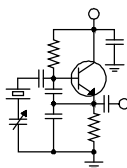


The Local Oscillator



The Newsletter of Crawford Broadcasting Company Corporate Engineering

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NAB 2015

The spring National Association of Broadcasters Convention and Broadcast Engineering Conference is always a time of great enjoyment. It's great to see all the latest products and technological advances, to visit with vendors, consultants and other engineers, and to hear and discuss the latest ideas.

But it's also a great feeling to board the airplane for the trip home! The better part of a week running from meeting to meeting, walking endless miles of exhibit floors and conference hallways, early mornings and late nights always leaves me exhausted, and this year was no exception. I'm just now starting to feel normal again!

In last month's *Local Oscillator* I mentioned that I would be taking part in a conference session titled "AM Boot Camp." That session was very well attended and very well received. It was heartening to see so many with an interest in AM radio. If you believe everything you read elsewhere, you would think that AM is dead and without the good sense to fall over. Judging by what I saw in the conference sessions and on the exhibit floor, the AM medium is going strong. I was very glad to see that.

This year was a bit different for me because of the full and tight schedule I had to keep and the change in exhibit hours. Usually Monday is my day in the exhibit halls, with the morning devoted to a walk-through to see what's new and exciting and the afternoon spent with Mr. Crawford and Don Crawford, Jr. zeroing in on specific things identified earlier in the day. This year the exhibits did not open

until 10:00 AM on Monday and because of my conference obligation, Mr. Crawford, Don and I made our walk-through as soon as the doors opened. That was far from optimum but we still enjoyed seeing people and new technologies, even if I had not had the opportunity to preview them first.

I did have the opportunity to sit down with several manufacturers to discuss ongoing issues and suggest features and product additions. The NAB convention provides a unique opportunity to do this kind of face-to-face interaction, tossing ideas back and forth in real time and discussing the benefits and challenges. I came away from those discussions with some new ideas of my own that I will pursue going forward, and I will be

watching to see if any of our talks result in new products or features in the future.

While it's impossible for me to highlight everything I saw in these pages, there were a few standouts. First, Nautel was showing its new NX5 and NX10 AM transmitters. It's exciting to see a great company such as Nautel devote significant engineering, development and manufacturing resources to AM products such as these state-of-the-art units. Nautel also showed its new GV30, a true 30 kW addition to its GV FM transmitter lineup. In addition, Nautel won two of the coveted New Bay Media Best of Show awards, one for its NX5 and NX10 and another for its HD Multiplex Technology. Congratulations to our friends at Nautel for this and for continuing to support our industry with great products and support!





Wheatstone brought its IP Blade technology to the show along with a whole family of WheatNet-IP control surfaces and WheatNet-enabled products from other manufacturers. Jay Tyler, Kelly Parker and Paul Picard were there along with a host of others to explain the products and technology and discuss the few issues we have had in implementation.

I spoke at length with those folks about the possibility of using a WheatNet IP Blade as an STL transport at some of our facilities. Doing that would eliminate the need for separate codecs at studio and transmitter site. At the studio, the WheatNet class C network would be VLANed (a new word I think I just made up) along with our class A transmitter network over the licensed microwave link. The blade at the transmitter site would show up in the WheatNet-IP network and we could map to and from it just like any other blade. Once we get through the current wave of WheatNet projects across the company I will consider giving that a shot.



One thing that I really latched onto was a developing partnership between Wheatstone and RCS. Those two companies are apparently moving to support one another's platforms in a whole new way, something that will have great benefit for Crawford

Broadcasting. I sat through a mini-demo of RCS Zetta, which is the successor to NexGen (and which we tentatively plan to move into in 2016). The RCS folks were able to address a number of questions that I had, laying to rest my concerns. I should have known that they had already thought of those issues and dealt with them in an elegant way.



It was good to visit with the folks at Burk Technology and address some minor issues we have had with the ARC Plus Touch remote control system. In recent years my whole outlook on Burk has changed 180 degrees. They have really done an excellent job of addressing the real-world needs of broadcasters, including AM, FM and TV. I really couldn't be happier with their current product lineup.



And of course our good friends at the Telos Alliance were displaying their lineup of Axia AOIP products along with their great telecom systems and Omnia audio processors. I had nice visits with Marty Sacks and Frank Foti, two of the best in our industry, radio people through and through. I so much appreciate their commitment to continue making excellent products that our industry needs to provide the very best listener experience with our radio stations.

In addition to those, we had great visits with

the folks at TieLine, Kintronics, Worldcast, DoubleRadius, iBiquity Digital, ERI and many others. My thanks to each of these and others for all they do to support our industry.

CBC Satellite Network

Last month I mentioned that we planned to make a major change to the CBC satellite network in early April. The best laid plans, as the saying goes, often go awry, and that was certainly the case with this project. The installer arrived at our Costa Mesa facility, swapped out the L-band cables, replaced the block up-converter (BUC) and powered everything up as we all watched the spectrumí and *nothing!* No output. Nada. Zilch. The installer spent several hours working with the folks at Orbital Media Networks to try and resolve the problem before throwing in the towel. We packed up the BUC and modulator and shipped them back to Denver.

Later that week, the OMN folks put our modulator and BUC on the bench and began investigating why it would not transmit. After hours of experimenting they found that a jumper cable was missing, a little SMA to SMA 50-ohm cable that should be connected between ðMod Outð and ðIFL Inð on the modulator. There was nothing in the documentation that mentioned this cable, and as this gear was also new to the OMN people they did not have the experience with it to immediately recognize that the jumper was missing. I ordered the needed cable from Pasternack and the modulator and BUC were sent back to California.

