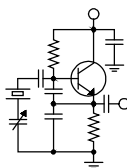


The Local Oscillator



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Measurements

In recent days, Amanda and I have been running around the urban and suburban landscape north of Denver making a lot of field intensity measurements. It looks like we will, in a couple of years, have to move KLDC, our 1220 kHz station, from the current leased site on Ruby Hill to some other location. The ideal plan would be to collocate it with KLZ and KLVZ-night, feeding one of the four 200-foot towers used for KLVZ, and from an engineering perspective, that would be pretty easy to do. Add multiplex filters at that tower and traps with 1220 kHz detuning networks at all the others.

The challenge is a first-adjacent-channel station up in Laramie, Wyoming. There is currently some overlap with that station, and we could maintain that overlap under the FCC rules, but we could not increase it. That would, on the surface, require a considerable power reduction for KLDC. That eleven-mile move north would otherwise create a lot of impermissible overlap if not for a power reduction to something under 400 watts.

But there is another variable in play that we need to account for, and that is the ground conductivity between the Laramie station and the KLZ/KLVZ-N site. There should be measurements on file for this, but COVID-19 got in the way. Before the pandemic ramped up, the FCC packed up for a move of its headquarters, including all those old directional proof-of-performance records. The FCC staff has since been working remotely, and there's no way they would in any event go digging through boxes to find those old proof files. So we have two choices: wait out the pandemic and the FCC move to obtain the old records, or go out and make new measurements ourselves that would supersede whatever is in the FCC's files.

While we have some time on this, we don't have a lot. Once we figure things out, do the

engineering and file the CP application, processing can take six months or more. Then we would have to order the filters, which will have a considerable lead time, and once they arrive, we would have to build out the facility. My guess is we would be long past the end of our expiring lease by that time. So the choice is clear. We have to get busy and do these measurements ourselves.

It's possible that the conductivity data won't be favorable for us, and if that's the case, we may have to hunt for another site. There are a few possibilities, none of which I am excited about, but we may have no choice. That will take even more time since we'll be working with a landlord and possibly other stations that we don't own.

And so it is that Amanda and I are spending a lot of windshield time making field intensity measurements, the first batch of which is for KLZ. We have the old (1962) conductivity measurements for KLZ, but back then the area north of the site was all farmland. Now it's urban and suburban, lots of asphalt and concrete. The conductivities measured 10 and 20 mS/m in 1962; they are measuring 10 and 15 mS/m now, at least to the northwest. We're hoping that they will be even lower to the north and northeast.

When we're done with those, we'll have to head north of the border into Wyoming to measure four radials on the 1210 station up there. I will likely measure the most critical radial, stop and plot the data and do a graphical analysis to see what the conductivity is. If it's favorable, we'll continue with the other radials. If it's not, we'll quit. There would be no point in continuing at that point; we'll be looking for a different site.

I've done a lot of AM field intensity measurements in my career, and as we were running radial measurements on the KLZ site toward the end of last month, it occurred to me how easy it is to

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make measurements these days. Back in the day (when I say that, Amanda rolls her eyes), I would start out with a stack of topo maps, laying out the radial paths in pencil on the maps and circling likely measurement locations. Then I would spend many hours in the car wrestling with those big maps that would keep trying to roll up, trying to correlate topo map features with actual streets and landmarks, measuring and making map annotations.

For the past couple of decades, GPS has made things much easier. I set up the radial paths as “routes” in my handheld GPS, reversing the route so the display shows the distance back to the site and setting up a display field for “off course.” Then it’s a matter of finding safe measurement locations where the magenta line crosses an accessible road, parking lot, cemetery, park or whatever, driving or walking until the “off course” display reads zero, then making the measurement, noting the distance to the site, the time and the measured field. All that can be done in a couple of minutes in most cases. It’s pretty easy to run four 30-km radials in a day – it takes about two hours per radial.

For those fortunate enough to have the new Potomac FIM, it’s even easier since the FIM has a

built-in GPS receiver. Just find the location, orient the meter for maximum signal and press the button – the field, location, date and time are stored in the unit for later retrieval. I am not fortunate enough to have one of those fancy new FIMs, but Potomac did loan me one once as a demo. Why I sent it back remains a mystery to this day.

GPS really has been a game-changer for modern civilization. Just think about it. We have navigation systems in our cars that will talk us through to any destination within the installed database. The airplanes I fly have (sometimes multiple) GPS systems installed, for navigation and automatic position reporting (ADS-B). With WAAS augmentation, we can use it for RNAV approaches that are almost (but not quite) “precision” approaches in FAA parlance. Our broadcast transmitter sites have conical GPS antennas on the roofs feeding (usually) integral GPS receivers in our HD Radio equipment and transmitters, providing date/time and carrier reference. It’s an amazing technology with many applications, not to mention the original purpose, which was military. I am thankful for this technology. It has certainly made my job much easier, both on the ground and in the air.

