# The Local Oscillator

*The Newsletter of Crawford Broadcasting Company Corporate Engineering*

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**25 Years!**

This issue marks 25 years of publication of *The Local Oscillator*! Thatôs quite a milestone.

Many readers have been with us for the whole trip while others have joined us in more recent years. Whether long-time reader or new ñsubscriber,ò we appreciate your readership and occasional feedback.

The *Oscillator* is mostly a labor of love. We certainly donôt make any money with it. Its purpose is to provide a platform for distributing information within the engineering ranks of our company and also sharing this information with the industry at large. We started out back when our company had just six stations, and I wrote the whole thing, usually four or five pages, discussing what was going on in the various technical plants of our company.

At some point (and I donôt recall exactly when it was), I began asking our market chief engineers to contribute. This provided a set of unique viewpoints and writing styles as opposed to my own monologue, and that has remained the format for many years.

Later, we began distributing outside out company, initially at the request of vendors and ñfriends of CBCò that were interested in the goings-on here. That distribution was by U.S. Mail for a good number of years before we went to an all-electronic delivery system. Now the *Oscillator* is available on the World Wide Web to anyone who wishes to read it, and people do indeed read it all over the world. I get emails from all over in response to various topics and columns in our modest newsletter. I have no idea how many folks actually read it but it has to be hundreds if not thousands. At some point I may have our web people install a counter so I will actually know!

My thanks go to each of our columnists for their tireless efforts in producing interesting content month after month. Thanks also to each of you, our readers, for your loyal following and occasional responses. And Happy New Year to one and all!

**AM Revitalization**

Over the past year, I have watched with great interest the debate, mostly in the trade press, about ñAM Revitalization.ò Ideas have been floated and many have been shot down.

For some, an all-digital future is the only possible way to ñsave AM,ò while others have decried digital as being the last nail in the coffin for the senior broadcast service. The idea of moving AM stations to a new FM service in former television spectrum has been around for some time now, and that idea is again being pushed forward by some in the ongoing debate. And still others are promoting a return to a ñhigh-fidelityò analog model, something that AM is certainly capable of but which will be difficult to achieve by more than a handful of stations given the current environmental and regulatory conditions.

In response to the FCCôs Notice of Inquiry on the subject, we filed comments encouraging the FCC to deal aggressively with ñunintentional radiatorsò and other sources of manmade noise. We also commented in favor of ñAM on FMò translators, special translator filing windows for AM licensees, and relaxing of FCC policies that constitute a ñmajor changeò for translators that are used exclusively for AM stations. We also commented in favor of elimination of the ñratchet rule,ò relaxation of community of license coverage standards and elimination of skywave service area protection. Given the proliferation of other services, including full-power FM, LPFM and satellite, itôs hard to argue for the continued protection of skywave service areas that in many cases preclude or restrict local nighttime

service by co-channel spectrum neighbors.

So what is the long-term solution for AM, or is there one? Thatôs a tough question, and the range of ideas being tossed around in the AM Revitalization debate is a good indicator that there isnôt a simple or apparent answer.

From time to time I have been contacted by one of the trade reporters for a few words on the subject, and Iôve tried to provide positive responses in every case. It occurred to me that I havenôt really addressed the issue in these pages, so as we roll into 2015 I will take the opportunity to do so.

The increased noise floor caused by power lines, compact fluorescent lightbulbs (CFLs) and many other ñunintentional radiatorsò is, in my view, the #1 problem for AM as a service today. Even the strongest AM stations suffer interference from these sources. As I pull into my garage each day, our own KLZ is obliterated by the buzz from the CFLs in my garage door opener. Multiply that by the millions of CFLs that are in use in homes and businesses, each one contributing a little bit to the noise floor, and youôve got a listening environment that is a whole lot more hostile to AM signals that in times past.

How can we deal with this? Any solution wonôt be quick, but I think we have to start with aggressive enforcement of existing rules and making of new rules to restrict the amount of hash that CFLs and other such devices can produce. Over a period of time and through attrition, the problem will abate. If there is one thing I have learned in recent years itôs that CFLs donôt last forever (and they smell really bad when they do go bad!).

We also need a mechanism to deal with hash from power lines, which is as insidious and ubiquitous as any interference source that we face today. Dirty and cracked insulators, particularly on cross-country transmission lines carrying 120 kV or more, produce a ñperfect stormò for the creation of hash on the AM band. Corona on the dirty or cracked insulators generates the RF and the transmission lines propagate it over a wide area. In todayôs economy it seems that utility companies would rather live with the losses from leaky insulators than invest in the maintenance required to fix them. This amounts to no less than pollution and we have to address it through regulatory means.