After I got back from NAB, I had Todd Stickler at KBRT install the jumper on the modulator and on the morning of Tuesday, April 21, we put KBRTø programming up on CBC-3 using the TieLine Bridge-IT and moved the San Diego, Oak Flat, Oakdale and Portland receivers to CBC 3. That allowed us to take the uplink down while Todd swapped out the BUC, which took just a few minutes. He called me saying it was done, and I logged in to the modulator. While watching the L-band off the Denver rooftop dish, I turned the transmit on andí *nothing!* The power was turned way down, so I began turning it up until I reached the upper limit. Still nothing! What a letdown!

It was then that Todd told me there were actually two ðMod Outð SMA jacks on the back of the modulator and that he had connected to the top one. I told him to try the other one. Suddenly, this

huge carrier, 30+ dB higher than any of the others, appeared on the transponder! Very quickly I turned the power down, eventually reducing it to -32 dBm.



Figure 1 - New BUC on the KBRT uplink.

With the power properly set, I began checking receivers in San Diego, Portland, Oakdale and Costa Mesa. All had a great signal and the correct audio stream!

I notified our folks in those markets to go ahead and move the audio connections to the new receivers. The next day, Todd went up to the KBRT transmitter site at Oak Flat and swapped out the satellite receiver with the new one. I logged in, tuned it to the correct frequency, selected the right stream and adjusted the audio output level.

Just like that, we closed the book on a 21-year run with the old Comstream satellite system. The new XTremeSAT system is much more robust and provides for multiple streams per carrier (as opposed to single channel per carrier for the old system). This will allow us to both simulcast KBRT on KNSN sans Los Angeles EAS and send separate programming to that station as desired while maintaining our backup ðSTLð feed to the KBRT transmitter site and providing programming feeds to KKPZ and KCBC.

This new satellite network is solely for our west coast stations. The rest of the company gets live corporate feeds from Detroit and Denver using TieLine IP codecs. That has worked out very well for many months now. If we ever have the need to send a KBRT program feed to any other station, it will be a simple matter of installing a receiver at that station.

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

Hello to all from Western New York! While most of the country is enjoying the coming of spring, we here in Western New York are still clinging to snow and cold temperatures. Having experiencing Buffalo winters for the past 24 years, I do not recall a winter season that has lasted this long.

We broke numerous records this winter, most dating back into the 1800s. The most significant record broken was the amount of snowfall accumulations we experienced back in late November. Official totals recorded in South Buffalo, where I live, peaked at 8 feet, 3-1/2 inches of snow (this was over a two-day period). To a city that is prepared for almost any snowfall amount, this one brought the city to a standstill. If not for the aid from the New York State National Guard and other municipalities offering labor and equipment, we would in all probabilities, still be digging out.

As both of our transmitting facilities are south of the city and directly in the middle of the snow belt, there was concern as to how we could possibly react in the case of an off-air emergency. Although both sites have Internet access, if a catastrophic failure occurred, how would we be able to get to the sites? This is a situation we will have to address in the coming months. By not having a back-up plan, we could be exposing ourselves to hours or even days off the air without means of getting to the transmitter sites in a timely manner.

At the time of this writing, I am installing a new Audioarts D-76 console in the WDCX(AM) production room in Rochester. One tip I would like to offer you: never start a project during the NAB convention! It seems that every time I phoned a vendor, I could not obtain the information, parts or advice I was looking for because the parties involved were all at the NAB!

Getting back to the installation, I am extremely pleased with this console so far. The most

notable change Wheatstone has made in the Audioarts line is that the I/O and logic are all on RJ45 jacks. No more D-25 connectors that have to be punched down and cross connected.

In preparation for this installation, I figured how many CAT5e cables I would need, and their lengths, and began manufacturing them weeks before the installation began. This saves a lot of time in getting the studio up and running. I still have a long day of work to do before this project is completed, but the

end result will be a production/back-up air studio that will function for years to come.

Beginning May 1st, Earl Schillinger will be hosting the morning/afternoon program lineup on WDCX-FM in Buffalo from the new production room in Rochester. We will be using the Telos Zephyr I/P for audio delivery to/from Buffalo. Earl will have full control of the NexGen log and libraries via VNC connection to one of the Buffalo workstations. Should the Internet connection fail, we have ISDN in place to send audio to the Buffalo studio and a mix-minus return feed for Earl to monitor the broadcast. We have used this method many times in the past, especially for remote broadcasts, and it has worked very well for us with minimal problems.

As soon as the weather turns better, I have a lot of outside work to do at the transmitter sites. At the WDCX(AM) tower site, several of the wooden fences are in dire need of repair/replacement along with back filling of several of the doghouse foundations. If these are not attended to soon, we stand a chance of the concrete floors cracking or breaking off with no support underneath.

At the WDCX-FM site, the chain link fence poles have risen out of the ground several feet due to frost heave. In doing so, the chain link has also been pulled up from the ground, leaving a large gap that would enable a person to crawl under and get access



to the tower guy wires and grounding system. The transmitter buildings themselves are in very good shape, so no additional work is planned other than normal maintenance.

At both of the AM sites, a good post-winter inspection of the towers, doghouses and fencing is in order to see if any damage occurred from the significant snowfall we received. You simply do not

get many chances during the winter months to perform a good inspection of the towers and grounding system.

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!

The Motown Update

By

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

April has been another busy month in Detroit. We installed four production rooms with Wheatstone E6 control surfaces and the IP blades. Our staff loves the flexibility of the new surfaces. It is a real plus for them to have audio processing available on each channel input. They actually have been coming up with creative ways to use the equipment. The installation has gone well so far, thanks to the guide put together by Cris and Amanda. Thank you! Now we are preparing our Nexgen system to go online the first week of May with the digital drivers and IP blades.

