The Local Oscillator

The Newsletter of Crawford Broadcasting Company Corporate Engineering

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Proper Grounding

As storm season moves in, a lot of us are forced to stop and think about proper grounding at our studio and tower sites. It is a rare year that somewhere in our company, we don't take a hit causing serious damage and down time. Even in the facilities that we believe are the best prepared, sometimes we get hit and equipment is damaged.

This has gotten worse in recent years as we have made the transition to digital and gotten away from transformer coupling. It wasn't all that long ago in my view that we used Autogram IC-10 on-air consoles, and each input went through a 600-600 ohm transformer on an octal plug. I can't ever remember having any lightning damage to one of those mixers; I certainly can't say the same about their DC-coupled successors or today's digital boards and control surfaces.

But even the old stuff had its susceptibilities to lightning. For example, we took a "grand mal" strike on the FM tower at WMUZ back in 2000 or thereabouts, in February of all times. The main transmitter was at the time a Continental 816R-4. That transmitter was blown up, let me tell you. I can't recall what all was wrong with it, but every one of the fuse holders on the front panel of the power supply was vaporized, with only the wire stubs remaining. Some sleuthing revealed what happened – the cable that tied the internal transmitter building ground system to the ring of rods around the tower base had been severed, probably by one of the lawn maintenance people, and we didn't know it. Lightning hit the tower, came down the transmission line and onto the chassis of the Continental transmitter looking for a ground. With the chassis ground (and everything in the building for that matter) disconnected from both the site ground and Edison ground, the lightning energy was looking for a place to jump across to some kind of ground. Those fuse holders were the weak spot, and the lightning found some semblance of ground through the power distribution panel and the Edison transformer outside.

That was a good lesson for us, but it was one we didn't learn very well. Just a decade later, we took another grand mal strike at the same site and incurred a lot of damage because of a corroded ground connection outside the building, something that should have been looked at regularly but evidently was not.

When it comes to grounding, we tend to think of lightning protection as the main purpose, and for sure that is one of the main purposes, but it's actually only one of three. Our first purpose in equipment grounding is *operator safety*. Any piece of equipment, whether it plugs into an outlet or is hard-wired into a disconnect or breaker, should have a green safety ground that connects the chassis of that device to the ground bus in the distribution panel. Should the worst happen, such as a transformer with a winding that shorts to the case, that safety ground will provide a low-impedance path back to ground and cause the fuse to blow or the breaker to trip, keeping the operator safe.

Back in 1996, I had a funny occurrence with an AC safety ground. We were tuning up the then-new KLTT four-tower directional array. The three-tower daytime pattern was done and locked in, but there was something odd happening with the phase at tower 4, which was only used in the night pattern. With people and FIMs in the field, I would adjust the pattern and call for readings. Since we started with a moment-method model, tune-up didn't take long, and I thought we were done. But then I would come in the next day or after a lunch break and find that the phase on tower 4 was several degrees off the adjusted value. I would reset it (which would also require adjustments to all of the other three towers), have the crew check the monitor points, and find the pattern

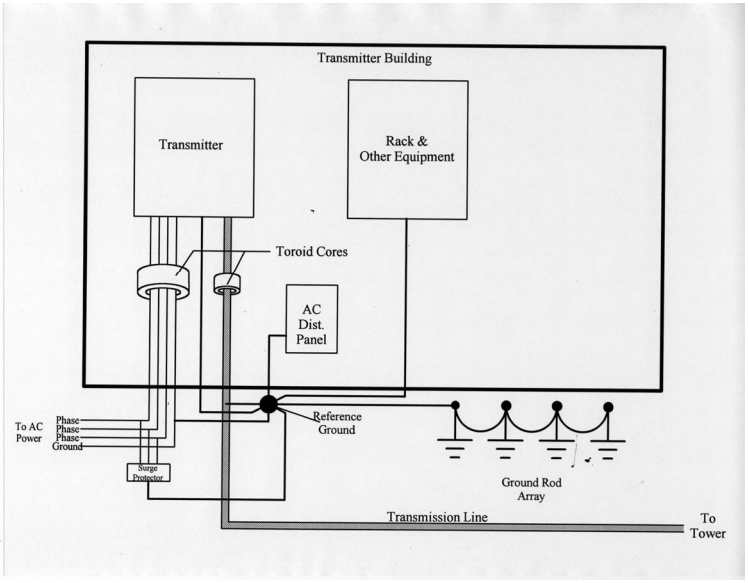
all out of kilter. I would readjust everything, putting towers 1-3 back where they started and setting tower 4 to the wrong value, and voila! The pattern was back.

