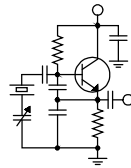


# The Local Oscillator



*The Newsletter of Crawford Broadcasting Company Corporate Engineering*

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## Storms

As I watched news accounts of the damage caused by Hurricane Florence in the Carolinas, I found myself thankful that we did not have any radio stations in that area. In fact, we don't have radio stations in any hurricane-prone areas, which tends to make this time of year rather pleasant. We tend to get a break from thunderstorms and lighting damage, even as the east and Gulf coast regions watch the skies with wary (and sometimes weary) eyes.

Many in our company and throughout the broadcast industry were thinking about our friends at Wheatstone in New Bern, which was pretty much "ground zero" for the storm. Thankfully, the plant and everyone who works there reportedly came through uninjured, but some had damage to their homes. Many were actually in Amsterdam during the storm, probably wondering about their homes and loved ones back in North Carolina. The Scriptures say that the wise man built his house on a rock, and evidently the folks at Wheatstone chose their site well, as the wind and rain came but the plant stands strong.

While we didn't have to deal with Florence and late summer is generally a quiet time in terms of convective weather where we have stations, we did have a pretty good line of thunderstorms roll through Denver on September 19. There was some lightning and maybe a little hail, but there was intense precipitation, several inches per hour. We were once again reminded of the propensity of Ku-band signals

to fade in the presence of heavy precipitation – all the 11 GHz microwave links for our Denver cluster experienced rain fades during the line of storms, some short and some a little longer. All came back within a few minutes.

Out at the KLTT transmitter site north of Denver International Airport, we evidently took a lightning hit on one leg of the 7.6 kV feeder that provides power to the site. The fuse on the primary side C leg blew. Amanda contacted United Power, and they came out and replaced the blown fuse. The replacement fuse immediately blew, so they tried it again. That time the fuse held, and the station got back on the air after an outage of a few hours.

The next evening, however, under clear skies, the C leg primary fuse blew again. Our friends at United Power came back out and replaced it, and they saw a 900-amp fault current! Clearly the 100 kVA transformer on that leg was shorted. The lineman called

his dispatcher who sent another lineman with a crane truck carrying a replacement transformer. A couple of hours later, the site was back up. Problem solved. Or so we thought.

The next morning at 7:15 AM, 50 kW KLTT was once again off the air. Both day and night antenna systems exhibited high VSWR faults. We finally got the transmitter to run at 1.5 kW into the night antenna, but it was indicating 50% reflected power and the load was way off the Smith chart on the lower left. There was some catastrophic failure in



**United Power replaces a 100 kVA transformer at the KLTT site.**

the antenna system, something common to both day and night patterns (which eliminated most everything in the phasor and everything at tower #4, which is only used at night).

I went with Amanda out to the site and we started with a visual inspection of every part of the antenna system. We didn't see or smell anything that would indicate a problem. We moved the J-plugs in the phasor and ATU cabinets and put the system in the non-directional mode with 1.5 kW on tower #4, making the other towers/ATUs "cold" so we could dig a little deeper.



**Figuring out the electrical length of a transmission line from the zero crossing frequencies.**

The "usual suspect" that immediately came to mind was the tower #2 transmission line, which is a 7/8" air dielectric line that had burned on three prior occasions when a fault appeared at either tower #1 or #3. Years ago, we installed air gaps right on the input and output of that line to give excess power a place to jump across before it jumped across inside the line itself, so the line should have been well protected, but because it had smoked on three prior occasions. I did a quick DC measurement on that line and it looked fine, open and shorted.

Next, we went to the KLZ site and retrieved one of our network analyzers and took it back to

KLTT. We used that to look at the #2 line and found it to be good. Tower #1 is on the same side of the canal that bisects the site, so I sent Amanda over to that tower to pull the J-plug and open the line and I shot that transmission line from the phasor – and it looked perfect. So I had Amanda put a short on the line – and I didn't see a thing – I had the same perfect spiral as I did with the line open! I took the analyzer out to the ATU and connected it to the line there and saw... nothing. No line. Clearly the line was open immediately under the ATU.

We pulled the six bolts holding the end terminal adaptor to the 3-1/8" EIA flange and the ATU cabinet, and the problem became immediately apparent. The brass stud that attaches to the bullet in the end terminal adaptor was burned in two. There was no evidence of arcing on the Teflon in the adaptor or inside the connector, so the stud had to have melted. Which is weird, because that 5/16" stud has to be good for 50+ amps. It's doubly weird because the Teflon showed no signs of heat stress, either, which would indicate that whatever happened took place quickly and not over a long period of time.

I don't really have a good explanation for this failure, and I don't think it was related to the power issue that had occurred the prior two evenings. Thankfully, we had a spare end terminal adaptor on



**Burned out end terminal adaptor from KLTT tower #1. Note that the Teflon does not show signs of arc-over.**

hand and were able to install it and get the station back in the directional mode at full power in short order.

Then a couple of days later, our Lookout Mountain FM site dropped off line. We could not connect to it from the studio, either via the microwave link or the internet. It looked for all the world like a power failure at the site. Amanda went up to the site and found the power to be on but the microwave link down. The VPN tunnel was also down, although the internet service was up and good, and the Cisco ASA VPN routers were both up and running.

Amanda bypassed the VPN router and set up port forwards for the codecs in the internet router and got audio back working again. I pulled the microwave radio and POE injector and took them back to the office, benched them and found that they worked fine. That meant we had either a power supply or cabling issue – likely power supply, since I tried connecting the radio inside the building with a short Ethernet cable and couldn't get it to power up. The power supply at the site was showing -45 VDC on a multimeter, but we didn't have a scope to look at it for waveform.