With spring finally here we had our AC units cleaned and serviced at the studio and checked at the transmitter sites. A filter and coil check is a good PM measure to prevent problems later this summer when it really

gets warm.

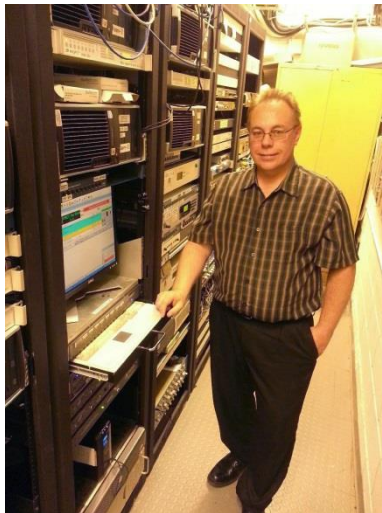
A few months ago I changed to pleated filters in our Nautel NV40 and have noticed that the transmitter is much cleaner inside. Also, the paper filter allows you to see the dirt much easier before it really builds up and becomes an issue. Washable filters can look clean, but be filthy on the inside.

Recently I have been dealing with occasional dropouts on the T-1 line between the studio and the WEXL transmitter site. In the last few weeks I ordered DSL lines and IP codecs to use as a fail-over STL. After reviewing our phone bills, I was surprised what our ISDN backup lines were costing us each month. Changing to an IP connections gives us more

connectivity options, and more bandwidth to work with. We will save almost \$1,000 per month in phone charges. I have also been in the process of building out secure VPN connections to each site. This will allow the network to be expanded remotely and securely.

I am finding all the discussion in the trades regarding the new Voltair PPM enhancer, processor and PPM encoding very interesting. The marketing material says that it "includes advanced audio signal processing to enhance the detectability of the watermark codes within the context of your programming objectives." If you haven't had a chance to check out the details, check out the white paper regarding the technical properties of PPM encoding at:

http://www.telosalliance.com/images/25-Seven/Voltair/25-Seven_Tech_Paper_Arbitron_PPM.pdf



Producer Mark Bostic enjoys the new Wheatstone E-6 in one of Detroit's production rooms.

The article discusses the principal of masking that I mentioned last month. The system takes advantage of acoustic masking properties to embed the PPM watermark in harmonics or during times where the source material allows it.

I really wonder how much distortion the listening public can take. I can hear the encoding if I listen for it on music that has a lot of keyboards, strings, or horns. I wonder how far it will go. In order to have better PPM encoding, some stations may decide to increase the amount of encoding to the point where it is not longer imperceptible. Will this be yet another source of listener fatigue? I guess time will tell where this will go. For all the technical advances in digital audio, music mastering, and overall quality, where have the standards gone?

Living near the Canadian border, has given me the opportunity to listen to a lot of different stations, AM and FM. I recently got back involved with Amateur Radio and purchased a software defined radio (SDR), and I have to say, it's wonderful.

The SDR receiver takes the IF and uses a digital signal processing (DSP) to set the filters. I can't tell you how shocked I was when I tuned to several Canadian stations that still broadcast 10 kHz wide audio on AM. The quality was excellent. As I scanned across the dial, I was able to look at how wide the frequency response was on most stations, and not have the receiver limit my ability to evaluate the audio. I was also able to see all of adjacent channel interference that was present across the AM band.

A number of domestic AM stations (including ours) have limited their audio to below 5 kHz. I can understand that this is mostly due to the

fact that most receivers are designed poorly, but the quality is affected. [*Transmission of HD Radio on AM requires a reduction in analog audio bandwidth to 5 kHz in most cases. –Ed.*]

Cris told me that I was free to pontificate in my articles, so I will take this opportunity to do so. What have we done as broadcasters in the last 20 years to improve quality? Where has the FCC been in protecting AM broadcasters from harmful interference?

By listening to domestic AM stations, I would have to say not much. And by adding LPFM stations that are now requesting power increases, FM is not too far behind. In addition, the lack of filtering in most switching power supplies make listening on AM indoors next to impossible in some cases.

I think the letter that Tom King of Kintronics sent to the FCC some time ago, should be considered to serve as an example of what can be done.

<http://www.radioworld.com/Portals/0/Kintro nic%20Letter.doc>

Instead of just saying that AM is dead, why not take actions to improve it? And for FM, we should protect the quality of what we already have, and not further degrade it by adding more adjacent-channel interference. Radio is still relevant today, as much as ever. In order to compete with digital options that will become increasingly more available, we should do our part to make it the best it can be.

With all of this, the news of the FCC closing field offices will not do anything to protect broadcasters from the interference we have now or what is sure to come.

Quality doesn't just happen. It takes standards and focus to make it a reality.

News From The South

By

Stephen Poole, CBRE, AMD
Chief Engineer, CBC-Alabama

Greetings from sunny Alabama!

By the way, some of you might wonder where the ~~CBNT~~ after my name has gone. I've let that one expire because I want to obtain my CBNE certification this year. I've been too busy to sit for the test so far, but it's definitely on the schedule.

WDJC-FM Antenna

When I left you last time, we had some reflected power on WDJC-FM. This became obvious after installing the new GV40 with its more accurate power metering. With 27 kW TPO, we were getting around 400 watts of reflected power for a VSWR of about 1.3 to 1. Not an emergency, but certainly not as

good as we want.

we started with an investigation all around the base of the tower. After finding water in the line at WXJC-FM (92.5) last year, I don't take any chances on that. We disassembled, examined connectors, replaced bullets and bypassed. No luck. The reflected power stayed between 380-410 watts at full TPO, no matter what we did. We had no choice but to call a tower crew to check the antenna.