Then by chance, I noticed that when one of the other folks working at the site would plug an extension cord in an outlet in the back room, the tower 4 phase would jump by several degrees. Unplug it and it would go back. I tried different outlets and got different results. Finally, I went out to the tower and temporarily disconnected the green AC safety ground from the ATU. When I did, the RF sample from the tower went away altogether! Can you guess what the issue was? The outer conductor of the 3/8ö sample line at tower 4 had broken, evidently the result of too deep a cut with a tubing cutter during connector installation (you can guess who was responsible!). Since the cut was up inside the body of the connector (and was covered with heat shrink), it was invisible. So the RF current sample being fed to the antenna monitor was getting its return through the AC safety ground! When someone would plug in a piece of equipment that was in the same rack into a different outlet, it would change the effective electrical length of the sample line and thus the phase of the sample. Go figure.

So we can all agree that AC safety grounds are important. But an AC safety ground cannot dissipate all that much energy, and that green wire will tend to meander its way through conduits to outlets, daisy-chaining to light fixtures and the like before landing in the distribution panel. That will present a high-impedance path for a high-current, fast-rise-time lightning discharge current. For that, we need the shortest path possible to a very low-impedance ground array, and we need a big cable to do it with (because of high current and skin effect). A thick strap will do the job in most cases, but running a large (AWG 0 or 00) wire is also a good idea. The termination should not be only soldered, however. The high currents in a lightning discharge can produce enough heat to vaporize even silver solder in a lug termination unless there is a very strong mechanical connection as well (crimp).

Note that it is important to tie the utility service entrance ground connection, which will provide the ñgroundò for all the AC safety grounds in the distribution panel, to the lightning ground. The best place to do this is outside, at the closest point the lightning ground array cable or rod comes to the service entrance rod. Use a big piece of wire, and Cadweld it if possible ï that takes all the possibilities of corrosion out of the equation. I would also recommend burying all the ground cables to protect them from damage and theft.

Third, you need an RF ground, which may be the same as your lightning ground ï an array of rods around the building or tower base (or both) but joined with 4-inch wide strap. This will give stray RF currents a place to go other than along the chasses of your equipment. Again, bury this strap if at all possible. Shiny copper strap is easy to cut and might as well be marked: ñSteal Me!ò



One of my favorite movie lines of all times was from the Karate Kid 2: ñMiyagi father always say... óBest way to avoid punch, no be there.ôò That line has a lot of application in life if you ask me, and it has application here as well. If you can keep lightning discharge energy out of your building altogether, you will in most cases avoid the punch, and the way to do that is to bond the outer jacket of each and every transmission line coming down the tower and into the building to the lightning ground system before it enters the building. This is fairly easy to do.

Locate a pre-drilled grounding block high on the outside wall just below where the transmission lines enter the building, and use a short piece of large-diameter cable to ground the outer conductors of each transmission line, small and large, to the block. The block, of course, must be well connected to the main ground system.

Cables that do not have an outside shield or metallic jacket (and even those that do) should be

fitted with ferrite cores to give them a high impedance to fast-rise-time lightning discharges. Do the same with AC power conductors, connecting the ground point on the TVSS to the block.

Donôt forget about nearby conductive objects. A few years ago, lightning hit the chain-link fence around the parking lot at the studio (someone saw the strike, so weôre not just guessing here). That fence has a pair of electrically-operated drive gates that are controlled from within the building, from the reception area and from the studios. You can guess what happened.

One other thing to consider is the very strong magnetic field generated by a lightning discharge current in a metallic object (such as a tower or ground wire). In the old CRT days, those strong H-fields would gauss up a display and make it purple or some other wild color. In todayôs Ethernet world, it will often damage or destroy switches, NICs and anything connected to a piece of cable. Analog audio cables are likewise susceptible to H-field pickup and you will often find op-amps in analog audio equipment damaged or destroyed. So if your building is next to a tower, consider running your Ethernet and audio cables in conduit or use shielded cable. The former is more effective and easier, believe it or not.

Finally, all of the above has to be inspected regularly. As I noted above, all it takes is one bad connection and something very bad can happen. Look for corrosion, cuts (accidental or otherwise), damage (an automobile hit a ground wire at our Chicago studios and contributed to a long list of damage from a strike) ï anything out of the ordinary. Put it on your maintenance checklist and donôt forget about it. It will save you a lot of trouble later.

A New Signal

Anyone reading the trades over the past few weeks could not have missed the story about Crawford Broadcasting Company purchasing WCHB in Detroit from Radio One. That is a project that has been a long time in the works ï I first looked at the station when it was brand new, in the late 1990s. It is 50 kW day using four towers and 15 kW night using ten (yes, ten!) towers on 1200 kHz. Both the day and night signals do a bang-up job covering the Detroit market from the transmitter site just southeast of the Detroit Metro/Wayne County Airport.

Putting this deal together has consumed much of my time over the past three months, even as I was going through so many medical procedures and hospitalizations, but by Godôs grace we got it done, and we got the request for consent to assign filed in mid-April, a public filing that let the cat out of the bag.

Brian Kerkan has been my eyes on the ground, visiting the site several times and helping me plan for a new transmitter, interior transmission line runs and a Part 101 11 GHz microwave link from our studio northeast of the site.

