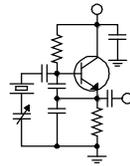


The Local Oscillator



The Newsletter of Crawford Broadcasting Company Corporate Engineering

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Hello Summer!

Not everyone is happy to see summer arrive, but I certainly am. While I enjoy winter outdoor activity ó skiing, snowmobiling and moving tons of snow around, I much more enjoy the warmer weather, leaves on the trees, water that is not frozen, and outdoor activities better suited to warm weather.

Summer is the season when broadcast engineers must get their outside work done. Most (major) tower work gets scheduled in summer months, as does site maintenance activities. We have a limited amount of time to deal with all these things before cold weather returns along with snow and ice.

Warm weather months are also the time when problems with air conditioning will show up. Units fail outright (compressor failure) or develop other problems seasonally.

In Colorado, for example, June is the month of the miller moth. We get them by the billions, and they get into everything. They cause the most problems at transmitter sites when they get past the filters into the evaporator coil area. They then die and fall into the condensate pan, and invariably they clog up the condensate drain. At one of Amanda's transmitter sites, the roof-mounted A/C unit will begin dripping condensate through the ductwork into the transmitter building when this happens. Thankfully, the unit is not located over anything but a concrete floor, so it's not a big deal.

Pollen, õcottonõ and other airborne plant materials can cause real issues with A/C units, clogging up condenser coils and causing compressor shutdown due to high head pressure. Last year, Rick Sewell came up with a way to filter the air going into the condenser coil on one of his A/C units so that this doesn't happen, and we featured that solution in these pages. Still, someone must check and clean those filters every few days or they will clog up and trip out the compressor. (Keep in mind that high head

pressure can damage the valves in a compressor, even if the high-pressure switch does not trip.)

I mentioned miller moths as one insect issue, but there are a lot of others that we must deal with regionally during summer months. Down south, fire ants present a real hazard. They are inexplicably drawn to 60 Hz AC power and will pack the contactor on an HVAC unit or an antenna switch in an ATU, each ant crawling over the carcass of the one before him to get in there and die. They secrete formic acid, and that secretion can cause permanent damage to electric and electronic components. Oh, and pity the engineer who inadvertently steps on a fire ant mound! It's going to hurt, and it will hurt in places you don't ever want to hurt, trust me!

Wasps, hornets and yellow jackets also put in an appearance come summer, and it's no fun getting stung by one of them. The drip caps on antenna tuning units are a favorite nesting spot, as are various places on satellite and microwave antennas.

And of course there are snakes. Amanda told me that she would not leave the back door open at the KLTT transmitter site while changing a light ballast in the back room (in the dark) because once in the past, a snake slithered into the building while that door was propped open. I can't argue with that!

So, hello summer! Hello miller moths, fire ants, wasps, hornets, yellow jackets, snakes, pollen, thunderstorms, mowing and all the other fun activities and features of the warm weather months! It's still my favorite time of the year.

Main Studio Rule

At its May 18 meeting, the FCC issued a Notice of Proposed Rulemaking to eliminate the main studio rule. All I can say about this is, õYahoo!!õ

For decades, a rule has existed that requires broadcasters to maintain and staff a õmain studioõ in or near its community of license. This made a lot of

sense in decades past, but in this day and age, it can be a burden with no benefit.

Consider that quite often, a station may be licensed to an outlying community, but because of a large coverage area, a much larger metropolitan area is served. If that metro area is outside the required distance or other defined parameters of the permissible location of a "main studio," the licensee may have to establish, equip and staff a secondary location that does meet the requirements. This is costly and provides no benefit to the station on the public.

Chairman Pai recognizes this and headed the effort to get the main studio rule rescinded. We applaud his efforts in this regard, and have filed comments in support. The docket number is 17-106. You can look at all the comments filed by going to the FCC's ECFS website: <https://www.fcc.gov/ecfs/>. Search for 17-106 to see what commenters have to

say about the proposal.

Satellite Change

The deadline for the switch from AMC-8 to AMC-18 is the end of this month. All of our antennas have been successfully moved to the new bird, so we're done.

