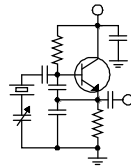


# The Local Oscillator



*The Newsletter of Crawford Broadcasting Company Corporate Engineering*

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## **The New KBRT**

With a full month of operation from the new KBRT site under our belt, the staff and audience are settling in nicely. We now have a good handle on the coverage from the new site and know where our strengths and weaknesses are.

Some of the early indications of signal problems in our core area were proven to be just plain wrong, and for the reason you might expect – antenna/radio orientation. Perhaps more than other formats, good portions of many of our AM stations' audiences are in fixed locations – homes and offices as opposed to mobile. Many fixed receivers utilize either built-in ferrite bar antennas or external loops, either of which exhibits strong directional characteristics.

With the KBRT transmitter site on the island, many of these L.A. Basin listeners had their antennas oriented north-south, and the new site is east, a 90-degree (and probably 10 dB) change from the old orientation. Reorientation of the external antenna or the radio itself fixed most of these situations.

I did some more signal driving in mid-March and found the coverage to be excellent. In downtown L.A., even in the “concrete canyon” the signal was strong, fuzzing out only when I went through what can only be classified as a tunnel. I noted that the signal was listenable even in the underground parking garage at the Orange County Airport!

Perhaps the biggest surprise is the transition hour and nighttime coverage. At 205 watts with KCBS breathing fire down our necks, expectations were low, but amazingly we have found the coverage to be quite good. We cover much of Anaheim, Irvine, Santa Ana, Tustin and Yorba Linda on the Orange County side (west) and Corona on the Riverside County side (east) at night.

During the transition hours, that period

between power change and full dark or vice-versa, depending on location and signal impediments it is often hard to tell if the power change actually took place. One evening last month I was in Tustin and the south part of Santa Ana at power change time listening to the station. When I didn't hear the signal change at power change time (which was just before dusk on that particular day), I pulled into a parking lot and logged into the remote control on my iPhone – and found that the station was indeed at the night power with a common point current of 2.0 amps. The signal remained solid in that area as long as I listened that night.

I think I still have some work to do on the HD signal. The load orientation is a bit off of the optimum, and while the spectrum looks okay I can undoubtedly make it better. With only one set of digital carriers operating, we need this to be perfect. Next trip out I plan to do some work on that. The phasor design provides for considerable adjustment in the common point network, hopefully providing me with some room to rotate the load around a bit.

On the day I spent at the site last month, we shut it down for a couple of hours, putting the island site back on while we went through everything at the new site. We opened up the phasor and all of the ATUs, giving anything that needed it a good cleaning and inspecting for heating, arcing and other problems. Everything looked perfect.

I am still tweaking the Burk ARC Plus system to get everything working the way we want. This is always a challenge with AM systems, where modulation moves the amplitudes of all the samples around. Setting up the averaging and the alarm and reset delays requires some amount of trial and error. At one point, Bill, Todd and I each had over 300 alarm messages in our inboxes! I put an electrolytic capacitor across the common point sample to help smooth things out, and with a few changes to the ARC Plus programming things have now settled

down.

One other important thing that has settled down is the security at the new site. We have had zero incidents of vandalism or theft since last November. The camera and alarm systems are functioning perfectly, and we have armed security guards making random patrols of the site and area.

The biggest factor, however, is that Riverside County has changed the lock on the Skyline Drive gate down in Corona, denying vehicular access to the entire area for all except landowners, Forest Service, fire, county and communications site personnel. The only vehicles we see on that road are those on official business of some sort, and there is no “four-wheeling” at all anymore. Those that would come up to steal or vandalize have to either walk or mountain bike up there (five miles on a switchback dirt road).

One other thing to note is that the grass has come back in a big way. After construction, much of the site was bare dirt. We had driven over much of it, and what we didn’t denude with vehicle and equipment traffic the ground system installation took care of. But plowing in the radials had the benefit of loosening the soil and turning under much of the remaining plant material on the surface. Now the site is as green as the Emerald Isle with gorgeous natural grasses and oats. This will do much to stabilize the topsoil and prevent erosion.

We have much to be proud of with this facility. It is, if I say so myself, perhaps the finest and most state-of-the-art AM transmitter facility in the nation. We plan to keep it that way, providing our great Southern California audience with the very best signal and fidelity possible.

### **Moving Out**

With the pressures of getting the new site operational now off, we now turn to the daunting task of clearing out of our site on Santa Catalina Island. I paid a visit to the site last month and looked through everything. In the process, I came to a fuller realization of what I already knew: we have 60 years of stuff to get rid of!

Residences and commercial facilities on the island are a lot like those we see in the mountains around Colorado. There is limited or no trash disposal service, which means that folks have to either pay the local sanitation company a king’s ransom to haul their waste away or do it themselves. As a result, the stuff piles up.

Take ordinary site maintenance equipment, for example. I lost count of the number of inoperative string trimmers I saw at the site. Over the years, one



**This look at the shop behind the transmitter room shows just a tiny bit of the daunting task with which we are faced in vacating the site.**

would break and we would purchase a new one (repair would require shipment off the island). The old one would be stored in the generator shed or elsewhere at the site. As a result, we could start a string trimmer museum, cataloging the history of such devices from the earliest to the latest iterations!

Similarly, when a compressor in one of the HVAC units would fail, the service contractor would order a replacement and install it, leaving the old and inoperative compressor in the dirt behind the building. We have a collection.

The same goes for just about everything else you can think of. Hardware, tools, retired equipment, parts, test equipment, household goods and much, much more. It has really piled up over the years, and now we have to get rid of it all.

Step one in this process is to have a yard sale. Bill plans to grab everything that has value that we won’t need on the mainland and put it out in the yard, advertising to the island population that we are having such a sale and to come and make an offer on any or all. We hope to dispose of a lot of the stuff this way.

After that, we will rent a large box trailer and will repeatedly fill it up with stuff to be disposed of, barging it over to the mainland as many times as needed to clear out the pile. Fortunately, the waste transfer station and recycling facility are near the barge terminal on the mainland, so there won’t be a lot of hauling to do on that end of things.

We also have to get the Nautel XL12 transmitter off the island and over to the mainland where we will install it as the aux at the new site. We hope to have that done the first week of April or so. We have already sent the trailer-mounted generator over to the mainland where the generator service

company picked it up at the barge terminal for service and reconfiguration. Once they have it ready, they will take it to the new site and install it there.