Anyone who has been through an acquisition like this knows that there are a lot of aspects to think about, things that are best thoroughly investigated and planned out before your name is on the deed, and that was certainly the case here. Weôre not done yet; we still have to wait on FCC consent to assign and we have to wait on the local township to approve a land subdivision. We expect relatively quick action from the FCC, but we donôt have any point of reference on the subdivision. So about the best I can tell you is that we should close sometime between the end of May and Thanksgiving.

In the meantime, we can get the new transmitter, a Nautel NX50, ordered, as well as the Part 101 link, a Trango Apex Lynx. We can even install the studio end of the Apex Lynx and get the path on that end roughed in. Brian has some work to do in finding us a backup data path to the transmitter site to keep the station on the air when lightning damages the microwave radios (and it will).

Weôll keep you posted in these pages as things move along. We are excited about this new ñbig gunò signal in our very important Detroit market and very much look forward to getting it on the air.

Health Update

First, let me say that I am sick to death of talking about my health, but I owe many of you an explanation and an update. For more than four months now I have been dealing with a persistent and limb-threatening strep infection in my lower left leg. I have had seven (yes, seven!) surgeries since January 11, and time and again believed I was on the road to quick recovery and getting well only to have the infection come roaring back and starting the cycle all over again.

A month ago, I thought I was just weeks away from being back to normal, but then three days after the doctor took off the immobilization brace, removed the surgical drains and lifted most of the restrictions, the infection returned with a vengeance. Within a day, I was back in the hospital and on a table in the O.R.

This time, after cleaning out the infection from the soft tissues, they sent me directly (and I mean directly from the recovery room) to get an MRI, and thatôs where they found the thing they had been missing all along. The tibia itself had an abscess

that would each time leak enough out to infect the surrounding tissue.

Two more surgeries almost two more weeks in the hospital later, I was discharged, and I am now at home recovering. All the infection has been cleaned out of the bone and now we wait for Jehovah Rophe (the God who heals) to do His thing, using the antibiotics and grafts and His own great power to make me whole again. This time is different. This time I will be fully healed.

Thanks to each of you for your diligent prayers in my behalf. There is no way I could have made it through this ordeal without those. And thanks to those of you who visited, sent cards, flowers, gifts and emails. So many of those came at just the right times, when my spirits were lowest. The Scriptures say that some have entertained angels unaware, and I believe the Lord sent some of you in that role, fully human though you may be.

At this point, I still have a ways to go. For the moment, I cannot bear any weight on the injured leg, and I am in an immobilizer to protect the grafts. I still need your prayers to get me the rest of the way well.

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

Hello to all from Western New York!

The facility remodel continues here in Buffalo, with the project finally gaining momentum towards completion. Our general contractor, Tom Dozier, has uncovered many unexpected structural surprises while working on this project, many of which were covered up and couldn't be seen until the actual demolition process began. We had everything from a wall being framed horizontally, to large windows that were practically "floating" in the walls and being held in place by a couple of finish nails, not to mention some construction methods that were nothing short of astounding.

Tom has worked diligently to correct all of these issues, which in actuality put us behind in schedule to complete. Not only did we have some structural surprises, but we found problems with the A/C ventilation, which answered why we had so much difficulty balancing out the air conditioning system to provide adequate cooling to both production rooms, control room and talk studio. Some changes will be made to the air duct work to provide a more efficient cooling system.

The electric distribution in the two studios was pretty bad also. After some 40 odd years since WDCX first moved into this facility, the electrical demands have increased, but instead of adding the needed circuits, splicing of existing wiring was a commonplace occurrence. We have looked at our present electrical needs and come up with a solution to alleviate the seriously unbalanced load to the electrical service. After determining what our amperage load requirements are, we have come up with a plan that will distribute the load equally between phases, thus thwarting any future electrical issues that may have surfaced later on. We will in all probability never get to do a remodel of this magnitude again, so getting it done right is our main concern.

While all of the construction is going on, I still have to take care of the everyday issues that come up, along with maintenance of all our studio and transmitter facilities, as well as any emergencies that crop up along the way. That makes for some pretty long days, but the end result will be well worth all the effort put forth now. Cris has approved the hiring of Philip Stachowiak on a temporary, contract basis to assist me in those tasks that require more than one person. While I only have the use of Philip on a limited basis, I am cautious to use him only when absolutely needed, but he is OK with helping out for only several hours at a time. One good thing that will come out of his helping in this project is in the fact that he will be familiar with our facility so he can cover call for me when I take vacation time off,

which has been a problem in years past.

Aside from the daily incidents that occur from time to time, there is not much else to report on, other than the outage we experienced with our fiber-optic circuit in Rochester on Thursday the 27th of April. We still have not heard from Frontier Communications what caused the interruption of service, but not long after the circuit went down, we switched over to the back-up fiber optic circuit and it worked wonderfully, saving us, no doubt, many hours of lost air time! Because, and in spite of, the problems we had the last time the circuit went down, Frontier built us a second circuit to be used in the event of a problem with our main fiber-optic line. This was done at no charge, and they are not billing us any monthly fees for this convenience.