The New York Minutes

By

Brian Cunningham, CBRE
Chief Engineer, CBC – Western New York

Hello to all from Western New York! It’s been quite some time since we spent time together here in the pages of *The Local Oscillator*. Last month, just as I was sitting down to write my column, I receive a phone call that my mom had passed away unexpectedly, so my wife and I had to drop everything and pack up and head down to Kentucky to take care of her affairs. Her passing was just under six months after my father passed, so this year has been a tough one on many levels. That, along with the COVID-19 pandemic has seemed to turn our lives upside down, so we have really leaned on the



Lord to help us through these times. The only normalcy these days is found in my work, which helps me not to think of all that has happened this year. Many thanks to all of you who sent words of encouragement during our time of grief, you have no idea how much your reaching out meant to me and my family!

This summer has been exceptionally hot in the northeast, with Buffalo breaking many temperature records with temps near 100 degrees. We had 12 days straight of temperatures above 90 degrees, which is highly unusual, as we normally only have one or two

days a year at or slightly above 90. With all the extremely hot weather, we have managed to keep our sites cool with no A/C problems at all! Regular maintenance on all our air conditioning units has seemed to pay off, as I have learned different methods of servicing our Bard A/C units from our service company, Solly Industries. Mike Solly took several hours in early June to instruct me on what needs to be done to these units to keep them running efficiently and problem-free.

Right before the 4th of July, I managed to finally get the Nautel ND-5 that we purchased from WDCD in Albany delivered to the WDCX(AM) transmitter site in Rochester. I attempted to perform the frequency change from 1540 to 990 here in Buffalo at the WDCZ transmitter site, but the RF in the building from the two 5 kW stations operating from that site would swamp my test gear, making tuning all but impossible.

All of the frequency-dependent components were replaced locally, but I could not progress any further with all the RF. Then the pandemic hit, and with the lack of manpower due to social distancing, I had no help in getting the transmitter loaded up here and unloaded in Rochester. Once things calmed down, Zach Boron and Josh Meyers helped me load the transmitter onto a rental truck, and Earl Schillinger, Mark Shuttleworth and Ed Smith assisted in getting it unloaded in Rochester and also helped get the old Continental transmitter loaded to bring it back to Buffalo for cleaning and possible sale.

I have completed the new electrical work at the Rochester site along with RF connection into the phasor cabinet and grounding, so the final tuning should be completed the first week of August. It seems like we hit one roadblock after another, but there is light at the end of the tunnel! I will be so glad to mark this off my to-do list!

At the WDCX-FM transmitter site, for several weeks now I have noticed the reflected power creeping up on the Nautel NV40 transmitter. The reflected power normally reads 0 to 1 watt, but something happened inside the feedline and caused the reflected power to slowly begin creeping up.

Once it got near 100 watts, I called Mike Cortese at Northeast Tower to investigate the cause. Mike and his crew checked the 3-1/8" Helix from the point it left the building all the way up to the center-feed of the antenna, noting it was exceptionally warm all the way up. They broke the connection at the antenna port and opened it up to see if there were any signs of burning or arcing, with none noted. They did mention that they could tap on the outside of the coax and hear something loose, like crumbs falling inside the coax. What this could be is anyone's guess -- possibly beads of Teflon that have melted -- but nonetheless, there is a problem, as the reflected power is now at 160 watts and climbing.

Cris has ordered a new feedline, connectors, grounding kits and hangers which are scheduled to ship July 30th. JT Tower out of Clarksville, Michigan will be replacing the feedline when it arrives. I am curious to see just what caused this issue and the "crumbling" inside the coax.

I should note also that the antenna and feedline are pressurized separately, and both are holding pressure, so I would assume that moisture was not an issue in the failure. The feedline has been on the tower since 1979, making it 41 years in service.

I recall how fragile and brittle it was when Don Boye and I re-positioned it at the tower's base when I installed the new transmitter building in 2007. We had to be cautious to not kink the line when we moved it from the old building into the new Thermo-Bond building. In order to facilitate the transition to the new building, we had to remove the coax from the hangers almost 80 feet up to make sure that there was enough flex in the line to direct it 90 degrees in the opposite direction.

More to come next month after John Timmer and his crew get the new coax hung and connected.

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

The Motown Update
By
Mike Kernen
Chief Engineer, CBC – Detroit

Hello from Motown!

It's wonderful to be a part of a company that really understands what engineering brings to this business. It's easy to spout epithets such as, "Without *us* there would be nothing for *them* to sell," or my favorite: "No engineers, no radio station."

The truth is that management teams of radio groups often dismiss the value of engineers, even resenting our necessity – until one of their signals isn't there... then they look for someone to blame. What a contrast!

I'm quickly learning that we at Crawford *are* valued, and most certainly, we are respected. Cheers to that, more than just a nod to Cris, who has worked his whole career to create and maintain this culture, and to Mr. Crawford who has signed onto it. It's no wonder engineering folk stay for decades at this company! I must say that I've never felt more welcomed.

I'll dispense with the introduction, because we did that on a video call a couple months ago. But I do want to share some of my experiences over the past 90+ days. We've been BUSY!!

When I started, Cris told me of a few priorities in the Detroit cluster that'd be a breeze to complete. Actually, he never said "breeze," but they sounded doable enough: A tower that was a little wonky, a transmitter backplane needing swapping out, an STL power supply and a few audio issues caused, he thought, by the H-field from a lightning strike on the tower at the studio building. Cake.

