The Local Oscillator

The Newsletter of Crawford Broadcasting Company Corporate Engineering

SEPTEMBER 2020 • VOLUME 30 • ISSUE 9 • W.C. ALEXANDER, CPBE, AMD, DRB EDITOR

Little Foxes

As the summer months passed, our engineering teams in many markets found themselves very busy. Some of this was project work, most planned. But some was dealing with issue after issue that either cropped up or were discovered in the course of dealing with yet other issues. One of our chief engineers characterized it as like playing *Whack-a-Mole*, and I don't disagree with that assessment, but I also have another name for it.

You're probably wondering where I came up with the heading, "Little Foxes." It's what came to mind time and again as we continuously put out fires and discovered problems we didn't know were there at all. There is a scripture in Song of Songs chapter 2: *Catch for us the foxes, the little foxes that ruin the vineyards, our vineyards that are in bloom.* That's what we've been dealing with – little foxes that ruin the vineyards. Small issues that, when ignored, produce big problems.

An example… HVAC filters. No big deal, right? And yet in one market, as we were dealing with a transmitter site A/C unit failure, we found filters that were so clogged with *inches* of dust and dirt that very little air could get through. There was a handwritten 2016 date on the filters indicating the last time they were changed. Is it any surprise that the evaporator coil was freezing up? Is it any surprise that the compressor now, even with clean filters and good airflow, runs very hot and draws significantly more current than it should? A little fox, failure to change or even regularly check those filters has had a negative impact on that transmitter site, possibly a big one. (For clarity, the current chief engineer is the one who discovered the issue, and he has only been on the job a few short months.)

More examples…

The feed system for a free-standing AM tower. Dealing with unexplained changes in impedance, we began to investigate the feed tubing system connecting the large-aperture tower to the ATU, and we found that on a couple of the legs, the feed tubing was held in place only by the paint – the welds were broken. Another little fox. A regular visual and mechanical inspection of that feed system would have revealed the problem long before it became a problem.

The RF contactors at that same site, used to switch between day, night and ND modes, were arced up and missing fingers. The shorting bars were arced up and pitted so that even after replacing the fingerstock, there was so much friction that the solenoids did not have sufficient authority to fully seat them. The likely cause: the RF kill on the transmitters was not connected, and remote control macros were relied upon to provide sequencing – RF off, select mode, RF on. Clearly those macros were not always firing properly or in order. Another little fox, ruining the vineyard.

And finally (but by no means concluding the list) is the main 400-amp disconnect at a collocated studio/transmitter facility that had not, evidently for quite some time, been seating the blades properly in the sockets. We had been experiencing intermittent power issues at the site for a long time, wrongly blaming the utility for delivering unreliable power and running on generator for days on end. The contactor was mechanically broken internally, and evidently had been for a long time. That had to have been noticed – it could be felt when the switch was thrown. That little fox could have burned our building down!

The point of all this is that it's important to see to the little foxes, to deal with even minor issues with dispatch when they come up. Deferring maintenance, putting off repairs and cutting corners on equipment installation will, sooner or later, come

back to bite you (or the person who comes after you). We can't let that happen.

Wildfires

Anyone who has watched the national news in recent weeks is undoubtedly aware of all the wildfires throughout the west, particularly California. Here in Colorado, we currently have four big fires burning, one of which is over 120,000 acres, although you wouldn't know about any of those from the national media – they only report the California fires and ignore "flyover country."

In early August, we had another close call at the KBRT Oak Flat transmitter site. A fire started in the area of the lower gate that provides access to Skyline Drive, the dirt switchback road that takes us up to our site some 2,700 feet above.

The area around the Skyline Drive entry gate below the KBRT transmitter site. Note the burn scar behind the houses.

Readers may recall that this road is closed to the public. Only landowners and their designees are provided with keys by Riverside County, and they (and official vehicles) are the only motorized traffic allowed on Skyline Drive.

The road is, however, open to foot and bicycle traffic, and lots of folks use it. When driving up, we have to be on the lookout for pedestrians and bikes around each curve, and we often get the stink-eye from those folks, some of whom believe that we shouldn't be driving on their "footpath."

It was evidently one such pedestrian or bicyclist that started the fire last month. It burned several acres, and Cal Fire (God bless them!) threw everything they had at it, getting it mostly put out in just a few hours and completing the mop-up in a couple of days. The people who live in the adjacent neighborhood no doubt breathed a sigh of relief.

The impact on us was minimal, just a closure of our normal route into the site. We can, if we have to, get in from the Orange County side, but it's a real chore to come up Blackstar Canyon. Thankfully we didn't need to get in during the closure of Skyline Drive.

So Long!

This month, we say goodbye to Fred Folmer, who has been the transmitter site contract engineer for KBRT since 2013. Fred is retiring and moving to Oklahoma, of all places (he has family there and visits often).

We'll miss you, Fred, and we wish you all the best in retirement!

As for who will take Fred's place, I'm looking. I have a couple of possibilities to explore, and if any of you know a qualified contract engineer in the area that might be interested, send them my way. In the meantime, Todd Stickler will continue to do most of the routine maintenance, and with a little direction from me by phone he can likely handle most anything that would routinely come up.