A local consulting engineer borrowed our Anritsu analyzer last month to move an antenna up in Greeley to the new bird. He told me the antenna was a consumer-grade mesh dish, certainly not 3.8 meters in diameter, but nonetheless he was able to land it on AMC-18 and get a solid lock on the radio station's receivers. I was amazed at that. So much for "two-degree compliant"!

For you readers who haven't yet made the move to the new bird, time is running out. Better get it done!

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

Hello to all from Western New York! Before I get into my local markets report, I would like to address an issue that affects each and every one of our stations.

I know that in past articles, I have detailed many different computer viruses that can leave our computer networks vulnerable and open to anyone that has discovered port access. Most of these viruses, or malware, were used to gain financial or proprietary business information, such as account information, credit card numbers or personal information that could be used later to impersonate you for monetary gain. These days, hackers have become more brass, actually injecting ransomware that virtually holds your computer and its contents hostage until you pay a sum of money to have the virus detonated or turned off.

The latest ransom-ware, Wannacry, has registered over 75,000 attacks in 99 countries according to Avast, a cybersecurity firm. Not only

does this virus "lock down" your computer, it has embedded in it a hunter module, which can morph into any computer hard-wired to your network or connected via wireless, and infect those computers



that are not protected. The ransomware is spread by taking advantage of a Windows vulnerability that Microsoft released a security patch for in March (MSFT, Tech30). But computers and networks that hadn't updated their systems were still at risk. In the wake of the attack, Microsoft said it had taken the "highly unusual step" of releasing a patch for computers running older operating systems including

Windows XP, Windows 8 and Windows Server 2003.

Recently, the virus made its way into the Erie County Medical Center in Buffalo, and virtually shut down their entire computer network. The unidentified attackers were asking for a specific dollar amount as "ransom," which would go up in dollar amounts until the ransom was paid. Once they received payment, the virus would be "turned off" and normal access could be obtained. One of the

attackers requested payment in the form of Bitcoin, a virtually untraceable form of digital currency. One Bitcoin is reportedly worth \$2000 in American currency.

Needless to say, ECMC did not meet the ransom demands, and had to totally rebuild its entire computer network, computer by computer. The attackers were not able to obtain any patient or personal information from this, that was not their intention, they were specific that money, or a ransom, was all they were after, and by paying the ransom was the only way that the system could be unlocked.

In order to protect our stations, we must insure that any and all measures are taken to prevent any such occurrence from happening to either our NexGen (automation) networks or the office computers. First and foremost, make sure that your operating systems are up to date with any patches or service updates. Secondly, insure that your anti-virus definitions are up to date and that automatic updates are enabled on your computers. Thirdly, keep an up-to-date backup of your file servers and local workstations that contain important information that cannot be duplicated easily. And, most importantly, instruct all station staff NEVER to open a suspicious e-mail, especially those with attachments. If you are unsure whether the e-mail is real or not, it is always best to assume the worst and delete it before opening.

I recall years ago a big problem of malware being introduced into a computer network via external media, i.e. floppy disks. In those days, most media content was distributed using a 3.5ö floppy, from computer to computer. Nowadays, you just connect to the station's wireless network and send/receive any files that do not have restrictions attached. Unfortunately, if your computer is infected, you just released the virus to each and every computer attached to the wireless network. This is the main reason I refuse to connect to the web using any Wi-Fi hotspot or unsecured networks. You just have no idea who may be lurking, just waiting for another sucker to connect without having protection in place. I am reminded of the age-old saying, "An ounce of prevention is worth a pound of cure." Amen.

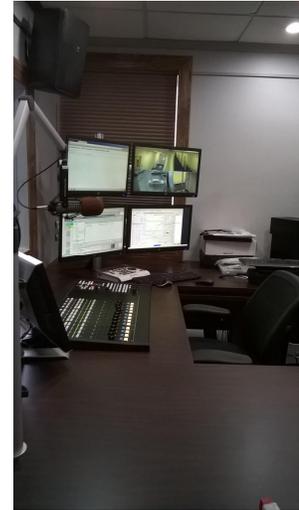
The Buffalo studio renovations have accelerated in the past several weeks. We were constantly being delayed by our general contractor not showing up for days at a time and not getting the remodeling work completed in our time-frame. After weeks of this, we finally had an eye-to-eye with the contractor, stressing the importance of getting this project completed.