Construction continues, and next month I will post some pictures of our new studios and rack room. We will finally be all-digital from the mic to the transmitter. This should greatly enhance our sound quality, something we have been working on for some time. The day of commissioning our new studio is near, and all of us here at WDCX would like to thank all who have been involved with seeing this project evolve from a dream to reality!

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 the Motor City! Michigan is finally warming up, and I have been able to get out and do some transmitter site field work. It is time to do some spraying and clean out.

We are in the process of eliminating our T-1 circuits and switching over to IP. This will give us more flexibility and bandwidth to work with. One of the most important issues is security. All devices must have a secure connection and the default passwords need to be changed. It is amazing how many times stations have been hacked by simply not changing the default password.

We upgraded our wireless network to handle the additional devices, and people the we have added in the office. It does not take very long to use up a DHCP scope these days. Some employees have up to three devices -- laptops, tablets, and iPads.

I have been preparing for the AMC-8 switch over. I have a spectrum analyzer, but I plan on trying to use a software defined radio to help make the switch. Since the L band block falls within the receive window of the SDR, you can use software such as HDSDR or SDR# as a spectrum analyzer on a tablet. By using a power-pass splitter and an SDR on the other port, the SDR will receive the L band block RF, which can be used by the SDR receiver software to display the spectrum. The setup is portable, inexpensive, and easy to use. The transponders can be clearly seen in the spectrum range displayed by the software.

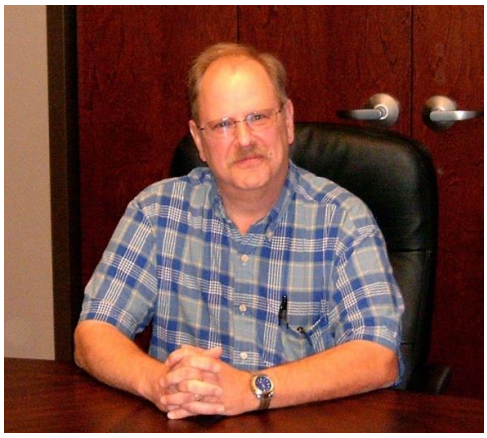
I have spent some time looking over the new property that we will be acquiring soon. Itôs WCHB - AM 1200. The station has a 10-tower array. The Kintronics phasor runs the length of the transmitter building, and is a work of art. It will be a nice facility to add to the Detroit cluster.

Until next time 73, from W8FP.

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

Ah, letôs be different this month. Iôll let Todd start us off with a report on another nice free program that heôs found.

MP3SPLT
Todd Dixon



I wanted to take a moment to share a program I found and how I am using it here in Birmingham. The program is called mp3splt (no ñiò), and its primary function is to take an mp3 file and split it in places where silence occurs in the audio.

So, the backdrop to the need for the program is that we have been airing the Joe Walsh Show for about 10 months. When it first started, life was good. We downloaded two-hour long audio files from their FTP server using a batch file and used the RCS format converter to plug it into our Nexgen system. Then, a couple of months ago, the Joe Walsh team informed us that they were going to be distributing the program over an XDS satellite channel. Sounds easy, except we air him at a time when we couldnôt get the first hour via satellite. So we were still using the FTP route for the first hour, the caveat being that the audio coming to us had silence similar to their satellite programming clock. We formerly had someone here during the time of the download to cut the audio, but he had since left our employ.

Necessity in this case was definitely the mother of invention. The best part about mp3splt is that it is free and works well. I have to run it twice to get the files exactly the way that I want them. The Joe Walsh audio is now given to us with silence at the beginning and the end, so the first step is trimming that silence at the ends. My input that I use to accomplish that job with the windows task scheduler looks like this (note: each line should have the full path to mp3splt, in our case, ñC:\Program Files\mp3splt\mp3splt;ò itôs trimmed here to save space):

mp3splt -r C:\Walsh\Hr1.mp3

This creates a file called WalshSyndicatedHr1_trimmed.mp3. Now that the silence has been cut from the ends, itôs time to break up that file into its five parts, so I run mp3splt again with the task scheduler making the following changes to the run line:

mp3splt -s -p th=50,nt=5,rm C:\Walsh\Hr1_trim.mp3

This string tells mp3splt to run in silence mode (-s) with a threshold of -50, to create five segments, and to remove silence.

Once mp3splt is finished in this step, it leaves me with five files named Hr1_trim_silence_01.mp3 through _05.mp3, cut and ready for the audio format converter to move them into Nexgen.

As a final thought, most of you that have used audio format converter know that it needs to see a single file in an input folder in order to process a file into Nexgen using a DAT template. So the final thing that happens here is that I run five separate batch files that take each of the files created earlier and move them into five individual folders (Segment1é Segment5). Then, audio format converter can be setup to convert the five trimmed mp3 files into Nexgen.

This may help you to lighten your burden by automating some trivial audio file editing or converting so that you can contemplate loftier things like how to increase the efficiency of your potato cannon and other important matters that engineers so often find themselves pondering.