C-Band Repack

Many of you have probably heard about the FCC reallocating 280 MHz of the C-Band satellite frequencies to wireless for 5G. That is going to impact our use of the C-Band in several markets: Rochester, Buffalo, Birmingham, Detroit, Denver and Modesto.

Initially, we will need to purchase and install bandpass filters that will go between the feedhorn and the LNB on our C-Band antennas. That will happen before the end of 2021. Then over the next couple of years, we may have to point our antennas at different satellites and replace our receiving equipment. We'll take our cues from Westwood One, Amb-OS and other providers for that.

For now, we don't need to do anything. I will get the bandpass filters ordered at the appropriate time and get them to the affected markets.

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

Hello to all from Western New York!

It's hard to fathom that we are already heading into the fall season, with winter close behind! This year has been interesting to say the least, with our lifestyles turned upside down and uncertainty around every corner. The COVID-19 pandemic has changed the way we interact with other people, enjoy leisure time with family and friends, shop, worship and perform our jobs. No one can predict the future with even a small amount of accuracy, but I concur that the future will be unlike anything we could have imagined.

It's been said that change is good, but it's hard to imagine that good changes could evolve out of what our country has gone through since the onset of the pandemic. The upcoming presidential election is perhaps one of the biggest in history, (aside from the conclusion of the 1930s Great Depression). It's difficult to know which candidate has the best plan to pull our country out of this, but one thing is for certain: man cannot do this alone! We've never needed God more than now, and we must look to Him for guidance to bring us back to some sibilance of normalcy and complacency. Pray for our country and its leaders, I believe that there is much more riding on this election that we could ever imagine!

In last month's column, I reported on the issues we were experiencing with the WDCX-FM transmitter showing high VSWR. We suspected some sort of anomaly with the feedline but were unable to pinpoint exactly what was causing the problem. Cris ordered 400 feet of 3-inch Heliax, along with connectors and hangers, to replace the existing 41-year-old run of the same.

On Saturday, August 8th, the crew from JT Tower arrived in Buffalo and began the removal and installation of the new coax. As they began removing the old feed line, they discovered a large area near the bottom antenna bay that had been arcing for some time. It appeared that the outer jacket had been rubbing against a hanger, causing a large area of exposed outer conductor which began arcing from the high RF field.

Another issue they discovered was moisture inside the feedline inside the building, right at the connector! Due to the positioning of the feedline at the entrance into the building, the moisture could not have entered conventionally and run down the line. It had to have been injected into the line from the dehydrator. I removed the dehydrator from service and found that it was defective and in need of repair. Until repairs are made, I am pressurizing the lines with nitrogen I have on hand just in case of an emergency.

After the crew installed the new coax, the reflected power is averaging about 22 watts, way below the 170+ watt reflected power we previously had. We considered having ERI come out and field tune the antenna for a better match to the new feedline, but with a VSWR of 1.06:1 or thereabouts, any improvement would be negligible and not worth the $7,000 or more it would cost.

Not long after this project was completed, we began having issues with the Burk ARCPlus Touch at the WDCZ transmitter site. On Monday evening the 10th, the WDCX-FM board op called and reported that the readings on the remote control were blank. Upon arriving at the transmitter site, I noticed that all labels on the remote control were blank. I uploaded the configuration files I had stored on my thumb drive, and all looked fine. The next morning, the same situation, all the configuration was gone. I re-installed the files again and began prodding around to see what could have caused the issue. No

The crew from JT Tower installs the new run of Andrew HJ8 on the WDCX-FM tower.

connections were loose, no heating of components on the motherboard, but I did discover that the power supply was putting out inconsistent voltage, dropping as much as 1.5 volts in a cycle. I did have a spare supply, so I swapped it out and thus far, no more issues. I recall that several CBC sites have experienced power supply issues with these units over the past few years, so at Cris's recommendation, I purchased a spare supply to have on hand in case we experienced such a failure, and I'm glad I did. I'll order a replacement just in case of a failure in one of our other Burks.

Just a few days after the remote control episode, I noticed that the readings on tower 2 at WDCZ were skewed from the normal. At the tower 2 ATU, I found a compression clip loose on the coil of the tee-network. There was minimal arcing, so all that was needed was the replacement of the clip.

Once replaced, I went back to look at the parameters on the antenna monitor and found that there were some additional issues; the indications did not return to normal. I shut the transmitter down and began feeling around the components in the ATU. I found one of the capacitors hot to the touch and removed it for further inspection. On the back side of the cap, I found a hairline crack, so replacement was indicated. Once I replaced the suspected defective cap, all the operating parameters fell back into place.

I did notice that there were signs of insect habitation due to a missing snap-in ventilation cap in the bottom of the ATU. These vent caps are made of plastic, and over time the heat will cause them to crack and eventually fall out. Before winter, I will inspect all the ATUs and clean them out where necessary and replace any of these caps to keep rodents from nesting in the nice, warm cabinets.

Here, the line had rubbed the tower until bare copper was in contact with the tower, arcing in the high-RF field.

