# The Local E Oscillator

The Newsletter of Crawford Broadcasting Company Corporate Engineering

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#### **Tower Light Monitoring**

Remotely monitoring tower lights on baseinsulated towers has long been a challenge for broadcasters. Those that employ lighting chokes have the advantage of a (somewhat) direct connection between the AC power circuit and the lamps on the tower, but those that use Austin transformers do not enjoy that direct connection. Even lighting chokes often cannot provide independent sampling of beacon and marker lamps if the lighting controller is located on the tower.

As we have moved into the LED tower light era, additional challenges have arisen. LED tower lights consume so little power that detecting the current drop from a non-functioning 40-watt beacon (or much less a 7-watt marker) is like splitting hairs. Such small current shifts are often hidden in the hysteresis current of the Austin transformer, making them impossible to detect upstream.

LED retrofits that run each beacon and marker off an internal (to the lamp) power supply consume more power than pure LED systems, and we have had some success in monitoring such retrofit systems upstream by simply looping several turns of the AC conductor supplying power through an SSAC (or other) lighting sample transformer. Doing so multiplies the sample voltage and the delta by the number of turns, and since current is so low in such circuits, a small gauge wire can be spliced into the tower light AC power feed without significant loss, making it physically possible to get several turns through the sample transformer.

Pure LED systems, at least some of them (such as the Dialight system we use on the KBRT towers), are so efficient that there is virtually no measurable change in the 120VAC current being supplied to the controller and lights. The small DIN rail 5-volt DC switching supply that provides power to the controller itself pulls about 330 mA as a continuous load, and the 20W beacon plus the three 3.5 watt markers on each tower represent only a few hundred mA total, even with losses. So there is very little difference between the no-load and full-load current draw of the system. Add to that the hysteresis current of the Austin transformer and we have essentially a zero change in the upstream sampled current with lights on and lights off. What do you do with that?

I learned most of this at KBRT during the construction phase. We had tower lights operational from fairly early in the construction process, first running them off solar panels and deep-cycle batteries, then off commercial power as soon as we had it available at the towers. We tried SSAC LED tower light monitor modules without success for the above reason (no delta in the sampled current between lights on and lights off).

Slatercom, the company that manufactured the lighting controllers we use on the towers, provides monitor modules in the controllers that give a normally-open contact closure on fault in either beacons or markers. Once we determined that current sampling wouldnøt work, I knew we would have to somehow employ those integral fault tallies.

Getting those tallies across the base insulator was the challenge, and for that we employed wireless alarm equipment, placing a 900 MHz Part 15 transmitter at each tower and a multi-channel receiver in the transmitter building. When we would get a fault closure, the transmitter on that tower would come on, activating a contact closure in the receiver in the building which was in turn connected to the remote control systemøs status channels.

That all worked greatí but one thing I had not counted on was that our wireless alarm receiver in the transmitter building would also receive wireless alarm signals from all over the L.A. Basin and Inland Empire, some 2,900 feet below. The site (and the building in particular) is terrain shielded from the populated areas below, but there were enough reflections off the surrounding hills and maybe the towers themselves that regular false alarms were produced. Bill Agresta had to make a lot of visual checks of the lights to confirm that they were working when the remote control reported a failure 6 itøs a good thing he can see the towers from where he lives! Without a viable alternative, we lived with the problem for several months.

At the NAB convention last spring, I visited the Slatercom booth and talked with Mike Slater. He showed me a new product his company had developed that uses fiber-optic cable to monitor the fault tallies across the base insulator. Having some experience with fiber-optic cable on AM towers, that got my attention.

The system employs a fiber-optic transmitter that is installed on the tower, either in the controller box or in another weatherproof NEMA enclosure adjacent to the controller, and a fiber-optic receiver that goes in whatever off-tower location you wish to place it. The two are connected together with a piece of duplex fiber that requires no connectors or special handling. Just cut the fiber with a utility knife or bypass cutters, push it into the receptacle and tighten the threaded compression connector.

I ordered four of the systems from Slatercom and they were delivered in early October. I made a trip out to California, and Bill and I spent a day and evening installing them. Instead of using the supplied NEMA enclosures for the receivers, I opted to mount the receiver boards inside the Kintronic ATUs, on the left wall just above the wire duct. That location was chosen because it was adjacent to the AC power outlet which was needed to plug in the supplied 5-volt õwall wartö power supply, and the four-conductor monitor cable we pulled in from the transmitter building was terminated in that location.

We were able to do much of the work during the day, marking, drilling and tapping the mounting holes and punching <sup>3</sup>/<sub>4</sub>-inch conduit fitting holes in the ATUs by working from the outside. I even managed to get all the receivers mounted while the station was on the air.

Once the station powered down to its 205watt night power we drilled and tapped the back plane in the lighting controller boxes, mounted the transmitters, disconnecting and removing the wireless transmitters, enlarging the ½-inch conduit holes to ¾ inch, running 100% PVC conduit from lighting controller box to ATU and pulling in the fiber-optic cable. Some towers were easier than others, and one was a real bear, mostly due to the location of the lighting controller box about three feet above my head as I stood on the base pier. By 10:30 PM we were done and had positive connections between each of the lighting controllersø fault tallies and the status inputs on the Burk ARC Plus remote controls.

