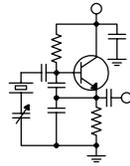


The Local Oscillator



The Newsletter of Crawford Broadcasting Company Corporate Engineering

NOVEMBER 2007 • VOLUME 18 • ISSUE 11 • W.C. ALEXANDER, CPBE, AMD, EDITOR

Education

When I came up through the engineering ranks, I had some excellent teachers. Not only was my formal education provided by “Carl Smith U,” but I had a number of on-the-job teachers that took me from the textbook/theoretical to the real world/practical.

In 1977, I was the new kid at the CBS television affiliate in Amarillo, Texas. With my new First Phone on the wall, I thought I was ready for anything. But I wasn’t ready for the shop full of video monitors that all needed fixing!

With a sigh, I fired up the old Tektronix scope and started poking around in the guts of one of those monitors that would not sync. I don’t recall how long that went on, but it was awhile. Then the chief engineer, Pat Gilbreath, walked in. He glanced at the monitor, went to the parts cabinet and came back with an electrolytic capacitor. He glanced at the schematic and then shunted the new capacitor across one on the circuit board. The monitor instantly synched up! I stared open-mouthed at Pat. How could he do in about thirty seconds what I had not been able to do in probably half an hour? I learned a lot from Pat about practical troubleshooting. That stack of busted monitors was fixed in no time.

Years later, Gary Hess, my boss at the time, taught me about FM allocations and FCC procedures. Until then, I knew about transmitters, transmission lines and antennas, but not about the allocations/regulatory process. Gary opened my eyes to a whole new world.

When I entered the AM broadcasting world, Ed Lorentz and Charlie Gallagher taught me about AM antenna design and construction. Charlie later taught me the AM allocations process and how to design directional antennas, diplexers and phasing/coupling systems.

Without these people who invested in me

and my professional education, I could not sit in this chair today; I would not be qualified. I won’t ever forget what they did for me.

Over the past ten or so years, I have tried to repay some of what these mentors did for me by teaching others. My friend John Furr occasionally puts on “immersion” training seminars to provide accelerated training in various facets of the broadcast engineering trade. I have been privileged to participate in several of these (and a number of loyal *Local Oscillator* readers have attended).

The SBE and NAB have also given me the opportunity to present various technical papers at their spring Broadcast Engineering Conference. And I was honored this year to co-author a chapter in the 10th Edition of the NAB Engineering Handbook.

I have participated in all these things because the generational teaching that I benefited from is all but gone from the scene today. It’s up to us “senior” members of the broadcast engineering community to find and take advantage of opportunities to share what we have learned through the years.

Most of you know by now that I was recently elected to a seat on the Society of Broadcast Engineers (SBE) board of directors. In that role, I was assigned to two committees: Certification and Education. Serving on the Certification Committee is a natural outgrowth of my local role as Chapter 48 certification chairman and my strong interest in seeing broadcast engineers further their professional pedigrees. Chairing the Education Committee is likewise a natural for me and is closely related to my participation in certification.

CBC-Birmingham CE Stephen Poole joins me on the Education Committee along with John Furr, John Bisset (BE), Ray Benedict and Scott Mason (both of CBS). It is my privilege to serve with these outstanding industry leaders. In the coming

year, we plan to provide a number of educational opportunities for the broadcast engineering community at large in venues all over the country. I very much look forward to seeing these efforts come to fruition and to broadcast engineers far and wide bettering themselves through continuing education.

HD Radio Observations

Here we are almost two months into the Great Nighttime AM HD Radio Experiment. No doubt much to the surprise and disappointment of some, the earth continues to spin on its axis, the sun still rises in the east and sets in the west, and amazingly, the AM band is still usable at night.

I don't have any hard numbers on the nighttime HD-R station count, but my guess is that it's close to 100. That's enough to give us a feel for how things will go but not so many that we are overwhelmed.

So far, the only interference complaints I have heard of have come out of the Citadel camp, and the information there is sketchy. Last month, Citadel shut down its night AM HD operations for some reasons that are not at all clear. I have heard various things through the grapevine that may or may not have any basis in fact, so I'll refrain from mentioning them here. Whatever the reasons for Citadel's night shutdown, they seem to be local to that company and not industry wide. I suspect that at some point, Citadel will revisit the issue.

Several of the engineers in this company have sent me their observations on AM nighttime HD Radio. Those observations have been consistent with my own, that it works well in the local service area and that there is not a great deal of interference being caused to distant adjacent-channel stations.

So where do we go from here? Within this company, we are working on getting WLJZ in Rochester up and running at night. Chief Engineer Brian Cunningham has already made the modifications to the night common point that should provide the optimum load. We anticipate having that station's digital carriers on the air at night early this month. And as we finalize the 2008 capital budget later this month, we will consider each and every remaining full-time AM station in the company and determine whether we will make the additional investment necessary to operate it in the digital mode at night.

We've gotten some good news in the past few weeks about HD Radio overall. During the NAB Radio Show in Charlotte, Ford announced that it would make HD Radio available as an option beginning with the 2008 model year. This option will

also be available as a retrofit for many past year models. That is huge. We are not ignorant of the import of OEM HD Radios in new automobiles.

Several other new HD Radio consumer products have hit the shelves in recent months. Amanda Alexander recently purchased a new Dual XHD6420 aftermarket radio with integral HD Radio tuner. See her review of this \$129 product on page 20. We also purchased a number of Sangean HDT-1 HD Radio tuners in various markets. The reviews on these units, which can be rack mounted (using a 2 RU shelf), have all been good.