It was planned that I would have completed the final tuning on the Nautel ND-5 we purchased from Albany by the 17th of August, but other issues kept me from getting this accomplished. CBC-Denver needed the equipment back that had been loaned to me by the 17th, so once their project is completed, they can send it back so I can finally get this project completed. I have already installed the electrical disconnect switch, feed line into the phasor cabinet, and grounding is done, so the only procedure left is the tuning to 990 kHz. Good Lord willing, this will be done by next month's report.

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

Nautel J1000 Electrostatic Discharge

As most of you know, you can hear AM signals making ribbon coils sing inside phasors and ATU cabinets. The RF also makes the various components inside transmitters vibrate as its current and amplitude impart changing magnetic H-fields that cross paths with other conductive materials. This is harmless and sometimes comforting, as you're always aware that you're on-air while working at the site.

But H-fields can be your enemy too. Of course, lightning strikes blow things up, and we all do things to try to keep that from happening. But do we do enough? It's probably impossible.

It's also impossible to know what the next victim of the clouds will be, and it doesn't necessarily take lightning to make it happen. Cloud formations always present a charge differential to the earth. In fact, the earth and the clouds form a giant air-dielectric capacitor. Our well-grounded antenna systems and transmitter sites are a fantastic path for electrons to move through, even if they don't result in a lightning bolt.

So, what am I saying?? Solid-state transmitters can be damaged by the clouds floating by overhead.

One of our J1000's received massive damage because of this phenomenon a couple of months ago. Electrons racing toward the clouds above present large differences of potential inside antenna-connected devices like our J1000. It has two 500-watt MOSFET power amplifiers that both required an extensive rebuild because there was not a proper ball-gap installed. Actually, there is an internal one, but the installer never set the gap as specified here:

https://www.thebdr.net/articles/steel/twrs/gap.xls .

We also employ static drain chokes within our ATUs, but they're clearly not enough. A properly set up ball gap would have discharged this capacitor by ionizing the air in tiny air gap and supplying electrons to the plate of the capacitor. The prescribed gap in our application is .010" -just 10 thousandths of an inch.

This repair project took many hours and dollars and a pile of parts to complete (see Figure 1). While not all the MOSFETs tested bad, I replaced them all anyhow. MOSFET devices have an infinite gate to source impedance, meaning that they are easily damaged by electrostatic discharge (ESD). CMOS devices are easily damaged in the same way.

If you look at Ohm's Law, I=E/R, using 2,000V (a conservative voltage for static), divide by ∞ and you get zero, so I=0. But all semiconductor junctions have an ultimate breakdown voltage and when that voltage is reached or exceeded, R becomes very close to zero. So say it's one ohm… 2,000 ÷ 1 = 2,000… imagine 2,000 amps even for a microsecond!

The problem with ESD and MOSFETs is that the breakdown voltage is often much less than

Figure 1 - A LOT of blown-up parts in the power amplifiers of this J1000 transmitter.

that of the ESD, which is why so much care is needed when working with them. At a minimum, the technician should have an ESD mat clipped to a trusted ground.

The damage was fortunately confined only to the power amplifiers and didn't affect the exciter. Since this is undoubtably not the only time this has happened, Nautel has a list of commonly ruined components and can supply them along with instructions for their replacement. It's a bit of work, but I did it in about a day. The J1000 is back in service and runs perfectly – now with a new ball-gap installed and correctly adjusted inside the phasor (see Figure 2)!

Recommended Reading

https://www.thebdr.net/articles/steel/twrs/LimitingStatic.pdf

Figure 2 - We now have a properly-spaced and rigidly-mounted ball gap across the transmitter output.

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

God bless the poor souls in Louisiana. As I write this, Hurricane Laura is still a hurricane with 100 MPH winds, headed toward Shreveport after devastating south Louisiana. Having lived through several hurricanes, my prayers go out to them. As soon as I'm able, I plan to donate to hurricane relief, and I would encourage everyone else to do so as well.

COVID Thoughts

How many months have we been in this COVID semi-shutdown and "wear a mask" thing? I've honestly lost count. One thing that this madness has made clear, though, is that American manufacturers were far too reliant on China. I'm not saying that's the only reason for empty spots on store shelves, but it's a big part of it.

Case in point: 101.1 in Cullman has been running on one (badly overworked) air conditioner for a couple of months now. Thankfully, we added a vent fan some years ago, and it's keeping us on the air, but I cringe at the long-term effects from moisture and dust getting into the building. The second air conditioner is still waiting on a compressor. In the past, we were able to get something like this within a week or two at most. Not anymore. Some American manufacturers are moving production back to this country (which is certainly a good thing), but others appear to be milling around in confusion, hoping that things will return to "normal." Whatever that means.

But... you're gonna think I'm whining here... you know what one of the most aggravating things for me, personally, has been? Most restaurants are only doing takeout, and you have trouble finding a bathroom that you can trust. Seriously. I won't bore (or gross you out) with the details, but suffice it to say, as you get older, sometimes urgent urges come along and you have to plan ahead. Travel centers are open, of course, but most of them are some distance from our transmitter sites. Plus, while the employees try to keep them clean, it's not easy, because so many people are using them... because the restaurants have closed their dining rooms (and bathrooms)!