It remains to be seen how well these units will hold up with lightning, RF and other environmental factors, but just looking at the design they appear to be robust. They work just fine with 50 kW applied to the antenna system, and with each end isolated from either the tower or ground, lightning shouldn¢t be much of a problem, either.

Going forward, assuming that these systems hold up well, I will undoubtedly employ them in other installations that have LED lighting and Austin transformers. They appear to be just what the doctor ordered.

My apologies for not having photos. I took a few of the completed installations but it was dark and they did not turn out very well. Next trip out I will get some shots during daylight.

#### **NX50** Power Modules

We have, since last December, been losing power modules in the KLTT NX50 at the rate of about one a month. Nautel engineers have been working closely with us on this, supplying us with replacement modules as needed. They have had us replace the RF drive cables and do some other things in the transmitter but the failures persist. These have all been õblue skyö failures, occurring apart from thunderstorms, power surges or other external causes, and in some cases they have occurred at night, with the transmitter operating at 1.5 kW. I am confident that Nautel will eventually figure this out. They are doing a õpost mortemö on each failed module to determine the cause. Hopefully a pattern will emerge soon.

We have had two NX50 module failures at KBRT in the last month. The circumstances are very similar to the KLTT failures, all öblue skyö events and in the case of KBRT, both occurred during lowpower night operation. My hope is that these two failures are õinfant mortalityö and not the start of a chronic issue as we have had at KLTT. I should note that the KCBC NX50 has had only one module failure in the several years it has been operating.

After one of the KLTT failures, I decided to try repairing the module myself. As it turned out, troubleshooting and repair was quite easy. Based on this experience, once we solve the chronic issue, routine failures will be dealt with in the field.

Overall, I am still very happy with the NX50. It is an excellent design with all the features I can imagine desiring in an AM transmitter.

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

Hello to all from Western New York! Where has all the customer service gone? It seems these days that more and more companies are

downsizing to the point that they can no longer adequately service their clientele as they should. How many times have you called technical support at XYZ Company (insert your manufacturer here) and be left on hold forever, or be told they would return your call only to wait hours at the transmitter site with no callback?

It s frustrating to the engineer with a station

off the air and little or no technical support available. Chances are, by the time they *do* return your call, you will have already figured out the problem and be well on the way to making the repair yourself. That is not to say that immediately calling customer support is a sign of being lazy or incompetent with your equipment. It is just that the technical support departments are usually well versed in their products and have at some point in time dealt with the same problem you are now experiencing.

There is a certain satisfaction in diagnosing a new problem and coming up with the right repairs on your own, but this usually takes time, and when you are off the air, time is of the essence. Several hours of off-air time could equal thousands of dollars in lost revenue. This not only applies to those companies that are heavily into technical support of the products they manufacture but to those who provide other products and services related to our industry.

We at CBC are fortunate in the fact that we have forged personal relationships with many of our vendors, and in most cases we can readily reach the correct personnel to handle our problem or situation. Those that readily come to mind are Telos-Omnia, Nautel, Continental Electronics and Crouse-Kimzey Company. These guys are at the top of their game. They realize that without customers, they have no sales, and no sales relates to no jobs/business.



Looking back over the years, I cannot recall ever having an issue with support/service from any of the above, and would without hesitation recommend

> them to anyone looking for their products or service.

Certainly, there are many other vendors we deal with from time to time, and that is not to say that their services are sub-par or inferior, its just that we have not created the track record over time that we have with certain companies. In today is economy, you have to fight for every dollar earned, and providing the goods and services in a

timely fashion at a price that is fair to the consumer, coupled with timely support, is a win-win situation for all.

Has anyone else noticed the downturn in Verizon service? Over the past year I have noticed that their service and support personnel are no where near the level it was. Previously, if you had a problem, it was addressed within hours; now it takes days to install new services or to have repair services to troubleshoot a problem. And if you have to contact the billing department with a dispute or problem, be prepared to play phone tag with at least five different departments. Regardless of where they send you, they are not responsible for handling your specific problem or services. Even they do not know what their job is!

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

Tower painting at the WDCZ transmitter site has been called off for the remainder of the year as cooler, wet weather has taken hold for the next five months or so. Don Boye was able to get three of the five towers completed this year, and he would have been able to rust treat and paint all of them this summer, but a late start deterred any chance of completing this year.

We were also scheduled to have the concrete foundations repaired and contracted a local company

to do the work. Numerous calls netted zero results. It was as if they just did not want to do the project, but were hesitant to tell us so. Each phone call resulted in, õI¢l call you right back,ö but that never happened. I had talked with at least a dozen companies that deal with concrete-foundation repairs, and all immediately declined giving a quote once they heard it was a tower foundation. I should have known something was up with the contracted company when it took them almost three weeks to submit a quote after the initial inspection of the scope of work.

Recently, I spoke with the former chief engineer of this site, the one who hired this company to do the original work on the tower foundations, and he stated that it took them almost six months from the time the contract was signed until the work was actually performed. Once again, so much for customer service! I have another contractor lined up for next spring to make the necessary repairs. My only hope is that we do not experience any further damage to the tower foundations from snow and ice.