I have a buyer for the Nautel ND10 transmitter, and we will have to help him get it off the island and on its way to Colorado. We plan to cannibalize the phasing and coupling system for parts and then recycle the cabinets.

We have set a rather ambitious deadline of May 3 for having all this done. We'll see.

#### **NAB Time**

It's hard to believe that it's time once again for the spring NAB Convention and Broadcast Engineering Conference in Las Vegas. I plan to be there Sunday through Wednesday of show week, attending conference sessions, looking at exhibits and visiting with our favorite vendors. It's always a pleasure seeing old friends and making new ones. If

you see me wandering around, be sure to stop me and say hello!

#### **Changes**

Last month we said goodbye to Larry Foltran. He will be greatly missed, and we wish him well in his new job.

With his departure come some changes. Elizabeth McGuire has taken over domain registrations and management. If you have domain registration needs, contact Elizabeth.

In addition to that, Elizabeth is also taking over Sound Exchange reporting. Stations should send their reports to her for filing.

Finally, Keith Peterson is taking over maintenance of our nine in-house websites. Local personnel should communicate needed changes and updates to Keith. His email address is [kpeterson@crowfordbroadcasting.com](mailto:kpeterson@crowfordbroadcasting.com).

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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! Several weeks ago, I received an email message from a good friend and broadcast engineer whom I had known for over twenty years. We had not kept in contact with each other on a regular basis for the past five years or so, as our workload had kept us both pretty busy. The bulk of his message was to let me know that he was leaving the broadcast field to pursue other interests. I was startled by this news, and picked up the phone to call and talk about his plans. Being a personal friend, I felt that he would open up and let me know just what was going on. He has been in the engineering field for 38 years, and for him to just walk away from a job he loved was totally out of character, and I needed to hear first hand, just what happened.

He started off by explaining the increased workload he had when the company purchased several other stations four years ago, and did not keep

the engineering staff that was at the stations they bought. Although the plants were in excellent shape, the bulk of his time was spent maintaining the facilities and handling small emergencies, nothing out of the ordinary, just basically day-to-day stuff.



His total responsibility was for seven stations – three AMs (one of which was a four-tower directional) and four FMs along with HD channels on all 4 FMs and streaming on all seven stations. Although this is quite an exceptional workload, the fact that his original four stations were in tip-top shape due to his rigorous maintenance schedules and the addition of three more that were also

well maintained, he was able to juggle all his duties with very little downtime.

When I asked about his compensation after the additional stations were bought, he stated that he received a five percent increase in salary and a 3.75 percent increase in his profit sharing plan, an

increase, he stated, that would net him an additional \$10-12k per year.

Fast forward two years after the three stations were added to his portfolio. His workweek went from 40 to 45 hours per week to over 70. With the additional workload, his maintenance schedule which he religiously adhered to in the past, began to break down, and he found himself not able physically to keep up with the normal day-to-day maintenance needs of the stations. He had repeatedly asked management for assistance, but he was given excuse after excuse as to why they could not afford to hire any additional manpower for the engineering department.

I have heard this story many times over from so many different engineers; in fact I have heard that some companies budget more for T-shirts and bumper stickers than they do for engineering! Although disappointed in the fact he could not hire any assistant(s), he said that his mindset was to continue on and do the best job he could for his employer, who had provided him a good salary and working conditions for many years. Perhaps, he thought, the time would come that they would recognize the need for an additional engineer on staff.

At this point in our conversation, I am beginning to wonder just what was going on. It seems like he had overcome the additional obstacles thrown his way and come out the other side with a good attitude and a renewed work ethic that everything would be handled to satisfaction in time. We all have felt from time to time that we were overwhelmed by situations that simultaneously came up, but these quickly pass, and normalcy is always found on the other side.

He continued on to say that last summer, the person handling all the stations IT needs quit to take a better job at a local bank's corporate headquarters and left a mess for someone to clean up. Station management felt that the chief engineer could assume the duties of the IT department and save them close to \$60k in the process. Reluctantly, he agreed to add the IT duties to his already overloaded schedule. For six months he literally lived at the stations, putting in anywhere from 70 to 90 hours per week. He had finally had enough and demanded that management hire an additional person to help out. They would think about it and get back to him with an answer in a

week or so. After numerous inquiries with no answer, the station manager reluctantly reported that there was not enough revenue to pay for any additional manpower. What about the \$60k that was paid to the former IT guy? Well, according to my friend, it seems that the station manager had decided that he needed a substantial raise to keep his up-scale lifestyle afloat, and when the IT position was no longer there, well that money quickly found a way into his pocket.

My friend submitted his resignation shortly after and vowed to never step foot into a radio station again. When asked what he plans for the future, he said that he does not have anything lined up as of yet, but he is looking forward to beginning his new career in the retail electronics field at his local Wal-Mart! As for his former stations, they are looking for a replacement, with an ad that states "good working conditions and make your own hours" as selling points, along with a salary range of \$40 - \$50k, depending on experience. Looking to make a change? Call me and I'll put you in touch with the right folks, but don't expect to have a personal life. Any agenda other than "work-eat-sleep" won't cut it in this position. Unless drastic changes are made in this station's business model, they will find themselves trying to fill this position over and over. Unfortunately, it will probably run a lot of other good engineers right out of the field, just like it did my friend.

#### **WDCX-FM, WDCZ(AM) – Buffalo, WDCX(AM), WLWZ-FM – Rochester**

At the time of this writing, I am installing a new mixer in the WDCX-FM production room/ back-up air studio. We have replaced the existing Mackie mixer with a new Audioarts D75 mixer that is capable of performing as a back-up air studio in the event of a failure in the main control room. In our previous configuration, if we lost the main control room, we would stand to lose substantial revenue as we could not provide any live programming or anything originating from the talk studio. This will help insure that we can continue providing our listeners with the full lineup of quality programming that they have come to expect.

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

### The Motown Update

By  
**Joseph M. Huk, Jr.,**  
P.E., CPBE, CBNT  
Chief Engineer, CBC–Detroit

#### Continental Transmitter Maintenance

Last month it was time to perform maintenance on the WMUZ Continental 816R-4 backup transmitter. In the past we have used Freeland as the vendor for rebuilt PA tubes for that transmitter. Since the last time I performed a replacement of the tube, four years have gone by. I found that in that time, Freeland was purchased by Econco.