We're nowhere near "critical mass" yet, but things do appear to be accelerating toward that point. This is all very encouraging.

Old School

I got to fix a transmitter last month. "Ho-hum," you say. "I do that all the time." Well, I used to, and I used to enjoy the challenge of troubleshooting and the satisfaction of a successful repair. Until I got to dig into the KBRT auxiliary transmitter last month, it had been a long, long time since I dug into a transmitter problem. What a blast that was!

But I made an observation during that experience. The problem with the exciter in this particular rig had been looked at by two competent and experienced engineers, and those individuals agreed that the RF driver needed to go back to the factory for repair. When Bill told me that, I asked him for an oscilloscope and the transmitter manual. Within fifteen minutes, the RF driver was fixed and back in service. No trip to the factory was needed. When I was poking around on that printed circuit board, I heard Bill mumble something about "old school." Doggone right, old school!

My observation is that the digital age has gotten most of us in the habit of returning equipment to the factory for repair rather than fixing it ourselves in the field as we used to in the "old days." Now this isn't necessarily a criticism – much of our equipment today is not field repairable; we have no choice but to send it back to the factory. But that's not always the case. The troubleshooting skills of modern-day broadcast engineers should extend well beyond board swapping.

So the next time you have a cranky piece of equipment on your hands, ask yourself if this something you can possibly fix yourself in the field. If it is, give it a try. You will likely be successful, and you'll walk away with the satisfaction of having done it yourself and the company's gratitude for saving us the cost of the round-trip freight and the factory

repair.

Copper

You have read about it online and in the trade press as well as in these pages. The price of copper has risen to a level where it is an attractive commodity for thieves. Those thieves are getting bolder every day, risking life and limb to obtain it. In addition to copper electrical wire, they are also going after copper pipe, tubing and refrigeration coils. In the last year here in the Denver area, copper thieves have lost their lives cutting the locks on pad-mounted step-down utility transformers and hacking into 7.5 kV primary wires. Some rather gruesome images have been making the rounds on the Internet of a similar fatality.

Broadcast stations have long been occasional victims of copper theft. Throughout my 31-year career, I have heard tell of entire ground systems being pulled up and sold for scrap. To date, we have not had that happen at any CBC facility, thank God, but I can see how it could easily happen. Just last year, we experienced some copper theft at one of our Birmingham FM facilities. The loss was no big deal, just a few feet of ground wire and some old ½-inch foam transmission line, but the missing ground wires left the site very vulnerable to lightning damage.

Just last month, we were victims of some minor copper theft at the 50 kW WXJC(AM) site. The would-be thieves cut the 4-inch strap at the base of the high-power tower. That is an exceptionally “hot” location, as you can imagine, and the vandal undoubtedly got quite an RF burn when he cut that strap. Whatever the case, he left without taking anything but a lightning ground wire from that tower base.

John White recently had a break-in at the KKPZ tower site which we are relatively sure was a precursor to some copper theft. We are watching that site closely and looking at our options for perimeter security.

In St. Louis, however, we have been dealing with a situation completely different than anything we have seen before. Copper thieves have been stealing the elevated telco trunk cable that feeds our site and many other users near the KJSL transmitter site. The crime scene is a couple of miles from our site and well beyond our control or ability to protect. But the thefts have still taken the station off the air several times. Read all about it in Rick Sewell’s column below.

The bottom line here is that we are facing a threat that we have not dealt with in any significant way before. The threat is also difficult to protect against. If you have any ideas, I would love to hear them.

The New York Minutes

By

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

HD Radio Update

Hello to all from Western New York!

I recently scanned all the radio stations currently broadcasting in HD in the Buffalo market. I was not too surprised at what I found, and if the HD Radio industry was gauged on it’s success/failure based on the Buffalo market, we might just as well shut our carriers off now.

I found many stations’ time alignment off by a second or two, and audio levels were all over the place. Some HD audio levels were considerably higher than their analog



counterparts, and others were three to five dB lower than the analog. About half of the stations I checked were offering program associated data (PAD), and only two offered an HD-2 channel with programming different than the main HD channel.

I also scanned the Rochester market and found that the station engineers there have done a much better job in implementing and maintaining the HD-1 and 2 audio streams. Most stations were right on the money with time alignment, and audio levels were within 1dB between analog and digital. PAD data was

working on most, and there was a good variety of programming available on the HD-2 channels.

The difference between the two markets is astounding. I attribute this to the lack of communication between station engineers. In the Rochester market, there is an active SBE chapter in place, one that has a good track record of attendance and keeping the market's engineers up to date with the latest changes in technology. In the Buffalo market, there is an SBE chapter set up, but they might as well advertise in the Death Notice section of the local newspaper. I had rejoined the SBE Buffalo chapter almost a year ago and still have not heard from the chapter president (or anyone in the chapter). I sent an e-mail inquiring as to the date(s) of the chapter meetings and never received a reply. It is clear to me that the local chapter is stagnant and does not care about the future growth of our industry.

While on the HD rant, I was pleased to hear some time ago that Wal-Mart had agreed to stock HD Radio receivers in their stores nationwide. By having a national retailer selling the HD Radio receivers, I was sure that the ball had started rolling on getting the receivers out to the public at a price that they could afford. Well, its been almost six months since that announcement was made and to date, I have not seen the first HD Radio receiver stocked or advertised in any regional Wal-Mart in the Niagara region. The same goes for Best Buy stores. Although Best Buy does stock *one* receiver in the local store, it is not displayed and working.