The following day, we took a new power supply, and for good measure, a replacement POE injector up to the site and reinstalled the microwave system. It came right up and connected with good RSSI to the studio, restoring normal operation at the site. Amanda pulled the Cisco VPN router and installed a 5-port switch for the internet service, connecting just the two Barix Exstreamer 500 backup codecs to that. If the microwave should fail or fade, the Omnia One.FM for each station will fail over to the other input, which comes from the Exstreamer. We're still thinking about what to do with the VPN.

I did pop the lid on the Trango -48 VDC power supply and could smell something burning – Amanda observed that it was a smell similar to that

of the burned-out connector at KLTT. That power supply box actually uses a vendor switching supply, and I was able to find a replacement at Mouser, so I ordered a couple. That should get our backup power supply operational again.

Amanda provides her perspective on all these adventures in her column below.

### **Microwave Links**

One thing I did learn when dealing with the microwave link failure at Lookout Mountain is that Trango Systems is, for the moment, out of business. I spoke on the phone with Ray Sewell, who used to work for Trango. He said that the company had been purchased by an outfit based in Wisconsin and that they planned to be back in production with Orion and Apex Lynx radios in a month or two. He said they would be providing support to existing Orion and Lynx equipment, but not for older equipment.

For us, that means that we have a lot of orphaned equipment. If/when it dies, we're done and will have to go with something else, and it probably won't be Trango.

We were looking at Aviat equipment and even did a PCN for a pair of Aviat links in Buffalo, but I was having so much trouble getting our Aviat rep to respond and provide promised quotes that I've decided to go a different direction.

We're currently looking at Cambium equipment, and I plan to budget for replacement of all our Trango Apex and Apex Plus gear in 2019. Hopefully they can provide adaptor plates for our existing antennas so we won't have to change those out. I'll still have to do PCNs and license modifications to move to a different type of equipment.

**The New York Minutes**  
**By**

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

Hello to all from Western New York! Somehow, last month's report ended up in virtual cyberspace, so this month will be a combination of the August and September columns.

This summer has undoubtedly been the hottest we have experienced in the past 25 years. We have broken numerous records in the temperature department, going back well over 100 years. Most notably, the number of days that we have surpassed 90 degrees, which is a rarity in our area of New York State, has exceeded 15 days this summer, and the rain (or rather the lack thereof) has our region bordering drought status.

Not too far to the south, in Pennsylvania, they are experiencing torrential downpours and significant flooding, with property damages totaling nearly \$250 million. It's either one extreme or the other. The western states have seen temperatures inching near 115 degrees with little to no rain at all. The California wildfires could certainly use a little of the precipitation that has fallen throughout the mid-south.

This is not intended to be a lesson on weather patterns, but the weather adversely affects our broadcast facilities in numerous ways, and keeping our stations running smoothly and without interruption is becoming increasingly difficult. Most all our transmitter plants have generator stand-by power in case of electrical interruptions, but what do you do in case of flooding and high winds?

Adequate air conditioning will keep our plants cool when the temperatures reach oppressive levels, but if they are not properly maintained, they just sit there and blow hot air during a heat wave. It's a similar situation with a generator – if it hasn't been serviced on a regular basis and checked periodically for proper performance, it will be useless in the time of need. If you don't do it already, set up a maintenance schedule according to the

manufacturer's recommended servicing intervals. Most generators can be programmed for weekly exercise intervals to insure they will start when called upon. This is great, but I prefer to know that the genset started, that all fluid levels are where they

should be, and there are no strange knocking sounds or vibrations are noted while running. These things you cannot check if the generator is exercised when you are not around. At least once per month, plan to be at the site when the generator is exercised to insure that all is working properly and that it can be relied upon in the event of a real emergency.

With air conditioners, it's not as easy

to foresee problems before an impending failure as it is with generators, but there are things you can check to make sure you're A/C will keep your equipment cool when called upon. First and foremost, keep those filters clean! The evaporator coils are not designed to operate efficiently when they are starved for air due to a grungy, dirty air filter, and dirt buildup within the coils is even worse, as the condensation, mixing with dirt and debris will cause the air flow to be restricted, causing a freeze-up.

One other area to check to insure that your A/C is working properly is the condensate drain. Make sure that the drainage hose or pipe is free of any obstruction and not backing up into the unit. I use a small air compressor to blow out the condensation drain several times a summer, but you can use a shop vac as well. Check to make sure that the condenser fan is operating properly. If there are any bent blades or the fan speed is not adequate to force the proper amount of air through the coils, compressor head pressure will be high and damage can occur. Most all fan motors these days have sealed bearings, so no lubrication is needed, but older units blower motors need to be lubricated annually, and the drive belts checked for tightness and dry rot.



One other thing you should check to insure proper operation is the condenser coil. Is it bright and shiny, and do you see any dirt/dust clogging up the air fins surrounding the coils? If so, there are numerous aerosol cleaners that work effectively to clean out minor clogs in the condensing coils. Blockages that are severe usually warrant the use of more sophisticated cleaners/solvents and the use of a pressure washer to clean the system out. If your blockage gets to this point, I would recommend a professional perform the cleaning. Again, inadequate airflow across the condenser coil can cause a trip due to high head pressure at best or valve damage to the compressor at worst.

As August rolled to an end, tower worker Don Boye hoisted the new antenna for the WDCZ(AM) translator station here in Buffalo up the WDCX tower. On Thursday, August 30, we put the final touches on getting this translator on the air.

There were several kinks that we had to be worked out before mounting the antenna to the tower. In addition to an issue with the mounting location, all of the coaxes on the WDCX-FM tower run up the tower legs, which means that Don had to move one of the 3-1/8" coaxes enough to facilitate mounting the antenna bracket to the tower leg. It's not an easy task to move coax that has been in place for nearly 40 years!