My friend Paul McLane recently asked me for my position on an all-digital solution for AM. I responded that I favor AM stations having the option to operate 100% digital, but they should not be required to operate in the all-digital mode until/unless some threshold of digital receiver proliferation has been reached (as in 80-85%). For some stations, particularly those paired with translators or FM stations, all-digital operation may make good sense even now, but for most, an ñanalog sunsetò within the next decade would likely spell economic disaster.

I donôt hold out a lot of hope for the success of a move to vacated TV VHF-Low spectrum for a number of reasons, and the biggest of these is timing. It would take too long for the migration to occur and for receivers to proliferate to the point that such a move would be worthwhile. From a receiver standpoint, an all-digital solution really makes more sense than migration to a new band. Receivers are already in production, and AM stations can in many (most?) cases adapt their existing transmission and antenna systems to all-digital operation. Moving to a new band would require starting from scratch. The fact is that there are *zero* receivers in listenersô hands today that can receive a new ñAMò band on VHF.

ñAM on FMò translators, if done right, can offer real relief for some AM licensees, but the way things are structured right now there are few opportunities, particularly in the more urbanized areas. To make it work, the FCC needs to do several things. One is to permanently pair translators with their parent AMs. This will stop some abuse that would otherwise come. Another is to make a translator move of any reasonable distance a ñminor changeò if made for the purpose of pairing a translator with an AM station. And the FCC should open an ñAM onlyò translator window to allow AM licensees to file for translator CPs.

The FCC can do a lot to make it easier for AM stations to remain viable. Three aforementioned things come to mind: elimination of the ñratchet ruleò and relaxation of the 80% COL coverage requirement would give AM licensees some real options for site selection, and elimination of skywave service protection for class A stations would open the door for 24-hour service by many daytime-only stations. One additional measure, elimination of 100 uV/m groundwave contour protection for class A stations would allow many co-channel class B and D stations to improve their facilities (where can you listen to a 100 uV/m signal in 2015, anyway?).

All these are good things, and all will help a little bit, but no one measure or even all these in aggregate will ñsaveò AM. Thatôs up to AM licensees. It all comes down to content. The fact remains that the most listened-to stations in the big markets are still AM stations. Why? Because of their programming. Provide listeners with content that they want and they will listen, whether AM, FM or whatever.

As broadcast engineers, our part is to

produce the very best quality and reliability that we can, be it analog, digital or hybrid. That means paying attention to the details, from the microphone to the top beacon. There should be no technical reasons within our control that produce tune-out factors for listeners.

Many of the AM stations operated by Crawford Broadcasting Company do very well financially. The reason is that those stations provide high-quality, high-fidelity transmissions of programming that our listeners enjoy. I daresay that as long as we continue to do that those stations will continue to thrive. But that does not excuse us from continually seeking ways to make things better. My hope and prayer is that 2015 will indeed be one of AM Revitalization.

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

Hello to all from Western New York! It is hard to believe that 2015 is already here! Last year seemed to accelerate at lightning speed once the winter weather changed to more favorable conditions. Luckily, we were able to complete all of our major outdoor projects for a change, several of which were carried over from the previous year. Barring any unforeseen catastrophes, this year we will not have any major projects to complete. There are several maintenance items that I would like to get done this year, most of which are at the transmitter sites.


At the WDCX (AM) tower site in Rochester, the doors on each of the tuning house buildings are in dire need of painting, sealing around the jambs and replacement of the seals along the bottoms of the doors. Insuring a good seal around the doors will deter any unwanted insects from nesting within the enclosures as well as hindering entrance by snakes and rodents. Several summers ago we replaced the roofs, soffits and trim on all of the buildings. This drastically reduced the number of wasp nests and birds nesting inside the buildings. By sealing up the doors, we should be able to keep the insides of the buildings cleaner and easier to maintain.

There are several places around the foundations where rainwater has washed out underneath the concrete floors. These areas will need to be backfilled in order to keep the foundations and floors from cracking. Also, many of the 6-foot wooden slats that make up the fencing around the towers are in need of replacement. Several have split or warped to the point that replacement is necessary. These fences were erected right before I joined CBC and were not properly installed. If they had been water-sealed when the fence was built, many of these problems would not be a problem now at all.