I think the problem with retailers getting on the HD-R bandwagon is that there are too many choices out there for the consumer. They have too many choices on how they can receive their entertainment; iPods, MP3 players, CellCast, XM/Sirius satellite radio, terrestrial radio, and we now throw HD Radio into the mix. Given the current state of HD-R (at least in the Buffalo Market), I can see why the average consumer refuses to shell out a couple hundred bucks for an HD receiver. Until the broadcasters in our area can clean-up their act and implement HD Radio the way it should be – and actively promote and program their stations with content worthy of tuning in and listening to – we are wasting our time and money trying to educate Joe Consumer on the importance and quality of digital broadcasting.

WDCX – Buffalo; WRCI / WLGZ - Rochester

October has been an extremely busy month here in Buffalo and Rochester. With the new WDCX transmitter building in place, I can focus my attention on other pressing issues. With no defined timeline in

place to get all the equipment moved into the new building, I can work on this project on and off until its completion sometime this winter.

The first order of business to attend to last month was to get the line stretcher network moved at the WLGZ transmitter site. One Sunday night, I took the station down, took the temporary breadboarded network that was sitting on top of the phasor cabinet and mounted it permanently inside the phasor cabinet. In order to properly facilitate nighttime operation of our HD signal on WLGZ, I needed to add a 4PDT 40-amp RF contactor ahead of the line stretcher, which would remove this network when in night mode. With this now complete, I can proceed with re-tuning the nighttime common point network for a –80 degree phase shift.

Other projects concurrently going on are the installation of new Audioarts D75 digital audio consoles for WDCX, WRCI and WLGZ. I have been diligently working each night at home to get the console pre-wiring done so the console installations will go swiftly and hopefully smoothly. All the studio wiring documentation has been done, so each installation should go rather quickly. We will broadcast from each station's production room until the respective console installation is completed.

You may recall in last month's report that I had to replace the 4CX 15,000A final tube in the WDCX transmitter. The tube had only been in service for a little over 5,900 hours and emission had been dropping steadily, so I ordered a replacement from Econco and sent the old tube in for evaluation. Econco stated that they could not find anything wrong with the old tube and that it looked like a tube that had completed its useful life cycle. They did, however offer a 50 percent credit on the new rebuilt tube, which I thought was an extremely fair gesture.

I had been nursing the final tube in the WRCI analog transmitter for some time to get as much life as I could out of the old tube before replacement. On Friday, October 12th, I replaced the final in that station's Continental 816R-2C, which had been in service for about two years. The first tube I installed acted kind of squirrely, so I had Econco send another tube, which tuned up rather smoothly. We should be set there for at least another couple of years.

One other event to report was the failure of the WDCX 950 MHz inter-city relay (ICR). We utilize this link for providing backup satellite programming from the transmitter site to the studio. We have not had the need to use this link for some time, and were leaving the transmitter off until needed because of heat build-up in the equipment

rack. But as Murphy's Law would have it, when we did need it, it wouldn't work. All indications pointed to a bad pigtail between the feed line and dish at the transmitter end of the link. I had Don Boye of Western Tower climb the WDCX tower and replaced the pigtail. That did the trick.

I was indeed fortunate to receive a visit this past month from Scott Fybush of Northeast Broadcast Watch. Many of you are familiar with Scott and the outstanding job he does keeping us up to date on the goings-on in our industry. Scott was given the nickel tour of our Buffalo and Rochester transmitter plants, and photos were taken of each location. Perhaps one of them will end up in his wonderful calendar he puts

out each year of transmitter sites and towers from all over the country. If you are interested in one of these awesome calendars, go to www.fybush.com and click on the 2008 calendar link. Scott has accumulated a wealth of knowledge on the history of many radio stations and shares that knowledge on his web page, "Tower site of the Week." Thanks, Scott, for all you do for the broadcast industry, and thanks especially for the new calendar!

That about wraps up another month here in the Northeast. Until we meet again here in the pages of *The Local Oscillator*, be well, and happy engineering!

The Motown Update

By

Tom Gardull, CBRE

Chief Engineer, CBC-Detroit

WMUZ just installed a new Telos Zephyr ISDN unit. Scoop for our infrequent ISDN programs.

Our Aeta had its limitations. It could process only one telephone number and one audio path. The Zephyr gives us two of both. But the great feature is access to the latest algorithms for audio transmission. G722 is universal, but there are others as well.

Our installation is just in time to help with an audio bypass for a KBRT project where their STL audio may be routed through our Detroit CBC Uplink via ISDN. KBRT is using one of the newer algorithms for their remote program feeds. Our Aeta did not include this protocol as an option, but the Zephyr does. We can handle KBRT audio without making them change to G722.

The Zephyr allows us to program the codec for any of about a dozen protocols and then it remembers which station to associate the parameters through the Auto Speed Dial. Todd at KBRT gave me their AAC setup and a test call quickly went thru. I could instantly turn around and dial one of our transmitter sites and it connected by G722 without going through any additional menus.

We went through a rough three weeks regarding our telephone service at the studios and offices. This time it was not the weather or vandals.

AT&T was trying to make things better. Because they want to get into the cable-TV business, they are building distribution nodes around the system. They

moved their old neighborhood cable distribution box from atop a twenty foot high wooden pole to a series of ground slab boxes on the public right-of-way across the street from the pole. They are adding additional fiber, and it looks like there might even be a backup generator. This work happened about five blocks from our offices.

AT&T had to make a lot of splices from the overhead

cables down to the new boxes, so we lost phone service line by line. Our hosts became aware of problems at 2 AM on a Sunday morning when some of our live telephone-talk programs realized they were not getting any phone calls. Repeated calls to repair service got a response but then more lines would go down throughout the week.