Since the cost of the rebuilt tube from Econco was higher than what Freeland charged four years ago, I was anxious to see its performance. To my surprise, the tube worked very well. In fact, I had to lower the screen voltage by re-tapping the screen supply transformer to reduce the screen current.

While tuning up the transmitter with the new tube, I heard some arcing in the main plate supply of the transmitter. A power supply bleeder resistor was arcing. After inspection of the resistor, I found it fractured in half. The factory indicated that resistor value was changed from 100k to 180k so that its current and power

dissipation were reduced to improve its longevity. I obtained a replacement overnight and the transmitter is now working great!



#### ZipOne Audio Processing

Last month, I indicated that we were working on a crosstalk issue with one of our Telos ZipOne codecs. After sending it back to Telos for evaluation, it was found to be in perfect working order. When we got it back, we did some testing here and found the issue to be only encountered with our afternoon talk show host Bob Dutko's home ZipOne installation. So the

problem is now been determined to be localized to him. Next month we will let you know the root cause of the issue.

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



## News From The South

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

We begin with congratulations to Todd Dixon, who passed the CBRE examination in February. Well done, TD! This gives me the impetus to get off my rump and pass the CSRE sometime this year; I'm being left behind!

### Ancestry

It has been said that everyone has at least a drop of royalty in their bloodline. Well, my last name is Poole, which is about as English as you can get, so that's where I looked on Wikipedia. Could it have been Alfred the Great? How about Edward the Confessor?

Nah, that didn't feel right. But after a bit more research, I found him: Aethelred the Unready, king of England from 978-1013 AD and then again from 1014 to his death in 1016.



**He looked like a doofus, but he had a green sword with lightning on it.**

There's a reason for that brief intermission.

Aethelred had a little disagreement with the king of Denmark, Sweyn Forkbeard. For a few years there, Aethelred's "reign" basically consisted of screaming and running from ol' Sweyn. You gotta give it to the Vikings, they had some cool names. But the English could run faster!

When Sweyn decided to put a serious smack-down on Aethelred, Unready-man decided to beat feet over to Normandy and enjoy a holiday with some relatives. Sweyn

declared himself King of England and kept the throne warm for a few months, but then he up and died. (The stress of chasing ol' Aeth must have been too much for him.) Aethelred returned to England, picking right back up from where he was before the rude interruption.

Yep, at least a smidgen of that blood *has* to flow in my veins.

Sandy says her bloodline includes King John "Lackland," the guy who grumbled and signed the Magna Carta while a bunch of barons smiled and held swords to his throat. But let's continue here ...

### More Severe Storms

I may be distantly kin to old Aethelred, but ATT and Alabama Power were the Unready ones when severe storms came through on Monday, March 18th. To be fair to them, these storms weren't expected to be as severe as they were, but everyone was caught flatfooted. Alabama Power had to bring in crews from other states. WDJC-FM and WYDE-FM were both on generator for days.

This is one thing that has changed in the past 10 years. It used to be that when there was an outage, you could expect service to be restored within 24 hours at the most. Nowadays, due to cutbacks and a tight economy, there aren't enough repair crews to go around. Believe it or not, WDJC-FM operated for

many years without a backup generator; outages were relatively brief and just weren't that big of a deal. Not anymore!

It used to be that, when you called for an update, a live human being would pull a "Montgomery Scott" ("Scottie" from Star Trek): they'd tell you six hours, then amaze you by fixing it in 3-4 hours. Nowadays, you get a Robot That Lies. A halting, mechanical voice will say, "We expect your problem to be resolved by... [change voice] ... 5:30 PM." 6:00 PM passes, you call again and the robot says, "...by 11:30 PM." The next morning when you still don't have power, the robot has stopped making predictions. It just apologizes for the situation, assures me that it loves me and appreciates our business and will there be anything else?

Not only do we have generators now, we're having to rethink our fuel situation. Next year's budget requests are going to include a couple of large storage tanks to keep the generators running for several days at full power. As it is now, unless we reduce transmitter power, we can only run for a few days, starting with a full tank. That used to be enough. It's not anymore.

### T1 Woes

I didn't include a picture with this section, but a mental image will do fine: just imagine Todd Dixon with smoke coming out of his ears, dealing with ATT's robot on the phone. Then imagine Jimmy Parker and me running to Cullman repeatedly to keep 101.1 FM on the air with a Matrix dial up (once ATT fixed the phone line, anyway).

While we were on generator, to save fuel, Jimmy and I took turns killing everything at 10 PM, then driving back to the site to bring it back up at 6 AM.

The same storms that knocked out the power for several days also did dramatic damage to the Cullman end of our T1 line. It took over two days to get that "repaired" (in quotes for a reason). Some genius at ATT had "tested" our line and decided that it was Okie-Dokie. I suspected that they were looking at the wrong link.

We've had that happen before. Our T1 actually goes from our studios in Homewood, AL, through *Decatur, AL*, and then drops back down to Cullman. We once even had *someone else's data* on our T1 line: all green lights, no alarms, everything looked OK, but no audio. Try explaining *that* to ATT's robot.

At length, after much yelling, Todd was able to get the T1 restored ... but as I write this, it keeps dropping. Jimmy talked to the ATT technician on the

Cullman end, who told him that lightning had chewed their underground cable. They'll have to bury a new one. In the interim, we get T1, but it's intermittent and unreliable. I've rigged the Matrix to automatically dial whenever it sees an alarm on the T1. (What could *possibly* go wrong with that idea?)

The net result of all this is that we are planning to double-hop an STL up to Cullman. In the past, we couldn't find anyone willing to rent tower space for a relay at a rational price. It was cheaper just to stay on the T1. But then I met a really nice fellow who just happened to own an old ATT Longlines site and who was willing to work with us.



**Designed to survive a nuclear war.**

### ATT Longlines

You've seen these; everyone has. These are Cold War Era facilities that, at one time, handled the bulk of long distance communications (including network television). They were a marvel of engineering, especially given the equipment available at the time. Tens of thousands (or in some cases, *millions*) of signals were multiplexed onto microwave carriers, mixed and ultra-plexed together and then fired across the country through giant horn antennas.