Don designed and manufactured brackets that allowed us to mount the antenna to the northeast leg of the tower using a 15-foot-long 2-inch pipe with standoffs. That way, we were able to assemble the antenna on the ground and hoist it up as a single unit to mount to the brackets that Don had already positioned on the tower. The transmitter and ancillary equipment was already installed and checked out, so once the antenna was installed, we simply hook up the connecting pigtailed to the coax, filed the FCC paperwork and were on the air!

The month of August we had two separate failures of tower lighting on our AM stations. In Buffalo, tower #3 of the 5-tower WDCZ(AM) array lost one of the beacons and one LED side-marker. I ordered the replacement bulbs and LED fixture, and on Friday, August 10th, Don made the climb to replace the failed lamps. There were no surprises in the beacons; they failed due to age, but the side-marker, surprisingly failed due to being shot with a rifle! This is unusual because the tower site is located smack dab in the middle of a gated residential community.

In Rochester, we had two towers that lost beacons and side marker lamps. We had purchased the LED replacement fixtures for all six towers some

time ago, but determined that they would not all be changed at once, we would replace the side lamps only when the beacon lamps had to be replaced, so on Sunday, August 12, Don and a helper replaced the 620-watt beacons on towers 1 and 2 and replaced the old incandescent side lamps with new LED fixtures. So now towers 1 through 4 now have the LED side lamps; the remaining two towers, #5 and #6, will be replaced once the beacons fail, so all can be replaced at once. Also, on tower #2, the color filter had cracked, so I had purchased a replacement filter for installation when the time came.

Four days after the Rochester beacons were replaced, one of the beacon bulbs failed on tower 2. In all my years, I have never seen a beacon fail that quickly unless it was struck by lightning or failed due to vandalism. Don has seen this type of failure many times before, and he says that it almost always is a defective bulb that "gasses out" and crystallizes. I have received a warranty replacement bulb, but we are waiting for Don to finish up a couple of projects he is doing so he can schedule in this repair.

The first day of September, I installed the repaired WDCX-FM Omnia.11 audio processor that was damaged by an electrical surge in early August. After operating flawlessly over the weekend, it shut down in the middle of drive-time programming on the following Monday. When I arrived at the transmitter site, I found the Omnia trying to reboot over and over, so I immediately called Telos to talk with tech support about this.

Telos sent me a white paper on this issue that pointed to loose connections on the power supply, and instructions on how to correct the issue. Evidently, many Omnia.11 owners were having similar issues with the processor randomly shutting down/rebooting on its own. As the power supply connections are really close to the heat sink, the screws were loosening up due to heat expansion/contraction. The addition of another #10 star washer and a little Loctite on each screw took care of the issue. I'm certain that there were many station engineers pulling their hair out over numerous unexplained failures in their Omnia.11s. Sometimes it's the simplest things that can drive you crazy!

Another issue I experienced recently was a failure of the BE HD signal generator at WLGZ in Rochester. When I arrived at the site, I found the HD transmitter down, with numerous faults on the exporter and exciter. After trying several times to reboot the exporter, it kept hanging up during the reboot process. I reinstalled the OS and was able to get the HD signal back on, but it was short-lived.

After approximately 20 minutes, the exporter shut down again, and this time would not boot up at all.

I called BE tech support, and they gave me several things to try, (which I had already done) with zero results, so they determined that the issue was not field-repairable and the IDi-10 had to make a trip to their repair center. I requested expedited service, as we lease out our HD-2 channel, which resulted in our client being off the air.

Four days later, the exporter was returned, and I began re-installing the unit. Our main HD service came up, but the HD-2 would not start, I kept getting an error that basically said that the importer could not connect with the exporter. I checked all the network settings and all the configuration settings and found nothing out of the ordinary. I was able to ping the exporter's IP address from the importer, so I ruled out a network issue.

I recalled several years ago when I installed the new Dashboard software on the importer, I had a similar issue of the two units not being able to connect. This was caused by an incompatibility with

the versions of software we were running. I phoned BE tech support again and found out that they had upgraded the software version when the IDi-10 was in for service, and the newer version of the OS was not compatible with our Dashboard software version! Luckily, I still had the older v2.2.2 operating software on disk at the site, so I reloaded the software, reconfigured all the settings, and the HD was back on the air! I know that the manufacturer's think they are doing us a favor by installing the latest software when equipment is sent in for service, but they don't realize that the other associated hardware must be upgraded also, or it isn't going to work! If I had only known from the outset that they had upgraded the software, it would have saved me several hours of troubleshooting and gotten our client back on the air a lot sooner!

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!

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**The Motown Update**  
by  
**Brian Kerkan, CBTE, CBNT**  
Chief Engineer, CBC – Detroit

Greeting from Motown! September was a really hot month. It's nice to see the temperature come down to the 70s again. We have been working on preparing for the WRDT translator move to the WCHB transmitter site. I love fall. It's the perfect season for field measurements!

Our WMUZ(AM) site has a John Deere tractor that came with the purchase of the station. We have been working on getting it properly maintained. There was a local vendor that had claimed to maintain it, but we found that there were several items overlooked. Sometimes, to get something done right, we have to do it ourselves. We ordered parts from the manufacturer and completely went over everything. We have a lot of ground to cover out there, so it's nice to know we don't have to be concerned with it running properly.

We had a nice visit from Jeff Welton from Nautel last month. We visited the 10-tower 50 kW

WMUZ(AM) site. It's coming up on one year that the NX50 there has been on the air. What a great transmitter it has been! We also stopped by the studio and looked at our NV40 for WMUZ-FM. The NV40 has been rock solid since we have been keeping it cool and clean. Several years ago, one of the first things I did was to go over all of the RF modules in the NV40. They had been running so hot that the combiner had separated in several places. Now that everything is cool, we very rarely see failures. Having two cooling units is essential to keeping it this way.