#### WLGZ-FM - Rochester

We have entertained several contractors to look at the WLGZ-FM transmitter building to come up with a solution to our air conditioning problems we had over the summer months. In a nutshell, we have been advised that the best solution to our problem is threefold: one is to replace the aging compressor in the 4-ton Bard unit with a new one; secondly, drywall must be applied to the underside of the rafters, which will trap heat; and thirdly, we will install reflective insulation on the underside of the roof decking along with an exhaust fan capable of changing out the volume of airspace in the attic each minute. The bids are starting to come in, and hopefully we can begin to address this long-standing heat issue and finally resolve the heat problems which have plagued us the entire summer.

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 Aaron McEachern Chief Engineer, CBC–Detroit

Hello from Motown! This month I launched a ClearOS firewall in our building. From my understanding, most are using the Clear OS firewalls with one external network and one internal. I was looking for a one-box solution to our

multi-network problems, and I received a ClearOS server.

At our building we have Comcast cable internet and AT&T DSL. Our Comcast internet is much faster than the AT&T. The network was setup with our office computers and remote gear on the Comcast ISP with a standard Netgear wireless router and our NexGen and production computers on the AT&T using a WatchGuard firewall. With this setup, everyone using a production computer was stuck using the slow DSL or had to have two network cards installed to use the internet on the

Comcast ISP but still be able to use NexGen. With two network cards you had to disable one, let NexGen connect, then re-enable it to have reasonable internet speeds. With this setup, the PC is always trying to decide what network card it should use. Now with the ClearOS firewall, we have our two ISPs routed to the server. Comcast, our faster connection, acts as the primary connection and AT&T as the fail-over. This now gives us the

> reliability of both connections, and all of the equipment gets the fastest speed available.

On the LAN side of things, I have not done many changes at this point as I am rolling the new server out phase by phase. Currently, rather than using the Netgear router and WatchGuard firewall, we are using the ClearOS server, but the networks cannot talk to each other. The next phase will be moving the production computers from the NexGen network and allow them to connect to the NexGen server through Clear

OS.

To do this I will have two network interfaces on the same physical network, with two IP addresses. One interface will be internet only 6 this will be our default gateway. The second will be internet and

NexGen server access. Computers that need access to the NexGen server will be manually assigned an IP with the second network interface as a gateway. By doing this I can control what computers can communicate with the NexGen server, and what protocols they can use. With the Anti-Malware protection and this control and this setup we should have great protection from the outside world.

#### News From The South By Stephen Poole, CBRE, CBNT, AMD Chief Engineer, CBC–Alabama

Things continue to blossom and bloom in the great state of Alabama. Weøre meeting our goals, engineering has several big projects lined up in the next few months, God loves me, and life is beautiful. A special nod goes to WYDE-AM/FM, our

talk format(s), which are doing as well as they ever have. Thanks to our sales team, led by the inimitable Laura Scotti, weøre making money. Thanks to Leland Whaley and the gang on air, we have listeners all over Alabama. Advertisers are happy, because theyøre getting results. Itøs a beautiful thing. This is how radio is supposed to work.

#### The Connected House TM

Have you ever looked at your washing machine and thought, õI really wish that thing

could talk to me?ö You would think that this would only be true of that odd uncle who once rode on a UFO, wouldn¢t you? But a few years ago, we were told that *everything* was moving toward the Connected House (capitalized out of reverence).

Your appliances, your entertainment system and your computer would all be joined together in one giant wireless network, all lying to one another and allowing you unprecedented control. You would finally be able to show that blasted dishwasher who was boss. You could even scold your air conditioner! It would be a beautiful thing.

Now thereøs nothing wrong with connectivity ... when it makes sense. For example, I have an app on my Android that lets me view the video cameras at different sites. Thatøs useful. But the people pushing the connected house crowed, õYou could check your refrigerator from work to see if you need milk!ö

No, I shall continue to struggle with the old-

fashioned method of actually looking in said refrigerator to check the milk level at regular intervals. Call me a dinosaur, but I¢m not alone: most consumers have failed to see the allure of being able to order their hot water heater to dance a hornpipe, so

> the idea has mostly flopped. The only ones trying to do that sort of thing are X-10 hobbyists and geeks who, unable to dominate anything else from their basement control rooms, gain some small satisfaction in commanding a hair dryer to switch on and off ... by remote control. Wow.

# I Love Technology... But Be *Real!*

Look: as Iøve said here many times in the past,

Stephen loves him some technology. I always have, always will. I may be in my 50s, but Iøm young at heart when it comes to new stuff. We just upgraded Sandyøs netbook to a Galaxy Note. We love it. You canøt get digital enough for me.