We have been actively involved in this project for the past 10 weeks, which was more than enough time to get the job done, but without everyone on the same page, there were delays after delays. The new control room and talk studio should be live and on air by the first of the month. All the infrastructure is in place, tested and ready to go live. The remaining piece of the puzzle is the audio server, which will be activated on the first, and all ancillary equipment has been pigtailed and ready to connect to the Wheatnet IP system. Programming was not too difficult, and we were able to get audio in and out of the console within minutes after starting the audio mapping in Wheatstone Navigator.

The two production suites remain to be done, but these will take a relatively short time to get on line. The network cables have already been run from the switch into each room, and the equipment pigtails to the engines are completed also, so these will be plug-and-play.

It will take some additional time to get the rack room into sufficient order, but this can be done after all systems are online and any bugs worked out.

This has been a really stressful build-out, due mainly to problems related to the contractor and unforeseen circumstances that were not discovered until the demolition began, but there is light at the end of the tunnel, and when everything is completed, we will have a really nice facility that we can be proud



The new WDCX-FM control room almost ready to go!



The talk studio under construction.

of! I have included a couple of pictures of the new control room and talk studio. Next month I'll have pics of the totally completed project!

That about wraps up another month here in

the great Northeast, and until we meet again here in the pages of *The Local Oscillator*, be well, and happy engineering!

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

Greetings from Motown. The month of May was a busy and productive month here in Detroit. Several projects are underway. We were able to realign our dish to AMC18 successfully, but the path was a little challenging.

When I performed the survey, I noticed it was partially blocked by the towers. It was my hope that towers wouldn't affect the performance much.

After connecting the spectrum analyzer, and adjusting the azimuth and elevation to the coordinates for AMC 18, we acquired the satellite. I had mentioned in last month's column about using a SDR dongle as a spectrum analyzer.

Figure 1 shows what the screen looks like when using a \$29 dongle. It will definitely work in a pinch if you don't have a high-end analyzer available.

With a Winbook tablet and the SDR dongle, the two-degree spacing between satellites was apparent on the spectrum plot. The proper polarization and skew were critical to optimizing the signal. We were able to get an excellent signal even with the towers being on the edge of the path. We now have a better signal on AMC-18 than we had previously on AMC-8. I am glad that is done.

There will soon be a new station added to the CBC-Detroit cluster. We are in the process of acquiring WCHB(AM) 1200. WCHB is a 50 kW facility with a 10-tower array, yes that's right! 10!

Figure 2 shows the WCHB phasor. This is the largest phasor I have ever worked with, taking up an entire wall. It is really a work of Kintronics Art!

We are in planning stages for a new transmitter installation, a new Part 101 11 GHz microwave link, new audio server, and studio engineering. It is exciting to have so many projects to be involved with through the end of the year.

I still enjoy and make time for my hobbies too, and had the privilege of attending the first Hamvention in Xenia, Ohio. It ended up being a fantastic event, even with the rain. The Greene County Fairgrounds were large enough to accommodate the event, and the food was excellent this year.

There was plenty of old broadcast gear to be seen, and several great deals to be had. Many of the new devices being shown are SDR-based, and I had an opportunity to pick up an amazing SDR transceiver, which is available as a kit. The mcHF SDR 15 watt transceiver is full featured, and includes the FreeDV

digital codec.

Figure 3 shows the mcHF transceiver in action. I have used it with my new Alpha loop antenna. Both have provided many enjoyable days near the lake running low power QRP operation.

There is nothing like communicating with people thousands of miles away using only a few watts.

I hope summer treats all of us well, and we all dodge the lightning. Until next month! 73 from Brian W8FP.

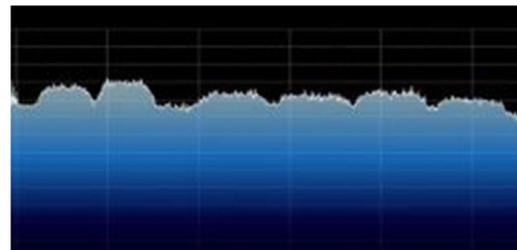


Figure 1 - AMC-18 spectrum shot off the SDR spectrum analyzer.