They were designed to withstand a nuclear assault. Not a direct hit, of course; nothing could stand that. But anything short of that would be shrugged off by these things. The towers are tough enough to hold up one end of a suspension bridge. The buildings have thick roofing and walls made of high-strength concrete over tons of rebar.

How thick were the walls? The guy who owns this site bought it when ATT was unloading the Longlines facilities for yard-sale prices some years ago. He then built a small factory that cuts ferrous

**We probably won't need an engineering study to see if this will hold our piddly 8-foot dishes.**



metals with a computer-controlled laser for laminations in motors and transformers. Nice guy, nice facility, totally fascinating.

I looked around and said, "So, how do you like your Cold War Era building?"

He shook his head and related a story. After they moved in and established the business (and are doing quite well, thank you for asking – they run two shifts to meet demand), the owner realized they'd need a loading dock. He wanted to cut a 16-foot bay

in those thick, thick walls, so he called in a contractor.

The guy quoted him a price, they shook hands and started work. The owner says this went on for days. And days. Much muttering and cursing was heard from the contractor (between the screech of high-powered concrete saws, of course). Finally, he had a 16-foot hole in the wall and a giant honkin' chunk of ultra-hard, uber-heavy concrete lying on the ground.

The contractor loaded up his truck and started to leave. The owner said, "Wait a minute. The deal was, you haul it off, too."

The contractor replied, "Let's re-make the deal. I've had enough of this thing and I never want to see one of these buildings again!"

The owner had to go through several other contractors to get that giant slab removed. Most would just take one look at it and then run screaming. Finally, one brave guy agreed to do it: he brought in a jackhammer, but that didn't even chip the concrete. He rented some huge, honking concrete saws... and it still took him a week.

That's proof that they built things better back then! Until next time, keep praying for this nation!

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### Valley Notes

By  
**Steve Minshall**  
Chief Engineer, KCBC

In 1979, while I was working at a marine electronics shop in the Port of Los Angeles, I stumbled across a book on AM directional antennas by Jack Layton. I had quite a bit of interest in broadcasting at the time and the book opened up a whole new world to me.

There were a lot of interesting things about installing and repairing ship-board electronics, but it also was demanding, long hours, and often long weeks. It was also dangerous at times, but the money was excellent. All things considered, I decided to enter Broadcast Engineering and leave the glamorous world of maritime electronics behind.

My first broadcast job was in Oregon, and I was in charge of the final construction phase of a

four-tower directional antenna system. Last month, I mentioned that the new KBRT facility is a no-compromise site; the site I went to work at in 1980 was quite the opposite. I could write a whole book

just about that project. Fortunately I did not go into the project completely blind. Jack Layton's book gave me a good head start into the world of directional antennas.

A couple of months ago, a problem developed in the KCBC antenna system. There was a sudden shift in the night parameters. Tower 1 was off by 5 degrees of phase

and tower 3 was off by 10 degrees in the opposite direction. The current ratios had also shifted in a similar manner. The common point had moved up to





65 ohms. The day pattern remained right on the correct numbers.

The above symptoms indicate a real problem with the night antenna system and also indicated that the sample system had not changed. Some field readings would have backed up that diagnosis, but that was deemed unnecessary. I could have readjusted the phasor to bring the numbers in, but that is definitely the wrong thing to do. Sometime we earn our pay by knowing when *not* to turn the knobs.

The thing I believe is right to do in this sort of situation is to *stop and think*. If some logic is applied to the situation, a lot of problem solving can be done just by sitting down and thinking about it. The first thing we know is that the sample system is telling us the truth because the numbers on the day pattern, including the common point impedance and current, are right on the money. That also helps rule out external causes such as shrubbery growth, or a tower being horizontal instead of vertical (that has happened to me at an FM site, SWR trips because the antenna was flattened on the ground!).

What we do know is that most of the components in the system are of one of two types, capacitors or inductors. Shifting 10 degrees is a relatively small change, and a small change in parameters should correspond with a small change in component value. At this point it is not a bad idea to stop thinking and just go and take a look, and a sniff, at things.

I gave the components in the phasor a good inspection, but everything looked good and smelled just fine. I took a walk out to the ATUs and checked the towers and the inside of the ATUs. There were no signs of trouble of any kind, no leaking capacitors and no varmints cooking. So it was back to thinking.

One thing that Jack Layton had said in his book is that one day the station engineer will receive a call from the transmitter operator (that would be a robot voice call or email now) saying that the parameters are off. His advice was pretty much the same as I spelled out above. The thing he mentioned that has served me well over the years is that there will be one tower that will have the parameters shifted more than the others, and the circuitry associated with that tower is where the problem will be.

There are probably exceptions to that rule such as in a two-tower array, where a change in either tower is going to show up in the readings of the non-reference tower. But even in the two-tower case you could probably look at the absolute values of base current and see one shifted more than the other. In that regard, it might be a good idea to put your

antenna monitor in the amplitude mode when everything is working right and log the indications for future trouble shooting.

I could also speculate that perhaps arrays with widely varying drive impedances, due to near parasitic operation or differences in heights, might have a larger shift in a tower other than the one with the problem. For me, the rule has always, every time, identified the problem tower just by phase and ratio measurements.

With the visual inspection done, it was time for a little more thinking. The greater shift of parameters was in the number three tower, so that was the suspect. I ruled out the reference tower as the likely culprit since the other two towers were not equal in change and the change went in opposite directions. Unless a coil is physically altered, its inductance values is unlikely to change. A mica capacitor, on the other hand, is more complicated on the inside with stacks of mica and foil with a lot of solder tying it all together. Add to this the fact, which we all know very well, that capacitors of all types fail, and they fail a lot.

I developed my theory that if I had a complete failure of a capacitor, I would likely see it or smell it and the phase shift would almost certainly be more than the ten degrees. What I was looking for was a capacitor that had changed value, not failed outright. I further theorized that capacitors don't fail by becoming more of a capacitor – it's just is not possible with the materials inside (they cannot make more stacks of mica and foil). What I would be looking for would be a capacitor with a loss of capacitance.

My first thought was to come back in the wee hours with my analyzer and start measuring capacitors with the station shut down. That process is accurate and scientific, but sometimes trouble shooting can be done faster, easier, and perhaps more effectively by cruder methodology. I really don't enjoy the wee hours inside dog houses like I used to, so I decided to use the substitution method.