At the WDCX-FM transmitter site we have several trees that are in need of cutting down due to their proximity to the guy wires. Should any of these trees topple onto the guy wires, we stand a good chance of losing the tower. Also the pine trees that run alongside the driveway are in need of topping, as they have grown into the power lines that feed our transformers. N.Y.S.E.G. (electric utility company) will be called in to handle the trimming of the trees along the high voltage wires. They offer this service at no charge to the customer. Also, the chain-link fencing around the tower enclosures is in need of repair. In most cases, the poles have shifted upward due to frost heave and have pulled the fence fabric upward with it, causing a large opening between the bottom of the fence and the ground, large enough for a person to crawl under. This will be a relatively easy fix, and should last for years, or until the poles are heaved upwards again from the frost.

At the WDCZ(AM) transmitter site we need to extend the 5-inch pipe that the STL dish mounts to on the side of the building. The bottom of the dish is only about 18 inches above the roofline, and in the event of heavy, accumulating snow on the roof, we could possibly lose our STL reception. It will be an easy fix to extend the present pipe another three feet or so and move the dish higher above the roof. Don

Boye of Western Antenna & Tower has looked at this and will perform the work at some point this spring.

This time of year we experience a lot of high winds that originate out of Canada and swoop down along the open waters of Lake Erie. These windstorms are quite powerful, many times with gusts as high as 70 mph with sustained winds near 40 mph. We had one of these windstorms over the Christmas holiday, so the day after Christmas I went out to the WDCX-FM tower site to see if we had any damage to our property. Other than a pine tree blown down, we escaped with minimal damage to anything else.

While inside the transmitter building, I noticed that the Nautel NV-40 was showing a fault, and upon further investigation I found that one of the power supplies had failed and the AUI screen was locked up. I was able to use the AUI to look at the operating parameters of the transmitter, but nothing on the front screen was updating or accessible. I phoned Nautel to get a replacement supply ordered and was told that the power needed to be recycled to get the screen operating again. As I was able to see everything via the AUI, I chose not to shut the transmitter down, just in case there was a problem with it coming back up, and not having the replacement power supply in hand. The supply arrived in a few days, was installed and the power recycled. Everything came back to life, but I am still concerned about what caused the screen lock-up. We have never had this problem until now, and I suspect that the latest software upgrade may be the culprit. Further investigation with Nautel will reveal if other NV-40 users have experienced this same problem, and if a fix has been developed for this yet.

This past summer, I installed a new dehydrator for the two 3-1/8ò FM transmission lines and two 1-5/8ò STL lines that feed their respective antennas on the WDCX-FM tower. What a joy it is now, not having to deal with those heavy nitrogen cylinders to pressurize the feed lines. I donôt know why I waited so long to replace them with the dehydrator.

That about wraps up another month here in the Northeast. Until we meet again here in the pages of *The Local Oscillator*, be well, and happy engineering!

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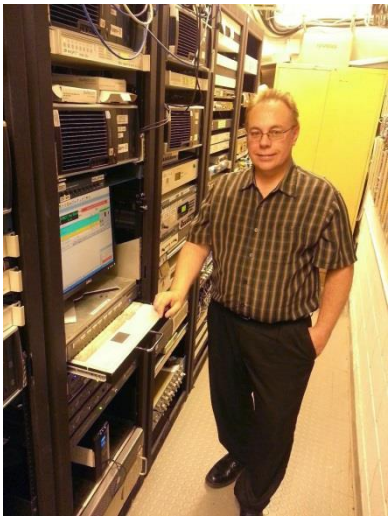
**The Motown Update**

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

Greetings from Detroit, and Happy New Year!!

The last month has been full of Christmas cheer. We had a group of musicians join us for a live Christmas show during afternoon drive. I was able to connect a 24-channel Mackie to mix the event from outside the control room, allowing us to do sound checks and rehearsals. It was great local radio.



I have been looking into some of the power supply failures in our early generation NV40. We had been just sending them back for replacement, or buying new supplies to replace those out of warranty. I decided to take two of them apart, and try to determine if there was a common failure between the two. I found that both supply fuses were blown, and there was a short across the DC output. I found several shorted MOSFETs on both supplies. There was a lot of thermal compound on the heat sink of both supplies. I ordered replacement MOSFETs and should have both supplies available for service soon. I will have a spare available to send out if anyone needs it.

Last month we received a call from Ibiquity regarding our AM IBOC exciters. It seems that there is an issue with some receivers having noise while blending using version 4.2.x. I will be upgrading WRDT in Monroe to start out the New Year.

Earlier in the month I had a chance to do some ATU work at WEXL. Due to a new installation on our leased tower, the night impedance shifted. It was nice working with Joe Huk, who assisted me with the ATU work.

I have been testing the use of Raspberry PI devices to replace computers that are used for monitoring through VNC. So far the testing has gone well.