Oh, well. I lost a good friend to the COVID virus last week. I hadn't seen her since high school,

but I remember that she always had a smiling face and was kind to everyone. She's in heaven now and free from pain or care, but she leaves behind a grieving family. While I think that the shutdowns were largely unnecessary, I do acknowledge that for some people, COVID is indeed a killer.

I realize that the death rate is actually quite low (something that our outstanding news media keeps glossing over), but the elderly and/or those with compromised immune systems still need to be very careful. If you're in that group... be careful. Don't think that a mask is a force field that protects you from everything. Keep your hands away from your face, wash and use hand sanitizer, and stay away from anyone who is coughing or otherwise displaying symptoms.

Tower Lights

One complaint that you'll often hear from engineers is that the newer LED tower lights are definitely more efficient and seem to last longer... but they won't work well with the old monitoring systems that we used back in the incandescent days. They draw so little current, it's hard to get a meaningful sample without resorting to multiple loops of wire and other tricks.

Our 92.5 tower is a perfect example. I found a really neat snap-on current transformer at Digikey for about $40; it has a built-in rectifier and filter. It works, but it only puts out 120 millivolts of DC when all lights are on. That's too low for reliable monitoring with our Burk ARC Plus. After piddling with it, in my copious spare time, I built a little DC amplifier to boost that to something more usable (Figure 1). I used LTSpice to model it and took some pictures of what I came up with. Spice modeling makes it easy to see if any components are overheating or suffering other stress (they weren't in this case; all were cool and happy).

The simplified schematic in Figure 1 shows

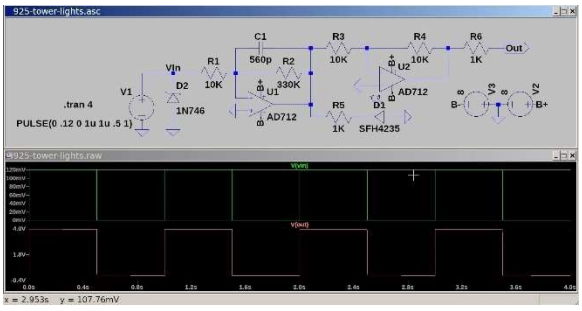

Figure 1 - LTSpice simulation of a DC amplifier for 92.5's tower lights.

what I came up with. The power supply (V2 and V3) is a simple brute force transformer-and-diode job; no need for regulation or a lot of filtering, because the op-amp that I'm using has an excellent power supply rejection ratio. The simulation shows an AD712, but that's only because LTSpice didn't include a model for what I'm actually using, a TL072 dual amplifier (i.e., two op-amps in one package). The AD712 has similar characteristics, so I used it for the model.

It's pretty easy to follow. The sample transformer, and the resulting pulsing DC voltage, is modeled by V1 to the far left. There's a 3.3V Zener diode (D2) to protect everything that follows. U1 has a gain of 33, boosting that 120 mV up to a usable level. The output is negative, so I feed it into the second section of the TL072 (U2), a unity-gain buffer that flips it back to positive for the Burk. D1 is an LED that gives me a visual blinky. (I like blinkies; they make me happy. Hey, joy is where you find it nowadays; amIrite?) I chose the inverting configuration for simplicity, and like I said, I had two amplifiers and resistors are dirt cheap, so why not?

As usual, I learned some things while I built this. Current transformers work on the same principles as a "regular" voltage transformer, but in practice, they can fool you. The biggest caveat is to never, ever run a current transformer without a load (called the "burden") resistor. The secondary voltage will go to some ridiculously high value – it (probably) won't actually hurt you, but it'll be more than enough to knock you on your rump and possibly arc over internally, destroying the coils inside. In this schematic, the 3.3V Zener prevents this and also protects A1. R6 limits the output current, and there's a second Zener (not shown here) at the Burk to protect its inputs.

Fail2Ban

Those of you who maintain servers likely already know about this splendid fellow. The number of attacks on our sites has increased exponentially of late, mostly from a bunch of Chinese IP addresses. These are brute force attacks that simply try every common username and password. Ergo, the first rule, oft-repeated and obvious, is to make sure that you use a unique, complex password. Yeah, they're a pain in the rump to remember, but if the alternative is having a Bad Guy shut down your server, it's worth it.

The next rule is to use something like Fail2Ban to block any IP address that tries the old guessing game. I've set this on our servers to three tries, with a ban time of one hour. This means that if one of our users forgets a password and starts guessing, they'll be locked out as well, but we can

cure that by telling them not to forget their password (duh). (And heh.)

In the past, we could enjoy at least some protection by simply not using the default port numbers – something like, say, port 30182 instead of port 22 for SSH, for example. That's no longer effective. The hackers have scripts and "bots" that will scan your IP address for hours, looking for opened ports. Something like Fail2Ban is a necessary addition.