But this doesn¢t mean that just because something can be done, that it should be ó or that consumers will actually want it. My brother is the consumer electronics guru in our family. JVC once flew him to Japan to see their new car stereo line. They were especially proud of the (then-new) handheld remote control that would come with their higher-end models. They asked brother Scott what he thought about it. He said, õMeh.ö They were quite disappointed; they expected him to dance with excitement. He tried to explain to them: õThis is for a *car*, people. Maybe you could integrate it into the steering wheel, like some manufacturers do, but a hand-held remote? In a *car*?ö

To this day, many manufacturers still throw

in these car stereo remote controls just because they can. The mass-produced, identically-programmed micro controllers inside the radios already have the capability, so they figure, why not? But most end users either ignore them entirely, or at best, lose them after a few weeks... and won¢t bother digging under the car seats to find them, either.

#### The Connected Dash<sup>TM</sup>®©<sup>SM(!)</sup>

I said that to say this: the Next New Thing, for us in radio, is supposedly the Interconnected Dashboard. You and I *must* be part of this revolution, or we shall wail and gnash our teeth when the rest of the industry leaves us in the dust. If you don¢t believe it, just ask Radio Ink magazine, which runs an article on this every other day now.

Again: Iøm not opposed to technology in general. I make my living surrounded by the stuff and I keep up with whatøs up as a matter of course. But I just donøt see this one. Loving technology doesnøt mean that I wonøt be skeptical at times.

Back to my brother Scott. I asked him what he thought and he said, õWhatøs a -connected dash?ø You mean where people can play their smartphones through the car stereo?ö Thatøs point one: folks, this guy has been buying and selling consumer electronics for decades. If anyone stays on top of trends, I assure you that he does. From him, two things became clear: first, the õinterconnected dashö thingie is anything but the latest trend. Very few consumers are demanding it, and of those, a simple õauxö jack on the car stereo will normally suffice. Second, what little he has heard about this has mostly been negative. Aftermarket car stereo folks actually hate it, because from their point of view, itøs just another attempt to lock them out of the dash.

Some auto manufacturers are tossing in dash connectivity as a bennie and a bonus, but very few people are going to say, õI will choose this Nissan over that Toyota because it has A Connected Dashboard!ö Most buyers look at things like price, gas mileage and styling. Theyød see a Bluetoothenabled, connection-ready dash as a neat feature, but it would not be a deal breaker.

Remember: industry pundits insisted that the 8-track tape player was going to kill radio. It didnøt. Then, they crowed that cassette players in automobiles would kill radio. It didnøt. The CD was going to kill us; same story. So please forgive me if I fail to run around with my hair on fire over this particular õLatest Thing.ö

Now, if youøre running a radio station thatøs essentially an automated, glorified juke box, yeah, you might be killed by new technology. But if you give people what they want, with personalities who treat the listeners as friends, you@l still be competitive, whether the Connected Dash ever takes off or not.

#### Free Market Research

Of course, I also suspect that some people really want access to your dash for another reason: tracking and data mining. Google has become one of the richest corporations in history by simply following people online and then selling that information to others. Imagine what a gold mine it would be for someone to know what you@re listening to, where you@re shopping and where you had lunch? The heuristics are improving all the time; they might even be able to determine what your mood was that day and target advertising to you on that basis.

What most people dongt seem to realize, though, is that you can do a good bit of õdata miningö yourself. If I was an account executive, headed out to meet a new client, yougd better believe Igd Google them first. Igd check out their Website. Igd even be able to gauge how likely they are to spend money on advertising *based on what that Website looked like*. Dry, dull and boring (or most telling of all, nonexistent)? Probably not going to spend money with me. But if itgs colorful, well-laid out and obviously done by someone who cares? That might be a different story. If nothing else, I could be knowledgeable about their business before I even walk in the door. That couldngt help but impress them.

I never make any major purchase now without doing a good bit of Web research. Sandy and I are members of Angieøs List; thatøs a great place to start, but we also Google and look for online reviews. Yes, youøl soon learn that many businesses write their own glowing reviews (õthis adorable little hotel, nestled in the foothills of the Schmuck Mountains, is a scenic paradise...ö). But those are easy to spot and itøs still worth the time and trouble.

And now for the zinger: as of this writing, you can Google õthe Dashö and youøl get some bands with that name. You can then search for õconnected Dash,ö and youøl get a few odd hits, but nothing that stands out. Finally, search for õthe connected dashboardö and youøl basically find Websites that are trying to sell you what you need for this Next Great Thing. No one else, and I do mean, õno one,ö is even talking about it. Case closed.

#### **Mail Server Woes**

A few weeks ago, I was in the middle of moving everything to a permanent home on our new

mail server when we had a glitch. Iøm still not sure what happened, but the old mail server, with all 50 Gigabytes of our mail data, had a major RAID failure.

I was annoyed, but I didn¢t get too upset. We had backups, after all. I back up our entire mail system at least once per week. But when I pulled up the most recent backup, it was corrupted. Itøs possible that whatever was glitchy on the RAID had corrupted it without me realizing it; I don¢t know. But at that point, I started to sweat a bit.

Moving to the next oldest backup, I carefully copied it over to the mail server. To copy 50 gigabytes of data takes quite a while (hours); it can¢t be done in a minute or two. When the copy completed, I restarted the system, saying a little prayer the whole time... and thank the Lord, it came up. We had lost several daysø worth of older mail, but we were up and running.