Figure 2 - The WCHB phasor. That's a lot of knobs!

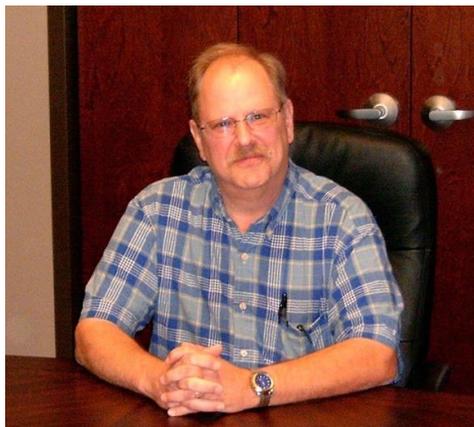


Figure 3 - The mcHF SDR QRP transceiver.

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

From the Random Thought Department: we have “Talk Like a Pirate Day” here in the United States, which is proof enough that we’re the greatest country on Earth. I think someone proposed a “Talk Like an Idiot Day” here in Alabama, but in some rural localities, there would be no discernible difference. The plan was dropped.

That said, wow, it’s June already. The year is close to halfway done and there’s still a lot to do here. I need to look over my budget requests and generate some PORs. Poor Cris usually has to remind me.



Moving the Engineering Mail Server

I just did an article on server moves for Radio World Engineering Extra (RWEE, if you’re hep). Then I had another chance to experience, first hand, how much fun this can be.

The engineering email server actually runs in a virtual machine (a “box”) on our local FTP system. We primarily use it as a target for hardware transmitter sites that need to email a status update, EAS machines that send copies of receipts, that sort of thing. The server immediately forwards it to our Crawford Broadcasting domains, so there’s very little storage. The entire virtual machine, with OS and all server software, is about 3 gigabytes in size. Contrast this with our primary mail server, which is now

approaching one terabyte.

What occasioned this was the failure of the current server the third week of May. This is where the strength of virtualization lies: we were able to get the server back up and running after Todd found an older backup. With that in hand, we simply switched execution to the backup.

You folks know that I love Linux. All operating systems have their aggravations, though, and Linus Torvald’s gem is no exception. It tends to be extremely picky about software versions. In this case, I needed to upgrade from CentOS 5 to 6 and from Scalix 11 to 12. The Scalix installers are actually very good at upgrading from a previous version, but there we clanged to a halt. The old version, 11.4, wouldn’t run on anything but CentOS 5. The new version, 12.6, wanted CentOS 6 or 7. No simple upgrade for Stephen! I would have to build a separate CentOS 6-based virtual machine for the new version of Scalix, then manually transfer the data.

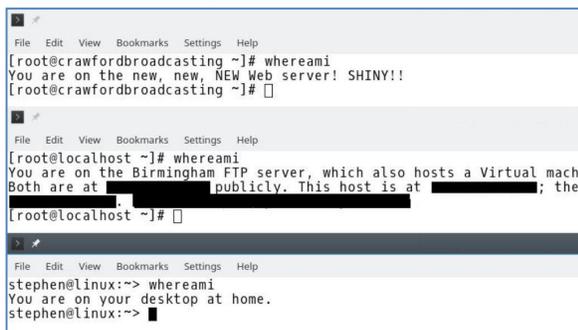
Step one was to “clone” the existing virtual machine, then copy the clone to my PC, where I could play with it without disrupting the email from our transmitter sites and EAS machines. I fired up the clone, then went in and copied out the mail data. With that in hand, I built the new box with CentOS 6 as the operating system.

More joy. To save time (heh), I had downloaded the minimal installation ISO. Trust me: when the CentOS folks use the term, minimal, they mean minimal. When it booted up, there was no networking at all. I had to manually edit the configuration files with the vi editor (one of the clunkiest pieces of software ever written). I also had to manually set the default gateway and the DNS servers. Finally, with networking up, I manually edited the iptables (i.e., the firewall) to permit Webmin and SSH so that I could work more comfortably.