Dynamic Analysis

Back when I was teaching electronics in industry, I wanted my technician trainees to understand the ebb and flow of signals through the

circuits that they were troubleshooting. I always started with a functional block diagram of the system in question, then showed them how it all worked together *dynamically*.

In the world of pure theory, we often use ñidealò conditions to describe how something works. While thatôs OK most of the time, and itôs certainly the best way to teach the underlying principles, you eventually have to move people into the real world. To give you an example, take the so-called ñperfectò operational amplifier (opamp, see Figure 1).

An ideal opamp would have infinite gain, infinite bandwidth, infinite slew rate and absolutely no noise or distortion. Sounds great, doesnôt it? But in fact, if you actually used such a device in the circuit of Figure 1, what youôd end up with is an oscillator.

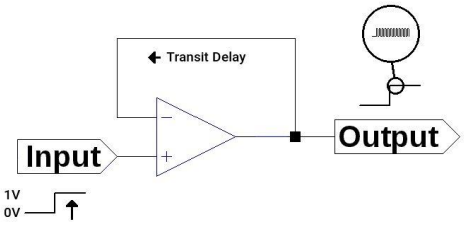


Figure 1 - An ideal op-amp would fail in the real world

Think about it, and remember your basic opamp theory. In this circuit (the non-inverting, unity gain ñbufferò amplifier), the feedback to the ñ-ò input will cause the output to precisely follow the input voltage. But letôs apply a positive voltage to the ñ+ò (non-inverting) input and see what would actually happen.

1. At the instant that the voltage is applied, the output is zero, so the ñ-ò input is zero. Since the ñ+ò input is more positive, the output will try to swing fully positive.

2. *It will take a small, but finite, amount of time for that output voltage to reach the "-" input.* Even if everything else is considered ideal and ñperfect,ò the speed of light gets us. It will take at least a few picoseconds for those charge carriers to make it through the feedback loop.

3. During that time, the output will have instantly gone more positive than it ought (because itôs a perfect opamp, remember, with infinite slew rate)? Eventually, the ñ-ò input will go more positive than the ñ+ò ... and then the output will try to swing fully *negative*(!).

The same finite transit time kills us either way: there will be a slight delay before the ñ-ò input sees what the output is actually doing. This cycle would repeat over and over, without end. I suspect the average DC output would be the same as the average input DC voltage, but superimposed on that would be an extremely high frequency oscillation. Please note that with a ñperfectò opamp, *even a capacitor added to the feedback loop* wouldnôt help, because you still have the transit delay time.

This illustrates the difference between ñidealò conditions and the real world. While assuming ideal components is useful for the math, they do not assure a perfect result. When I was teaching my technician trainees, I wanted them to *see and imagine* the flow of electrons through the circuit. I wanted them to understand what was happened. As a result, I believe they were better technicians.

LTSpice Modeling: T-Networks

I mentioned this excellent free program a couple of years ago. If you donôt have a SPICE program on your computer, you need one ASAP. It will allow you to model and experiment with circuits, showing you *dynamically* (see how I tied that in?) how that circuit will act.

Take T networks for example, which we use all the time for matching and phase correction, especially at lower frequencies (like AM). The math can get involved, but itôs straightforward. Better yet, you can get all kinds of software nowadays that will crunch all those cosines and impedances for you. Plug in the frequency, the input Z and the output Z, and it will spit out the needed X values for the coils and capacitors. Crisôs software even recommends the component values and ratings.

To become more familiar with how these things act in practice, I guess you could go play with your AM array, but management tends to frown on that. A better way is to model your T network in LTSpice. Itôs not really intended for that, so youôll have to interpret the results, but itôll let you do all sorts of ñwhat ifò guesswork without taking your station off the air.

Figure 2 is a simple SPICE simulation that is based on the ATU at WXJCôs tower #3. Iôm ignoring the tower reactance and just assuming a straight 300 ohm resistive load. The input, of course, is 50 ohms, no reactance. The values shown are calculated for that match, with a -120 degree ñlaggingò phase shift.

If you run this sim and look at the

waveforms, yep, the voltage across the 300 ohm tower/load is higher (as expected) and is indeed delayed by 120 degrees. But now start playing: you can have LTSpice estimate the load impedance presented to the generator (I won't get into that here; contact me if you're interested). OK: what if the tower impedance isn't 300 ohms? Maybe you measured it incorrectly, or maybe a @#$@# safety climb is touching a guy wire, altering the impedance?