We lost a program channel to the WRDT transmitter site. The repairs were irregular. Lines would get dial tone back but would have a ground hum. Our receptionist switchboard lines lost the lead number to the trunk-hunt, so most calls just rang and rang to the caller, never reaching us. Only when another caller attempted to dial-in while someone else was trying the main number would the second caller



roll-over into the trunk-hunt. We did not realize what was happening until callers who did get through told us their experiences. Then some of the repairs resulted in working lines but swapped cable pair positions out at the box. Our CBC uplink modem number was swapped with one of the dead switchboard lines.

It took about a dozen repair visits, but they took care of all the problems. Our phone service

should be better for the long term. They also repaired a long-standing underground cable leak nearby, which accounted for many lines with hum. The repairmen all said they much prefer working on cable boxes at ground level. They do not want to climb. They had been switching cable pairs for us because of hum about every month and were running out of pairs. Now we should be stable for a while, back to worrying about copper thieves disrupting service.

News From The South

By
Stephen Poole, CBRE, CBNT
Chief Engineer, CBC–Alabama

Greetings from Alabama, where a surprising number of people resemble Gilbert Gottfried. Sandy and I were discussing this just the other day as we took a little trip, enjoying the fact that the temperatures here have finally dropped a bit. We're still in a drought – way behind on rain – but believe me, after week on end of 100+ degree temperatures, I'll take the 70s and 80s that we're getting right now. I'll even call it a beautiful thing.

Another Day, Another Trip To Tarrant

I need a beautiful thing to contemplate after all the fun we've had at Tarrant, Alabama, home of the WXJC 850 AM site. I've mentioned the problems that we've had out there in previous issues of the *Oscillator*. The quick summary for this month is, we've repaired the connectors at towers 1 and 4, we've repaired the ground system, and now we have a new problem: every time it rains, the daytime system wants to drift. Cris has sent the bridge and synthesizer to me and we've begun taking measurements as you read this. We're going to do several checks of the tower self-impedances under different weather conditions.

In the past, with normal weather patterns, I was able to stay ahead of things. I had to tweak the array two or three times a year, and that was about it.



This past summer, with its extremely hot, extremely dry weather, has apparently exposed some issues that previously lay dormant. It's entirely possible, in fact, that all of the problems that we've had in the past several months have been due to this.

In a nutshell, when it rains, the reference (and high-power) tower for the day pattern stops admitting as much current as it's supposed to. The other towers get more power as a result, and that's when things start burning up. The ratios all change, but the phases are still within tolerance. We've been debating whether to add ground screens, ground rods, or both. Eventually, we may even look at re-doing the entire ground system, but of course that's gonna cost, what with the current prices on copper. Wow!

However, from the "always check everything carefully" department, while we were setting up to do our first round of measurements just this very morning, I happened to be watching the antenna monitor as Jimmy and Todd opened the door on the #5 ATU (again, the reference tower, and the highest-powered). The antenna monitor parameters changed! When they dropped the shelf at the front of the ATU, it changed even more. Hmmm! That shouldn't be happening!

A little further investigation showed that we may have had a little copper theft there (see my next

rant, below). The 4-inch copper strap to the tower base had been cut. The strap was still there, though – I guess the thieves cut it, then decided they didn't like all the RF on that strap! They left it hanging ... and I can almost feel for the thieves, in a sort of an Old Testament, “serves you right” kind of way. That strap was so hot with RF, we had to lower power to repair it. It kept burning our fingers while we were trying to solder it back into place!

Bubba and His Trusty Hacksaw

Speaking of the price of copper, theft of the stuff has become a national epidemic; you already know that. I'm wondering

how long it's gonna be before every tower site has to install security cameras. We've been blessed thus far; aside from some stolen 1/0 ground cable at a couple of sites (and the incident mentioned above), we haven't been bothered much yet. But I recently saw a picture of some 7/8" coax at a cell site that had been hacked off by thieves. I've heard about air conditioners and copper plumbing being stolen, too.

My personal nightmare comes when I imagine some Bubba with a hacksaw cutting through that 6-inch line at WYDE-FM in Cullman. To Bubba, it'll just look like a bonanza of copper coax, but once he gets through that outer conductor, he's going to discover 30,000 watts of RF waiting for him. That's a wee bit higher than the power levels that the cell companies normally use. When the coax, hacksaw and Bubba all melt into slag (not necessarily in that order), are we liable? Even though we've got a fence, warning signs and all that other stuff around the site? The way the courts are ruling nowadays, I wouldn't bet against it. So, in addition to having to repair or replace a bunch of expensive coax, I might get sued for having the audacity to tempt poor Bubba with all that copper!

There ain't no justice, and I guess we've just got to make sure the fence around each tower site is nice and secure.

A Loud, Noisy “Attaboy!” For Ed

If you haven't read the letters section of the October 24 issue of *Radio World*, you need to do so. Art Reis has contributed some excellent opinion to RW in the past about HD-R, but Ed Dulaney takes the most recent prize for his rant against the

ignorance and disinformation surrounding the AM flavor. In particular, Ed addressed the (surprisingly and depressingly common) misconception that it “violates” or “ignores” the NRSC RF mask. No, it does NOT. Ed proved it with a shot of the spectrum from one of his stations. You could clearly see that the HD-R fell well inside the mask. (Heh.)

I am all for a reasoned debate on any issue, but the impression that I'm getting from the more vocal opponents of AM HD-R are beginning to annoy me, too. They apparently think that the push for HD-R is being led by

brainless kids who are just dazzled by new technology in general – and even worse, that we're willing to accept

poor performance and interference just so we can say, “Hey, we be digital and stuff!”