I'd never worked as an engineer at an AM station before, so I studied material Cris kindly sent (and authored), which gave me a great foundation for my new job. Of course, God has his plans, and I'm good with that, but what I'm not fond of is how long it's taking me to give this little list the beat-down.

My grandfather always grumped, saying, "Everything you go to do is a PITA!" Here I am 35

years after his passing, remembering this diminutive Ford MoCo vehicle crash-lab technician's stories of frustration. Three trips to the hardware store were a

minimum for any project, and he'd always end up digging through the nuts and bolts drawer for something else. Metric fasteners would have put him over the edge!

Make no mistake, I'm loving the challenges here, but wow, there are some doooooosies! Let's get started, shall we?

Before I started, lightning blew up lots of stuff at the studios. I had to run them all down and even found things that no one had yet discovered were not working. Things like headphone amplifiers that

were low/distorted and an STL that had failed-over to the backup and gone unnoticed.

This was not too difficult, except for the Part 101 11 GHz STL that got smoked. The interim contract engineer had not noticed that its power supply was dead before calling in a crew. I'd have loved it, too, if the replacement UPS board had been clearly labeled (for this 48V UPS power supply) that it doesn't 'kick on' till you feed it 53 volts DC.

One other thing I discovered, unrelated to the lightning damage, was that the studio monitor speakers were connected out-of-phase.

The wonky tower at the 1340 site is, after months of poking and prodding everything we could on the tower, ATU and TX line, fixed. Once I finally started suspecting the phasor had issues, it was a lengthy but straightforward process to fix it. That thing was a t-total mess, and I worked hard to get it sorted out and back in shape. Bad RF contactors, sprung rollers on the ribbon roller coils, frozen roller coils, knobs that were impossible to move, wiring issues with the interlocks, burnt out bulbs. I've now fixed all that stuff, and the station is now back on the licensed pattern/power and modes.





Fixing the John Deere tractor...

Oh, and right in the middle of all those repairs, a lightning strike or static discharge took out BOTH PAs on the J1000 main transmitter at that site!

Because we were busy with other ‘stuff,’ the 1200 site, which has ten towers, developed an intermittent propensity to NOT complete its pattern changes. With ten towers, there are numerous RF contactors that must complete their travel prior to removing the RF inhibit signal from the NX50 transmitter. They nearly always all work, but sometimes, three to five of them will just refuse to move, meaning that the pattern switch is incomplete; off the air we go.

Naturally, when I arrive on site, everything looks fine. I even trained a security camera on the antenna control panel, but of course the stinkin’ security NVR doesn’t work right. Something else to fix.

In between these little projects, we have an old John Deere tractor that sometimes refuses to start

and has a mower deck that breaks off shear-pins. We had a T1 STL fail, an on-air phone system that failed (and of the two loaners that arrived, neither were operational), and a laundry list of things that are shoddy, broken, neglected, flooding, too hot, too cold, or just abandoned (but still turned on).

These are some bullet-points of the last three months. Next month, I hope to share something useful or helpful, but as you can tell, I’m busting my hump just to get outside of these “few” priorities.

Cris has been super supportive and has already managed to teach me enough to feel confident and to really enjoy engineering the AM stations, when I can find a screwdriver. Though this has been a bit daunting, I’m super excited about getting things to where they should be – professional, comprehensive, and most of all reliable.



Overhauling a cranky 40-amp RF contactor...

As Roseanne Roseannadanna always said, “It just goes to show ya... if it’s not one thing it’s another. It’s always something!”

News from the South

by

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

Well, OK. July had an unexpected twist for me. I had scheduled a couple of vacation days to look after Sandy, who had another arthroscopic procedure on her knee in mid-July. As is usually the case, Sandy is really blessed (and I appreciate the prayers, by the way!). She recovers pretty rapidly from most surgery, even some stuff that would probably have me curled on the floor with my eyes squeezed shut.

However, I didn't get to look after her as I'd planned, because the day after her surgery (the 15th, Wednesday), I started feeling pretty bad. Nauseous, tired, with pain in my abdomen and on my right side. For years now, I've had spells of very annoying cramps and pain that would come and go. This one came and stayed, so on Thursday, I called in sick and drove to the UAB Emergency Department in Gardendale.

Here's something to keep in mind, especially at clinics that are staffed by Nurse Practitioners and Physician's Assistants. Nothing against these folks; some of them are very good. But speaking generally, Sandy and I have found over the years that they're best with a straightforward diagnosis and treatment. Ear infection? Fine, take these antibiotics and go home. They also follow The Book to the letter. That's probably a good thing in the long run, because I don't want a Nurse scheduling me for brain surgery on a hunch.

This time, though, I was bitten by the fact that I was complaining of pain in my abdomen and chest, primarily around the diaphragm. As soon as I said, "chest," they went all-in on a possible heart attack. I was immediately connected to electrodes and given an EKG. They told me it looked OK. They drew blood and said my Troponin level was "slightly elevated." (Their words.) That worried them, because high Troponin levels in the blood could indicate a heart attack. They kept me in bed in the emergency room for hours watching that. In the meantime, the ibuprofen that I had taken before driving in had worn off. I began feeling worse and worse. The pain was getting to the point that I couldn't find a comfortable

position.