By my theory, I had a capacitor with lower than normal capacitance, so I should be able to parallel a small capacitance across the suspect capacitors one at a time and see if I hit one that moves the parameters all in the right direction. Further thinking brought about the ideal parallel test capacitor, a vacuum variable. Running the station at low power / night pattern, in the daytime, I could clip the vacuum variable across the suspect capacitors and remain on the air while doing so.

Where to start: phasor or ATU? I know this isn't scientific, but my gut said ATU. At the ATU

there are several capacitors in the circuit, but one stood out. It was one of those big white mica capacitors. I call them World War Two capacitors because they might be that old. In any case they are probably older than I am. Someone once said something to the effect that “parts under stress tend to relieve themselves of that stress.” There is also the second law of thermodynamics that states that all capacitors will eventually fail given enough time (my paraphrase, ok?). Looking first at the oldest capacitor is then the logical procedure in light of these truths.

I set the variable capacitor to the minimum capacity and clipped it across the WW2 capacitor. Checking the antenna monitor there was a small change in all of the parameters, and in the right

directions. I got on the phone with the station manager, John Yazel. He read the phase and ratio to me while I increased the capacity of the vacuum variable. When I reached what looked like 80 percent of the capacitor engaged the number three tower parameters were back to normal along with the parameters of tower one and the common point. At his point it was obvious that I had found the culprit.

I emailed Cris and asked for a new capacitor. It arrived a few days later and when installed, all readings were normal. No adjustments were necessary. This is one of the most satisfying repairs I have ever done because most of it was done just by thinking. In fact I think I spent more time writing about it than it actually took to do. It is nice when things work out.

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**Mainland Memoirs**  
**By**  
**Bill Agresta**  
**Chief Engineer, KBRT**

... or we could call it the Blackstar Bill Report. Whatever we end up calling this column, greetings from the new KBRT transmitter site at Oak Flat!

This has been a very productive month here both at our new mainland transmitter site and our old site on Catalina Island. We are now on-air from the new site with great coverage, and we're packing up and moving out of the old site.

We continue to work through a little bug here and there at the new site, but the site went on the air with very little to worry about and our new signal covers Southern California extremely well. Even our 205-watt night signal seems to be listenable over a much wider area than we imagined it would be!

Now the big job is moving many years of accumulated *stuff* off the island, a task not easily done due to the logistical nightmare it poses. I am working hard on this, making it my new primary focus and hoping to get this entire job completed by the end of April. Doing this will call for some creative moving methods in order to accomplish things like moving the Nautel XL12 transmitter out of the old site, barging it to the mainland then getting it up the hill and into the building at our new site. Since neither site really has much of a load-in area,

the transmitter will need to be rolled on pipes around the rear of our old island facility then onto a trailer. After being barged off the island and up the hill to

our new site, we need to get it over a one foot high doorjamb then up about two feet into our new transmitter building. Thank God the power transformer can be easily removed!

I found myself driving a rental car about a week ago and it made me to realize an issue I had not noticed before. Look around and notice how many new cars no longer have real radio antennas

but instead, those little dimples that look more like something designed for the GHz band. The vehicle I drove was a Scion, one of those box-looking things that seem to be popular now, especially with the kids, and it had a Pioneer radio in it.

The radio unit itself was nice, it was easy to operate, had a lot of functionality and plenty of power for an average listener. My issue it that the unit had HD Radio, but with the factory installed antenna (or should I say dimple), it hardly could receive a good analog AM signal then alone lock onto AM HD. In fact, even being almost on top of some major AM HD stations, I couldn't get more than a quick 30-second lock before it would unlock back to analog for a minute and then try to lock in digital again. In a few cases it would do this several



times within a minute – now you here the high end, now you don't. Even with a station that has well aligned their analog to HD sync, the mere change of fidelity back and forth in short intervals is enough to drive one mad.

This really upset me realizing that since turning the HD Radio function on and off was one of the hardest things to reach in the menu, many people might just tune past an AM HD station. The FM stations did work a little better – still not great, but listenable if you had a flamethrower nearby (though the HD 2 and 3 channels were not very reliable).

The committed AM listener would be forced to go through a couple menu layers and turn off the HD Radio function while the listener who listens to both AM and FM would grow very frustrated if he tried to use the HD Radio function to listen to his favorite FM station since they would have to pull over to turn HD off each time they decided to tune to their favorite AM station. I apologize if I seem to repeat myself on some of my observations here but

You would think if the manufacturer or dealer were going to go to the trouble of installing a premium sound system, they would know enough to install an antenna that allows the system to work properly. As I dug for more information about who designs these antennas and why, one dealer told me that the same people that design the body also design the size and shape of the antenna. I can only imagine the design is then sent to China and never really engineered, just manufactured without any idea of its gain structure over the bandwidth it is intended to receive. I know many models may draw a dimple on their face in an attempt to look cute, but these all-show-and-no-go dimple automotive antennas are a major FAIL in my opinion. Or maybe there was just something wrong with this one.

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

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### The Chicago Chronicles

By  
Art Reis, CPBE, CBNT, AMD  
Chief Engineer, CBC–Chicago

#### The Month of Murphy

Remember the old saying, “I’ve been trying to take it one day at a time, but lately, several of them have been ganging up on me at once?” Well, this last month has been rather like that. I’ll explain. And, oh, by the way, this article is reconstructed from memory after the original draft was lost somewhere in my computer. It’s been “that kind of month.” Or, rather, “The Month of Murphy”.

We have had several major projects gestating here in Chicago for a few months, and all of them seemed to be coming to completion at about the same time. The projects were: the completion of our Dragonwave STL project; the completion of Studio E; and not *a but the one* major maintenance project for our big 150 kW UPS at Burnham, the replacement of the bearings on the unit’s energy source, the 3 ton (at 7700 RPM) flywheel.

The fun started the day of a regular visit to my podiatrist, who proclaimed that a rather middling

operation was going to be necessary on my right foot, one which would prevent me from losing said foot, that I would be laid up for at least a week, and that my ability to drive would be missing in action for some time thereafter. Wonderful. That meant that at least one of those projects was going to have to get done ASAP.