Folks, if that wasn't so silly, it'd be insulting. I am just as jaded as any other middle-aged, experience radio engineer. I keep an open mind toward new technology – anyone who doesn't, becomes a Dinosaur who has passed his or her prime – but I don't automatically jump onto any bandwagon just because it's new and shiny, either. You've got to make your case to me. In fact, like you, my day at the office usually begins with sorting through advertisements for “things that I never knew I needed until they told me so.” And as with you, most of it ends up in the trash. Right?

From a technical and engineering standpoint, I can objectively assess the AM HD-R system. Is it an improvement? I honestly think so. Is it an ideal system? I think it is *for AM as it exists*. Maybe the “ideal” (if such even exists in real life) would be to find some spectrum and just assign every current AM owner a corresponding HD station in a completely different frequency band, but that's not likely to happen. (And besides, there are arguments for AM staying right where it is, too – but let's move on.)

I am perfectly aware of HD-R's shortcomings. The AM flavor uses a low bit rate that can sound a little gritty at times, the same as a low-rate Internet stream ... or (wait for it! ...) Sirius and XM, which are *also* low bit rate. I'm certainly not advocating HD-R just because I'm “dazzled with digital” and don't know any better. Please!

I honestly think that in the long run, AM



It's a dirty job, but someone had to do it – so I gave it to Todd!

HD-R will be an improvement. But you know what makes this so funny to me (in a sad sort of way)? The same arguments have been reappearing for years. I italicized the qualification “for AM as it exists” above for a reason. We are stuck with very old technology, at a relatively low frequency, with narrow channel spacing (regardless of how you want to parse it, having my adjacent-channel “neighbors” only 10 kHz away from my carrier is “narrow”). The fact is, we were getting tons of interference before, as AM broadcasters began using preemphasis to overcome noise and limited bandwidth on receivers. The NRSC standard was proposed; we still had preemphasis, but more modest, and we limited the high end to 9.5 kHz. But don’t these HD-R naysayers realize that this was basically *institutionalized interference*? Same as what they’re claiming for HD! With stations spaced 10 kHz apart, if you run the NRSC recommended 25uS preemphasis, even with a brick-wall low pass at 9.5 kHz, you are STILL walking on your adjacent “neighbor,” aren’t you?

If you still have irony-poor blood, taste this final morsel: What was the rationale for accepting a 9.5 kHz limit with preemphasis? “It’s good enough, it’s a compromise, it makes the best of what we’ve got to work with ... so we can live with it.” So why can’t these naysayers say the same of HD-R? What’s the difference if I hear a little high-end “swishing” from preemphasis at night, as opposed to a little digital “hiss” from HD? What makes the latter inherently “evil” and the former “acceptable?” As Spock would say, it’s just not logical.

AM HD-R does NOT violate any current bandwidth requirements. The AM HD signal (just like FM HD, for that matter) is tucked inside the mask of permissible emissions as defined by the FCC. I’ve got news for you: without running HD-R at all, it would be possible for me to build a *perfectly legal* AM transmitter that caused *worse* interference than HD-R does. I would simply implement a broadband high-frequency noise generator and design it to stay just inside the NRSC mask... but HPF it out of the audio bandpass. So, fair is fair. If the naysayers persist with these flawed arguments, I’m going to petition the FCC for a fixed 5 kHz bandwidth, period, end of discussion. That way, there will be NO emissions outside of one’s assigned channel. You think they’d agree to that? Heh.

Folks, the real problem, in a nutshell, is that there are a bunch of small AM stations on tight budgets out there that don’t want to (or – yeah, I’ll be fair – can’t) spend the money to upgrade to HD-R. Most of them didn’t upgrade to C-Quam Stereo, either. They *only* upgraded to NRSC preemphasis and

9.5 kHz band limiting because the FCC made them do it – I know this because, at the time, I was a contract engineer in North Carolina and spent a few frantic weeks installing filters before time ran out; these people waited until the very last minute to do even that (and then I had to wait forever to get paid, but I ranted about that in a previous issue, and that’s an aside!).

These people are leading the criticism of the HD-R system, and sadly, some of them are willing to say, believe, or do anything against it. Their minds are made up and they’re not interested in facts. To *Radio World’s* credit, they posted Ed’s reply (and a couple of others), so I’m not picking on them. I also know that RW isn’t a peer-reviewed scientific journal, but I do hope that they’ll consider some of these arguments more carefully in the future. Allowing people to say things that are demonstrably false or inherently misleading is in no one’s interest. Ed’s response was dead-bullseye on the money.

Finally: I Hate Heat!

And not just the temperatures that afflict us Alabamans in the summer, but heat in general. Heat is a killer of all things electronic, and as the push continues to squeeze ever more function into smaller and smaller case sizes, it’s becoming a real problem. I’ve decided that many manufacturers do NOT actually put their equipment in an environmental chamber and test it for that advertised “0-70 degree Celsius” operating range. They obviously just estimate that because the components used inside are all rated for “industrial” or better. Watch out!

The most common example is a small piece of equipment with a regulator that gets warm. There’s no way to cheat physics. Even with a very efficient switching power supply, there is going to be some heat generated. When you seal that inside a small box with no vent holes, the innards are gonna get hot. As a result, even though the manual might specify “0 to 50 degrees Celsius” (approximately 32 degrees to 122 degrees Fahrenheit) as the operating temp range, that box will fail when you mount it in a rack with inadequate ventilation.