**Report-IT PC?**

We have been doing a lot of remote broadcasts lately, and the Report-IT app has worked well for us. We use an iPad for most of them, but we use a separate computer for VNC to display the Nexgen automation screen. I had wondered if there

was a way to run both Report-IT and VNC on the laptop we use for remotes. That provided an opportunity for an experiment. Report-IT is available for Android or IOS, but there is not a version I could find for the PC. Why not try an Android emulator? So I downloaded the Bluestacks App Player. I installed it and used Google Play to install Report-IT through the emulator. It installed without any issue.

We use the Shure MV1 USB audio adapter as our capture device. Time to give it a try. We connected the MV1 to the laptop and launched Report-IT from within the emulator. After a minute or two the app launched and looked exactly like it looks on the iPad, and Bluestacks created an icon on the desktop to make it easy to start the application with a single click.

We looked in the settings, and to my surprise, the MV1 was listed as an audio device. After selecting the MV1 for send and receive audio, it was time to connect. We logged on to the TieServer, and our Bridge-IT was listed. We connected and heard audio right away from the studio. We bought our feed up in the studio to test the audio quality, and it was perfect.

I wanted to make sure we could run other application, such as VNC, while the emulator was running without causing glitches in the audio. The audio remained glitch free.

If you are looking at options to connect to your Tieline equipment using your PC, this might work for you.

### **Goin' Up the Country**

Next month, I will be able to tell you how I make out on my latest adventure. I have been considering buying a class B motorhome to take on camping trips and hamfests. I was looking for the

right deal, and my opportunity came. I found a Winnebago Lesharo for sale that wouldn't start due to an electrical problem. It was listed for \$2000, but I figured I would negotiate. I was able to get it for \$600, and the owner gave me permission to let me work on it for two weeks before having to move it.

I looked at it over a weekend, going over the wiring and checking for spark and fuel. It would start,



### **Brian's class B motorhome project**

but only run for a few seconds. The owner said after he bought it, he was able to drive it home. It wouldn't start after sitting for a while. I looked at the schematic and found a relay that closes on start, and injects fuel to a prestart injector, and powers up the engine control computer. I found the problem, and the original owner felt bad.

He was using a large shop charger to start the bad battery. The charger voltage was 17 volts, way outside of the ECU operating voltage. His use of that charger fried the ECU. I know he will be sad when I drive that motorhome off his property. I hope to have good news next month that it starts and runs when I replace the ECU.

Until next month, 73 from Brian, W8FP.

**News from the South**  
by  
**Stephen Poole, CBRE, AMD**  
**Chief Engineer, CBC–Alabama**

The weather here hasn't been terribly bad this past month. We've had some heavy rains, but thankfully, we haven't had a great deal of truly severe weather. Then again ... perhaps it's an indication of how long I've lived in Alabama that I consider flash-flooding and scattered power outages to be minor! Hmm...

Figure 1 is a picture taken in July at the 92.5 FM transmitter site. I didn't include it last month because I was discussing the joys that we'd been having with 850's Nautel transmitter. But you can see that WXJC-FM's phone line took a nice bite of lightning during one of the severe storms in July. AT&T has long since



repaired it; in fact, they installed a nice new network interface.

My folks in the Carolinas, on the other hand,

were hammered by Hurricane Florence. Thank the Lord, my friends and family are all safe, though there was some damage and plenty of extended power outages. The Wheatstone facility is located in New Bern, NC, which received some of the worst flooding of all. That city is right on the Neuse and Trent rivers at a low elevation. The storm surge can flow inland quite some distance from the coast. Their facility is located on higher ground away from the river and

did fine. But some of my friends who work there weren't so fortunate: Mike Erickson, to name one, had major damage to his home, and Scott Johnson was cut off and without power for several days.

As is the case with most hurricanes, the real danger inland isn't so much from the wind as it is from flooding. Given that Florence slowed down and poured up to 30" of rain on the Carolinas, scenes like the one in Figure 2 are to be expected. The moral of the story, looking at that image, is that even though it looks like there's only a few feet of water on the road, *you don't know what's under it!* (Or what *used* to be there before it washed away.)

Those pictures are actually of two different roads, taken by some friends on Facebook, but it gets the point across. When there's water flooding across a road, it's entirely possible for it to undermine the pavement. This may not be obvious, especially not if you're driving in a heavy rain with low visibility to start with. The lesson here, as the weather folks like to say, is to "turn around, don't drown."

If you can donate to a good charity (Sandy and I like Samaritan's Purse) to help with relief efforts in North and South Carolina, it would be deeply appreciated.

**Speaking of WXJC...**

The WXJC(AM) XL-60 has received a minor modification. After some discussion with Cris, we decided to put a time-delay on the "charge up" relay closure. Many transmitters use this step-start



**Figure 1 - Lightning did a bit of damage to WXJC-FM's phone line in July.**





**Figure 2 - Two different pictures, but they show what can happen. Turn around!**

method: when power is first applied, a small relay charges the supply through some resistors to limit inrush current. Once the supply reaches a certain level, a large relay kicks in, bypassing the resistors and placing the AC line directly on the input. I'm sure most engineers are familiar with this; if you've been doing this for any time at all, you've doubtless seen this.

The XL-60 uses the step-start (or "charge up and full power") method, but with a twist: the 300V supply is actually charged up the entire time that the transmitter is connected to the AC line. As mentioned last time, that's why there are two discharge paths in the transmitter, and that's why the XL-60 has that odd key-based interlock. They don't want you to casually work inside that transmitter with the AC mains applied.

The only time the step-start process occurs is when you first apply AC to the transmitter, typically with the wall-mounted disconnect switch. You should hear the familiar "click ... CLANK" as the smaller relay, and then the larger one, kick in after a second or two. We wanted to put the time delay on the smaller "charge" relay. That way, if we received one of our notorious flickering power outages, the relays wouldn't chatter while the utility decided what to do.