Like most geek-designed software, setting up Fail2Ban can get complicated if you're protecting a number of different servers on the same machine. There are walkthroughs and "how-tos" online, but most of them leave something out or have slight mistakes in the text. (Ask me how I know this.) To protect SSH on CentOS 7, which is what we use, you can simply install Fail2Ban, then create a file called "sshd.local" in the /etc/fail2ban/jail.d directory. Mine looks something like this:

```
[sshd]
enable = true
port = (your port number)
action = iptables-multiport
logpath = /var/log/secure
maxretry = 3
bantime = 3600
```

This might need to be tweaked if you use a different OS. Fail2Ban will scan the indicated log ("logpath") for failed login attempts. After "maxretry" attempts, it will ban the offending IP address for "bantime" (3600 seconds, or one hour, in my case). Worth its weight in gold. Figure 2 is a snapshot of the results from our FTP server after only a few hours in operation: 53 bad IP addresses blocked. When I first installed Fail2Ban, sure enough, it was blocking several IPs per hour. But as Figure 2 shows, after only a few hours, the attackers gave up and moved on. Perfect!

Until next time, keep praying for this nation and be sure to vote in the coming election!!

```
Status for the jail: sshd
|- Filter
|  |- Currently failed: 0
|  |- Total failed:     3432
|  `- Journal matches:  _SYSTEMD_UNIT=sshd.service + _COMM=sshd
`- Actions
   |- Currently banned: 0
   |- Total banned:     53
   `- Banned IP list:
```

Figure 2 - Fail2Ban doing its job; the attackers have given up!

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

WPWX Auxiliary Transmitter Site

The tower crew came in and replaced the 1-5/8" transmission line going up to the auxiliary antenna on our Lansing, Illinois, tower with the 2-1/4" inch line that will allow our new GV20 transmitter to be at full power when we use it for WPWX as an auxiliary site.

This could not have come at a better time. Shortly after we had the aux site ready to go after the line replacement, we experienced some very severe weather that included eleven tornados in the Chicago area. While just about every generator at all our sites came on at some point, it was the main WPWX site in Burnham, Illinois that was very much affected.

It went to generator and power wasn't restored until five days later, and that was earlier than expected. During this timeframe, we had some close calls. The day after the storms, we noted that our propane tank was getting low, and I am guessing this was the case with a lot of customers. Getting someone to deliver that day was challenging, but we did eventually get a delivery late in the day. I didn't think we would have any propane left to run the generator by the next morning and the site would be off air.

Later in the week, even though we had planned the delivery ahead of time, we went through a similar scenario. This time it was due to the delivery truck not being able to reach the site due to the crossing arms being stuck in the down position at a railroad crossing. Once again, I had doubts about the

site still having fuel in the morning and being on the air. Fortunately, the crossing arms were repaired, and we were able to talk the delivery truck driver into coming back later in the day.

Now it wasn't fun having to wonder when power would be restored to the site and worry about getting fuel to the site when we need it, but I didn't go into complete panic mode because I knew we now had a high-power backup transmitter at another location not too far away, and that site had only gone to generator for a few hours.

While we never went to the auxiliary site during the five-day power outage at the main site, it was great peace of mind knowing that we could do so. I thought about how bad the storms were that created the outage and realized it could have been much worse. If any of those tornados had been much closer, we could have had a lot of trees down in the immediate area surrounding the main site and the propane truck might not have been able to make it in there for days. Not to mention the possibility that the tower could have been taken out by a tornado.

The assurance of having this alternate site now in place with a much higher power level is great to have for this important station.

Studio Rebuild

At the time of last month's writing, we reported that we were just finishing up on the first of our control rooms, getting new studio cabinetry and converting fully to the Wheatnet system with the new Wheatstone LXE control surfaces.

The new WYRB studio has been up and running without a glitch, and the staff is really pleased, not just with the new equipment, but with the way the new furniture design fits the way they work. At the time of this writing, we are just completing the last few remote start connections on the equipment, and then we will officially commission the room and move them back from the temporary studio. Two down and two to go.

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

It was a hot summer afternoon with temperatures of over 100 degrees and the sun shining brightly. It was then that our FM translator decided to go off the air. My guess was that there was a heat problem and perhaps the air-conditioner had quit.

I arrived at tower #3 where the cabinet for the translator is located, and found some very lively wasps swarming about. They really love heat, I guess. I approached the cabinet with caution so as not to disturb the wasps. I have found they mostly ignore me unless I mess with their nest, and if you mess with their nest, it is not a good time at all.

The A/C was running and sounded normal. Opening the cabinet, I found all the equipment cool. The transmitter appeared completely dead, but it was hard to tell with the sunlight. Moving slowly, so as not to disturb the wasps, I removed the transmitter at took it back to the shop.

I connected a dummy load and power to the transmitter and the screen soon lit up with the message "TX6SDCARD ERRORING…" Nice to have a message, but it doesn't tell me how to fix it. I figured it wouldn't hurt anything to take the lid off and have a look. Maybe something is loose or maybe it just had a bad 807.

After taking out the 26 screws and removing the cover, I was dismayed to not find an 807 anywhere inside. Oh well, time to look in the manual. I downloaded the on-line manual and did a search for the error code and found zilch. Time to call the factory.

I soon discovered that the factory was in the UK. The good news is that they speak the same language (well sort of anyway). The bad news is that they are seven hours offset from California.

I waited up until 0130 local time and called their office. I was pleasantly surprised to be talking directly to a guy that could help me. He said that he would email me with instructions and a file to re-flash the SD card. He also said that I might want to buy a new card in case that one was bad.