The good news is that this is easy to cure. Still, unmoving air is a terrible conductor of heat, but *air in motion* removes heat very well. This is the very principle that cools the tube in your transmitter, and the key is to keep “changing the air” at the hot surface as often as possible – the higher the air volume, the better.

“What about air friction,” you might ask?

That's a very old bromide. Satellites and meteorites don't burn up when they fall to Earth because of air friction; the heat is caused by air *pressure* in front of the object. Pressure = heat in physics (just ask the interior of a star, next chance you get). Unless you're trying to force way, way too much air through a very small space, thus causing a huge increase in pressure, you'll only help your hot situation with more air flow. More is better!

Even a small fan from Radio Shack can work wonders. For example, one brand of 950 MHz STL that we use around here used to come with a

great big old heat sink on the output chip. Nowadays, on the newer units, that heat sink has shrunk (shrunked?) to about half the size of the old ones. As a result, it gets very hot. Just clipping a 12V fan on there makes all the difference in the world. It doesn't even have to be high-tech or pretty; you can take a couple of wallboard anchors, cram them down into the slots on the heat sink, and then use some screws to tack on the fan. Works like a champ!

That's enough for this time... until next month!

Gateway Adventures
By
Rick Sewell, CBRE
Chief Engineer, CBC-St. Louis

Copper Theft

When you get back from a week of vacation, especially one where you've laid on the beach for a week and done nothing, you hope to kind of ease back into things. That was not in the cards for me when I got back from a week in Florida at the beginning of October.

Once again, the T1 connecting the KJSL transmitter site to the studio went down due to stolen phone lines. As in June, this happened in the middle of the night and we were off air without knowing it until our first board operator showed up at 5 AM.

As in June, the engineers in Denver were more than willing to help us out with getting back on the air. The plan again was to have our studio ISDN dial up the KLZ transmitter site ISDN and then take the KJSL programming audio through CBC satellite uplink there and we would get it through the satellite receiver KJSL transmitter site. However, I was not getting the audio through the receiver. I tried reprogramming the receiver and then changing the cables to make sure there was nothing on my side of the world causing the problem. I called Ed Dulaney in Denver and asked him if there was something happening out there on the uplink.

While Ed checked that out, I had to run to the KSTL transmitter site because something happened to their main transmitter and when they went to the backup transmitter, it was not working either. Nothing like having two stations off the air at

the same time! I was able to quickly get KSTL back on the air with their main transmitter because the only problem there was the alligator clips I had put across the failsafe of the remote control at 5:30 that morning had come loose. Since the stations' remote controls were daisy chained together, if we lose one remote control connection, both stations get taken off the air. Thus the need for the clips.

Ed and Cris told me that they had an issue with the uplink in Denver and would have to reprogram the uplink transmitter there. Since I was waiting for either the T1 to get repaired or for the Denver uplink to get through, I thought a might as well see what was going on with the backup transmitter at KSTL. I found that the processor for the backup was not working. Being that it was well over 20 years old, it could have had something to do with it. I had another old processor on hand and switched them out. This made the KSTL auxiliary transmitter serviceable again.

When I got back to the KJSL transmitter site I was still playing the waiting game. As luck would have it, both options came through at the same time more or less. The AT&T crew got at temporary patch laid across the ground for the four stretches of missing cable. We were back on the air with the temporary T1 connection before noon. I kept the connection through Denver open because, well, temporary is temporary. This turned out to be a good thing because about midnight, the temporary cable



running across the ground was cut by a would-be thief again.

Once again we were not aware until 5:00 the next morning, but were able to get back on the air fairly quickly because Ed had left the ISDN through satellite option open to us. All we had to do was dial up the ISDN connection and for me to make the switch at the transmitter site.

At this point, I was politely but rather firmly asking AT&T to get this cable buried. They said they would take this idea to their engineering department for consideration but it would probably take three to four weeks to get this accomplished. So that meant the temporary patch would lay on the ground during that time frame. This made me very nervous, but for the long term benefit of the cable being buried, I was willing to live with the temporary patch for that long. We also found out that option to use the satellite uplink in Denver was going to be going away in a few weeks due to some programming changes.

So with all this factored in, besides the fact that we were obviously going to be hit with copper theft many more times in the future, I decided that we needed to explore a wireless means to get the audio from the studio to the transmitter site. I purchased a "cantenna" (Wi-Fi antenna) at the local Radio Shack and took that out to the transmitter site to see if I could find any free wireless hot spots at the site. Unfortunately, the site is too isolated for any hot spots to be accessed. At the same time, our station manager Beth Kreminski graciously showed up on a Saturday afternoon to allow me to test the Sprint Broadband Wireless Internet she had for her laptop. This worked great. We got a full strength signal on the Sprint wireless utility and when we listened to the KJSL stream, it sounded great. We only had one dropout, but this occurred when we had it in a part of the building that signal was lower.

I was very encouraged by this and of course got busy the following Monday putting together the purchase request to get this service at the transmitter site. It was good that we had tested this out because, well, you guessed it... we would need it soon.

Two weeks later at one in the afternoon, copper thieves hit the temporary cable again, taking about a hundred feet of eight-pair cable. I called Ed in Denver, but he was not in town and would thus not be available to help us out with the ISDN through satellite method. That's when I gave Beth a call to see if she could bring out her laptop with the Sprint wireless service. She said she would but was about two hours away. She made it out there about 4 PM and we got back on the air with a connection from the headphone output on her laptop to the processor analog input, not exactly what you would call a balanced audio connection. It actually sounded pretty good and the connection never once had a drop out while I was listening. It was certainly was better than not being on the air at all! Had Beth not had this service, we would have been off the air until 8:30 Sunday morning when the AT&T crew restored our temporary patch for the T1.