As I've mentioned in the past, this is a big problem here. The lights will flicker on, off, on, off, perhaps twice a second. The time delay prevents the "charge" cycle from ever starting until solid power returns for at least 2-3 seconds. We're convinced that this is what caused our damage. Some plastic inside the main contactor was physically broken, and a big IGBT in the discharge circuits was shorted when it repeatedly and rapidly had to drain the supply.

The only question we had (and which Nautel couldn't answer, given that this is a two-decade old design) was whether the micro controller in the transmitter might get confused about such a delay. When you apply power to the XL-60, the supply for

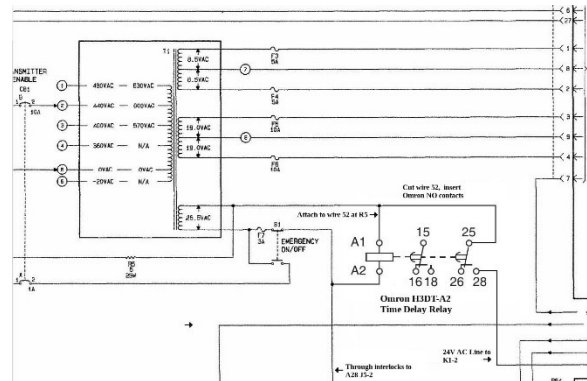
the controller immediately comes up and it starts running. I didn't know if the controller would complain about it taking so long for the "charge" cycle to begin. I guessed that it wouldn't, though, based on my experience with the controllers of that era.

Nautel makes splendid transmitters, and the XL-60 is no exception. Rather than have the microcontroller do all the overload protection, that transmitter actually has a bunch of comparators and other old-school analog circuitry to protect things. The microcontroller mostly maintains power levels and *reports on* overloads and other problems. Many problems are detected, and directly addressed, by other circuitry.

At any rate, this mod worked like a champ. Not surprisingly, when I throw the Big Switch on the wall, I will get an AC Fail alarm at first. But after about three seconds, the "full power" contactor whacks into place and the alarms are extinguished. Now if the power flickers and stutters, the big contactors will stay idle until things settle down.

### Documentation

Mention modification to some engineers and they get very upset. Some say that it "violates the type acceptance!" The FCC hasn't type accepted transmitters in decades. Others say, "Do you really think that you can do better than the manufacturer?" Well ... yes. Given that most radio equipment is built by a high-tech cottage industry, there *have* been cases where we could clearly improve reliability with a simple modification.



**Figure 3 - It took me about 30 minutes total to make this drawing in Photopaint.**

I suspect the real reason why so many engineers hate modification is because of the lack of documentation. In the past, that might have taken a lot of time, but nowadays, it's a breeze. It takes very

little time to come up with something like the diagram of Figure 3. I'll tell you how I did it.

First, I pulled up the PDF of the XL-60's schematics and zoomed in on the power supply. I took a screen shot of that, saved it as a JPG image, and opened it in an image editor. I then did the same to grab an image of the time delay relay diagram. I copied and pasted the time delay image into the XL-60 picture. My editor (I use Photopaint in KDE) surrounds the pasted image with a box that has "handles" that I can drag to size it as needed. A few minutes of redrawing the lines and I was done.

I didn't stop there. I also typed up a brief description of the modification: what it does, why we added it, and where I physically placed it inside the transmitter. Copies are kept at the transmitter site, in my office at the studios, and elsewhere.

Modification isn't something to be done on a lark. You could be reducing the resale value of the equipment if you go crazy. I try to do any modification in a way that can easily be reversed, leaving only a few screw holes at worst. Of course, in our company, Cris should approve any modification (there have been times that he has told me no, and after thinking about it, I realized he was absolutely right). But if you think you can improve reliability and keep us on the air and generating revenue, it's worth a try, isn't it?

### **Back to Weather**

I've been doing a good bit of running (again) this past month, but rather than bore you with details of each fuse replaced, I'll close with a short editorial comment. I've been a big defender of the National Hurricane Center for many years. They have a difficult job, and they have to warn everyone of the

worst case that could occur. That's naturally going to cause some to complain that they're "crying wolf." But yet, if they downplay the possibilities, and a storm turns out to be a very big thing, they'll be accused of not doing their jobs! They can't win.

That said, it is becoming pretty obvious that many in our government, and in our news media in particular, have bought into the Global Warming thing hook, line and sinker. They (and especially the media) *want* these storms to be catastrophic so that we, the Great Ignert And Unwarshed Masses, will finally get our minds right and agree that drastic measures need to be taken. This could include (but is not limited to) government control of the economy to ensure that carbon emissions are reduced.

I'm sure most of you have seen that hilarious video of the Weather Channel guy stumbling and struggling to stay upright while a couple of guys walked by in the background. There are also images of CNN reporters standing in chest-deep water ... while their camera crew is just a few feet away on higher ground. Frankly, that's just amusing to me; I don't complain about that. What does bother me is that some of these folks in the media are even worse than the government boffins about Global Warming. They've swallowed the hook and sinker, and they're being strangled by the line. But then, we've had ample evidence that the Big Media have long since lost their objectivity. E'nuff said.

Until next time, keep praying for this nation, and again, if you could give a few bucks for hurricane relief, my folks back in the Carolinas would deeply appreciate it.

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

It's easy for us to take for granted certain brands of equipment. We use them over and over again with so little trouble that when they do have problems it almost catches us off guard. That's due to the manufacturer's track record and our personal experience with them.

I certainly have seen that recently. Early in the year we installed a transmitter that just wasn't quite right from the first day that everything was connected to it. We finally had to ask for a replacement. I would still strongly say that I wouldn't want any other transmitter brand out there. When you get used to a certain level of reliability you are just surprised when you end up being the one that gets that rare albatross that just isn't quite right.