They wanted to admit me to the main UAB hospital downtown for "cardiac observation." I told them just a couple of days ago, I had walked about 1/4 mile while Sandy was in surgery and never even breathed hard. I also told them that I had been popping ibuprofen like breath mints to help with the pain; that can raise the Troponin levels. Not at all happy with their diagnosis, I finally told them I was going home and would go to the Ascension/St. Vincent's emergency the next morning.

Anyway, long story short: you know what else can raise Troponin levels? A bad infection – which, it turns out, I had in my gall bladder. St. Vincent's also checked my Troponin and ran an EKG, but the doctor who saw me said that my white blood cell count was very high. They took me back for a CAT scan and said my gall bladder was badly inflamed and swollen and recommended that I have it removed. In the interim, they put me on intravenous antibiotics, and I had already started feeling a lot better before they wheeled me up to a bed in the main hospital.

Saturday, I had the surgery. Sunday, I drove myself home without a problem. The anesthesia freaked me out a little bit – for a couple of days afterwards, I would see random text switching and shifting around in my vision, and I would hear perfectly clear music that wasn't there. But thank the Lord, that went away, and I now feel much better. Again, thanks for the prayers.

You know me: I always like to learn a lesson. Never forget, you are ultimately responsible for your health care. You should certainly listen to your doctor and take their advice strongly. You should also be careful about using the web to diagnose yourself; that's (at best) hit-or-miss. But in my specific case, I saw the symptoms for a bad gallbladder (especially the pain on my right side) and decided to get a second opinion. I did, and it panned out.

To be fair to UAB (one of the best hospitals in the world), I have to believe that they would



eventually have seen the gallbladder infection. But it's also possible, however unlikely, that they could have kept me overnight, sent me home with some pain meds, and my gallbladder could have ruptured. Then it would have been a major medical emergency. God was looking after me.

Pumpkin Center Gets A Backplane

I mentioned this last month. Not long after the July *Local Oscillator* was published, I received a replacement backplane board from Nautel for our NV3.5 at 92.5 in Pumpkin Center. I had heard some horror stories about replacing the backplanes on other new Nautel models, but this one turned out to be cake and ice cream. I switched us to the older Nautel FM5 to stay on air while we worked.



Figure 1 - A bunch of screws had to be removed, but otherwise, not a big deal.

As is typical of RF equipment, you have to remove a thunderin' bunch of screws. The illustration in the manual wasn't too clear to me (and that's probably me), so I pulled out a couple of the wrong screws. Fortunately, I was able to get them back in and remove the correct ones. Nowadays, I always take pictures of everything before I get started. Smart phones have made our jobs a lot easier. I also marked a few plugs that I suspected might confuse me. Armed with everything and a blank chassis, I stuck the new board into place. All in all, it only took an hour or two (and I was taking my time).

When we fired it up, though, it gave me a communication error. The funny thing was that the transmitter would come on and would make normal

power. It sounded fine, too, HD and all. But I didn't want to run it like that, so I called Nautel support and talked to Ryan and Adam. I was told to check the switches on S1 (Figure 2). They looked right, so I wasn't sure what to do. Just to be safe, I put us back on the FM5 and headed home to ponder on things overnight. Adam then emailed me the suggestion that I might need to toggle the switches a few times; maybe they'd gotten stuck in shipment. That fixed it. We're back on the NV, sounding great, full HD.

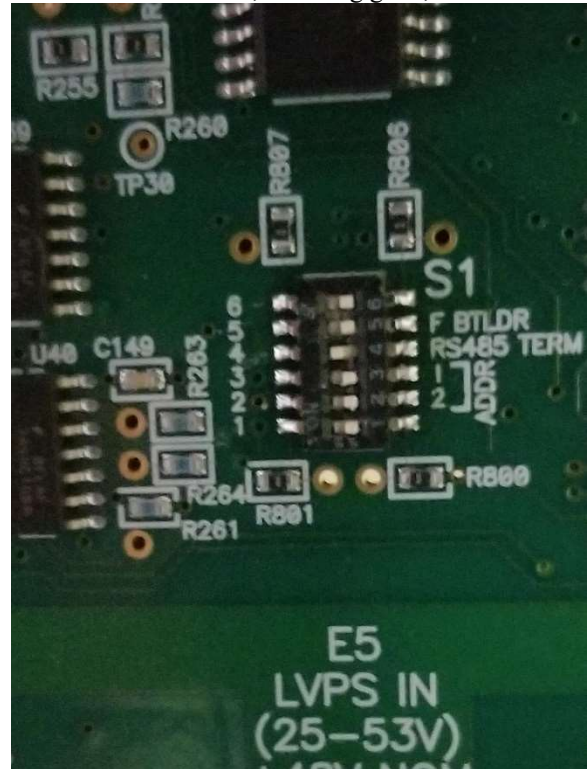


Figure 2 - This little rascal hid from me. Hurt my feelings.