One thing that I've learned over the years is that if you don't order parts, you'll

need them. But sure enough, if you *do* order the parts, maybe you *won't* need them? We ordered a rebuild kit for WDJC's 8-bay ERI antenna just to be safe. It has been many years since we've replaced the bullets and o-rings, so it's about time, anyway.

Figure 1 shows what the tower crew found when they climbed to the top of the antenna. WDJC's antenna has vertical directors around the bays. These don't create a directional pattern but rather smooth and restore the pattern circularity. One of the directors had apparently come loose and was touching the end of one of the bays. The crew moved it back in line with the other directors, honked it down and the reflected power instantly dropped to about 40 watts. Beautiful.

Fortunately, the bay wasn't badly damaged, but we're still planning to rebuild that antenna sometime in the next few months. There are some other pressing issues elsewhere, though, which I shall cover next.

WYDE (AM)

1260's Trango microwave link is on the fritz again. It's not accepting -48VDC power. We've had a flood of severe storms here lately, but Todd and I suspect that one of the cables might have come loose.

After discussing it with Cris, we've decided to get away from the Power-Over-Ethernet (POE) stuff as we repair and upgrade. It's nothing but

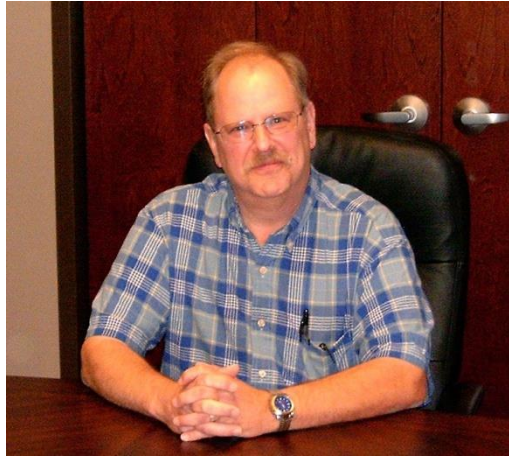


Figure 1 - A loose director contacting one of the bays was causing a bit of reflected power.

good as we want.

Even more frightening, of course, is that something like that is warning of a possible burnout in the near future. So: not an emergency, but we did

trouble. We'll replace the CAT5 cable with a fiber link, then run SO cable for power (with plenty of lightning protection, of course!) separately.

For now, 1260 is on air courtesy of WDJC's HD-3 signal. I can't tell you how many times those "extra" channels have bailed us out over the past few years. They're a beautiful thing as well. For years, 1260 basically just simulcast WYDE FM, but lately, we've run a good bit of separate programming on the AM. Having the ability to place that on an HD-2 or HD-3 is quite handy.

WXJC (AM)

Last time, I related the story of the bogus antenna monitor at WXJC. Potomac Instruments did a good job of repairing and turning it around to us. It took a little over a week. When I put it back in, I was astonished at how stable the pattern was. It makes me wonder if, over the years, we haven't tweaked and diddled and checked grounding because of a drifting antenna monitor?

In this case, of course, I should have known something was up because the antenna monitor showed drifting parameters, but the common point impedance wasn't changing. That was my clue. But we thought we had eliminated the antenna monitor. One common test, of course, is to simply reverse some inputs to see if the numbers follow. In this case,

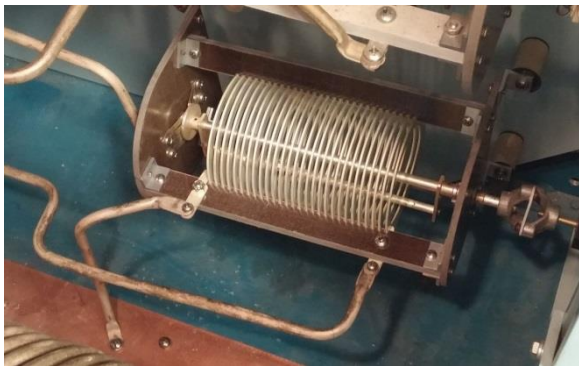


Figure 2 - The new power divider coil in WXJC's phasor.

they did.

That convinced us that we did indeed have a problem out at one of the ATUs. It didn't help that we had found a couple of issues at the towers that further led us in the wrong direction. Problems like this can really stump you, but like I said last time, stick to your guns. Know your theory and apply it.

While we were poking and prodding all over the system, we discovered that the power divider coil for tower #1, the lowest-powered tower (daytime),

was arcing. I had already flipped and reversed it a few years ago, but this time, the roller had arc-welded itself to the coil. I emailed Cris and told him that I might be able to rebuild the thing, but he ordered a replacement. Thank you, sir!

The new coil came in, I installed it (see Figure 2), and it's as smooth as butter again. The replacement is about 20' longer than the original, though, so I had to come up with a way to support the back of it, to prevent drooping over time.

This summer, we plan to go through that entire system again, cleaning and tuning and tweaking.

Worldcast Nextgen Horizons

We've had some intermittent problems with these units. They'll very occasionally hang and require a reboot. I sent a support request to APT and never received a response. Cris suggested that I contact Tony Peterle, who told us that we probably needed to upgrade the software.

There was another issue: we had budgeted for, and I had long since ordered, several additional Horizon units (ten total). We wanted to eliminate the old Intraplex stuff that we've been using for several years. But we ordered them and waited... and waited... and they never arrived.