The next morning, I stopped by Best Buy and bought two microSD cards. That was a fortunate decision, since the original card turned out to be bad. I formatted and flashed the new SD cards and then installed one and re-programmed all the parameters for the transmitter. I also set all the parameters on the second, spare, SD card. I tucked away the spare SD card in the transmitter so that it would be a quick fix should I ever have to do this again. The transmitter was back to normal operation and has been without errors on its log so far.

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

The early movie comedians become the theme for the column this month. In the early days of local TV, stations would fill vacant broadcast hours with old Hollywood movies. Radio has been called TV without pictures. Sometimes stations would be forced to resort to even older silent films. I wonder, would that be radio without sound?

Some of the classic entrainment figures who transitioned to the golden era of TV became national champions of the American spirit. Others entertained us with slapstick comedy. A typical scene might include a dozen people moving in apparently disordered fashion, many carrying ladders and other dangerous implements. Amazingly no one ever seemed to be seriously hurt.

The Keystone Kops were one such group, and the name became slang for any disorganized event in which nothing it seems could ever go right.

Lately here in Portland, the issue of safety has developed its own local flavor. That came home to roost this month as we began to transition to a new alarm system monitoring service. We were totally happy with our old service, but as a small entity, they were bought out and we now have to deal with a new service.

It didn't help that we learned of the transition when we received a quarterly bill from an unknown party. That bill was sent to wrong address and there was no purchase order, so when we got it, nobody knew what it was. And then two false alarms in a few weeks isn't a good recommendation.

In the ongoing saga of the alarm system since the new monitor service provider appeared, we had a service tech come out to audit our system. There were no problems with the physical system or other issues at our facility, but it turns out there were issues and they were not at our plant.

When the service tech arrived, he called the monitoring center and placed our system on test. During the test, I received a page to an 866 number, which seemed to be some kind of promotional number. Then Roger at the station mentioned that a former employee had called asking us to please take her off the alarm company list. (We had changed the list some time ago and once again last month.)

The tech called in to tell the monitoring center that our system was in test status. Then, about 45 minutes later, Roger said that someone from the security company wanted my authentication. The call was from the monitoring center informing me of a break-in. At that point, I let the on-site tech talk with him directly.

A much toooo long story made shorter, the tech got his manager and the monitoring center manager on the line, and they think they have resolved the problem, which was in part due to having several accounts in the system.

(That also may explain why the former employee got called.)

The tech thinks we have the problems under control and the accounts in are straightened out. I did get a partial answer to the change in monitoring vendor. It appears that Stanley bought out someone else who bought out Sonitrol. That seems to be an explanation for the multiple accounts.

At this point I was not totally comfortable with the answers for the monitoring center believing there was a break-in alarm, which had already caused two false alarms. The tech said he had tested that and confirmed that the monitoring center is getting the proper codes.

Then two days later, I received an automated computer-generated voice message from the alarm monitoring company, which was almost intelligible. The message informed me that the system located at "sout heat hay out street had missed a periodic test on day at time." It went to my voice mail and I replayed multiple times to understand the mumbling message. I did not get a page.

Fire alarm systems are required to have two different paths to the monitoring station. There are two RF (wireless) transceivers at the station. These operate on a mesh wireless radio network, which periodically (every eight minutes) sends test messages to detect a possible failure. Occasionally, in a mesh network, there will be a missed test, which is not unusual and is a problem only if tests repeatedly fail.

Then I got a third automated call with a "Dial 1 to talk to an operator." I did. Then got placed on hold for 16 minutes. Now mind you, if this is reference to an urgent alarm report (as the mumbley computer voice intimated), being on hold that long doesn't seem to build confidence.

It seems that our system is programmed to make a status report every 48 hours. Someone programmed the monitor center computer to expect a report every 24 hours. Did I say Keystone Kops?

Rocky Mountain Ramblings
The Denver Report
by
Amanda Hopp, CBRE
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August is typically a slower month for me. With our weeklong vacation each year, it seems that it makes the time just slow down. No big projects, the start of inventory, a time to go to each site and just make sure all looks good. This August was a bit more chaotic than usual.

Satellite Issues

For months, we have had on-again, off-again satellite issues. Our satellite programs come in at the KLZ transmitter site where the C-band antennas are. The audio is then transported over a 20-year-old Harris Intraplex to the studio.

I guess 20 years is a bit long for a piece of equipment to be working as well as it had been, and it began having issues. The symptoms were random, some days being intermittent audio and other days no audio whatsoever. It made the problem difficult to track down.

One day, it required a CM-20 (IP card) reboot. The next day I had to reseat all the cards in one of the units, even the ones not being used. When I did this, the unit went into alarm when I put the cards back in. I've been dealing with these units for years and had never seen that. It made it even more difficult to diagnose an issue because it would interrupt the audio, and we don't have a backup for the satellite feeds other than old backup programs loaded in NexGen.

We made the decision to move the four satellite feeds we currently use to our Worldcast Horizon codecs. We have two of those codecs at the KLZ site, one for KLZ and the other for KLVZ-night, which is collocated at the site. This seemed to somewhat solve the issue. At least it got us off the failing equipment.