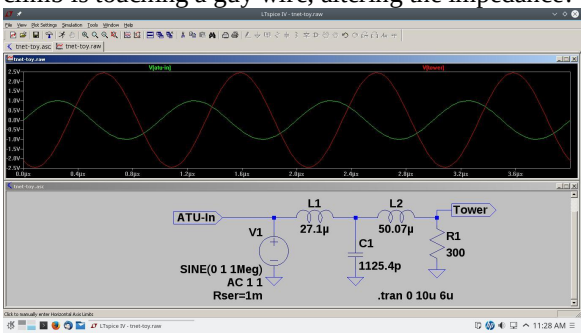


Figure 2 - Modeling a T network in LTSpice

This isn't something that most of us would even give a lot of thought. We'd correct the problem, carefully (re)measure the base impedance, then recalculate the T-network component values. But this simulation shows that some interesting things will happen as the resistive load is varied. The biggest surprise may be that, if the tower impedance goes *up*, the input impedance will go *down*, below 50 ohms. This is counter-intuitive: you might think that if you measure, say, 45 ohms at the ATU input, you need to move the coil taps one way, when you might need to go the other way.

Modeling will also show you, intuitively and dynamically, why T-nets are so popular for phase control. The math says that the shunt reactance actually changes very little over the useful range of, say, 70 to 110 degrees. That's why, in a typical phasor, once you set it up correctly, the input and output coils will be ganged and will be adjusted together, while the shunt isn't changed. Modeling with LTSpice bears this out.

What does change when you adjust those ganged coils, though, is the load impedance presented by the input of the T-network. We all know that from experience; it may not change much, but it does alter the ratio. That's why you have to tweak the power controls on the phasor if you're adjusting the phases.

Tight Nulls

We just finished our bi-annual recertification of WXJC's night pattern. It was licensed as a modeled array back in 2010, so you'd think that I'd need a recert in 2018, but I put an extra in there a few years ago (in 2015). Ergo, since the Rules say that you can't go more than two years between recerts, we were due again this year.

Checking the sample lines was a snap and a breeze with our little Array Solutions 4170 analyzer. We were literally off the air for at most a few minutes. Todd would move one of the sample lines from the back of the Potomac 1900 to the Array Solutions box, I'd run the scan, then save the data to disk. On to the next tower ... and in short order, all five were done.

As expected, the sample lines were fine, so we moved on to the reference field strength readings. Cris tells me that the industry is really trying to get the FCC to drop this antiquated requirement. Me? I personally suspect that, when modeling was approved, there was one old curmudgeon at the FCC who refused to sign off on it unless some kind of field strength measurement was included. ñAfter all, we had to lug a heavy FIM-41 all through the wilderness back in the day, no need to give these young whippersnappers a break!ò

The fact is, especially given urbanization, these measurements are a complete waste of time. Let's see ... I've done 2010, 2012, 2013, 2015 and now 2017, for five sets of measurements in total ... *and not once* have they ever agreed perfectly. There will always be some differences, especially at the lower-valued points, and/or in a built-up area with lots of construction.

Believe me, WXJC's night array has some deep nulls. The theoretical parameters call for all four towers to have the same ratio, and the reality isn't far from that. The first array I maintained was in Laurinburg, NC. The nulls weren't that deep, and it was easy to find points out in the countryside where I could still get plenty of signal. Not so with a 1 kW night pattern with deep nulls. I can move in closer to the array and deal with reradiation from all the power lines and construction, and it's very easy to miss the ñsweet spotò on the null. That close in, walking 20-30 feet either way can make a huge difference. OR ... I could move farther out, but with the deep nulls, the FIM is down to the lowest (500uV) setting in short order. Lots of interference.

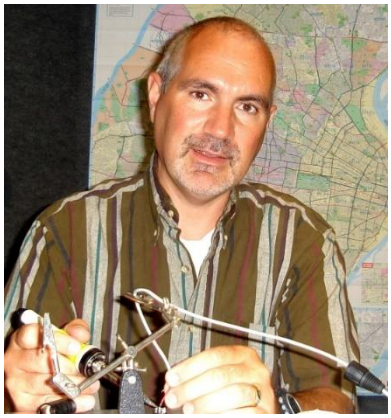
Ergo, I am now completely sold on modeling from start to finish. Carefully measure your towers beforehand, carefully run your model(s) to get believable results, then carefully adjust your array to the generated values, and you should be fine. That old guy at the FCC would growl, ñyou hope, you think,ò but he's just being a curmudgeon. Plain and simple.

Iôll finish with an example, and youôre gonna love this one. The closest point in our main lobe had a giant crane right directly in the path to the array. I mean, they couldnôt have used GPS and put it in place more accurately. So, naturally, I donôt trust the reading at the point at all, but Iôve dutifully recorded it and it is part of the record for two years. Anyone else who goes to that point with an FIM, though, canôt possibly expect to get the same value.

At any rate. Thatôs enough for this time, and until next month, keep praying for this nation!

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

We live in a PPM world. Everyone working in radio in a PPM market is affected by the glare of the green light. Programmers live and die by it. Salespeople know it can make or break the billing. Itôs certainly not something engineering can just ignore. Any engineer worth his pay knows the most important thing next to a transmitter being on the air with audio is that audio better have PPM encoding or you might as well be off-air.



Now factor in that we are moving towards a time period when online and in-app listening becomes more important. It may be awhile before we have just as many listeners online as we do over the air, but it is something that is probably coming. That means the PPM encoding and monitoring for online listening is becoming even more relevant.