Of course, the first point here is obvious: keep backups, and the more the merrier. Unless you just dongt have the space for them, dongt automatically delete older backups, either. Keep two or three in rotation.

The second point is that RAID, while a beautiful thing, isnøt foolproof. If you think that just because you have a RAID array you donøt need to make backups, you are going to be badly burned someday. There are many reasons, but one of the most important is that if you have a hardware failure in the RAID controller itself, *the data on that entire RAID array could be corrupted*. For another thing, as I mentioned here a couple of years ago, several studies have shown that when one drive in a RAID array fails, the others are at about the same age and could very possibly die *before you even finish rebuilding the first one*.

RAID is nice, RAID is good and RAID is a beautiful thing, but it does *not* eliminate the need for regular backups. Dongt make the mistake of assuming that it does.

Thatøs it for this time. Until next month, keep praying for this nation!

#### Valley Notes By Steve Minshall Chief Engineer, KCBC

Consulting engineer Cecil Lynch went home to be with the Lord on September 5, 2013 at the age of 102. I first met Cecil at a four-tower AM directional facility under construction at Klamath

Falls, Oregon in 1980. The station was building a night facility to change their daytime-only station to fulltime status. The project had to be done on an extremely tight budget, and that was where Ceciløs expertise in economy made the project feasible.

Cecil had traveled from Modesto, California with a trunk load of coils and capacitors. I remember

him sitting in his car with a polar chart and some scratch paper. He designed the phasor and ATUs on the spot. He left us with blank aluminum panels and a bunch of coils, capacitors, and insulators. This was my first job in radio ó what a great way to learn, and learn I did! Not everyone gets to build a four-tower phasing system from scratch.

I found out quickly that Cecil often had a

unique approach to RF engineering. Conventional thinking would have put teenetworks in each of the ATUs. Cecil preferred õtuned autotransformers.ö Tee-networks are pretty straightforward and predictable, but the range of phase shifts and impedance transformations has its limits and the õQö is set by design. The tuned autotransformer is an entirely different animal.

The tuned autotransformer can provide a wide range of impedance transformation and phase shifts in either direction. The õQö can also be adjusted on the fly. I have used the tuned



autotransformer concept for broad-banding a common point with astonishing results using only a fixed inductor and a fixed capacitor.

The tuned autotransformer certainly has its drawbacks. Circulating currents and losses can quickly get out of hand. Calculations for tuned autotransformers are difficult as compared to teenetworks, and I surmise that this is one reason they have not been used much in AM antenna systems. I think that the concept is worthy of further consideration, especially now with computer modeling of circuits so easily done. Cecil Lynch did not invent the tuned autotransformer, but in my mind he is certainly a pioneer of the concept.

Another area that Cecil made a contribution to the broadcast industry was õSuper Modulation.ö Prior to 1973 there was no legal limit to the amount of positive modulation that an AM station could put on the air, and there were a few stations that took full advantage of that.

Cecil Lynch was instrumental in squeezing a new frequency into Modesto in 1963. Radio station KLOC went on the air with 500 watts on 920 kc. With only 500 watts, it was the lowest powered station in the area. However, at sign on it was by far the loudest station on the dial. Cecil had taken a 1,000 watt Raytheon transmitter and, with an outboard cabinet of extra iron components, seriously modified the high level modulation stages to provide extreme positive modulation while maintaining legal negative modulation levels.

Eventually Cecil developed low-level limiters that provided asymmetrical modulation for capable transmitters without the need for high-level modulator circuit modifications. By the early 1970s there was growing concern over excessive positive modulation, and the FCC stepped in to regulate the matter. The FCC requested comments and many were submitted. Cecil sent in a report of distortion vs. positive modulation with the finding that the FCC¢s distortion limits could be met at up to 140% positive modulation. The FCC eventually set the limit a little more conservative, at 125%.

Cecil Lynch is well known for doing the impossible. Sometimes this was manifested by squeezing a new station into an already crowded market. Many times it was building an elaborate directional AM antenna system for pennies on the dollar. Many broadcasters owe their start to Ceciløs generosity, imagination, and talent. Cecil helped me out a number of times throughout the years and he certainly affected the course of my life in a large and positive way.

Cecil has many stories to share. One of the most appropriate for this column is his involvement with the proof for (then) KBIG, 740 kc, on Santa Catalina Island. This was, up until recently, Crawford Broadcasting& KBRT. Being an AM directional station on an island, it was necessary to do much of the antenna proof on the ocean. Navigation was not what it is today. Armed with charts and a field meter several engineers boarded a boat and headed out to take readings on the radials.

The captain was shown where he needed to go for the first point. They traveled on the water for a quite a while and one of the engineers started asking if they were there yet. The big burly captain kept emphatically telling them  $\delta no/\delta$  The captain just kept looking over the water, nothing other than his eyes and a compass to guide him. Finally he brings the boat to a stop and plants his big hands on the shoulders of the impatient engineer and tells him  $\delta we$  are here!"

At his 100-year birthday, Cecil still lived in his own house and was still sharp and active. Almost to the end, Cecil spent much of his time corresponding with friends and writing letters to those that need his opinions and advise on a variety of subjects. Cecil enjoyed a long and healthy life. He will be missed by many.