But on the Amb-OS satellite feed, we continued to have problems. We only carry one live show, but it is an important one. I did everything I could to find a solution with no luck. The Amb-OS receiver is circa 2005, so it has 15-years on it. Although the audio coming from the receiver seemed to be okay, I decided it best we upgrade.

We have noticed in years past that these particular receivers will expand to use up as much network bandwidth as is available, and that has caused audio issues for the radio stations. I don't know if somehow it found a way to expand past what I allowed in the smart switch, or if this was some other unknown issue still.

So we upgraded to the AMR-100i, which is an internet-only unit. I was able to plug this in at the studio and now we don't have to worry about its audio being transported from the transmitter site back

to the studio any longer. This solved the audio issues on that feed.

We carry several XDS feeds throughout the day. We noticed early in the morning (4AM) was when the audio problems were at their worst. The issues usually were cleared up completely by 9 or 10 AM. We looked everything over and could see on the receiver the signal randomly drop to zero. The log was full of those dropouts. The signal didn't gradually go up and down… it was there, then it wasn't, then it was back again, quickly. So we replaced the LNB, and I have had no more reports of bad audio. All those signal dropouts disappeared.

These types of issues are the ones that irritate the heck out of me. It seems that by the time I get to the site to really dig into them, they clear up… for the moment. I have a choice: either get out there super early when I know they happen, or take my chances, waiting for a little bit of daylight. Thankfully, my choice to wait it out paid off in this case, and we were able to hear the issue at the site when it was happening. That led to the decision to replace the LNB.

Port Forward Problems

Last year, we got Century Link internet service at the KLZ, KLDC and KLVZ transmitter sites. We wanted to do away with ISDN and have a more automatic and quality way to get backup stereo audio on air.

The modems provided by Century Link have the ability to do port forwards. We needed to get them set up so that we could send audio from the studio Barix units, which we use for backup audio to the Worldcast Horizon codecs on the microwave links, out to each site. So, one port forward, maybe two per unit. Shouldn't be a big deal, right? Wrong! I can get the port forward to work for a time on the units, but then when I actually need backup audio, I find the packets aren't being forwarded.

I have checked into every setting and cannot find anything that would cause this issue. I looked it up and it would seem this is a known issue. We need this to be reliable, so we purchased one Ubiquiti Edge Router ER-X. Ubiquiti is a brand we know and trust. We use their NanoBridge 802.11 links at the transmitter sites, and I personally use their Lite Beam to scarf internet from my dad's cabin at our cabin in the mountains. I have been very impressed with their products.

My dad and I wanted to try the Ubiquiti router at KLZ first. We went out and put the Century Link modem into transparent bridge mode but could not get it to work. Part of the issue is thay Century Link never gave us a document with all the various IP addresses we would eventually need: WAN, gateway, LAN, and DNS. The modem had most of this on the status page, but it made no sense. A subnet of 255.255.255.255… how would that even work?

It doesn't help that every time I start doing network projects like this, ones that get a bit complicated, purple smoke starts billowing out of my ears. Networking is something I want so badly to learn and understand, but I just can't seem to. My dad got on the phone with Century Link one morning at the office to discuss the issue with them and to try and get the info we needed. They were more than helpful, telling us the router should allow a PPPoE option. They gave us the info for us to use that, so we went out to the site, put in all the info and still no go.

The one confusing thing was on the Century Link modem, when you put it into transparent bridging mode, a second box appears for VLAN tags: Untagged, Tagged 201 and Tagged 0. We chose untagged, not entirely sure what we were doing. It did not work. After fussing with it for a while, my dad had the idea to mess with the modem instead of the router. I think he had determined the router was doing its job, so the issue was upstream. We put it to Tagged 201 because that was what it gets set to initially. Then a miracle happened: it began working! We now hope to have a reliable port forward for our Barix, so we never have to worry about going to it and it being silent.

WorldCast Horizon Firmware Update

Part of the reason we decided to do all the work with the Edge Router was because I was having to go around to all our sites and update the firmware of our Worldcast Horizon codecs. I had an issue sometime before vacation, and the issue clearly wasn't too important as I cannot think of what it was, but I do remember discussing it with tech support who, as always, said first we need to update the firmware.

This seems to be the first step any time there is an issue. We were running 1.5.2 on all our units. I had tried to update the firmware to the latest, 3.1.0, several months ago, but it never worked. I finally gave up. I had to try it again, though. I really don't like being behind, and the new firmware has some great updates to it.

I chose to do KLVZ first. This is our all-music station, the station with the most Horizons in the chain (separate day/night sites plus separate codecs for both FM frequencies), and one that if we

were to go off air, it's not the end of the world. I made sure to get the Barix working with the port forward, and once I determined it was okay, I began updating.

The unit would show it was updating, reboot, then still be on 1.5.2. I cannot tell you how many hours I spent trying to get this to work. I followed the instructions given with no real luck.

Then one unit started acting weird after the reboot. It would let me log in, kick me off immediately, then began showing "Equipment Busy." I was finally able to get access, and noticed the login screen was a little different. This must be a good sign. I finished the rest of the steps and moved on to the next.