I attacked this situation on all fronts. We had had the Dragonwave project ready to go up the



towers for a few weeks by then; the issue was getting the tower crew in to do the final work. But, wouldn't you know, two problems intervened—the weather, and the tower company's schedule. These guys are *busy!* So busy, in fact, that we haven't been billed for the last job they did for us. Understand, that compared to the mega

customers they have, we're really not a big fish in the whole scheme of things, so our projects keep getting pushed back. When the crew was available, the weather got snarky. When the weather was nice, they were busy somewhere else. I had to keep at them, and

at them.

They weren't the only ones who were overly busy. The folks at the only company in the area which can do the kind of bearing replacement maintenance that our UPS requires were also dragging their feet, and I was getting frustrated with them, too. It isn't all their fault. This had become a high-priority job because the job had been originally scheduled, by us, to be done this summer. The UPS itself, however, was keeping better track of its needs than we were. In December, it started letting us know that it wanted its bearings replaced *now*, so now were up against it to get this job done. We started pushing them to get it going. But since the work had to be done at night to keep any mishaps from affecting the station's prime listening time, scheduling was difficult.

In the meantime, Studio E's project had run into a snag of its own... actually a couple. During the planning stage, we all realized that there was a definite possibility that the reconstruction of that studio would take more time to complete than we had originally thought. As it turned out, we were right. That studio is very important and generally heavily used, and here we were installing a new control surface and preparing the room to be used as an emergency control room in case of trouble or heavy maintenance happening in one of the regular control rooms, and be a production room, too. The new control surface would be integrated into the existing IP-based system and function just as the others do. Control Room Four had served that purpose very well until it became the headquarters of WYRB, taking away its ability to function in any such capacity. This new studio had to again do double duty.

So, what to do for a backup facility for E? The answer was already in hand. Studio D had been commandeered for a new "green room" for VIP guests several months ago, but after being gutted and painted, it had lain fallow, undeveloped. We had already used it for the staging area for Dragonwave and a couple of other projects. After getting permission from promotions to use it temporarily, James set up a temporary studio on one of our folding tables, with a Mini-Mix we had in storage plus a CD player, CD recorder, VOXPro, the RCS setup, all taken from E, plus two mikes, two speakers and some wiring. James set it up, it worked, and the folks in the production department were happy campers, at least for awhile.

The original plan for E was to install the control surface, call the manufacturer and get their engineering department to come into our system over

the Internet and upgrade the system software to graft the new console into it. Simple, and for little cost. Sales had told us that that was all which was involved. There were two problems, however. First, we weren't told that another Ethernet card would be needed in the main bridge router frame to physically connect the new control surface into the system. I had wondered about that from the outset, and finally brought it to the attention of their customer service folks. They told me I was right. Luckily, that got fixed quickly, because we caught it right at budget time, so we were able to request that item for fiscal year 2013. Whew!

The other issue was that sales had not run our project by their engineering department to find out what really was involved. Engineering got the project description only long *after* the project had been budgeted. When they found out about it, they had a cow—and rightfully so. In point of fact, one of their engineers *would* have to come to Hammond and perform the upgrade and modification of the hardware and the software; that wasn't planned for in the cost analysis. I will spare you all the machinations which followed that little revelation, which took awhile, but the result was that we got what we wanted, the financial arrangements were worked out, and finally a date was set for their engineer to come out. And sales got a memo from engineering spelling out how such situations *will* be handled in the future.

My surgery had originally been scheduled for the second week in February, which would have been the best time, but again Murphy intervened. First, it was the first time I had ever had any surgery at this particular surgical center; the place apparently requires a battery of pre-op tests. None had been done, and telling them that I'd never had to do that before didn't get me anywhere. But, dealing with that moved the surgery back about a week. Then Murphy struck again. The surgeon contracted pneumonia! Another week's delay.

Now not only was this surgery bumping up against the conclusion of three projects, it was also going to conflict with surgery being done on my assistant, Brian. Like mine, his was an outpatient procedure. Now, the two were both scheduled to be done on exactly the same day, February 27, and now neither could be moved. It seemed that engineering would be short-handed right during the culmination of all three projects.

That's exactly what happened. The Monday after my surgery, the tower crew showed up to aim the Dragonwave dishes. James called me on the phone at home and I supplied what expertise I had to



give to help the process. It only took maybe two hours to aim both dishes, not simultaneously but in succession, but the result was exactly what was predicted: -30 dBm signal strength in both directions. The system was locked down and the tower crew left. I remotely turned the system's alignment mode off and the project was just about done. One down, two to go.

In the meantime, Brian had tried to come back to work on Friday, two days after his surgery. It didn't work, and Mack sent him home early. During his follow-up visit to the doctor the next day, he suffered a setback and was off work healing for several days, right through the Dragonwave aim and the UPS project. Murphy was having fun. We weren't.

So it was that, on the following evening, Tuesday, after working half a day each, James and Mack met the service tech at the Burnham site for the UPS bearing replacement.

James worked the first shift, and the plan was, after the UPS was bypassed, that the main Nautel transmitter would be turned off and the aux rigs turned on, so as to keep the draw on Edison to a minimum during the time that the UPS was off-line. Re-enter Murphy. The normally-reliable BE FM-30T decided that it would pitch a fit. Merely turning on the filaments caused the rig to go into alarm mode and shut down. You guessed it—grid-to-filament short. Cute. The rig had worked the week before when I exercised it.

James has had some experience replacing large final amplifier tubes, but not lately. It was time for a refresher course. So, I talked him through the whole process over the phone, from home. First job was to turn down power on the main transmitter power to about 65%. Next was to get the spare tube into the aux, then re-tune the rig for that tube, into the dummy load. The process took maybe an hour or so, but in the end James was able to put the aux transmitter back on the antenna. After resetting the power on the main rig to license value, James brought it down, and put the aux rigs on. All else went well that night. James even got a malfunctioning tower light alarm module re-calibrated. Just as that wrapped up, Mack arrived and the rest of the night went uneventfully. The bearing replacement was a success. Two projects down, one to go.

Brian came back to work a few days later and now there was only me and Studio E left to deal with. Fortunately, the studio wiring layout had already been documented before I left. We had decided to recycle some of the wiring from the old

Studio E setup; it was cut to a near-length and labeled at one end before I left for the surgery.

Then, in a surprise, a few days before the upgrade, my home-confinement was ended. Mid-week, the doctor cleared me to be at the studios for the console upgrade and then, that Saturday, told me I was cleared to come back, completely. But I still couldn't drive.