That switch block is fun to find, by the way, especially for those of us with old eyeballs. It's a tiny, surface-mount DIP block that looks like a chip unless you're carefully scanning with a good light. Figure 3 shows where he's hiding. The individual switches are very small, too; ideally, you'd use a very fine point to slide them back and forth. Even the small-tip screwdriver that Nautel includes in the auxiliary kit was almost too big unless I cocked it sideways.

Times Are Changing

Figure 3 is something of a sad sight. The old BE FMi that we used for HD for many years is to the left; that one, I won't miss. But the rock-solid Nautel



Figure 3 - The one on the right was a thunderin' workhorse for 20 years.

ND2.5 on the right chugged along, never complaining, for 20 years here in Birmingham. I've got it pulled apart for cleaning (I took this picture right after we moved it), but I have no doubt that I could connect AC power and audio and be back on air in short order. Nautel makes some good transmitters.

Over 20 years! We started the build of the new 850 AM directional system back in 1999, right in the middle of the Y2K circus. As I recall, it was ridiculously hot, the ground was so hard it kept throwing the chain off of the Ditch Witch, and we drank so much iced water and iced tea, it's a wonder we didn't float away. That was one evermore hot job.

We also had a problem for some time getting the system to tune properly. That's when we

discovered that the prior consulting engineer, who shall remain nameless, had played games with everything – for example, he found that the system was far more stable with one of the towers completely inverted in phase. The fact that this was almost as legal as a \$3 bill didn't slow him in the least. He also mis-measured the lengths of the coax runs to the tower bases, so to get the thing into pattern, we were dangerously close to the max on some of the tee networks.

Because Cris designed our system based on that consultant's numbers, the ATU for tower #1 had the wrong components in the output leg of the tee network. He caught that on one of his many trips to Birmingham to help us get the thing running. Ah, memories, memories.

Tired of The Pandemic

Nothing else to say about this. I don't know about you, but I'm ready for this thing to go away. It has become pretty obvious that, unless you're elderly or have serious health issues, it's not a big deal. You will feel bad for a while, then get over it. It is nowhere near as deadly as the media keeps honking. I've never seen anything like it in my life.

As many other people have noted, it's easy to find people who either don't understand the guidelines, or just don't care. (One of my nurses in the hospital wasn't wearing a mask. I asked her why; she said, "because they don't work." Ah. OK.) People bump and crowd into each other in the stores, and you have to believe that a simple cloth mask isn't a force field that will protect you from dunces.

Nonetheless, I wear a mask and I'm constantly hand sanitizing. If I see someone coughing, I stay away from them, mask or not. These are things I've done for years during flu season. I'm not so much worried about myself as I am Sandy. I don't want to bring it home to her. I've been doing a lot of work at transmitter sites and can't wait for this whole pandemic thing to go away.

But God is still in control, and like you, I pray for this nation daily. Until next time!

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

WPWX Aux Site Project

At the time of this writing, we are still waiting for the tower crew to arrive any day now to install the new transmission line on the tower. This is the final step that will enable us to use the newly installed Nautel GV20 transmitter at higher power level to broadcast the WPWX signal from the WSRB tower in an emergency.

We have finished the installation of the 3-1/8 inch transmission line on the inside of the building, so when the tower crew is finished, we can then test to see just how much this signal will serve us in emergency and high level maintenance situations.

I am very excited about getting this completed, as this has been a goal of mine since I became Engineering Manager at the Crawford Broadcasting Chicago cluster.



system to the Wheatnet AoIP system. While we are making this conversion this also means we are moving on from the 15 year-old G5 Control Surfaces to brand new Wheatstone LXE Control Surfaces.

Since we are doing that we might as well change out the very old studio cabinetry. So, in reality, this is pretty much starting from scratch in these rooms. We began working a few weeks into July on getting the first room converted.

We picked on WYRB first, which is our Rockford, Illinois, station. I did that because their operations are the simplest, they basically do nothing but music from automation and use Vox Pro to drop-in jock talk. So, they would suffer the least being a long time in the small auxiliary control room.

This would give us the opportunity to move slowly on the first installation and learn the new Control Surface installation without a lot of pressure due to staff and clients complaining the about the inconvenience of being in the smaller control room.

The reality for the staff of WYRB is the auxiliary control room is not much smaller than their full-time control room. This has also meant the new furniture/cabinetry had to be compressed to fit in this room. Our supplier, Rob Smit from Designcraft, did great work customizing the furniture I liked to fit into the smaller space.

Again, at the time of this writing we are nearly finished with the installation. I have used the time it is taking to learn to program the new LXE surfaces. Just about every button on the surface is programmable. That being said, most of them will probably stay as they came programmed from the factory.

The soft keys are not programmed, and I am primarily using them as source select buttons for the associated fader. In short, they will work similar to the A/B input select buttons a lot of boards and mixers have hardwired to them. But we are not

Wheatnet Conversion/Studio Rebuild Project

The big project this year for the Chicago Cluster is the conversion of the remaining four Control Rooms from the legacy Wheatstone TDM



LXE/Wheatnet installation in progress in one of the control rooms.

limiting ourselves to just that function as they can be used about any way you could imagine in the LXE/Wheatnet world.