The following Monday, the decision was made that we should go ahead and contract the service for the KJSL transmitter site. I got the USB version of the Sprint wireless card. That way I could use it on a desk top PC and put in a better audio card. Although, I have this located at the KJSL transmitter site, I should be able to quickly move it to the KSTL transmitter site should a similar problem occur there. As for the cable being buried, as of this writing, the head cable repair crew at the local AT&T office told me that they were only going to bury the four stretches that were down right now. Since this mile-and-a-half stretch that runs along the road to the transmitter site is very isolated, this plan to bury only what is down right now is a waste of time. There still a mile of cable waiting to be pulled down.

The only glimmer of hope that AT&T gave me was the possibility that they would bring the T1 out of another central office and then bury the whole stretch. To that, I said, Amen!!! In the meantime, we have the Sprint Wireless Broadband option and should be able to get back on the air quickly with that.

Valley Notes
By
Steve Minshall
Chief Engineer, KCBC

I recently had the privilege of implementing HD-R on another AM station. This is a diplexed AM DA-2 (different patterns day and night). The night common-point impedance bandwidth was a very poor and this led to a significant amount of work in order to broadband it sufficiently to make the HD-R play at night. The story of this broadbanding will be the subject of a future *Local Oscillator* column.

Working on radio station transmission systems during the day brings down the wrath of the programming and sales departments due to interruptions in programming. Working late at night increases the difficulty of the work and I get complaints if I interrupt the late-night guy who talks about spaceships that hide behind comets. What's an engineer to do? Presented here are a couple of tricks I used to get some work done while the station was on the air.

First is tuning an inductor and capacitor network to resonance. Using an RF bridge would do the job, but that's not easy with the station on the air. My trick for this is to use the RF from the station as the signal source and a Field Intensity Meter (FIM) as the detector. The inductor and capacitor are put in a parallel configuration (see Figure 1 on the next page). An oscilloscope probe is connected to the Ext. input of the FIM and hooked across one or two turns of the inductor. The components are then adjusted for a peak on the meter. This is very quick and definitive. Of course it should be kept in mind that stray/distributed capacitance and lead inductance will alter the tuning when components are placed in a

cabinet or when switching to the series-resonant mode.

The second trick is measuring the common point sweep while maintaining programming on the air. This can be done by injecting a low-level audio tone into the audio input of the transmitter. A spectrum analyzer is connected to the common point bridge (CPB). The bridge is adjusted for a null on one of the sidebands. The pictures tell the story.

Figure 2 shows the spectrum, from the jack on the CPB, with a 20 kHz tone adjusted to -50dBc. This was taken with the knobs on the common point bridge turned to the extremes. Figure 3 shows the spectrum with the +20 kHz sideband nulled on the

bridge. As you can see, the null is complete. By adjusting the tone frequency and nulling the resulting sidebands, you can get the impedance sweep done without interrupting the operation of the station. It is very quick and there is no ambiguity about the null. This is very handy if you are experimenting with broadbanding the CP. I used video averaging for the sake of a clean picture, but it works fine in real-time.

KCBC now boasts new Wheatstone studio cabinets. Our old cabinets were installed in 1986 and were getting to be pretty rough around the edges, and you know that this is literal – we still had turntable holes in the old cabinets (you younger engineers can look up “turntable” on Wikipedia). It is nice to have good looking, modern cabinets. I really like the way the Wheatstone product went together and the rack rails are all tapped, something that I really appreciate.



New KCBC Control Room Cabinets



Figure 1 - Resonating an LC Circuit

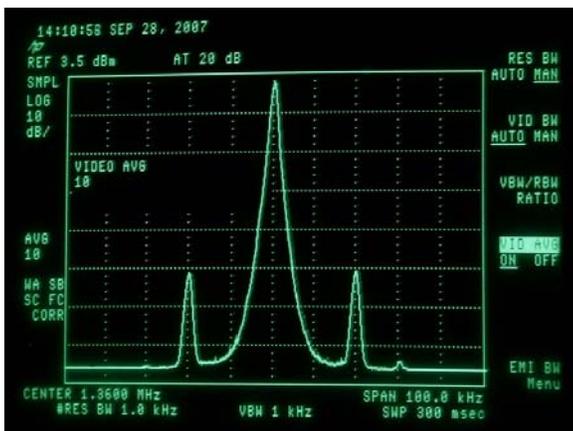


Figure 2 - 20 kHz tone at -50 dBc

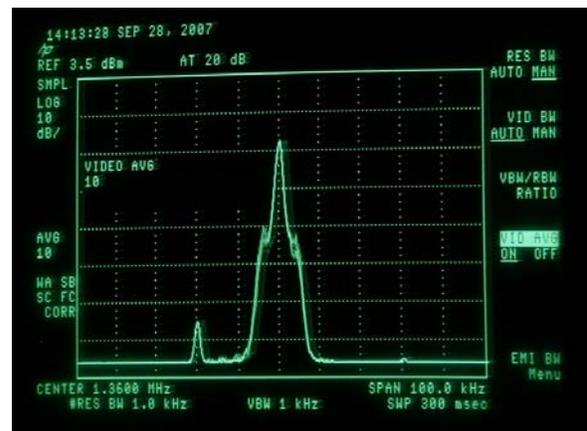


Figure 3 - Upper 20 kHz Sideband Nulled

Catalina Tales

By
Bill Agresta
Chief Engineer, KBRT

Greetings from Santa Catalina Island!