Here is an interesting interview with Cecil at 98 years of age: <u>http://youtu.be/To5db8Q-K1w</u>

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

Greetings from Oak Flat! October was a rather interesting month as I continued to work out some minor bugs at our new mainland transmitter site all while trying to finalize our move from the old KBRT Ranch site on Catalina Island.

Jason Kardokus and his crew from Northstar Broadcast spent several days on the island with me, taking down our old towers, and that project went very well. It is always a pleasure to work with Jason and his crews. They always have their job well planned out and approach things with a sober mind, a lot more than I can say for many tower crews these days. As anticipated, all three

towers came down and were hauled away without issue and the job was completed on schedule. We posted some video of this event at <u>this link</u>.

Now comes the final cleanup of debris from the site. For this job we contract locally, but as the island has always dictated, this job only seems to move on õisland-time.ö I recently went to the island on the date the debris clearance was to be completed only to find the job was just getting underway. As I write this, it appears that õisland-timeö has set us and Iøm working hard to make sure there are no more undue setbacks. On one hand it has been a rather emotional

back by one week of normal time here in California

situation, saying goodbye to old friends, but at the same time I really want to put this job behind me so I

can focus more clearly on our new transmitter site and what is going on here on the mainland. Here we have projects building up as we now enter the õwinterö season. We have roads that need to be built up before the ground radials crossing underneath are exposed; we have minor system bugs to resolve; a new storage building that needs to be located, purchased and put in

place to keep our brush clearance and other tools and machinery out of the weather; and the list goes on. There is always plenty to do at the new site, but it is a great site to work at and I enjoy the many projects I get to do up there.

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







#### The Chicago Chronicles

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

Crime Sometimes *Does* Pay.... For the Victim! You@re going to like this one. About a year ago we began having a

problem with the exciter for the aux transmitter at

Soul 106.3. The thing would quit while on the air ó go out of lock ó and down the rig would go. It was getting less intermittent and more consistent. We switched in a spare exciter and called Nautel. This was our first NE-50 exciter, more than 16 years old at the time, so maybe it needed a trip to the doctor in its dotage. Nautel CS first suggested a repair of one of the modules. They

sent instructions. We followed the procedure and put it back in place. No improvement. We went back to troubleshooting and found another module with a possible problem. Nautel said, õLetøs send you a new one.ö They did, it worked for a little while but the problem again returned.

This time, they said õSend it in.ö We did. They kept it a month. They made a valiant attempt to fix the problem, burned it in, and sent it back. The box worked for about 30 minutes and quit again. I called Nautel back. They gave me a list of things to troubleshoot. At that point, I had a bunch of other priorities which needed attention, so I let that project go for a while. After all, I had a good working exciter in the aux rig at the time, and it was just easier in the short term to concentrate on other things. Cris came by in September and saw the situation, reminding me that after all, the earlier factory repair was still under warranty, and to get it back to them, so I did. That was late in September.

Almost a month went by. I began to wonder what was up with the repair, so I called Nautel to check. A few days later, the lady who coordinates the repair department, called back. She told me our exciter had been stolen off the loading dock. It was the first time that such a thing had ever happened in the history of the company. Crime had come to Hackettøs Cove.

Of course Nautel was absolutely wonderful about it all. Theyøre sending us a brand old exciter very similar to the NE-50 we had, and the best part of it is, theyøl make sure that it works! Nautel gets my



vote for their prompt, forthright and honest handling of the situation. And the thief? Well, that person gets a blessing in disguise of the knowledge that õcrime still doesn¢t payö ó an exciter which doesn¢t work

> and may never work right again, for all we know. And Cris, when I texted him about it, replied in two words: õProblem solved!ö Indeed.

A final note: I can¢t help but believe that Godøs Hand was involved in this, because God tends to make good come out of almost any bad situation, this one

included. Nor will you convince me that God doesn¢t have a sense of humor, because this whole situation has, It made both of us not just smile, but laugh.

#### Generator Exercise Timer Clock Issue, Revisited

A couple of years ago, I did an article in these pages about replacing the generator exercise clock/timer on our Onan emergency power generators. Iød first tried to order a new clock, but the \$500 price tag stopped me cold. I tried secondsourcing the timer through Grainger. They have them, they re made by LeGrand, but the price was still prohibitive. I was told by Cummins N-Power that the failure mode was that the internal backup battery for the timer was both unreachable and irreplaceable. I didngt have time to fool with it at that point, so I went the next best route and used a programmable home furnace thermostat to do the job. For about \$35-50, it was a pretty good choice. I eventually replaced all those old timers with them, and that as where the situation sat until I ran across my stash of the older LeGrand timers recently and got curious.

The Cummins folks had told me that the timers were non-serviceable. That suddenly became a challenge to me. So I endeavored to open the unit up. After all, it wasnøt potted. When I got inside, I found out what the battery really was, and why it was allegedly non-serviceable. Of course it can be fixed. The part is available through Digi-Key: a .22 <u>Farad</u>, five volt capacitor!