Back to the units on hand, the ones with intermittent issues. After talking to Tony, within a couple of weeks we had the upgrade on hand. I sicced Todd on it. Whenever he gets really, really focused on something, he chews his shirt. After a few hours of watching him gnawing cotton and muttering darkly, we finally made a decision.

Given that it was taking way too long to (1) get a response from APT support and (2) to receive the additional units that we had ordered, we decided to cancel that order and go with TieLines. We're using the Bridge-IT Xtra units now to replace the Intraplexes and they work fine. They have their quirks (the way the meters act is aggravating, for example), but they're reliable and they sound good. It's a shame, but we'll probably migrate away from the APT equipment as we upgrade and replace in the future.

WYDE-FM

Steve Minshall and I have corresponded in the past about line pressurization. Like me, Steve likes to experiment with different arrangements of compressors and driers. One of the warnings that he gave me, though (bumbled almost prophetically, if you can imagine such a thing in a plain-text email) was as follows: *beware of oil-lubricated compressors.*

If you just put a single separator/filter in line with that compressor, said Steve, you will still have at least some oil in the line. A very fine lubricant mist will coat the inside of your transmission line and saturate your desiccant. A little bit of misty lube is actually a good thing for pneumatic tools, but it's somewhat icky in an RF coax. I had a large tank with a drain, followed by two separator units. My desiccant was nice and dry, so that problem was taken care of.



Figure 3 - The rebuilt compressor, ready to be rewired and moved back to Cullman.

The biggest issue is that even the so-called "professional grade" compressors at Lowes and Home Depot just won't last. As I write this, we have another dead compressor at 101.1 FM in Cullman. However, I had anticipated this; given that the first one had already died less than a year ago.

I had Jack rebuild the old Gast monster (see Figure 3) from the Andrew MT-2000 that we were using a while back. The plan now is to move that noisy thing into the old building at Cullman, with a line run to the separators and drier section in the new transmitter house.

Of course, they're *all* noisy. I've never met a compressor that wasn't as loud as a bomb. Different size units simply represent different amounts of

explosive. The basic distinguishing figure, that of *le bombe*, remains a constant regardless.

Final Thoughts: Being Offended

As I write this, Mr. Crawford's Stand commentaries have been about "offensiveness" and so-called hate speech. You know, non-believers love to picture Christians as intolerant, Bible-thumping thugs who would love to impose theocratic rule on the United States. But in fact, the opposite is true.

You know why? *Because no one knows, better than Christians, what it feels like to be offended, dismissed, overlooked, lied about and mistreated.* We live in a brief, blessed period of time where Christians are free to follow their consciences. For most of history, that hasn't been the case.

One of the saddest facts of human nature is that, more often than not, if a previously-oppressed group ever takes power, they won't be fair; they'll try to get even. Have Christians been guilty of this? Of course, at times. But in general, *because we know what it feels like*, we try to be fair.

And if we're talking about being offended, think of all the garbage that Hollywood routinely throws in our direction. They have no idea what it feels like for someone who has a personal relationship with God through Jesus Christ, to see His name dragged through the mud. We don't necessarily get angry. We get hurt. We want to defend His good name, but most of us have enough sense to know that dynamite or an assault rifle isn't the way that Jesus would have us deal with it!

As Mr. Crawford correctly pointed out, isn't it interesting that the one remaining group that can be ridiculed, made the butt of jokes and used a punchline... is Christians? You can't do that in a racist, bigoted or sexist manner, but hey; Christians (and conservatives in general) are fair game nowadays.

And we're the ones who are "intolerant." Okay. Whatever.

God is still in control. Our job is to listen to Him, to serve Him as best we can and to let Him handle it. Therefore, as usual, I'll finish with: *Until next time, keep praying for this nation!*

The Chicago Chronicles

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

The last month has been very busy as we have been doing as much prep work as possible for the installation of the Wheatstone IP Blade system at the studios. My goal is to have every audio cable necessary finished before the blades arrive in May.

In addition to changing over the ASERV and control room Nexgen computers from internal audio cards to the PC blades, we have production rooms that will get a complete makeover using not only the blades for the Nexgen computers but all peripheral audio sources as well. We also will be replacing the older analog mixers with the Wheatstone control surfaces integrated with the blades.

While our production people are happy to get new equipment, they aren't excited about losing use of their rooms for long periods of time, so we want to be as ready as possible with cables made to fit so that we can hopefully not have each room down for more than a day. It will be interesting to see if we can tear down and install a room in one day. That is the goal I have for the project.

Another project that has been finally taking place this month has been the extension of the fence and gate at the Burnham transmitter site. This has been planned for almost six months now, but the weather kept the fence company from coming out until April to make the changes.

Due to some very scary activities and discoveries at or near the transmitter site, the security of the engineering staff became a great concern going to this site, especially at night. It was decided that we needed to take some reasonable steps to increase security at the site.

The project involves moving the front fence line out about 25 feet so that we can park our vehicles inside the gate. While doing this we are having a motorized rolling gate installed as well. In order to save costs, I volunteered the engineering staff to do

the electrical wiring to the gate operator.

This turned out to be more difficult than I imagined. First off, we rented a trencher to make the 60 foot trench we needed to bury the electrical wiring. We only got a few feet of trench done before we realized it wasn't going to work. Apparently, the site was filled in at one time by a lot of rocks. Most of these were fist sized rocks that fit exactly in between the teeth of the trenchers chain. Within a few minutes we had to clear out the chain three times because it had jammed.