When it comes to PPM encoding and monitoring, by now, most of us are fairly used to the concept of putting our stationôs audio through the PPM encoder, inserting it in the broadcast chain. We also are familiar with the monitoring of the encoding by using the audio output of an FM or AM monitor and connecting that to the Nielsen-furnished monitor. This is then usually connected to a remote control to furnish an alarm to appropriate staff when there is a problem with the PPM encoding. Alternatively, the monitor is sometimes kept in control rooms where board operators monitor it for alarms.

If youôre in a PPM market, this configuration is now just standard engineering practice. With an increase in digital listening we are seeing more stations with PPM Encoding on their digital streams. To get PPM encoding on your streams, itôs not really all that different from placing encoding on your terrestrial station signal.

It did have some challenges for us, since our final audio product is in a Wheatnet-IP (WNIP) audio network and our streaming encoder is also a fed as a WNIP device with a PC driver installed. This meant we couldnôt send the same feed that was going to our STL output directly to our streaming encoder through the WNIP system. We had to break that up with actual physical wiring to and from the PPM encoders for the streams.

While that presents a little extra effort and wiring, it was even more difficult to figure out the best way to monitor the encoding on the other end after it has gone from the streaming machine to our stream provider and through the Internet. In other words, you want to judge the encoding levels in a real world setup.

I had thought about setting up computers which would be logged into the streams and use their onboard sound cards to feed the PPM monitor. But knowing how often a stream on a computer gets disconnected during my own personal use, I figured I would get more alarms about my monitoring setup than I would that an actual stream was down or there were problems with the actual encoding. I didnôt really want the kind of grief that would come with rebooting computers and reconnecting the streams to make that scheme work.

I figured the best way was to purchase an actual device that was designed for this type of monitoring. After a bit of research I decided to use the Inovonics 610 Internet Radio Monitors. I have had good experiences with their FM, AM, HD and modulation monitors. They rarely, if ever, needed a reboot.

We installed them last month, and connected them to the new Nielsen Multi-Channel Encoding Monitor. The Inovonics 610 has a really nice looking front panel with meter, artist and title display and

Inovonics 610 Internet Radio Players

three alarm lights for Internet loss, audio loss and stream loss. These alarms are also delivered through optos on the rear panel and can be sent via email.

Like most of their 600-series monitors, a lot can be done through the front panel rotating selector knob. While it is handy, I couldnôt imagine trying to enter a URL of any length by that method. We used it to get the IP address in it and did the rest of the configuration through the built-in web server.

Just one month after being setup, we found that we havenôt had to reselect the stream or reboot either of the four 610 Internet Radio Players we installed. Having something solid to do this function was exactly what I was looking for. I could see these being used at transmitter sites that have Internet to bring in the station stream as an emergency STL. They are that solid and they have pro level analog audio with XLR output and an AES digital output also via XLR connection. So, you donôt have to place any impedance adaptor in line to interface with your broadcast equipment.

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

This last month was a milestone for local broadcastersô preparation to respond to public need during a disaster. During both Katrina and super storm Sandy, the ability of local broadcasters to keep the public informed was impaired by obstacles which prevented accessing and supplying broadcast facilities.

As we were preparing to begin issuing credentials, a problem developed with the authority of engineers to escort maintenance personnel and supplies to our facilities. I spoke with a significant number of stake holders and we were told that the capability to escort supplies is critical to keeping broadcast stations operating during a disaster. The OAB, the SBE, Credentials Committee members, and engineers all indicated the vital nature of the capability to escort.

The ability of critical infrastructure workers to travel and perform emergency maintenance and repair during a disaster is not a new problem. A process to allow critical infrastructure access has been an ongoing, multifaceted debate for decades.

More than 15 years ago, a local county engaged a major planning firm to study local critical infrastructure access needs. As with many previous attempts to balance needs, this effort was unable to produce a solution.

In those circumstances, the progress of our engineer credential program was remarkable. The OAB stepped up and provided resources to help bring the debate to a positive conclusion. In a meeting with the Credentials Committee, Oregon Office of Emergency Management, the OAB, and the SBE, we discussed the need to update the procedures language. The objective was to preserve and clarify the ability to escort supplies and personnel during a disaster. The updates were approved by all parties. The new language clarifies that the credentialed engineer is responsible for the behavior of individuals that are being escorted.

Although this delay is frustrating for everyone, it's probably better to have clarified this question earlier rather than later. With that hurdle resolved, we will begin issuing credentials within the next two weeks.

What is required to qualify for the credentials?

Credentials are available to individual

broadcast engineers holding SBE or other certification, individuals designated as FCC chief operators by local stations, or Registered Professional Engineers practicing in the broadcast field. The requirements to earn credentials are simple.

- Applicants need to demonstrate ongoing familiarity with the operations of emergency management during a disaster by taking and passing three free online courses.
- Individual broadcast engineers seeking credentials will need a sponsorship signature from an employer, contracting entity, or credential committee member.
- For your own protection, you will need personal protection equipment. Basic starter kits are available on line for as low as $30.
- Engineers are expected to be on their best behavior as described in Engineers Code of Conduct.