Hereøs the recipe: You will need:

- Two small flat-head screwdriver (a -:greenieøis ideal for at least one of them.)
- Usual soldering equipment, including de-soldering.
- A .22 Farad, 5 volt capacitor. (Digi-Key SKU #283-2813-ND)



#### Figure 1 - Opening the case

The procedure:

- Remove the smoked plastic cover from the front of the readout.
- On the black plastic bezel of the readout are two screws at opposite corners. Remove these completely with the larger flathead screwdriver, and put them safely aside.
- Notice that the white plastic housing behind the readout is in two parts. On the underside (See figure 1) will find three small square-shaped holds. Use the -greenieøscrewdriver to push aside the tabs on the inside of the bottom of the white cover. This is best done by sliding the greenie down the part of the hole closest to the outside of the tab, then push the tab back toward the inside.
- With the other flat head screwdriver, carefully separate the two halves of the chassis near each tab hole. This may take some time, but in due course the chassis will separate. Do it right and you won¢t break the tabs during the process.

(See Figure 2)

• Once inside, you will find a circuit board with about 15 parts on it. In one corner you will find a small IC with four pins, which, is the bridge rectifier for the circuit board power supply, and a 100 microfarad



#### Figure 2 - 0.22F capacitor

electrolytic cap next to it. The .22 <u>Farad</u> capacitor, designated C3, is also next to the bridge rectifier, mounted on its edge. Unsolder, remove and replace that capacitor, put the unit back together, and it should work, keeping the clock running for the few seconds that it needs to be while the power is off.

• Reassemble the unit and put it back on line. Remember, both the  $\pm 10^{\circ}$ and  $\pm 0.00^{\circ}$  terminals connect to ground. The hot 24 VAC line goes to U1. The command to turn the generator on connects to U4, which is brought to ground via U1 when the clock activates it.

#### Finally...

If you are owned by a laptop, it is likely you have one of those little rectangular mouse pads in front of the keyboard for moving your cursor around, That is its secondary function. Its primary function, I swear, is to drive you nuts by doing terrible things to your work by causing functions to come up that you dongt want to happen, like erasing your work, and other such niceties.

I we found a fairly good cure by simply procuring one of those ubiquitous anti-static bags, the

kind used for storing IC¢s, cutting out of it a patch the same size as your mouse pad, and taping it over the pad. The sensitivity of the pad is thus reduced to an almost tolerable level. The incidents of out-of-control

operation are greatly reduced if not eliminated, and you can even use the joy stick more effectively, if your laptop has one.

Until next month, blessings to you all.

#### The Portland Report By John White, CBRE Chief Engineer, CBC–Portland

defects.

Restoring an RCA WX2 Filed Strength Meter Last month I addressed tower detuning, a

subject I will return to next month. This month I

want to describe the restoration of an antique RCA WX2A Field Strength Meter I recently had the opportunity to rescue and restore. This instrument is 60-plus years old and the forerunner of the Nems-Clarke 120E. The RCA WX2 is a rebranded instrument also built by Clarke Instruments Company.

Step one in the restoration was to obtain documentation. That proved difficult as little if any

documentation sources were found for the earlier RCA version of the meter. The second best option was documentation for the virtually identical but not *exactly* identical Nems-Clarke 120E.



When received, the meter contained a good receiver B+ battery and fair calibrator B+ battery. After installing a new set of A batteries, I was ready to proceed to step 2, a power-up check. The instrument did power up and weakly receive signals. The lid antenna was making intermittent contact and both the calibrator and received signals indicated gain was at least 20 dB low. Those results indicated a need to disassemble and determine the cause of the



Upon disassembly, I found a violation of Pet Peeve Number 1. It seems that the previous

disassembly procedure used was to remove all assembly screws, throw them in a random box of screws and retrieve only one of the original screws for reassembly. Further, no two screws were to be of the same type. A trip to the hardware store provided suitable replacement screws of a type consistent with the original.

Once disassembled, the next step was a thorough visual inspection. The inspection found the FI meter series resistor replaced with a much smaller value, apparently in an attempt to increase sensitivity. I replaced that with the correct value. Other items noted were the lid activated power switch was missing and bypassed along with several mechanical problems.

The largest problem was the lack of gain, so I started with that problem. Referring to Figure 1, the block diagram, the meter is a basic super-heterodyne receiver with a three-stage IF. According to the manual the IF frequency is õ455 kc,ö a common IF of the era. (For this discussion I am using kc, the original nomenclature of the era.) The magic of this instrument is the loop antenna, which I will discuss later in the calibration discussion.

A check of the DC voltages showed nothing unexpected or unusual, so it became necessary to keep looking. For further evaluation I decided to check gain stage by stage.

Beginning with the last IF, I injected a signal at the plate of the previous stage (see Figure 2). My signal source is an IFR service monitor with a 50-ohm variable output. I used a clip lead and a 470 pF voltage blocking capacitor. Removing the

tube from the previous stage, it was easy to insert the capacitor lead in place of the tube plate pin.