We had to punt. Fortunately, the rental company owner was still present and he

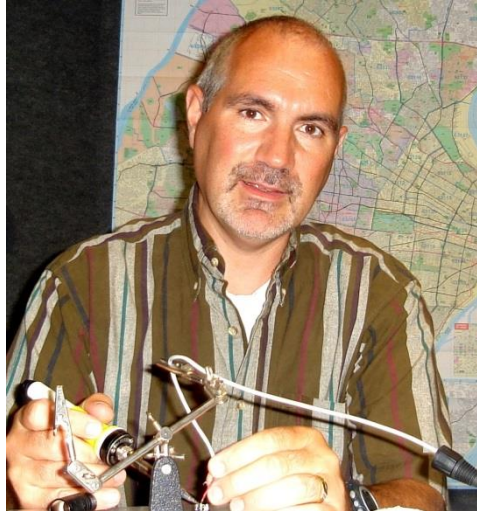
let us return the trencher with no rental charge as long as we rented a back hoe from him. He was quite concerned that we were going to damage his trencher if we continued trying to finish the trench. The next week he brought out the back hoe with a qualified operator and they got through digging the trench in less than an hour.

I wish it would have been that easy to get the wires into the building through the concrete walls. The building is one of the pre-fab buildings and the concrete walls are quite thick. I burned through a couple of drill bits getting my wires through there.

At the time of this writing we are awaiting the fence company to return and finish the installation now that we have electrical wiring in place. This will really be a great improvement to the site's security. Once totally done we will have remote controls that allow us to get into the site without getting out of our cars.

We also will have our ARC Plus Touch Remote control wired into the system as well, which will allow us to open and close the gate by phone or the web Interface. So if we don't happen to be in a vehicle that has a remote in it, we can still do so with our phones. So this project should be completed before we get too far into May.

We are also adding two more cameras at the site.



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These will be installed inside the new gate but close to the front with a camera pointed down each direction of the drive way so that we can get clean recordings of all license plates that come to the site. We will then put signs at several spots along the

driveway with warnings that we are recording 24 hours a day. It is my hope that the additional cameras and the signs will be enough to encourage the criminals to take their activity to another location.

Valley Notes By Steve Minshall Chief Engineer – KCBC

My first job in radio broadcasting was with a station in Oregon. They had just erected four towers to add night service. Four towers in line all lit up with red lights was a beautiful sight (others may not fully agree, however). Monitoring of those pretty lights was done by the station's receptionist with nightly visual observations from her living room window. While this met the requirements of daily monitoring of tower lights, it left much to be desired.



One of my first tasks on my new job was to



The new retrofit beacons from Dialight are small and very efficient.

rig up some sort of remote tower light monitoring system. The station had already purchased an old, well used Schafer remote control system. This system used two continuous copper pairs of wire between the studio and transmitter site. One pair controlled command relays and a stepping relay at

the transmitter site to switch metering circuits to the other pair of wires. In essence, the analog meter at the studio was directly connected to the sampling

circuits across town with a long pair of wires. This is extremely crude and simple by today's standards, but it had charm and I sort of miss that part of the past.

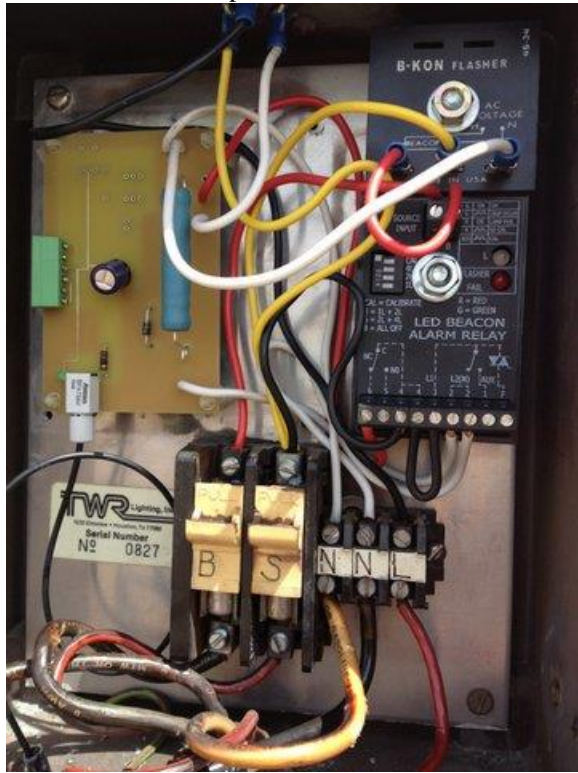
This operation was being built on the cheap, but that was understandable. A four-tower, 5 kW site dedicated to night-only operation was quite a stretch for a daytimer in a rural

market with a depressed economy. Whatever I came up with to monitor the lights would have to be cheap. The local parts store was Radio Shack, and I found all that I needed there.

Using a wire table on page 526 of my trusty 1969 Radio Amateur's Handbook, I calculated how much #14 wire I needed to make a 0.01-ohm resistor. It turned out that it didn't take a lot of wire to coil into a resistor of that value. Using an aluminum mini-box I put together a circuit that used the resistor, a 6.3-volt transformer, a bridge rectifier and a barrier strip. The tower lighting current ran through the 0.01-ohm resistor, developing about 0.1 volts across it. This voltage was applied to the 6.3-volt winding of the transformer, which developed about 2 volts AC on the 120-volt winding. The 2 volts was applied to the bridge rectifier that gave almost a volt to the remote control. The small voltage was enough to move the meter at the studio to full scale on each flash of the beacon. Pretty cool.

Thirty-five years later I now find myself doing another AM directional tower light monitoring project. Here at KCBC, we have removed our old incandescent beacons and replaced them with new LED beacons. The new beacons operate on about one percent of the current that the old ones did, and it

is nearly impossible to monitor that on the primary side of the Austin ring transformers. Fortunately Cris had a solution to the problem.