This past month, we had a couple of these incidents. We had hoped to upgrade the Ethernet switch that we use for our main Wheatnet AOIP network. Since the Cisco 2960 Plus was no longer being manufactured, we had to choose something that would be its equivalent. After careful research, we chose the 2960L. It has an IGMP Querier and the ports are configurable for 10/100 or 1G.

I don't remember ever having difficulties with any of the mid to upper line of Cisco switches before this. But from the get-go, we had trouble with the configuration. We had to abandon the GUI and use PuTTY to finally get it configured. Still, we had it configured for our needs and moved forward with the installation.

After putting it in place and moving all the devices to it, I noticed a few days later that Wheatnet Navigator, which is on a computer on a different but connected switch, showed no audio levels for the blades located on the new 2960L switch. The audio was actually working, but it wasn't showing up on this software. Since everything else seemed to be working, this seemed to be an annoyance more than

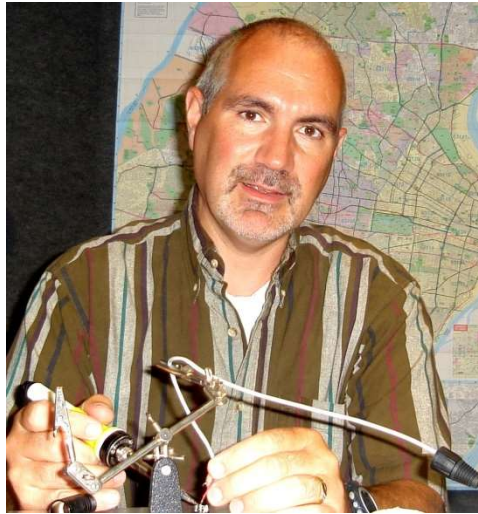
anything else.

Then a few days later, we heard that our Rockford studio, which is connected to our Wheatnet network through a Tieline Genie that has a Wheatnet card in it, was not receiving audio from the main studio. Everything was connected by crosspoint still, but no audio was showing up. The two Tielines were connected and we were getting audio back from Rockford. The local Tieline was on a different Ethernet switch than the new 2960L. That's when I thought to try moving the Ethernet cable to an open port on the 2960L. When I did, the port would not work. Nor would any of the open ports work with any known working Ethernet device.

A quick check of the 2960L configuration showed that all the open ports were still enabled. At that time, I decided that I just couldn't trust this switch in this important role. All our audio server computers and their associated Wheatnet blades are on this switch, and I had no comfort level with this switch. We moved back to the original Cisco SG300 Ethernet Switch and all the problems went away. This is an example of an item that you would never expect to have difficulty with – a Cisco switch. They work right out of the box, and you usually get ten years out of them.

We also had a similar experience with a Wheatnet PC driver. We have never had any real issues with these drivers before, other than the fact that they would sometimes turn on so quickly on reboot that the computer wasn't ready for it.

This time, it was on a new computer we installed as an audio server. The caveat here is that it was a Windows 10 system and we had not used a Windows 10 computer yet for this purpose. The audio server had been running a little over a month and we rebooted it due to reports of audio hesitation when using the fader start from there Wheatstone G5 surface.



Upon rebooting a PC with the Wheatnet PC driver, I always use the built-in test in the Windows system to test the audio to make sure everything is ready to go when they restart the automation software. I did so this time and it passed the test. However, when we started the audio server actually playing, it was silent.

This led us to an hour or so of trying to get the audio working again. We even had RCS support involved, but they threw up their hands and told us to get in touch with Wheatstone support. Knowing that they were in hurricane mode at New Bern, we were going to try to resolve it ourselves first.

The one thing we did notice is that we saw a message on the Ethernet adaptor properties that

showed “no network access” where you would normally see the “no internet access” message. The adaptor was still working because we could ping other devices on the Wheatnet network. Our best guess was that we had a corrupted Wheatnet driver that wouldn’t enter the Wheatnet network properly.

We then uninstalled and then reinstalled the driver. This time it was working properly. We rebooted the computer again to make sure it would survive the reboot. It did, and after thorough testing, we put it back on the air. With the reliability we normally have from the Wheatnet PC drivers, I probably spent too much time looking for the problem elsewhere.

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

Well, well... Two surprises in the tower detuning arena, and arena is a good term, as in gladiator. For months, we have been dealing with yet again another tower detuning issue. At this point, I was beginning to think there was nothing new I could learn.

This last time around, I learned that grounding is a major factor with detuned towers. The most recent offending tower is working slowly to being resolved. Earlier, we had found that the ground system was not working well and transmission line grounds were behaving differently than the tower ground.

We put a temporary fix in place by bonding the transmission line ground to the tower. The detuning adjustment was much more effective and is a good approximation pending repair of the ground system.

The results do show that ground system quality is a significant variable of detuning effectiveness, particularly when the tower structure and transmission line grounds are separated. This separation is generally considered to be a requirement of the Motorola R56 standard.

Most communications towers are grounded with a buried ring circling the tower foundation. Separate conductors connect tower legs and

transmission line to the ring. When any of these fail, the ground system is no longer homogenous.

Even when the ground is functional, grounding is not contiguous, which forces the detuning current to flow through the ground system in order to terminate the transmission line ground

path. I have seen one other incident where one of three leg grounds had failed. Once repaired, the detuning adjustment was vastly different.

I now believe that in any case where ground system changes are involved, the detuning adjustment should be checked.

Just recently, KKPZ received a new Omnia.9 processor. The results are very interesting and informative. Prior to the upgrade, we had been complete in the market with the old processor.

Competitive takes a bit of explanation. In our case, out of 20 to 30 stations, we were consistently in the top five with no single station outstanding. Not bad, but no clear winner.