It has been a great year with Crawford. I am glad to be part of a great company, and a talented group of engineers.

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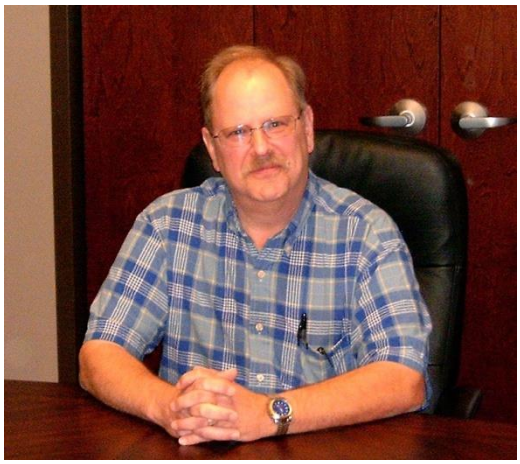
**News From The South**

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

Greetings from sunny (and wet) Central Alabama! Happy New Year as well. May Godôs blessings continue to shower on us all as we work in His service!

As I usually do, I took a little time off over the Christmas holiday. The original plan was to do some things around the house and to get some rest, but the best laid plans never survive contact with reality.



My dear mother, while visiting my sister Holli in Bolivar, TN, fell and broke her leg. We were afraid at first that it was her hip, but thank the Lord, it was her upper femur ï still no fun, but a lot better than a hip replacement (of which my wife Sandy has had two; I know of which I speak). Sandy and I went to visit her at the hospital in Jackson, TN, and were pleased to see that she was doing well. While we were there, they moved her to a small hospital/rehab center in Bolivar, near my sister, where sheôs coming along nicely. I deeply appreciate the prayers from all of our friends on Facebook.

**Obamacare**

I have to say this, if youôll permit me: Obamacare is really beginning to have an effect. I remember something that one of our commentators said a while back: ñUnder Obamacare, you will be able to get coverage. You wonôt be able to find a provider.ò

The hospital in Jackson is part of the West Tennessee Health System, a big non-profit that runs several medical centers. It seemed nice and clean, but they were obviously short-staffed (it was obvious to me, anyway). This is a growing problem: as reimbursements under Obamacare continue to be cut, medical facilities cutting back or are even being closed. The rehab center in Bolivar may be closed; I just thank the Lord that my mother was able to go there before this could happen.

Letôs just hope that the new Congress will address this.

**More Shoddy Tower Work**

It just never ends, does it? Weôve chronicled the problems that weôve had in previous issues (and by ñwe,ò I include the rest of you around the country). Things not mounted properly; things not grounded. You name it, weôve seen it.

Well, hereôs one I wish I *hadn't* seen: the shielded CAT5 cables up to the Trango dish on the WYDE(AM) tower werenôt properly tied down. Some gusty winds came through in early December, not only knocking loose a couple of support arms on the unipole lines, the Trango cables came loose and started blowing around in the wind. See figures 1 and 2. This not only did wonders for the antenna impedance, they eventually flopped far enough to hit the unipole lines. Of course, this destroyed the CAT5 cables; they were burned in two (and I donôt want to think might have happened to the Trango itself). At that point, there was fire and smoke in the building: the Trango power injector box on the wall was destroyed (see figure 3). Thankfully, the surge protection in the box stopped it there. Nothing in the network chain past that point was damaged.

But back to the tower. This is a real problem, for two reasons. First, the lines waving in the wind give us a variable impedance. Itôs hard to tune to a variable impedance (obviously). When thereôs no wind, we can run the transmitter at full power, but as soon as we get any kind of breeze, we have to reduce power to stay on the air.

**Figure 2 - A view of the CAT5 cables blowing in the wind.**

The second problem is finding a tower crew to come replace those cables and repair the unipole. This, too, has been well-chronicled in these pages, and I don't know what the answer will be. It's getting almost impossible to (a) find a quality tower crew and (b) have them show up in less than several weeks. We're brainstorming ideas here – we've even considered building a robot. We think we know how to get something to "climb" the tower and take pictures, but we can't figure out how to make remote-controlled arms to do the work!

(No, I'm not kidding. Todd and I have seriously thought about this.)

Incidentally, the company whose crew did all of the shoddy work that I've mentioned here in the past called me several weeks ago. We had some items still in storage at their Birmingham facility; they were closing it and moving everything to Atlanta, so could we come pick it up? We hopped in my truck the next day and headed over to their shop. While I was there, I chatted with the nice fellow who was overseeing the move. He told me flat out that his company was no longer doing broadcast work. I'm not sure what they're doing now, but I found that interesting.