Solid-state beacon flasher (top right), alarm module (top center) and fiber-optic board (top left) inside the control box on the tower.

Cris supplied me with circuit boards that would transmit a relay closure over a fiber-optic cable. The concept is pretty simple. We put an SSAC LED beacon alarm and a fiber-optic transmitter on the tower and a fiber-optic receiver in the tuning house. Thus we have a non-conductive link across the base insulators. Fortunately we had already pulled a spare CAT5 cable into each tuning house a few years back that I could use to make the connection to the remote control system in the transmitter building.

The concept is simple enough. Implementing the system was not difficult, but like everything else I do, it took much longer to accomplish than I had anticipated. I wanted to keep the tower side of the project as simple and compact as possible. My implementation of the new monitoring technology was accomplished inside the existing lighting controller box on the tower. This was done by removing the aluminum panel from the controller box, stripping it down to just the fuse

holders and barrier strips, and then rebuilding from scratch.

One of my latest joys has been learning Computer Aided Drafting (CAD). I have always had the desire to learn and use CAD but just never got around to it. Recently I bought a CAD program and had my son, John, give me some lessons on it. John has used CAD professionally for years, and with that jump start I was off and running. Now I wonder how I ever got along without it. I drew up a combination pictorial/schematic diagram of the new tower controller circuitry. Using the diagram as a guide, I wired the tower controller and alarms circuits. As it turns out, I did make a couple of minor errors in the diagram, but they were easily corrected on the panels once they were discovered.

Albert Einstein once said, "Simplicity is the highest form of sophistication." With inspiration from Einstein and a lack of space to accommodate the small, switching power supply that Cris provided, I devised an alternative power source for the LED transmitter. Since isolation from the 120VAC circuitry is not required, a simple power supply can be made very easily. I added two components to the circuit board: a diode and a 12,000-ohm dropping resistor. This provides for about 10 mA of current for the fiber optic and the status LEDs directly from 120VAC. The dropping resistor dissipates less than one watt, but I used a 10-watt resistor for the sake of



Fiber-optic receiver board mounted in a weatherproof box inside the tuning house. The fiber enters at the lower left.

reliability.

The circuit board is mounted with nylon standoffs for electrical isolation and ease of circuit board removal on the tower. I used the ground plane of the circuit board as a common buss for all the

various neutral connections in the box. Adding the additional components to the circuit board was accomplished by making isolated pads on the ground plane using a pad cutter. I doubt that I will ever have a need to remove the circuit board, but if I do I will just cut the wires and reinstall with ¼" insulated quick-connectors. The total current through the box is well under 1/2 amp now so there was no need to keep the contactor; the photocell can easily handle the current requirements.



Air brake line was used as "conduit" to carry the fiber-optic from the control box on the tower through the doghouse insulator.

The fiber-optic cable needs to be protected in a conduit in all exposed areas. I chose to use a ¼-inch O.D. plastic air-brake line as a conduit. The ¼-inch diameter makes entry into the boxes, penetration through the building, and mounting a breeze. The typical flexible PVC electrical conduit would have been very cumbersome to work with in this particular installation. These air lines are tough and designed to stand up to the elements, so I assume they will last almost forever. I was going to tap the tower controller box with a 1/8-inch NPT pipe tap and use

an air fitting for an interface. I discovered the box was made of a thin fiberglass material and not thick aluminum as I had recalled. Instead I just drilled a ¼-inch hole and stuck the tube in with a strain relief on the inside. Simplicity prevails again.

I attached the plastic tubing to the tower with Scotch 33 electrical tape. I have never seen this tape deteriorate or come loose outdoors – amazing stuff. The tubing runs down to the base where it then follows the copper tube RF feed connection back up to the tuning house insulator. The original engineer that constructed the tuning houses did not like bowl insulators so he used large square plates of Plexiglas for the insulators. This made it easy to pass the conduit inside via a ¼-inch hole in the Plexiglas.

Once inside the tuning house, the conduit makes its way to a nice plastic enclosure purchased from Mouser Electronics. The fiber-optic conduit enters one end and the CAT5 cable enters on the other. The fiber optic receiver circuit board is placed in the box and the cover is secured for a nice, clean and easy installation. Power for the circuit board is provided by a common power supply in the transmitter room via a pair of wires in the CAT5 cable.

Each of the fiber optic interfacing circuit boards has a status LED, which has helped a great deal in setup and troubleshooting. Another nice thing about this fiber-optic system is that it uses visible red light. It is easy to just look at the end of the fiber cable to see if light is being transmitted. I found the fiber-optic components to be very easy to work with. Cutting the fiber optic square with a utility knife is more than adequate.

I wired up the system in a fail-safe configuration. I get a relay closure indication when the Beacon is operating normally. A failure releases the relay contact. In this way I will receive an alarm if any part of the monitoring system fails. The system has been running for almost a month now and is working perfectly.

The use of LED tower lighting is quite a change after nearly a century of incandescent lighting. The station will realize a very substantial cost savings in electrical usage and annual tower relamping. The LED lights will pay for themselves very quickly. The one real stumbling block to using LED lighting on AM towers has for a long time been the difficulty of remote monitoring. The implementation of inexpensive fiber optic components has solved the problem.

The Portland Report

By
John White, CBRE
Chief Engineer, CBC–Portland

This last month I had the opportunity to attend a presentation by a local radio/electronics preservationist. Dick Howard, K7DVK, has collected paper records, photographs and documentation as well as early receivers and transmitters.