The Omnia.9 is a complex device and setup is equally complex. Fortunately, we have a template that can be loaded remotely, allowing the setup requirements to be limited to adjustments specific to the station’s transmitter. Once on line, the results



were informative.

With any processor that elevates loudness, listener fatigue is a potential undesirable side effect. In all my observations, I did not observe this kind of problem.

The bulk of my observations were in the car under varying road conditions. And in that environment was my first observation. Portland area roads and freeways are in poor condition with road noise a major problem. New construction this year has repaved some areas. The road noise transition from quiet to old pavement is very pronounced. The immediate tendency is to turn the radio up. With the new processor, there is considerably less need to turn up the radio while other stations disappear in the noise.

I did note two negatives that should not exist when high technical standards are observed. In one

case, a music bed was higher than necessary. The announcer disappeared in the noise of the liner. This should never happen under normal conditions.

The second was an odd circumstance. We aired a segment that appeared to have been recorded at an event in which the microphone was 10 to 20 feet from the presenter. The room and background noise were amplified and the original unlistenable material was worse after processing. The solution in this case is to not use this kind of material or to use better microphone placement.

I also noticed the PA current is more dense when the processor is on line. The difference isn't huge, but is noticeable.

At this early stage, I am impressed with the results. This new processor is a good addition to the KKPZ signal.

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

### **Storms**

I think every month this summer I have mentioned that it has been fairly slow. I am always grateful for those slower days, days where I can take a breath and just relax. Then along came September. It started off slow, but one week in particular became hectic. It all started on the 19<sup>th</sup>. We finally had some cooler temps, which produced a round of storms in the evening. By that time, I was at home and was keeping an eye on things. I could see the storms take down one station at a time as they moved through the area. No damage, just a lot of rain washing out the microwave signal. Thankfully, three of the stations came up within minutes of going down.

### **Issues, Issues and More Issues**

KLTT was a different story. I could not get the microwave to reconnect. Then, I lost all

communication with the site! I finally determined it was a power outage. I called the power company, and they were on it as it was a known issue. I



received a call at about 8:00 PM from the power company saying they needed access to our site. We have a power pole right outside the building, and that was where the problem was. We were off air for about three hours that night. Ouch. But things did seem to come up fine. We were on air and at the proper power level.

The next morning, I checked on things remotely to make sure I could communicate with all the various pieces of equipment. We found we could not talk to the exporter for the NX50 main transmitter. It was obviously working, but we could not Telnet into it. I decided to go ahead and make a trip to the site to get eyes on things.

Once I arrived, I found the A/C not working. It was a cooler day, so the high-temp alarm hadn't

triggered yet. I reset the unit, to no avail. I called the A/C service company, and they immediately came out and found a tripped breaker inside the unit. Once he reset that, the cooling began. He explained the issue for future occurrences, which would come in handy sooner than we would have liked.



**My dad talking with a United Power lineman at the KLTT site.**

I also found the alarm system was not working. The panel was dead, so I went to the back room where the heart of the unit is. I opened the box and could smell that wonderful smell of electronics burning. We could clearly see the power supply was fried. I called in for service and the wait began for the callback for scheduling. I power cycled the exporter and got it up and running normally. Then I called it a day.

While at home about 4:15 PM that same day, I was remotely checking on the site and found it was giving me issues. The transmitter was not holding power, and the commands to turn the aux transmitter on were not working. Then I couldn't see anything. Power was out again. I immediately called the power company and they headed out. My dad joined me, and we met them at the site.

By the time we got there, they had already determined that a transformer for one phase of power had shorted. The wait was on for another guy to come in to the office, which was actually not far from the site, load a new transformer and head over. We decided to hang out during this time, so we could make sure everything came up properly once they finished. A few hours later, the transformer replaced, they did get things back up and running. We checked

on everything and even ran the transmitter at full power for a couple minutes to be sure it looked okay. Everything, and I mean everything, looked good. We were on air, antenna parameters were good, and transmitter power was good.

It was late by then, so I went home, caught a few winks, woke up, checked on things, and found that all was not good. At power up at 7:15 AM, the main transmitter did not go to full power. In fact, it wouldn't hold power at all. My dad was the one who found things weren't good and was already working on it. He was able to get the site on for a small bit of time at a much lower power. Dad came over and we headed to the site.

This time it was not a power issue this time. We discussed all the issues it could be. It acted like a transmission line got fried, but how? It was a clear night/morning. No weather since the initial storm Wednesday night. We ran at full power most of the day Thursday, the day after the storm, and you would think if it were lightning related, the would have presented itself Thursday. Regardless, there was an issue.

When this kind of thing happens, we tend to assume it is tower #2, since it has the smallest line of all the towers in the daytime system and this is where we have had several issues in the past. We looked in the building in the phasor as well as the ATUs at the towers but didn't see anything obvious. Not what we had hoped. Of course, I think we can all agree that



**The damaged end terminal adaptor -- note that the stud on the back of the bullet has been vaporized.**

being able to just look and see the issue is always nicer than having to dig into it to find the issue.

We needed some test equipment, which was back at the studio, a 45-minute drive away on a good day, so we brainstormed and decided to run over to the KLZ transmitter site, which is only 15 minutes away, to get the network analyzer we had stored there. We did essentially the same kind of transmission line measurement that we used to do on the sample lines in a moment-method recertification. My dad got that set inside the building while I ran to the various towers to do whatever he needed me to do. We started with tower #2 and did all sorts of things. Despite some strange readings, things still seemed to look okay at this tower.

We then moved over to tower #1 and he had me first put a short and then a 50-ohm load on the line. He couldn't see either on the other end. Odd. He ended up bringing the analyzer to the tower, where we checked the line looking toward the transmitter building, and couldn't see any line at all!

Looking closely at the line termination in the ATU, we found the stud connector where the transmission line terminates onto strap in the ATU was loose. We took things apart and were hoping the issue was right there, and it was. Lots of black soot. The bullet was damaged, destroyed in fact.