Right on time, Jeff Vance from Wheatstone came in to do the upgrade process. He came in on Saturday morning, and together with Mack and James they performed a lot of work which had to be done prior to shutting the system down. The process necessitated putting all stations on voice tracking for the duration, and the feeding the automation audio servers directly to the STLs.

That was when we discovered that we had to hard wire a temporary bypass of the bridge router, from the output of the main audio switcher directly to the STL inputs, something we had never had to do before. This we did after midnight, and it should have gone smoothly, but lo and behold, Murphy was back. The first connection wouldn't work, and it didn't respond to our efforts to make it work. The culprit turned out to be one of those Phoenix connectors, which actually had a missing pin internally. Obviously, the problem couldn't be seen except through the use of an ohmmeter. Finding that one took 45 minutes or so, putting us behind. Throwing the offending connector out took five seconds.

Once the bridge router was bypassed, Jeff was able to get to work installing the latest versions of all the software, and the new quad input Ethernet card. He found out that the memory upgrade had already occurred, a pleasant surprise. Yes, Murphy tried his best after that, as there were a few hitches in the procedure, but by 4:15 AM the system was back up and all stations could resume live programming. The new Studio E console was now part of the system. Pretty much, two and a half down projects down, just a little more to do.

I was back the following Monday. A few other issues were left in studio E. The big one: the control surface was designed to be dropped into a hole cut to fit it. We had not done this in any other control rooms before, because we were concerned for the physical integrity of the studio cabinet with such a large hole in it. In E especially, the center span where the board sat wasn't really big enough to accommodate such a hole that size. But without it, the console would sit awkwardly high. It was time to bring in the local cabinet shop.

That took several tries, but we were finally able to get their attention long enough to get them to

send someone over, the owner, actually, to see what could be done. The answer was to embed only the front two-thirds of the console in a hole cut into the counter top, and let the back end rest on the counter top itself, making for better structural integrity, *and* a more convenient viewing angle for the operator. This was done, along with some bracing of the counter top, and the result is most gratifying.

By the time you read this, studio E should be on-line, and the month of Murphy will have come to

an end. Many kudos to James and Mack for holding down the fort while Brian and I were out. They worked many hours above and beyond the call of sanity while Brian and I were out. Most happily, with these three projects out of the way, we can now work on a whole backlog of projects that we've only been able to dream about until now. I won't mention them here, but you'll see more about them in the months ahead.

Until next month, blessings to you all!

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### The Portland Report

By

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

By mid-month last month I was wondering if March was going to be one of those months when noting unusual or interesting happened. I was beginning to think I would have nothing to write about. In retrospect, I had nothing to worry about. An old saying, "Be careful what you wish for," came to mind.

The proof of that old saying came at 8:50 on a Thursday morning. The security system sounded an alarm indicating a dialer down and the audio alarm for Radio Disney transmitter, which is diplexed with KKPZ at the site, was triggered. We quickly found all the PBX lines were down. Next, it became obvious that every telephone circuit at the site, which also houses the KKPZ studios and offices, was down.

With everything down, it was fairly quickly obvious a cable had been cut somewhere. Now the task was reporting the outage. I dialed the most recent trouble reporting number. That number answered, "Welcome to telco, are you calling from the number you wish talk about? Press 1 for yes, 2 for no." We played "twenty questions" like that, but it was really more like "forty questions!" At long last, I was asked, "Are you calling from Oregon?" I pressed 1 for YES, absolutely.

I then got, "Welcome to telco, are you calling from the number you wish talk about? Press 1 for yes, 2 for no." So I pressed 2 for NO yet again. All to get a different question: "Please enter the number you are calling about," which I did and finally got a real person.

I'll bet you can't guess the next question. Yep. "What number are you calling about?" I gave the number and also indicated the business numbers are out of service. Then there was a pause while the number was looked up.

"I don't find that number sir, what part of Idaho is that located in?" Huh? A 503 area code in Idaho?

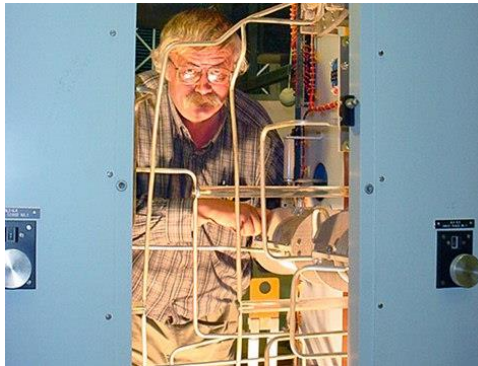
It would take several pages to go through all the high points of that dialog, things like, "I only handle residential telephones, let me transfer you." Click, buzzzz. To make a long

story short, by 11:30, at long last, I had the phone and data line outages reported.

So far in this story, probably not much seems unusual, particularly the reporting problems. But let's follow the story a little further. In order to get an idea what had happened, I thought I would investigate, checking out the route of the telephone cable feeding the site. When I saw a repair tech stopped at a cross-connect / service box I stopped and chatted with him.

From that conversation, I learned that a subcontractor working for another utility had been boring under the road. In the process they had cut a major trunk line at 92nd and Foster, some distance from the site. The tech told me that altogether, the boring machine took out two cables totaling 1,800 pairs.

This wasn't just a buried cable or conduit, it was a large cable run that serves south of Foster and east of 92<sup>nd</sup>, which is a small part of south



Multnomah County and a larger area of northwest Clackamas County, including Mt. Scott. That's all of Mt Scott, most of the town of Happy Valley and some of eastern Portland. In other words, a large and big-deal cable cut. I also had feedback that there were double digit open T1/DSL tickets. I did notice another problem fairly quickly at the local gas stations and convince stores. The sign went up. Cash only, credit/debit cards out of service.

I expected to hear news coverage and some plan to handle emergency 911 calls. But that never happened. Which raises the question why? One part of the thinking is the penetration of cell phones. As more households have access to a cell, the home land line becomes less critical. However if the cell penetration is 70 percent of the households, that's still 30 percent that have no alternate 911 access when the land lines are down. And aren't the cell sites fed with telco cables?

Even with a cell, that is no guarantee of ability to report a 911 emergency. A neighbor at Mt.