The other part of programming this first surface that took a bit of time to learn is the SS8 button module we had installed. I wanted larger buttons that would be use for peripheral functions that our operators have to do often. The biggest thing I like is a big button for the delay dump function.

I want the operators to be able to find the button easily and quickly when they are in the panic mode of an obscenity possibly getting to air. Using the dump button is something they don't do every day or often at all, so there is no muscle memory involved. The easier the button is found in panic mode, the better.

The SS8 module was a good choice. It has large, programmable buttons that also have tally functions. The fun part is that it has configurable displays on each button that can be programmed with two pictures for the differing states from an external opto.

For our dump button, I chose to use the famed poop emoji. This was suggested as a favor to Jay Tyler from Wheatstone when I told him I was using one of the SS8 buttons delay dump. The poop emoji is smiling and happy when the delay is built up and ready for use. However, the second picture is showing a much-panicked poop emoji when the delay is not ready for use.



A cool feature of the LXE is the ability to customize pushbutton graphics, such as this "dump" button. Left is the button with the delay ready; right is the same button, not ready.

Some of the other buttons being used are for remotely opening the gate to the parking lot and unlocking the back entrance to the building to allow clients and guests into the building off hours. I actually used pictures I took of the gate and back door for the buttons. I have one picture of them closed and the other open. These are just a few of the ways that you can be creative with this module. I am sure I will wake up in middle of the night with a few more creative ideas on these buttons can be used.

I am very pleased so far with how this project is going. While staff has not used the new setup yet, they are very excited with what they are seeing.

Valley News
By
Steve Minshall
Chief Engineer, KCBC -- Modesto

COVID-19 cases are on the rise here in California's Central Valley. In fact, we are a hot spot on the map. Fortunately, the virus has had little impact on our operations at KCBC. We only have one full-time person, one part-time person, and me, the contract engineer.

Mitigation is pretty easy since we tend to work at different times, and in different spaces, making social distancing quite easy. Wearing masks when appropriate, wiping down keyboards and surfaces, and washing hands is what we do. So far so good.

In my last submission to *The Local Oscillator*, I gave a brief account of the upgrading of our ND50 auxiliary transmitter with an AM IBOC exciter and an Exporter Plus. What should have been a very simple upgrade turned into quite an ordeal. We had some software and hardware issues to overcome. At one point, the power supply in the AM IBOC unit partially failed, which caused considerable confusion.

Fixing one transmitter problem is usually a straightforward troubleshooting problem. However, when you have multiple problems pop up at nearly the same time, it really does confuse the issue. At one point, an on-air noise introduced itself. It sounded similar to a periodic arcing as heard on the stations on-air audio. The noise turned out to be some DC bypass capacitors in the RF driver section of the "A" exciter chain. Years ago, I had a failure of these same capacitors, so this time around it was one of the first things I checked.

Having replaced the RF bypass capacitors in the RF driver assembly, I thought we were back in business for wrapping up the project, but that was not to be. While testing the transmitter, it suddenly lost all RF output. Switching to the B exciter, output was restored, so that narrowed down the problem considerably. Probing around in the exciter drawer with an oscilloscope, I found that the crystal oscillator was not putting out a signal. Because the exciter a chain is driven off the AM IBOC external

exciter, the carrier frequency is not dependent on the crystal oscillator. However, the pulse duration modulation does use a divided-down frequency from the crystal oscillator for the PDM frequency.

The crystal oscillator does not have many components, and probing around I thought I had determined that the transistor was bad. I replaced the transistor and still had no oscillation and checking the removed transistor, I found it to be okay.

I took out both oscillator circuit boards and put them on the workbench with a bench power supply to make troubleshooting easier. I swapped the crystals between the two, and that brought the oscillator back to life. Moving the crystals between the two oscillator circuits, I was able to determine that the crystal was indeed bad. In all my years, I've never had a crystal go bad. Until then, at least.

I was contemplating what to do about getting a replacement crystal – they are not so easy to come by nowadays. I remembered seeing a crystal on the shelf in the spare parts cabinet, so I took a look. Indeed, there was a crystal on the correct frequency sitting there. I plugged it in the oscillator, and it worked. It was a bit off frequency and was not adjustable up to the exact frequency. Since this was not providing the carrier frequency, it probably would not have mattered, but I still wanted to get it on the correct frequency.

Looking at the crystal holders, I saw that my replacement crystal was for a load of 32 pF, and the original crystal was 50 pF. I was able to lift one capacitor from the oscillator circuit and that brought the crystal within range to zero it on frequency.

How could I be so lucky to have spare crystal on the shelf? Well, a few years back, we retuned our old MW-1A transmitter and sent it to a struggling station in Honduras. Evidently this was the 770 kHz crystal removed from that transmitter.





A GPS antenna splitter allowed use of the single rooftop antenna for both exporters.

After all of these complications, the AM IBOC system is working great. We are now able to operate in HD mode along with MDCL, which makes our auxiliary transmitter a full back up in every way. The AM IBOC unit is a very neat device that can be operated in a number of modes, or in our case, a couple of modes simultaneously. Scrolling through the menu, there are some interesting things. I notice there is a setting to run C-Quam stereo. I did not see an FT8 option, but maybe that can be added in the future.