At any rate, they're in Atlanta now, leaving us with no local options. (Not that they were an option before; we won't use them again.) At present, I have to call a guy in Georgia, who gets to us when he can. The other regional companies won't even return our calls. Let's just hope and pray that we get 1260 back up to snuff sometime in January.

And we've still got to finish that data link to WYDE (AM)! Whimper.

**Figure 1 - One of the support arms for the unipole lines is also loose and will have to be re-attached.**

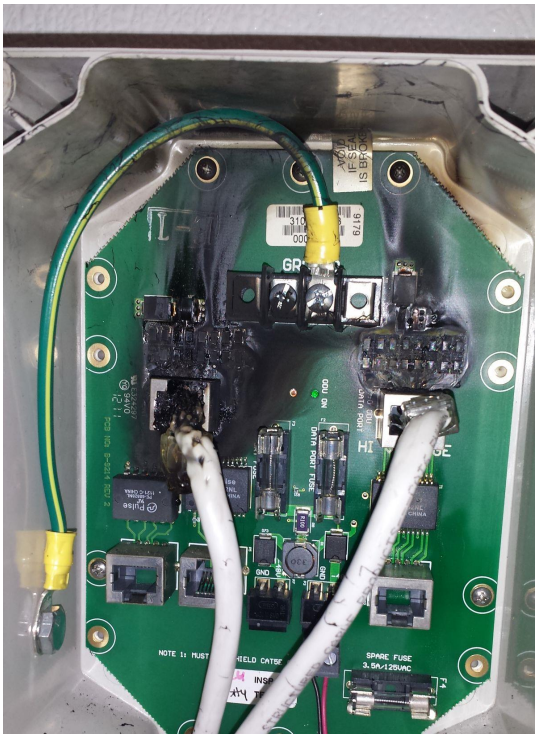


**Figure 3 - 5,000 watts of AM crawled into this power injector and had lunch.**

**The Mighty Jack**

If youôve read these pages, you know how much I think of Todd. Heôs about 20 feet *past* indispensable and is worth his weight in gold. But when Jimmy left last year, it created a big hole in our department.

Well, Iôm pleased to report that Jack Bonds, our new assistant, is shaping up nicely. Heôs smart as a whip, learns faster than lightning and isnôt afraid to tackle the big jobs (like walking around that muddy field at 850, knocking the wasps out of the way so that he can look in the ATUs).

But there are differences. Jimmy was a serious practical joker who was always chattering. Jack is... quiet. Iôve been told that the quiet ones are the dangerous ones, so we shall henceforth call him The Thoroughly Dangerous ManÊ .

Weôre blessed to have him.

**And... That's All!**

Not much going on; the holidays are like that. I learned years ago that, especially in Alabama, nothing happens in December. Many of our vendors are even closed for a good part of the month, so a lot of stuff gets put off until January. We have much to do in the year to come, and Iôm sure Iôll natter about it endlessly in these pages as we proceed in the months ahead. Until next time, keep praying for this nation!

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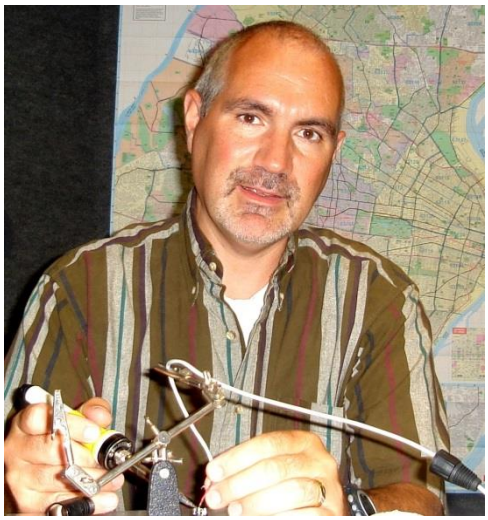
**The Chicago Chronicles**
**By**
**Rick Sewell, CSRE, CBNT, AMD**
**Engineering Manager, CBC–Chicago**

**NextRadio App**

We recently installed the NextRadio TagStation program for WPWX. By now, most of us are familiar with the concept of the NextRadio app. The app is for certain smart phones that have an FM chip built into the phone. While the FM chip allows users to listen to FM radio on their phone, the NextRadio app integrates with the chip to provide not only artist and title but album art as well. It is a very cool app that when properly developed and deployed by radio stations will give us some great avenues for promotions and sales campaigns that tie into songs or artists as they play on the radio app.