With SSH, I installed a new, empty Scalix 12 in the new box. There's a special procedure that you must follow to the letter: delete the data from the new, just-installed server, carefully copy the old data into that slot, fix all the permissions and file ownerships, delete the database, regenerate the database, then re-index everything. It takes a while, but again, since I was working with a separate box, no disruption occurred.

I finally finished the new box over the Memorial Day weekend and copied it to the server machine. Now it's just a simple matter of killing the old box and switching to the new. By the time you read this, Lord willing, it should be up and running.

One final thing. I didn't specifically mention this in my RWE article and I probably should have. If you're working on two or more servers, it's very, very easy to make a catastrophic mistake. You could forget which machine you're on and accidentally delete or overwrite something important. In fact, we had this happen several years ago with our main mail server. We were still on the actual live server and deleted the entire mail storage before we realized what we were doing.



```
File Edit View Bookmarks Settings Help
[root@crawfordbroadcasting ~]# whereami
You are on the new, new, NEW Web server! SHINY!!
[root@crawfordbroadcasting ~]#

File Edit View Bookmarks Settings Help
[root@localhost ~]# whereami
You are on the Birmingham FTP server, which also hosts a Virtual mach
Both are at [REDACTED] publicly. This host is at [REDACTED]; the
[root@localhost ~]#

File Edit View Bookmarks Settings Help
stephen@linux:~> whereami
You are on your desktop at home.
stephen@linux:~>
```

Figure 1 - You'd better believe I even have that script on my PC at home (bottom pane).

Fortunately, we had a backup, and that experience taught me a lesson. Now, anytime we put a new server online, one of the first things I do is to write a simple little script called whereami. Other

approaches are possible; some folks like to change the prompt text, or use different colors or even Post-It notes on two separate monitors(!). But I've gotten into the habit of running that little script before I do anything that's potentially destructive. See Figure 1.

Trango!

We're still waiting on some answers for our Trango link to the 1260 site. We're on air with a backup, so we've resisted the urge to ship the radios back to Trango. Speaking from past experience, they'll look at them, say nothing is wrong, then ship them back to us with a hefty invoice. Neither the unit that we pulled down from the tower at Red Mountain or the spare returned to us by Trango will work.

The problem is that the Ethernet is dead. We've tried different switches and different cables. We've gone in through the serial port and have verified the configuration. We even put the unit on a VNC-capable machine and had Trango look at it. Nothing wrong. The Trango guy essentially dismissed it, thinking that we've made a mistake somewhere and somehow.

I outgrew my need to be proven right many, many years ago. With something like this, I just want it to work, and I don't care if it makes me look like a dummy. But in this case, I'm pretty confident that (a), Todd and Jack know how to connect Internet cables and switches, and (b), Todd and Jack know how to configure the radio. And re: what I just said and to prove my point, we had Cris go in with VNC and double-check the configuration for us.

We have radios. The Ethernet doesn't work. Trango says they can't see anything wrong with them. I'll keep everyone updated; I want a resolution on this in (early!) June.

Threading

Todd will write this up for us in the future, but he may have found the issue with our Nexgen ASERVEs hanging at random. Somehow and for some reason, hyperthreading had been switched on with WDJC's audio server. This is a BIOS setting, so there's no telling who (or what) (or how) did it. Our clue came when Todd was poring through the Windows system event logs (Figure 2). The text dump is unicode, so there are nulls (dots) between the characters, but you can clearly see that Coyote.exe (i.e., NexGen) hung because of a threading issue. That was what we needed.

Now that Todd has disabled that, the audio server hasn't hung one time. We've since gone through and checked our other machines here.