Since we now have two exporters in the rack, two GPS antenna feeds are needed. One option would be to put up another GPS antenna on the roof. I don't like going up on the roof if it can be avoided, and I don't like adding more electronic stuff on the roof than is needed. So, I went with option two. I purchased a GPS signal splitter and the appropriate cables. It is a nice and neat way to get the signal to both exporters while keeping the extra GPS antenna as a spare.



Yes, I wimped out and bought a feed horn cover online. No more wasps!

While I spent a lot of time working out the bugs in the transmitter, I also ran into another situation causing me technical issues. In this case the bugs were... bugs, or more correctly, wasps. Yes, wasps in a feed horn, how could you ever guess. Feed horn covers are certainly a nice thing to have. Unfortunately, they seem to deteriorate fairly rapidly, and wasps seem to think feed horns are a great place to build a nest.

Sunlight rapidly deteriorates any kind of plastic you attempt to put over feed horns, with the exception of Lexan. I have used 1/8-inch Lexan to cover feed horns in the past, and it works great. The Lexan will probably be there for the life of the dish. I've been told that the cover for feed horns has to be some special super-duper, super thin material so that the RF won't get blocked. Well, I am here to tell you that 1/8-inch Lexan works great. You probably think I cut a disk of Lexan and glued it on the feed horn, but alas, I got lazy and just ordered a feed horn cover online.

The Portland Report
by
John White, CBRE
Chief Engineer, CBC–Portland

The more things change, the more they don't. Yogi Berra famously said, "When you come to a fork in the road, take it." Or, alternatively, when you don't, then don't.

Watching the national media coverage of Portland is an experience in alternative journalism. The media must be filming the city of Portland in the State of Jefferson. I don't recognize that Portland. In my Portland, as the night goes on, peaceful demonstrators withdraw as rioters carrying bricks, stones, industrial lasers, gasoline, and firework mortars arrive late at night.

This reminds me of an early Charlton Heston movie, *Omega Man*, in which Heston plays a military doctor. In the opening scene at dusk, Heston is racing back to his home base, a fortified high-rise building. As the night progresses, a horde appears to attack and the battle ensues as Heston defends himself from the mob.

That movie opening reminds me more of my Portland. The one in which nonviolent demonstrators march during the day and a different group attacks at night.

With security invisible these days, our security system becomes one element of protection at the station. Recently, our system monitoring service provider changed without our knowledge. Around ten years ago, we canceled ADT due to repeated false alarm reports. The local replacement monitoring service preformed reliably with only two false alarms

in a ten-year period.

Well, that all changed when the authorities were called recently without the monitoring service calling the phone at the station or me. Several weeks later, they reported a break-in as the alarm system was being armed.

The false alarms were not the most troublesome events. More bothersome is that we received billing from an unknown alarm company, which arrived with no explanation. It seems there was a sale, and the new company took over without explanation. Yes, that builds confidence.

An ongoing problem here at KKPZ has been the continual nearby tower changes that damage our directional pattern. Most recently, a very significant tower is becoming an even more significant structure. Last February I discovered this work in progress. Of course, we hadn't received the statutory notice.

This work has been in progress since then, with no projected completion and detune date. In late July, we received word that the lack of detuning will continue until February next year.

Lately, COVID-19 restrictions have continued with no clear goal or plan. That's not good, as I see more and more the public patience is being stretched thin. I am seeing an increasing number of people simply ignoring mask requirements. It doesn't seem likely that public acceptance of restrictions will continue.



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

Barix Issues

At four of our five sites, we use some Barix Instreamers/Exstreamers for backup audio (STL) paths. Our main audio is transferred via a microwave link, and when that link goes down, the Omnia switches over to the analog input, which is fed by the Barix units that operate over the internet.

One thing I am noticing is how the units occasionally lose their way. It could be an internet service provider issue, or it could be something else altogether.

What I have found, despite having port forwards set up and having tested things, is after a while, the units will occasionally stop passing audio. I will mess with the configuration, check port forwards in the router, and all seem to be fine. There may be a more in-depth way for me to check this, but I know enough to know that I have no clue how. I end up having to delete the router port-forward and add a new one with a different port. Once I change the port, it seems to work for a time.

Again, I have no clue why this keeps happening. It makes it so we cannot depend on these units in a time of need. I am open to suggestions if anyone has any.

Worldcast Horizon

After some storms and a power glitch, the Worldcast Horizon codec at the KLTT transmitter site decided it didn't want to work anymore. I went to the site and did a power cycle with no luck. I did a few other things, all with no luck. So I put in the spare unit which, thankfully, I had already programmed up with selectable profiles for our entire market. This made it easy, as I just selected the correct profile and off to the races we went.

I took the faulty unit to the office, plugged it in on the bench, and the thing was working perfectly! I guess all it needed was a lengthy power cycle. I let it run through the weekend on the bench, and the following Monday decided it was safe to put it back in at the transmitter site. So far, so good...