We took the piece back to the building, expecting to have to jury rig something that would work. I remember seeing spare line parts when we installed the NX-50 several years ago. I went to the cabinet where I saw the parts and found that we had the full part! Not just a bullet, but the whole end terminal adaptor! Praise God for that!!

We went back to the tower and cleaned out the line side of the connector, then put Humpty Dumpty back together again. Back to the building, a look at the network analyzer showed all was good. We could finally see the tower. I went to each tower and put things back in the directional mode. We then brought things up and all ran as it should.

In the process of all this, we were able to finally get the security company to the site. They saw the issue with the power supply, something I had repeatedly told the tech about on the phone and he didn't believe me. Thankfully the tech they sent out didn't treat me like an idiot. He did what he needed

to do and got the system back up. I am very grateful he came out and took care of this quickly, as I did not want to go an entire weekend with no working alarm system at the site. So much could go wrong when the system isn't working.

### Even More Issues

Finally, a day off. My husband and I have been spending every weekend in September at our cabin in the mountains. We plan to have it closed up for the season by the time this goes to press. But knowing our time was limited, we just wanted to spend all our free time up there. That Saturday was a great day, the first relaxing day of the week. Sunday started off good. We headed home early as we normally do. To be honest, I didn't even think to switch over to our stations to check on things as we headed down the hill. I've become so dependent on emails/texts from remote controls, mod monitors, etc. that I usually don't need to.

That afternoon, I got a call from my dad letting me know that the two FM stations on Lookout Mountain were off. I began looking into it and realized I could not connect to the site because the microwave was down. For some reason, our internet backup wasn't running, either (we have Comcast internet at the site which we use with our Barix Exstreamer 500 backup codecs for backup audio to the site).

I headed up to the site to try and fix the issue and found, as expected, that the microwave link was down. I was hoping it was a power outage, but that was not the case. All equipment in the building (it is a shared building) was on.

I'm sure most of you can relate to this – when there is more than one issue, they all tend to collide as you troubleshoot. For me, the microwave was down as was our backup. Where do I even start? I did a few reboots of the microwave system but it wouldn't come up. This particular microwave radio is a newer one to me. I don't have a lot of experience with it. I measured voltage and noticed it seemed good. 45V to me seemed close enough. You'd think I'd learn that even a volt off could be an issue.

Once I determined the microwave wasn't coming back on, I began looking at our Comcast internet. I plugged directly into the modem and

could not get to the internet. There are four ports on the modem/router. We have our VLAN plugged into port 1, so I plugged into the other ports, but I could not get internet. I set my computer up the way I always have to get it to work with this modem. Nothing.

Comcast uses 10.1.x.x IP addresses, so that's what I set my computer to. I ran a command prompt and did ipconfig. It showed my IP as 169.x.x.x. Hmm... not right considering I have my computer set to a 10.1.x.x IP. Certain network issues I just don't understand, and this was one of them. I tried all three remaining ports. Then it mysteriously began working. It saw my computer as being on the proper IP. I looked things over and didn't find any issues. In fact, I found the internet working just fine, but the VPN was still dead. It was pretty late so I called it a night.

We decided the backup issue had to be the VLAN. We have Cisco ASA units on each end, one at the studio and the other at the site. I called Steve Solton of Convergence Solutions, who initially set this all up for us, and he began looking at it. He would think he found the issue, but it ended up not being the issue. My dad and I headed to the site to continue looking at things there. We had to get the two stations on the air. My dad worked on the microwave while I worked on the internet.

After hours of troubleshooting and not finding a fix to the VLAN, I bypassed it. I plugged our internet directly into our network switch, then re-enabled the port forwarding that we had thankfully saved in our modem. I just had to change some IP addresses at the studio to send to the correct address and port. I got the codecs talking and audio back at the site, but still, many of the port forwards weren't working. To get us remote control of the two transmitters, I got a laptop set up and left it at the site so I could at least have VNC access.

We brought the microwave radio back from the site to continue troubleshooting that. Thankfully, the radio was fine. It was the power supply! We made sure it was working on the bench, took it back to the site the next day and tested it in the building before we finally put it back on the antenna. It came right up and I was able to get things routed properly again. I had taken a five-port network switch up there and decided to leave the Comcast internet and the two Barix boxes plugged in so they can still work as our backup. We brought the Cisco ASAs back and haven't decided what exactly we want to do with them.

I am just glad we figured out the issue and got things back. It was definitely a crazy week for us. I don't think I have been as busy as this since we installed the new Wheatnet system.

### **Looking Ahead**

While spending all that time at the KLTT transmitter site, I realized it needs work. It's not for lack of trying, but the sticker weeds are out of control. The ATUs are dirty, locks need to be replaced, weather seals need replacement, and so much more. The canal needs to be maintained. While there wasn't much growth to warrant a tractor visit this year, I am planning on hauling it to the site to go ahead and mow down what little growth there is and use the bucket to smooth out the canal road – the prairie dogs have taken over, and it makes getting to each tower very difficult. I plan on finding a way to kill off the weeds around the building and in the tower base areas. So I plan on making October the month for KLTT. I want to get that place looking great again.

That about covers it for this edition so until next time... that's all folks!!!



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The Local Oscillator  
October 2018

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**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/95.3 MHz, 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, 2.2 kW-D/430 W-N, DA-2*

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

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

**WDCZ • Buffalo, NY**  
*950 kHz, 5 kW-U, DA-1*

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

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

**WRDT • Monroe - Detroit, MI**  
*560 kHz, 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*



Corporate Engineering  
2821 S. Parker Road • Suite 1205  
Aurora, CO 80014

email address: [crisa@crawfordbroadcasting.com](mailto:crisa@crawfordbroadcasting.com)