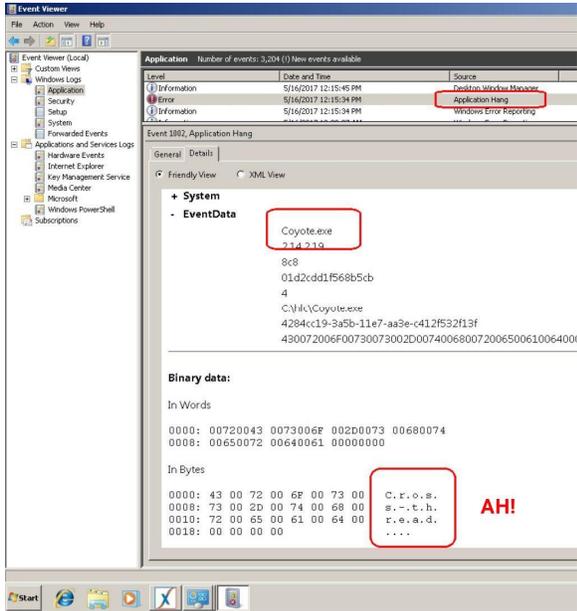


Figure 2 - Our clue with the NexGen hangs: threading errors.

This makes sense to me, from my experience in writing operating system code and drivers. Originally, multitasking was actually just fast switching: the OS or desktop would run one process for a while, then switch to another, over and over, in a round robin. Nowadays, it has become quite sophisticated, with Simultaneous Multithreading (SMT) running more than one thread at the same time.

What's a thread? Any program is just a list of instructions that can branch to a different spot in the list as needed. If you print out the list and trace

with a finger ... if this, then continue; if that, jump to step 50 ... that trace is the thread. You're threading through the instruction list. Multi-threading, then, is the ability to execute the same list of instructions, but perhaps in a different order.

You don't have to be a system-level programmer to see the problem here. If two threads try to access the same memory (or whatever) at the same time, you could have chaos. One thread will store a value in memory, and the next thread might immediately change it to something else. To help prevent this, we use all sorts of Do Not Disturb flags throughout thread-safe code. If I'm doing something that can't be interrupted, I'll raise a flag, tell everyone else specifically where I'm working, then lower it when I'm done.

In the Bad Old Days, we literally disabled interrupts. We told the hardware, "Ignore everyone else and let me run exclusively for a moment." That's extremely bad form, though, because if your program has a bug, you could hang the entire machine. Because interrupts are disabled, the PC stops responding to the keyboard or mouse. You'll probably have to power down, then restart. (Sounds familiar to those who used to run MS-DOS and early versions of Windows, doesn't it?)

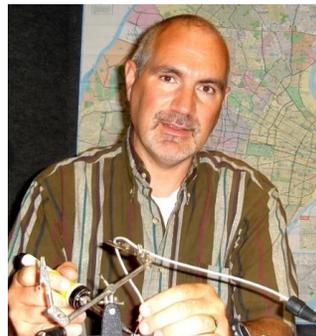
Nowadays, the problems tend to be much more subtle. They can be deeply weird, totally random and exceedingly difficult to track down. I'm not ready to say that this is definitely what was causing our hangs, but consider that NexGen is actually an older program. I doubt that it's thread safe (i.e., able to raise and watch for these Do Not Disturb flags).

I'll let everyone know next time if we're still hang-free. Until then, keep praying for this nation!

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

In last month's issue, I discussed the new stream monitors that we had installed to monitor our own internet streams and in particular, feed audio from the return of the stream to the Nielsen PPM Multi-Channel Encoding Monitor to ensure that the audio was properly encoded with PPM.

We had installed the Inovonics 610 Internet Radio Monitor to do the work. I have no complaints about these



units after they have now been in place for nearly two months. What I did notice was that two of the three stations that have PPM encoding were having regular periods where we would receive PPM alarms.

Now I have to confess that I was way too slow figuring this one out. It didn't take me long to determine what was happening during the spot blocks on the two music stations. The Gospel

station that has regularly occurring long time slots of Bible teaching was not having the same issue. My thinking was, if the PPM encoders were having issues with not being able to encode talk, then I should see more alarms on the Gospel station than the primarily music stations.

Still, my approach was to see if the spot blocks just didn't have enough audio to make the encoding work. So, I patiently watched the encoders as the stations went into the spot blocks. Sure enough, the green light on the encoders stayed green, but the green light on the PPM monitor went red. I also paid careful attention to the audio levels on the Inovonics 610 meters. There was no substantial difference between spots running on air and during music sweeps.

The mystery only deepened for me and the over-thinking of the problem really kicked in. I hadn't yet resorted to calling Nielsen about the issue, but I was almost at that point. That's when I started thinking about the issue in terms of the audio chain and put the differences in talk versus music and audio level differences to rest.