What is the cost and term of the credentials?

The typical term of credential will be five years and the credential fee is $50. This fee will cover the administration of the program. This fee is tax deductable as a work expense or business expense if reimbursed by your employer. There is no fee for ongoing training during the life of your credential.

What are the ongoing training qualification requirements?

To help keep engineers current, we require minimal ongoing refresher and enhancement training. These include general items related to emergency management, safety items, and emergency oriented items. Many items are also applicable to ongoing SBE recertification.

Now that 90 percent of the job is done, that last 10 percent remains.

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

Satellite Dish

I am so grateful that things have, for the most part, behaved for me these last several months. While we have had some issues here and there, the majority of things have been easily fixed.

One thing that I am not able to fix as of yet is the heater for our main satellite dish at the KLZ transmitter site. We had some snow early last month, and I began getting phone calls about certain shows not being there. We have two receivers that I can monitor, one is the XDS and the other is the iPump that we get Laura Ingraham from. Neither was seeing the bird, so I knew it had to be snow in the dish. I sent Keith out, and while there wasnôt much snow on the dish, there was apparently enough to mess things up. He swept it off and everything came back.

I had him inspect the heater control box at the dish, which showed a fault that would not reset. He began looking at the heater itself and found a burn hole on the back of it. Iôm not sure when it happened or what exactly happened, but I have no doubt it is the source of the issue. This heater is pretty old, and unfortunately the only thing for me to do is to order a new heater. Due to the fact the snow season is nearing an end, I just cannot justify ordering a new one only to have it go unused for six months. I am inquiring about what is available and will see what the cost is. Until we get a working heater, it will mean trips to the site during any other snow storms we may get. Hopefully there wonôt be any more.

Dehydrator

Thankfully, the dehydrator at KLTT has been somewhat cooperative. We found the pressure switch that stuck closed is no longer available, which meant finding a secondary solution or ordering a new

dehydrator. We initially thought we would install an external pressure switch, however, when trying to find adapters and all sorts of other things, we found it was going to be seriously difficult. After having the dehydrator working for several weeks, after an AC failure at the site, I decided to look at things and found it was stuck on again with very high pressures in all the lines. Keith was able to go out and bleed the lines down to a safe value. We decided at this point the best option is to order a new dehydrator.

We ordered the Lab4.50 by Kintronic Laboratories. It is crazy how far things have come. I get that transmitters and other equipment have come a long way, but how far could a dehydrator possibly come? Apparently a long way. The Lab4.50 is rack-mountable and has an optional Ethernet port which we did specify. How nice will it be to be able to monitor remotely the dehydrator? I could be alerted right away when there is an issue, not just hope to catch it shortly after it happens on a site trip. It is just crazy to think about.

KLTT AC

As mentioned above, the AC at KLTT quit. I got an email about the temperature being high, so I checked. It was 85 degrees. The unit showed it was cooling but I couldn't be sure. Due to the fact I had a couple of appointments I could not miss, I sent Keith out. He verified things were not working. I called our HVAC repair company, and of course they could not get out that day. Thankfully, they were able to come out the next day. They found a broken belt. Replaced the belt and thankfully it began working.

Connection Issues

During all this, I found KLTT had lost its network connection to the studio and gone off the air. I immediately put it on ISDN and began troubleshooting. Thankfully, Keith was still at the site. I was thinking maybe the excessive heat had caused some damage. I found I could see the tower NanoBridge and Trango microwave radio. I could even see the NanoBridge on the transmitter building, but nothing beyond that point, and I could not see any of the FM stuff at the tower base.

I was able to have Keith do some troubleshooting at the building itself, starting with a visual inspection of the CAT5 cable feeding the unit on the roof. He found that cable wasn't in very good shape. He barely touched it and it fell out.

I remember when we worked on it before, we could not get it to click in, but due to weather we had to leave it and let the friction of the strain relief hold it in place. Unfortunately, that came back to bite us.

Keith was able to get a regular connector on a piece of UV-rated shielded CAT5, and all seems fine now. I was now able to see all the equipment in the building but still not the FM stuff at the tower. Keith went out and did a reboot on the NanoBridge at the tower, and after that all seems to be fine.

Keith has been a tremendous help these last several months as I have needed to stay somewhat close to home, not always able to go out myself to deal with an issue. Keith hasn't been one to know how to do a lot of this transmitter troubleshooting, mainly because he has not had to deal with it, but he is a quick learner and I now feel even more confident when I do need to leave him in charge of things.

Upcoming

Sometime in May we will get our new dehydrator and I look forward to getting it installed and learning how it all works. Having something reliable will be great as I am currently having to check a web camera looking at the line pressure gauges for the various lines going to the transmission lines several times a day.

No doubt, mowing season will soon be here as well. Keith will begin the maintenance at the tower bases to keep growth down, and at some point we will need to take the tractor to the various sites to mow.

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

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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