3.0 is now available to consumers.

As with most changes in the computer world, USB 3.0, referred to as SuperSpeed USB, is designed to perform much faster than its predecessor. In fact, Intel claims that transfer rates with USB 3.0 can reach up to 4.8 Gbps as opposed to 480 mbps of USB 2.0. There's also good news for those of you who are accustomed to running powered peripherals or even charging your phones or MP3 players via USB. SuperSpeed USB will be able to provide better power flow when needed and reduce the power flow when no longer necessary.

Don't get rid of all those old USB 2.0 cables and peripherals just yet, though. USB 2.0 devices can still be used with USB 3.0, but they obviously won't enjoy all of the benefits of SuperSpeed USB. Also

keep in mind that a chain is only as strong as its weakest link. USB 3.0 will be capable of faster transfers, but certain hard drives may not be able to keep up with the increased transfer rates. That

essentially means that unless you have a super fast solid state hard drive, you probably won't be able to utilize all of USB 3.0's speed capability.

Ironically just as Intel throws out USB 3.0 for us to digest, it follows up with Light Peak. Light Peak is a high speed optical cable that's in fact at least twice as fast as USB 3.0. Based

on the information that's available, transfer rates can reach up to 10 Gbps. One article I read recently gave the example of Light Peak being capable transferring an entire, full-length Blu-Ray movie in less than 30 seconds.

Intel believes that Light Peak technology will begin to appear in consumer products later this year. Light Peak peripherals and can also simply be plugged into an existing USB port, although doing so would limit the transfer speed benefits. Some experts believe that USB 3.0 and Light Peak will be able to co-exist for some time. Others believe that Intel essentially made USB 3.0 obsolete before it even had time to take flight. In my opinion, I believe it will all come down to cost. If products equipped with Light Peak technology cost considerably more than those utilizing USB 3.0, I think most consumers will tend to lean towards the latter. Especially considering that most current hardware can barely keep up with USB 3.0, much less Light Peak. Either way, I'm quite eager to see how this will all shake out.

Making Copies

A good friend of mine owns a company that leases and services "photo-reproduction" machines (never call them Xerox machines around him) in the Metro-Detroit area. While chatting recently, he mentioned something that made my ears perk up a bit. With more and more digital technology going into newer photocopy machines, there is now a significant security risk when it comes to sensitive documents replicated on such machines.



One fact that I was completely unaware of is that almost every single digital photocopier built since 2002 is equipped with some sort of hard disk storage device. This storage device stores an image of every document copied on the machine. After learning about this, I decided to start doing some research and I was very surprised at what I found.

Based on one report, it takes about 30 minutes to pull the hard drive out of a copier. Then, using some basic software that can be downloaded for free, it is possible to retrieve every document scanned by the digital copier. Documents that can contain sensitive information such as social security numbers, bank account numbers, or a variety of other data that can make an identity thief's day. Similar to those roller style hand towel machines you've probably seen that continually feeds a "fresh" section of towel at every pull, the data will remain on the hard drive until the drive is full and the oldest data will be overwritten with the newest.

Based on my research, I found that some photocopier manufacturers do offer solutions to combat this as optional features. Some are in the form of increased encryption and others include software that will erase the hard drive each day. But in almost all cases, these tools can cost the purchaser an added \$200 or more. Similar to how many of us

view purchasing extended warranties, these features can simply be overlooked in an attempt to keep office expenses low.

In 2007, Sharp commissioned a survey that showed 55% of Americans planned to photocopy their tax return forms that year. Almost half of those planned to use a copier outside of their homes, including the machine at their office, library, or copy center. 54% of the total survey also had no idea that the copiers stored an image of their document for an extended period of time. Although I didn't participate in this survey, I could definitely be included to that number.

After conducting my eye-opening research, I've definitely decided that I will be using my personal multi-function printer to make any copies of sensitive documents. Unfortunately, I don't believe we can ever be sure that others who handle our sensitive information are taking the steps to ensure it's secure. I suppose it's become an unavoidable risk in today's digital world and one that seems to be increasing. That is unless you move into the mountains and sever all contact with the outside world. In some ways the seclusion sounds nice...but satellite Internet access really isn't the greatest. ;-)

Until next month...

The Local Oscillator
May 2010

KBRT • Avalon - Los Angeles, CA
740 kHz, 10 kW-D, DA

KCBC • Riverbank - San Francisco, CA
770 kHz, 50 kW-D/1 kW-N, DA-1

KJSL • St. Louis, MO
630 kHz, 5 kW-U, DA-2

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

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

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

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

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

KSTL • St. Louis, MO
690 kHz, 1 kW-D/18 W-N, ND

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

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

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

WEXL • Royal Oak - Detroit, MI
1340 kHz, 1 kW-U, DA-D

WLGZ-FM • Webster - Rochester, NY
102.7 MHz, 6 kW/100m AAT

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

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

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, 6 kW/65m AAT

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

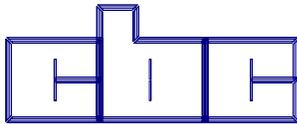
WYDE • Birmingham, AL
1260 kHz, 5 kW-D/41W-N, ND

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

WXJC • Birmingham, AL
850 kHz, 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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