Working my way back from the last stage, I found stage gains between 20 and 30 dB. Overall the gain from the mixer plate to the meter detector was in the neighborhood of 80 dB with the FI switch at 100 uV. Those numbers seemed quite normal. Moving from the mixer plate to the mixer input I found no gain. Typical mixer gain is in the 30 dB neighborhood, so I had isolated the general area of the fault.

After several checks showed nothing of note with the mixer input, I decided to look at the IF alignment. My IFR has a spectrum analyzer with tracking generator, which is very useful for alignment. A clip lead near the IF transformer output served as an analyzer pickup. The tracking generator signal was injected at the input to the vacuum tube grid of the stage. (The 50-ohm signal source output will load the high impedance of the IF transformers.) The third, second, and first IF staged were found at 448 to 446 kc. The mixer IF input stage transformer was tuned to 424 kc, the low end of the adjustment range.

All of the IF stage outputs were retuned back to 455 kc with no problems. (The IF stages are capacitively tuned in the WX2A rather than permeability tuned as in the 120E.) The mixer output stage would not and could only adjust from 415 to 429 KC.

Figure 3 shows the mixer output IF transformer. The components L12 and C20 make up the frequency-determining components with very little to go wrong. Note also C21 and C22, which form a voltage divider to the input of the IF attenuator. These components also influence the resonant frequency.

Next month, we will discover what caused this problem and how the meter can be calibrated. (Thatøs known as a õteaseö in the radio biz.)



**Figure 1 - Block Diagram** 



Figure 2 – Tracing Gain through the IF



Figure 3 - Mixer Stage and IF Attenuator

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

#### NX50 Module

We had yet another failure of a module in

the Nautel NX50 transmitter at the beginning of October. It happened in the middle of the night, no storms, no reason for it to fail. The logs didn¢t show any type of power event to cause the issue. We called Nautel and they shipped us a new one as usual. While we waited for the new module to come in we decided to troubleshoot the current module. We found to repair it was much simpler than the modules from the

ND50. We now have a working spare so if another module fails, we can send that one in and already have put the spare in.

#### **NX50 Reset Switch**

If any of you have touch screen Nautel transmitters, you may have had issues from time to time with the screen responding very slowly, if at all. When I first encountered this, Nautel gave me a simple solution: short the reset terminal on the control board to ground. If you open the front of our NX50, the top board has a row of wires going into screw terminals. One is reset one is ground. So anytime we had the issue I had to take a wire and carefully touch the screw for the reset and the screw for ground. While this has worked, it was a little dangerous. How easily I could have touched something else and caused a real problem. We decided to buy a SPST momentary switch to put in line with this so now, all we have to do is push the button and the AUI will reboot.

#### **RF** Contactor Replacement

We finally got some time to replace another of the RF contactors in the phasing and coupling system at the KLTT transmitter site, this time at tower 3, right behind the building. The job went fairly fast, so when we were done, we decided to do some other work inside the building. Something to keep in mind here ó originally my husband was going to join me. We were going to work on the prairie dog



population after I finished replacing the switch. We made another commitment so while he stayed back to

finish up what he was doing, my dad decided to go with me. He wanted to do some work at the site for a while now, and it is off-air work, so what better time, right?

When he opened up the center bay of the phasor he saw a mess and immediately thought I hadnøt cleaned up the last time the night common point capacitor went kaput! Wrong! He quickly realized

something else went wrong and the current night common point capacitor was split in two. Wires were black, the wire duct was warped, and there was soot and solder everywhere.



#### Figure 1 - AUI Reset Switch

We are still unsure of what exactly caused this. Our best guess is that it was some sort of power surge at the site that resulted in 50 kW being fed into that network (it is interlocked to 1.5 kW, so that shouldn¢t ever happen).

So now the plan is to put in another

capacitor and a series fuse to help in the future. This will be the third capacitor in a few years that has blown up. Mind you, the last two times were human error. We are hoping to fix the issue with a fuse in line.

#### **Network Analyzer**

It looks like our õbig boyö HP network analyzer has finally kicked the bucket. At least for now. It dates back to the 1980s. We were going to use it to touch up the diplexer filter tuning out at the KLDC transmitter site one day, but when we turned it on, all we had were lines across the screen and none of the front panel buttons did anything. We opened it up and tried to find the issue, but nothing seemed to work. After doing some research I finally found one place in Wisconsin that can work on it. Hopefully we can get it working soon as it is a very important piece of equipment for us.

That about does it for this month, so until next timeí that¢s all folks!!!

KBRT • Avalon - Los Angeles, CA 740 kHz, 50 kW-D/0.2 kW-N, DA-1 KCBC • Manteca - San Francisco, CA 770 kHz, 50 kW-D/4.3 kW-N, DA-2 KKPZ • Portland, OR 1330 kHz, 5 kW-U, DA-1 KLZ • Denver, CO 560 kHz, 5 kW-U, DA-1 KLDC • Brighton - Denver, CO 1220 kHz, 660 W-D/11 W-N, ND KLTT • Commerce City - Denver, CO 670 kHz, 50 kW-D/1.4 kW-N, DA-2 KLVZ • Denver, CO 810 kHz, 2.2 kW-D/430 W-N, DA-2 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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