The installation was not that difficult once I was able to find all the instructions for the software. Before installing the software I checked to make sure the PSD data was working on an HD Radio receiver under what was the current transport mechanism which was a direct TCP/IP export from the NexGen automation system to the Nautel Exporter at the WPWX transmitter site. It was working as I expected. I just wanted to make sure we werenôt chasing our own demons if any problems occurred with the new method.

The new method of getting the HD PAD data to the transmitter now involved sending the NexGen Export data to an Internet server that would ñcleanò the data to make it match a database of album art and other station generated campaigns, so that when a certain song plays the smart phone app will generate album art on the phone and any other station generated matter associated with that song or artist.

So, instead of a direct route from the playout automation computer to the Exporter at the transmitter site, we now are sending to another local computer with the necessary software to be the ñgo betweenò for all these transactions. This makes it a lot more interesting.

Once the local computer receives the data it uses a cloud-based data transportation software, Slingshot, to send it to the TagStation server. It uses this same software to send the ñcleaned,ò matched data back to the local computer. The final step is for the local computer to send it to the HD Radio exporter at the transmitter site.

When I got this all installed and brought up the software dashboard for the TagStation/Slingshot

program, none of it was working. I was doing a direct TCP/IP export from the playout computer to the TagStation computer. But because the playout computer has two NICs this will not always work even with the computer being on the same network. I have been able to get around this by setting up a port forward in our local firewall and sending it indirectly this way.

This worked in this instance and the dashboard was now showing the data arriving from the playout computer. However, the dashboard didn't show that the data was coming back from the TagStation server. NextRadio has a very handy tool on their station website where you can see an actual demo of your station's app as it would look on the phone. It updates as song information is sent to it. This allowed me to see that the data was making it to the server but not back to our local TagStation computer.

After checking with their support tech he verified data was being sent. I then installed Wireshark on the computer and found the data was not showing up. I opened ports on the local and computer firewall with no change. I finally decided to give the computer a good cleaning using Malware Bytes and a cache cleaner and this did the trick. Hindsight is 20/20, but this should have been my first step knowing this was an older computer.

So, now I would have expected the data to show up on my HD radios. However, this final step wasn't working either. I again started fighting the problem with opening ports on firewalls with no avail.

One of the other engineers here was headed to the site to address another problem so I asked him to reboot the Nautel Exporter Plus while there. I really didn't expect this to be the cure since before installing the new system I had confirmed everything was working. However, this did the trick. Almost immediately on the next song starting up I saw PSD data again on the HD radios.

I kept a close eye on the PSD data for the next couple of weeks. I noticed that not every song's data showed up. I'm not sure the problem occurred all the time, but we were definitely missing data for a good number of the songs. Rebooting the TagStation computer and the exporter didn't fix the issue.

After observing through Wireshark that data was getting sent from the TagStation computer, I turned my focus on the exporter. The one thing that seemed a little off to me was that the interval for the PSD data was set to 90. The default on this exporter was 45. I set it back to the default of 45 and then observed the PSD data was now consistently showing up on HD Radio receivers.

I still haven't been able to observe the actual NextRadio app working on a phone. No one here at the station has a phone right now that works with the app. I have been able to see it work on the online demo tool and can see that it will be another great app that will help keep terrestrial radio relevant as we continue to move forward in this connected age. Further penetration of phones and carriers that work with the app is obviously the next big step, but it is good to know we are ready.

## The Portland Report

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

As most readers of this column are aware, Oregon Broadcast engineers have been actively planing how to respond during a disaster. Just this last month a major news story and an article in the *Business Insider* highlighted just one more reason for being prepared for large and small disasters. As always, the major issue was and is communication of vital life-saving information. A quick look at the past will show just how true that is.

With all due credit to Rocky and Bullwinkle, winding our way back to ancient history Mr. Peabody twists the dial of the Wayback Machine. Poof. It's May 30, 1948 as the water rises in the Columbia and Willamette rivers. The Portland suburb of Vanport is protected by the dike holding back the Columbia River until a section failed. Vanport, and

the location of KGW AM 620, was soon flooded. KGW lost its east tower in what is probably the first time in history that a tower was destroyed by a floating house. Likely the last as well.

Twisting the dial once again, Mr. Peabody marches the Wayback Machine forward to October 12, 1962. A major wind storm pounds the Northwest, leaving widespread damage in its wake. After the ñColumbus Day Storm,ò power and telephones are down, roads are impassible and broadcast stations are dark. In Portland, 1190 had generator power and a working transmitter with no audio from the studio. Engineer Lee MacCormick searched several DC pairs from the studio, finding one conductor with end-to-end continuity. That conductor against ground provided an audio path for public safety information to the public. Elsewhere across the state, engineers rigged workarounds to return broadcast signals to the air.