FM Antenna Issues

We had a tower worker from 3dB Networks go around to three of our sites to get an idea of what exactly will be needed for changing out the 11 GHz microwave antennas so that they will work with the new Cambium radios.

While at KLTT, we noticed the FM antennas, a horizontal and vertical stack of 10-element yagis, were pointing the wrong direction. The week prior, we had a storm come through that had some crazy

winds, and we think that is when they moved. I've been to the site often enough that I know it wasn't pointing the wrong direction for more than a week.

So I called Derek Jackson, our climber/tech, and had him come out to climb and realign the antennas. He found some deficiencies with the installation that most likely caused the issue. He was able to realign the antennas, but we will need him or another crew to come out and make some changes to make sure the antennas stay put. They shouldn't just move around like that.

UPS Battery Oops

During the site survey at the KLZ transmitter site I noticed one of our rackmount UPS units was telling me the battery needed to be replaced. I pulled the battery pack out and noticed they were all swollen. We've had this issue a lot, and I've even had to replace a UPS because the battery could not be removed. I decided to remove the pack and leave it out. Power was on at the site, so it would just mean the rack would power down until generator start if the power did go out.

After I got back to the office, I got a call that KLZ was off the air. I started digging into it and could not get either transmitter to respond. So back out to the site I went, and there I found that entire rack was dead. I learned (the hard way) that when the UPS doesn't have a battery plugged in, it will after some period of time turn itself off. That killed the rack, including the antenna controller power supply,



which powers the failsafe interlock relays. That caused both transmitters to go down. Lesson learned.

I was able to plug the battery back in but leave it out of the UPS, just in case the battery swelling got worse, or worse yet, explode. I ordered the new battery pack and was able to get it replaced in a short time.

Windows Updates

I can't tell if it is a Windows update thing or my laptop. I have a Dell Latitude E5570 that runs great. Sometime in the last couple years I purchased a couple of solid-state drives for it. I was able to use Samsung's data migration program to copy the image to the new drive and then install it. It has made working on the computer easy. The boot time is so quick. I keep an updated backup of that drive on the other SSD so if need be, I can easily just switch them out and carry on.

In recent months, I have begun having Windows update issues. My computer seems to run fine until it doesn't. The computer pretty much freezes. I can move the mouse around and see the task manager. All looks fine. Nothing is anywhere near peaking. I wait and wait, but the only way to regain control to do my work is to power off the computer. Uninstalling the updates does nothing.

My dad has the same computer, a year older than mine, and has had no issues. My desktop, which I know is technically different, has had no issues with updates.

In an effort to fix this, I have decided to reinstall Windows on one of the hard drives. I still have the other one, so if this doesn't work, I'll put the other drive in, but I am praying that with a fresh Windows installation and no unwanted programs on the machine, it will be able to be updated and work again.

Rebooting the computer isn't a huge deal, but there have been a few times when I needed to do some off-air troubleshooting, and waiting on a reboot cost precious minutes. I guess we'll see if this is something I have to live with or not. As I write this, it's sitting at 26% in the recovery process.

Coming Up

August is always a fun month for me personally. This year will be no different. We go on our annual family vacation to Lake City, Colorado, high in the San Juan Mountains in the southwest part of the state the second week of August. This is always a fun time full of fishing, ATVing, fishing, off-roading, fishing, relaxing... and did I mention fishing?

In preparation for that, I am busy working on finding people to help Keith out in case things go horribly wrong while I'm away. We have a good, strong engineer field in the Denver area, so I have no doubt I'll be able to find someone to help out.

That about covers it for this month. I pray you all continue to stay safe and well.

The Local Oscillator
August 2020

KBRT • Costa Mesa - Los Angeles, CA
740 kHz/100.7 MHz, 50 kW-D/0.2 kW-N, DA-1

KNSN • San Diego, CA
1240 kHz/103.3 MHz, 550W-U

KCBC • Manteca - San Francisco, CA
770 kHz/94.7 MHz, 50 kW-D/4.3 kW-N, DA-2

KKPZ • Portland, OR
1330 kHz/97.5 MHz, 5 kW-U, DA-1

KLZ • Denver, CO
560 kHz/100.3 MHz, 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/95.1 MHz, 50 kW-D/1.4 kW-N, DA-2

KLVZ • Denver, CO
810 kHz/94.3 MHz/95.3 MHz, 2.2 kW-D/430 W-N, DA-2

WDCX • Rochester, NY
990 kHz/107.1 MHz, 5 kW-D/2.5 kW-N, DA-2

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

WDCZ • Buffalo, NY
950 kHz/94.1 MHz, 5 kW-U, DA-1

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

WCHB • Royal Oak - Detroit, MI
1340 kHz/96.7 MHz, 1 kW-U, DA-D

WRDT • Monroe - Detroit, MI
560 kHz/107.1 MHz, 500 W-D/14 W-N, DA-D

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

WMUZ • Taylor - Detroit, MI
1200 kHz, 50 kW-D/15 kW-N, DA-2

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/95.3 MHz, 5 kW-D/41W-N, ND

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

WXJC • Birmingham, AL
850 kHz/96.9 MHz, 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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