I was able to get three of the five KLVZ units to update. I got on the phone with support and had them get on a local computer so they could try it and see what was going on. After finally bricking one of the units, I was told to use an SD card to bring the unit back to original defaults. I got the image file flashed onto the SD and went out to do the work.

Updating from an SD card takes it all the way back to the original firmware of 1.0.4. I followed the steps given to me and could not get it to update to 3.0.1. It turns out the steps were out of order. The last steps were to update to 1.5.2. I should have known to step up the firmware instead of leaping to 3.1.0. After doing this a couple times, it is much easier than I thought. I will most likely have to do this on all of our units, as many of them do not seem to responds to the 3.1.0 update.

For those of you wondering what those steps are, I'll give them to you briefly.

1. Do the SD card update.
2. Firmware updates 1.5.2 then 3.1.0.
3. Run the Environmental Variables program to set the MAC addresses of the NICs.
4. Program it up.

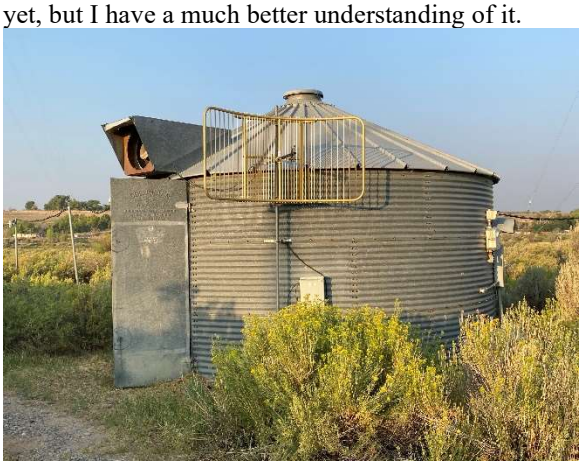
There is more detail available, but this is not the place for that. If anyone is wanting to update and knows their units are okay to update, I'm more than willing to help out by providing more detail. In fact, I plan on rewriting the update instructions given me and putting them on our engineering web server. I may never know if this update will fix my original issue, but that is only because I cannot remember what that issue was.

Side Work

The middle of last month, I was able to take a couple vacation days to go with my dad to another part of our state to help an AM station there. They wanted a moment-method proof so they could have their FM translator antenna on one of the towers in their night directional array. The FM CP required a proof, and they didn't want to mess with a traditional proof and monitor points.

I jumped at the opportunity to help with this work, as it has been years since we did any of our stations, and to be honest, I wasn't really ever involved with the nitty gritty.

It was fun watching my dad and learning how to do this. I don't think I could do it on my own yet, but I have a much better understanding of it.



Yes, this was the transmitter "building" for the radio station in we proofed. Pretty cool!

It is always interesting to go to another company's transmitter site. All companies are different, and you get a feel for what their priorities are. What I liked about this station was they used an old, small silo as the transmitter building. I have never seen anything like it. It was a clever building to use.

The company doesn't have much say over the condition of the field where the building and towers are located because they lease it. It concerned me that it was covered in sagebrush (see the photo above), and with the drought going on right now, it was one spark away from catching fire. Colorado has enough wildfires right now, so I was careful with where I parked the truck and kept an eye on the area around the truck just in case.

Being in a field, mice are an issue. We all know mice can get in through the tiniest of places. Because of that, the one tuning house and the transmitter building had a lot of… well… mousy stuff. Not an ideal place to work, if you get my drift. There were also hornets' nests in the buildings, which is not fun. We were very careful to not make any of the hornets angry and did manage to get out of there without any issues, thank God.

I am not trashing this company at all for the condition of their site. I understand how things are – non-owned site, challenging conditions and a very competent but stretched chief engineer. But it does make me grateful that Crawford has the personnel and resources to take care of each location we have and to keep them clean and in good condition.

This station, and I'm sure many others like it, tend to have one engineer for a whole region that is responsible for a lot of sites scattered over a large geographical area, so his or her time at any one location is limited. Which means you don't want him or her spending hours of time cleaning. Makes it a bit difficult to keep up with each and every site.

I cannot tell you how bad my OCD wants me to go back down there with the proper cleaning tools and to just clean. Get the place looking great again. I have found that a clean site is typically a properly working site. When you take the time to clean and maintain a site, things just work.

We did talk to their engineer about it, and he knows but is swamped with having to go to all these other sites all over the place. It makes sticking to one place for an extended period of time difficult.

We were able to get the MoM work done and were able to leave the morning after we arrived which was nice since we knew we'd get to sleep in our own beds.

I hope more work like this presents itself in the future. I enjoy learning, and I learn by doing. I enjoy any experience I can get when it comes to radio.

Coming Up

It is inventory time again. I look forward to going through it all and remembering equipment I forgot we had. I don't look forward to not being able to find other equipment. It is the way it goes. I get in a hurry and forget to mark where an item went, then I have to try and remember. I always get it done, though.

I also have on order two more of those Edge Routers, and once they arrive, I will get them set up and installed for KLVZ and KLDC. Then I plan on getting the remaining Horizon codecs updated.

September will no doubt be another busy month for me. Until next time, I pray you all continue to stay safe and well.

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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