Years later, telco-provided DC pairs were replaced by analog audio-only copper pairs, often equalized for wideband audio, only later to be replaced by digital copper and coaxial cable distribution. Meanwhile, telephone service has migrated to a highly complex digital wireless network supported by copper DSL interconnections.

One last hop in the Wayback Machine ï poof bang. We have traveled back to September, 1859. An English astronomer, Richard Carrington, is observing the sun when he sees an immense explosion on the sun now known as a white light solar flare. In the days following, the telegraph lines spark and burn as the magnetic field of the earth rings like a bell. (See ñThe Day the Sun Exploded.ò Richard A. Lovett, Analog November 2012.)

With today's complex telephone and power distribution another event similar to the Carrington 1959 event would be disastrous. Telephone and power distribution could be hard hit.

As recently as 15 years ago, broadcasters relied on wireless STLs, RPUs, and satellite distribution to transport audio and video. In the last few short years these tools have been replaced in many cases by technology that has become extremely complex. For the most part those old programming transport tools have been replaced by content on the Internet, which is itself an extremely complex resource. Remote content collection moved from VHF radio to POTS digital dial to ISDN, and then moved again to Skype and other Internet protocols. National programming distribution has moved from Telco copper and microwave to Satellite and now to Internet codec technology.

But threats to the stability of modern broadcasting go beyond earthquakes, floods, and solar flares. The author of an article in the *Business Insider* spoke with a North Korean defector who trained with its hackers. A quote form that article is food for thought:

> North Korea realizes they have no chance fighting their enemies in conventional warfare. But in cyber space, they can create chaos with relatively few resources. Itôs why the North Korean government has spent so much effort in this area since the 1980s. They call it the ñSecret War.ò Jang says the ultimate goal is to attack the central IT infrastructure of enemy countries, primarily the government, and steal as much information as possible while also causing social pandemonium.

Telephone and Internet service in the Northwest are particularly sensitive to earthquake damage with the trunk lines supporting Oregon following fault lines. Projections for time to return telephone and internet service range on the order of *years*.

By now most readers are now asking for a solution to that dark and foreboding picture I have drawn. With planning and preparation, that picture changes. A creative engineer can often find workarounds for otherwise fatal damage. Those solutions and a picture of the planing to provide preparation will be the subject of next monthôs column.

On another subject, I wanted to mention an interesting observation. As many of you are aware there are several tall antenna support structures located within 800 feet of KKPZ. Most of these towers are detuned and I have to regularly assist with the maintenance of the detuning networks. Within the last six weeks there have been changes on two of those towers.

At a check just last week I saw a new warning sign which stated that any work at the tower would require coordination with the tower ownerös environmental department due to the presence of a federally protected bird nest. Silly me. I thought the problem was harvesting timber which is the cause of bird mortality.

**Rocky Mountain Ramblings**
**The Denver Report**
**by**
**Amanda Hopp, CBRE**
**Chief Engineer, CBC - Denver**

It seems December is always the slowest month of the year, at least in terms of work. It is nice to be able to relax some. Last month we were able to finish up some projects and take time off work to close out the year.

We started the month off with cleaning up the trees from the canal at the KLTT transmitter site. Some of you may remember that in November, we had Kilgore Construction come out and do some canal maintenance. Part of that maintenance was to remove the trees that had grown up in the canal and along its banks. The contractor piled the trees and brush alongside the canal to be dealt with at a later date. We rented a wood chipper from Home Depot and spent the better part of a day clearing as much as we could. It was a little windy, which made this already messy job a very messy job. We got the majority of the trees taken care of. What we left was at the back of the property and Keith is going to spend time cleaning that up this winter and spring and possibly using some of it for firewood.