Scott told me that when he reported his phone line was out, he was given the chance to forward his calls to another number. He said yes and gave his cell number. That only worked when he wasn't at home because the cell site was also down because – you guessed it – the data line was down. So it's clear that a cell is not a foolproof replacement for 911 access.

At KKPZ we lost business and the ability to take callers on the air. We were able to work around that problem without losing air time. Fortunately, our Internet service is from an alternate, non-telco, source. Radio Disney was able to install a backup Audio Vault, using an alternate Internet service. I have been asked about the time it took to repair the outage. The cut occurred at 9 AM on a Thursday and the last of the repair was done on the following Wednesday. Nearly a week. When the cut happened, telco techs had to first locate the cut. Once they got to Foster Road they found ongoing road work in progress. From there they had to get City of Portland permits and permission to halt the road work. Then they had to dig down to the cut, safe off the other utilities, (power and gas) and install trench safety. The cable splicers didn't get to the cable cut until early Friday morning.

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### Rocky Mountain Ramblings The Denver Report

by  
**Amanda Hopp, CBRE**  
Chief Engineer, CBC - Denver

#### Lessons Learned

We did our bi-annual sample system recertification for the KLVZ night array in early February. That was fairly easy. It involved sweeping the sample lines with a network analyzer to check for electrical length and characteristic impedance. It also involved pulling all the sample transformers out of the ATUs, connecting them to the antenna monitor, running an RF current through them and checking their outputs against one another. With that done, we put everything back together, buttoned up, checked things and all looked okay.

Over the next few weeks, I didn't pay much attention to the remote control in regards to the tower ratios and phases. One of the

towers tends to walk a little bit with temperature and conditions anyway, and we also have to wait a few minutes until the phasing and coupling system components warm up before we can fully trust those readings.

Well, before our big snowstorm in early

March was to hit, I decided I'd go check on the sites. I turned on the KLVZ night system to write down some readings and found things out of whack. First lesson learned: always write down where the phasor controls are before making any adjustments. Things were so out of whack, it took quite a while to adjust things back in. We had wanted to go back our starting point on the phasor controls to make sure

we were doing things right, but since I forgot to write



this down, we couldn't. Based on what we were seeing, with the amount of turns we were making, something was horribly wrong. I did a quick drive out to all the towers and saw nothing obvious. We got things where we could leave it until the next Monday when we were back in office and had time to deal with the issue without having to worry about snow.

Over the weekend, we noticed things walking quite a bit again. So first thing Monday, we headed back out. Now do you remember me mentioning us doing our bi-annual recertification? In doing this, we disconnect the sample lines from the antenna monitor to make measurements. The one thing we hadn't checked was to make sure the connectors were tight back on the antenna monitor. Lesson two: After doing work like this, make sure you double or even triple check the connection. Had we done this that previous Friday, we would have found nothing wrong with the antenna system; the problem was a loose connection on one of the tower samples.

Since we didn't know where we started to begin with, we had to guess. We found a spot on the coils that had things right, but the reactance had no more turns in the coil and the transmitter was very unhappy with modulation. We decided to drag out Big Bertha, the HP Network Analyzer, and connect it to the common point in the phasor. Watching the analyzer, the problem was apparent: the load was very narrowband and had the cusp oriented the wrong way.

Knowing that tower 2 was the problem, we began looking for another spot on the power divider and phase shifter network coils where the operating parameters were correct and the load looked good. This is most likely where we started to begin with. While this proved to be a complete pain it was something I hadn't dealt with, so I got to learn how to use the network analyzer in regards to adjusting an antenna system. I saw how my dad moved the clip on the coil for the reactance and was looking for the line on the analyzer to make a specific backwards C shape. It took him a while to find the right spot, but once he did, we were able to tune it all in. The load, when we were all done, was quite a bit better than it had been after the system was originally installed and tuned up.

### **KLTT Cube Failure**

We had yet another cube failure in the Nautel NX50 at KLTT. This makes the third cube failure in four months. We immediately tested the fuses and found one was blown. We replaced it and

put in the filler cube (which maintains proper airflow over the remaining power modules with one out of the transmitter) while we waited for Nautel to send out a new cube. It arrived within a couple of days. When I put it back in, Nautel wanted me to bring the transmitter up slowly. So I started out at 0 kW and slowly made my way up to 50 kW. Everything came up with no issue.

At this point and after performing post-mortem examinations of the failed cubes, Nautel believes that drive to those particular modules was lost while PDM remained. Things get ugly in a hurry when that happens. So they are sending us a new wiring harness for the drive and PDM cables. I can't wait to try and replace that!

### **Bridge-IT**

We received our Tieline Bridge-IT IP codec last month. I installed it in the rack and connected it to the network and the bridge router, but right now am in the process of reading the manual before I do anything else with the unit. I want to make sure I have everything figured out before I put it in play. I am looking forward to using this unit for remotes in the future. I do think in some ways, it will make things a little more difficult (it will be a learning curve), but in most ways, things will be so much easier. Who would have thought ten years ago that we'd be able to do remotes using a smart phone?

### **A Look Ahead**

Spring is here. That means severe weather in some areas. While I always look forward to spring (and this year I am looking forward to possibly getting out with my husband to do a bit of storm chasing – safely of course), I am *not* looking forward to the inconveniences storm season brings. The periodic transmitter site power outages, squall lines taking down the signal completely and possibly lightning strikes... the list goes on. I pray everyone has a safe season with few issues due to spring storms.

By the next edition I hope to have some of our new APT Horizon Nexgen codecs, which are on order, installed and working. Some of our old Harris Intraplex codecs are in desperate need of replacement. I also hope to have the Bridge-IT installed and working. We would also like to have started on replacing the contactor switches at the KLTT transmitter site. This will be a several month process, but we have to start somewhere.

That about wraps up this edition, so until next time... that's all folks!!!



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The Local Oscillator  
April 2013

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

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

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

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

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

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

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

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

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

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

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

**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*

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

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

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

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

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

**WYRB • Genoa - Rockford, IL**  
*106.3 MHz, 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*

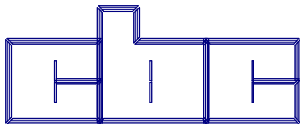
**WYDE-FM • Cullman - Birmingham, AL**  
*101.1 MHz, 100 kW/410m AAT*

**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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