One early Oregon radio pioneer was Charles Austin. His family moved to Portland in 1902. He was attracted to the new field of wireless electronic experimentation and developed his own home laboratory. Sometime in 1920 he received the License 7ZI for 200 Meters. Austin was associated with the construction of 7XG which later became KBPS, for Benson Polytechnic School, a part of the Portland Public School system.

Another pioneer duo was Joseph Hallock and Cliff Watson, best known for the radio manufacturing firm started by the pair. Both were part of the innovation of the early twentieth century. Joe Hallock later became Federal Communications Commission's Engineer-in-Charge of the Portland FCC Office. The firm of Hallock & Watson was only one of the many innovative firms that sprouted in Oregon. Hallock and Watson traveled extensively building radio stations worldwide.

Innovative uses of wireless radio included the early use of radio for public safety dispatch. The Portland police dispatch first started with an experimental transmitter pressed into service to demonstrate the feasibility of radio dispatch. Later, Los Angeles followed by Portland's KGPP became early users of police dispatch radios.

Some of the early receivers have been preserved and many of the early receivers still survive. However, few of the early transmitter facilities remain. A notable exception is the KPF D building shown in the photo with its tower still in place. The building on Northwest 21ST carries the legend: "Fire Telegraph." In the early 20th century, Portland had fire call boxes placed strategically around the city. These terminated at the Fire Telegraph office from where fire companies would

be dispatched.

Another Northwest pioneer was Philo T. Farnsworth. Prior to WWII, he developed the idea of scanning pictures while driving past rows of in a potato field. That created the first mechanical and later electronic flying spot scanner. Then, during WWII, the Farnsworth Company manufactured equipment for the war. In Oregon, the first television broadcasts were made prior to the war by a



The KPF D building, which bears the inscription "Fire Telegraph" above the door.

famous local broadcaster.

Following WWII the foundation begun in the

northwest by pioneers like Hallock, Watson, and Austin sprouted well-known firms Tektronix and Electro Scientific Industries. These firms grew in fertile ground thanks to the work of pioneers in the early years.

We are now discussing a project to produce content to put together video of the materials for preservation. This can serve as an image repository of close-ups of the historic documents and

equipment. Thanks to a few dedicated individuals, some of these historic items have been preserved.

At press time, the depressing news is of the earthquake in Nepal. The 7.8 earthquake has a high death toll with relief unable to gain access to epicenter of the quake. The quake should remind us of the need to prepare here in the Northwest, which has a higher vulnerability and higher population density.

Rocky Mountain Ramblings The Denver Report

by
Amanda Hopp, CBRE
Chief Engineer, CBC - Denver

KLZ Road

The month of April proved to be a rather slow month. We are at the start of spring, and with that means wet weather, chilly weather and some nice weather. We have been in need of improving the long driveway at the KLZ transmitter site. It is several hundred feet from the gate to the building, and when it rains or snows, the road gets muddy and it can become a pain (4WD required!).

Several years ago we had a contractor bring some recycled asphalt out and top the driveway with it. That worked well for a long while but it has since disappeared, sinking into the bentonite soil, so I



Recycled asphalt on part of the access road at the KLZ site.

scheduled to have some more recycled asphalt delivered. I spent the better portion of the day



working on spreading it out. There is still work to be done.

We also decided that we probably need to put some recycled asphalt in our barn. We have old equipment stored in there along with our trailer, tractor, sickle-bar mower, water tanks and a few other items. Having some recycled asphalt in there would make it look a lot better and make it easier to be in there when the weather

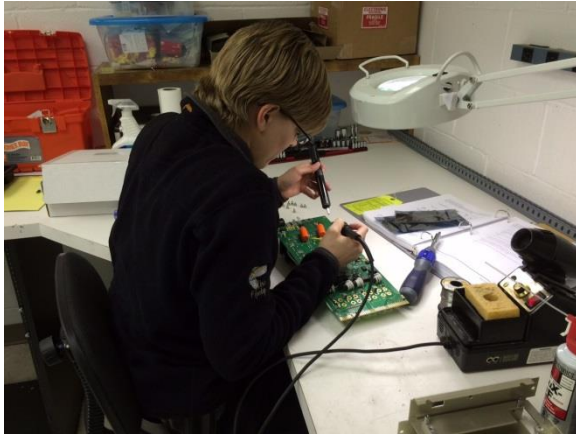
gets windy.

Spring Cleaning

This year, part of our spring cleaning involves getting rid of things never used. We have a lot of things in the barn at KLZ that have not been touched in 10+ years, so this year, we say *adios!* We are also working on getting things organized. Inventory is only a few months away and we always have issues finding items. Maybe if we get a head start on things it will be easier. I guess we will see.

Mowing

We have been trying to get ahead in the growth department at our sites. It always seems like a losing battle. We've had several days of rain as of late and I predict in a couple weeks it will be a jungle at the sites. Thankfully I have Keith who can spend time mowing when I can't.



Amanda replaces modulator MOSFETs in an NX50 power amplifier module.

Power Module Fault

We have had two modulator faults in the KLTT NX-50 in the last month. Both times the modulators were shorted. We replaced them and everything works fine. At first we were thinking it was something having to do with nighttime because for a year that's the only time they would fail. More recently, it has moved to the daytime.

These are blue sky failures; there are no storms or anything else that would cause the issue to happen. After speaking with Nautel, they have requested when this happens to notify them and get an RMA to send back the failed ones so they can begin researching this issue. It does seem we are not the only ones with this issue, so hopefully as more and more people find this happening they will report it and Nautel can begin figuring it out.

Well, that about does it for this edition so until next time! That's all folks!!!

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May 2015

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
KLVS • 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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