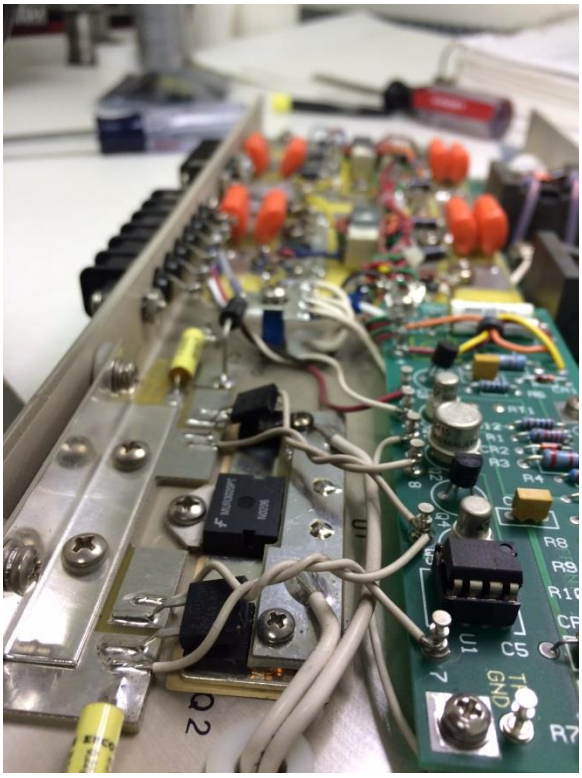

**My dad feeding tree branches to the wood chipper.**

On December 13, I received a phone call from our security monitoring company informing me there was a power failure at the KLTT site. Thankfully we have the cell phone transmitter as well as a backup battery to help keep the alarm system going when the power is out so they can inform us of issues. I tried getting info from United Power about the outage to get an ETA for when power would be restored. Their website was not working properly, nor were their phones. After trying to get info for a half hour, I decided to wait about an hour. It was shortly after that when the power came back on.

While most of our equipment came back with no issues, we did have a few problems. I noticed the main transmitter was working but there was no audio. Remotely, everything looked fine. There was audio going through the chain. I immediately headed out to the site to troubleshoot the issue. I moved wires around trying to bypass the AES distribution amp that was apparently causing the problem but nothing worked. Finally, after an hour of troubleshooting and feeling defeated, I put everything back to normal, and voila! There was the audio! Okay, not sure what happened there. It probably had something to do with AES sync.

The next issue was the A exciter on the backup transmitter would provide no drive. I had originally switched to the aux and noticed it would not come up in digital. I then noticed the AM-IBOC exciter for the aux was giving us grief. Again, everything looked normal, no alarms or anything, so after the transmitter came up on the B exciter I assumed someone hit a button at some point and didn't catch it. I pushed the button for exciter A, and BAM! Sparks flew out of one of the PA modules! I quickly put it back to the B exciter and proceeded to try to find the problem.

Many of you will know that when one of these Nautel ND-50 transmitters has a module blow like we did, there will be a red light showing a modulator or PA fault. This time there was nothing. I had to switch the transmitter to high power before



**KLTT ND-50 PA module - note the two blasted modulators, Q1 and Q2 (lower left) - the plastic caps have separated from the rest of the MOSFETs.**

finally seeing the alarm light. Maybe itôs been too long since Iôve dealt with an issue with this transmitter, or maybe I am not crazy and have never had this problem before. I decided to leave this problem for another day. Our main transmitter was working and we had a working backup, just not a 50kW working backup.

The following Monday I headed out there with my dad to deal with this issue. We made the initial repair to the module that had failed. We reinstalled it and BAM! It popped again. This time we replaced a couple more things, even though they tested fine. This fixed the module. We then sent off the AM-IBOC exciter for repair. We found that the exgine inside the unit was stuck in a continuous boot-up loop.

It seems this power failure caused us more issues as we found when we arrived at the site that day a module in the main NX-50 transmitter had failed since the power failure. This failed module caused a fuse to blow on the backplane, so we had to replace the fuse (which turned out to be a chore as the fuse fell into a place where you had to take apart much of the transmitter just to get to it). What we were hoping would be a couple hour ordeal ended up taking the majority of our day. We did get the NX-50 working, though, thankfully.

After this, things calmed down. Itôs always nice to have some time to get things done for the end of the year. I enjoyed taking off what ended up being nearly a full two weeks with the Christmas and New Year holidays. It was very nice and it appears everything worked as it should, which is always a great thing if you take time off work.

That about covers it for this edition, so until next timeé thatôs all folks!!!

**KBRT • Costa Mesa - Los Angeles, CA**
***740 kHz, 50 kW-D/0.2 kW-N, DA-1***
**KNSN • San Diego, CA**
***1240 kHz, 550W-U***
**KCBC • Manteca - San Francisco, CA**
***770 kHz, 50 kW-D/4.3 kW-N, 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***
**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***
**WEXL • Royal Oak - Detroit, MI**
***1340 kHz, 1 kW-U, DA-D***
**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, 3.8 kW/126m 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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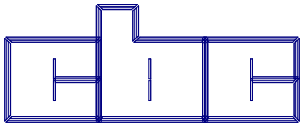

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