I came back to thinking about what was different about these two stations versus the Gospel station, which seemed to have no issues. That's when the light finally came on, albeit way overdue. The two music stations have ad replacement and the Gospel station does not. Insert Homer Simpson "D'oh!" here!

We PPM encode the stream at the local level and then transport the streams through the internet to our stream hosting provider, Triton Digital. This is where we do any ad replacement through Triton's ad replacement system. It was so obvious that my face turned red at the moment I finally figured out what was happening.

Of course we will have PPM alarms when

the ad replacement occurs, since this audio is being generated at the provider level and not from our local facility. I should have come to this conclusion the first time it happened, but I overlooked the obvious. I never gave thought to the matter that our streams have had regular seven to eight minute periods of no PPM encoding. This was one of those times where you have to step back and look at the big picture instead of focusing on the minute. In this case, the big picture was the way the audio chain was set up.

This did get me to thinking about this setup. If stream listening becomes even more important as we believe it will in the near future, we will have to rethink how we do the ad replacement. In all likelihood, we will have to run a separate audio server for ad replacement locally so the spot blocks can be PPM encoded. If PPM numbers take on greater emphasis, no program director is going to put up with 8-minute periods of no PPM on the stream. You could lose shares rather quickly.

I also thought about the problem streams have in general in regards to PPM monitoring. If more of the stream listening begins to occur at app level, i.e., TuneIn-type apps, a good portion of that will be done with headphones or Bluetooth headphones.

At this point, if the PPM panelist is carrying a Portable People Meter, the encoding would most likely never reach the meter as the sound is held at the headphone level. Perhaps the answer would be an additional app that the PPM panelist would download to their device to monitor audio that leaves the device for PPM encoding.

I am sure that as we move forward and other platforms for audio listening take on even greater importance, these PPM problems will have to be addressed.

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

Mt. Scott has earned a reputation as a busy communications site. I often think of the travels of Johnny Antennaseed. He must have stopped at Mt. Scott for lunch one day and ripped a hole in his antenna seed sack with an abundance of towers sprouting and growing wildly.

Under these conditions, it can hardly be a surprise that frequent interference problems develop and need to be corrected. The MF AM transmitters at our facility are far removed from the VHF and UHF frequencies, and interference between the two are minimal.

Recently, while conducting the occupied bandwidth measurements on KKPZ, I noted a localized elevation of intermediation (IM) products near the Water District tower site. The mix between 1330 and 1640 was higher than expected at the boundary of the water district facility.

As the most visible facility on the hill, we often are asked to resolve interference problems. A number of interference problems have arisen at Mt. Scott which brought together an interference team to help resolve interference problems effecting several communications users on the mountain. The team initially discussed the known information to attempt to identify the sources of interference. We believe there are several different interference sources that need resolution. What follows below is a day in the life of a radio engineer and detective of interference.

There is an interference situation that is the result of the mix of two commercial VHF transmitters. This particular interference is well researched and the data is being provided.

In one case, our initial data is contradictory and confusing. The initial data points are outlined below.

We have interference to a full duplex VHF system that causes an elevated noise floor and transmit to receive feedback. Analysis of the problem initially collected several data points.

- The elevated local noise floor contains artifacts of nearby AM



broadcast stations on 1640 and 1330 kHz.

- The interference only appears between local sunset and local sunrise when 1640 is on low power.
- There was some indication that the tower detuning at the AM frequencies may be involved.
- There is some indication of locally elevated IM products of 1640 and 1330.

After discussing the initial data, which as I said is contradictory in some cases, we proceeded by investigating the detuning and grounding at the tower.

The detuning apparatus does need some maintenance. Initially we did not see indications that the adjustment equipment is the source of problems. We did see indications that the adjustment equipment was improperly grounded. The current ground conductor was tightened.

The next step was to use a frequency-selective current probe to check conducted current (at AM frequencies) on the transmission lines into the equipment shelter.

Generally, the conducted current was higher than expected. Further, we found that some transmission lines conducted considerably more current than others. The cable with the highest conducted current was the system receiving interference.

Further inspection found that this cable was grounded at both the tower and the ground bus. Further inspection of the conducted current revealed that the transmission line was providing grounding of the tower to the ground bus. These differences in ground potential suggest that a defect in ground conductors exists.

During this test, we disconnected the transmission line secondary tower ground. This resulted in an 8 dB reduction of the noise floor.

Preliminary conclusions:

- We found a clear correlation between conducted current and the

interference problem. Reducing the conducted current reduces the interference. These observations suggest that a nonlinearity must exist downstream of the tower.

- We found grounding anomalies that need to be resolved, particularly the grounding disparity between the tower and the ground bus connections to the ground ring.
- We observed the correlation with 1640 operating at low power, although we have not resolved the reason for this correlation. We can

test this by operating 1640 at low power during day hours.

- We do have some maintenance to do with the detuning system.

Steps going forward:

- We need to resolve the cause of some of the grounding anomalies.
- We need to look downstream for a nonlinear connection.
- We need to perform maintenance on the detuning skirt.
- We should schedule another session relatively soon.

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

Year So Far

This year so far has been less busy than in years past. I don't know if that's because I'm sticking around the office more to help my dad out with getting to and from the car since he can't carry his computer bag easily. Or perhaps things are just behaving themselves this year. Whatever the case, I appreciate it. It seems a lot is different this year with how things have started, and I am enjoying it. Especially the Rockies being above 500 and having the best start to the season ever.



were five wires as opposed to the four the older one had. I decided to have Keith go on a hunt.

After talking it over with someone who actually knew something, he found that the new standard is five wires. We just had to figure out how to use the diagram and do it a little bit differently than the old one. The old ballast wired power directly into the light itself whereas this new one bypasses that and the power is wired up direct to the ballast. That left two wires untouched in the light fixture which drew some confusion at first, but we got it working.

KLTT Ballast

With the dehydrator still not working properly, I've had a camera set up on the line pressure gauges at KLTT and with that, I am keeping the lights in the back room on. The first week I did this, one fixture lost both bulbs. No biggie, as we bought new ones and replaced them. I think those were original to the building (1995), so we got a good long life out of them.

Then the next week, I got to the site to find the other light out. I had Keith go buy new bulbs, but that didn't help. We figured it was the ballast, so I proceeded to find one that would work. The first ones I received I did not think would work because they

Dehydrator

I am hoping to have the new Kintronics dehydrator in sometime before July. Thankfully, even with power turned off to the existing dehydrator, pressure has held. Means we didn't blow anything when the dehydrator went crazy the last time, which is a relief. Those lines are really airtight!

Springtime Mowing

It is that time of year again where we get to mow the sites. My husband was kind enough to go to KLZ with me to help me figure out how to remove the backhoe and install the brush hog on the tractor. While I probably could have done it by myself, it's

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nice to have someone else there in case something does go wrong (plus, those things are heavy). We will wait for growth to stop, then take the tractor to KLTT and KLVZ to mow as needed. Keith is already working on keeping the tower base areas cleared by using various herbicides and of course a lawn mower.

Upcoming

We are looking to replace a leaking base

insulator at one of the KLTT tower bases, as well as get all the towers painted at the site in the coming months. I look forward to seeing the base insulator work done, as it will be a first for me. I am also nervous as so much can go wrong and this is our big money-maker. I absolutely hate having to take it down for any work. We will continue mowing at the sites in hopes of staying caught up with it.

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

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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, 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/91.1 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
970 kHz, 5 kW-U, DA-1
WDJC-FM • Birmingham, AL
93.7 MHz, 100 kW/307m AAT

WEXL • 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 • Detroit, MI
103.5 MHz, 50 kW/150m AAT
WPWX • Hammond - Chicago, IL
92.3 MHz, 50 kW/150m AAT
WSRB • Lansing - Chicago, IL
106.3 MHz, 4.1 kW/120m AAT
WYRB • Genoa - Rockford, IL
106.3 MHz, 3.8 kW/126m AAT
WYCA • Crete - Chicago, IL
102.3 MHz, 1.05 kW/150m AAT
WYDE • Birmingham, AL
1260 kHz/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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