Fires and smoke have been the story for Southern California this last month, and though Catalina Island remained safe from the fire portion of this awful situation, we did deal with the thick smoke and ash for several days. With this came lots of sinus issues and such, but thank God, no more fires. The cleanup is just about complete here at the plant and we are working on some new projects for the future.

One of those projects is the beefing up of our security system. Back long ago, our plant had a closed-circuit type alarm system that would call the local police station if someone were to break into the building. That system was never needed back in those days and was soon decommissioned. But these days, Catalina is dealing with more and more burglaries as well as vandalism and drug-related issues. This being the case, we have decided to be proactive by updating our security system and securing our fences. It wasn't all that long ago when islanders used to leave their car keys in the ignition 24-7 without the least worry of someone taking their vehicle, but those days are surely gone forever!

With all the changes our plant has been through over the last year, we now find ourselves needing to rethink our audio rack. KBRT has seen quite a few changes and upgrades since the fire left us without power or phone lines for several months. Though the power has been restored, the phones lines have only been patched, remaining on the burnt and condemned poles that AT&T refuses to replace to this day. Our T1 is intermittent at best and the phone lines continue to give us trouble. The cables are half burnt and the poles are beginning to break one by one. This being the case, we know that it is only a matter of time until we lose service completely, and who knows how long AT&T will take to get us back on line?

With this in mind, we have begun utilizing satellite technology to its fullest potential and will soon be able to run completely removed from landlines. We have been running our STL via satellite for several months now and it has worked flawlessly for us. Now we are working on installing a commercial Internet pipeline running on satellite IA-8 that will give us 2 mbps down and 1 mbps up on a static IP, allowing for remote control, security video and audio streaming to be run

simultaneously through this pipe. This new service is also optimized for VOIP, since they seem to have dealt with the latency issue we were experiencing on HughesNet. The new service boasts a 99.7 percent uptime using 4-watt radios on 2.4 meter dishes instead of the 1 or 2-watt radios on 1-meter or smaller dishes like HughesNet. We will also utilize the contact closure feature on our existing CBC satellite system as a backup to the Burk remote control connection.

So, now that we are at this point, it's time to redo those audio racks, this time with plenty of planning and nice, clear drawings. When this is all done in the next couple of months, we will certainly have something to cheer about. These updates will allow KBRT to run more robustly and with much less chance of failure while allowing me to work smarter and even to have some time off to make a trip to the mainland now and then.

Ibiquity contacted me last month telling me of an HD Radio demonstration they were doing for some European automakers in the Los Angeles area. Oddly, they said that KBRT was just a tad out of time alignment. That struck me as odd since we spent considerable time tweaking the analog diversity delay and had it about as perfect as could be only a couple months prior. I had no indication that anything had changed in our Nautel exciter, so I put our BA Receptor into split mode to listen. Well, after it



locked up several times, I finally got it but then as I plugged in the headphones it locked up once again. Then I could not get it to pass audio when I turned it on until I turned the tuner up and then back down to our frequency. Don't know what the issue is with the silly thing, so out came the recently updated Day Sequerra M2.

We bought this unit quite some time ago but it was sent back to ATI for a recall issue as well as to have the new upgrades installed. That took several months. Finally it is back, and I have a real HD-R monitor that I can fine tune with. I will write about how well (or not) this unit works in next month's

article after I am more accustomed to its features. So far, out of the box it is pretty impressive. I bumped up our analog diversity delay time about 270 uS (I cannot believe most people can hear this) and found the M2 very easy to navigate. Soon, after we rewire our racks to make room, this unit should prove to be a very vital part of our HD-R operations. Until then, it is wired and sitting near the bottom of the rack, not a good place for such a nice piece of equipment. Until next month, the Lord bless you and keep you; the Lord make his face shine upon you and be gracious to you; the Lord turn his face toward you and give you peace.

The Chicago Chronicles

By

Art Reis, CPBE, CBNT, AMD
Chief Engineer, CBC-Chicago

Academia vs. Broadcasting (Krister's Song)

We have had a new part-time remote engineer on board for a little while and, like Brian Bonds before him, Krister is trying to work his way through college.

There are differences. Krister is going through on the GI bill (which he earned with six years in the Air Force – Krister, I salute you). Brian did it the old fashioned way, which in itself is respect-worthy. Krister is studying at UIC (University of Illinois, Chicago); Brian went to Purdue-Calumet here in Hammond. Both have been and are still working here at CBC-Chicago. Brian has graduated and is working here full time now.

But the biggest difference between their experiences is the way in which each is and has been treated by their mentors at their respective schools. Brian worked here to partly pay his way, and the powers that be at Purdue Calumet said not one word about or against the fact that his career goal was in broadcast engineering. I recently had a conversation with Krister, and it was both revealing and disturbing. In short, his faculty advisors are trying to discourage him from the career path he has chosen, that is, a broadcast engineering related field.

Their tack seems to be that broadcasting is not a worthy choice for a person with an EE degree.

They are trying to get him to leave a paying job and instead become an intern, a non-paying position, in something more worthy. He is being urged to attend so-called "internship fairs" to seek such a position, without pay.



I have a problem with this. While we in broadcasting are approaching a manpower crisis in the one area which is vital to keeping the industry going, namely engineering, here we have some weirdo academic type trying to discourage a person who has made broadcast engineering his life's work, from gaining experience in just that career. Now, I don't consider it fair to extrapolate from that,

especially considering Brian's experience, but I wonder how widespread this sort of discrimination is – and yes, that's what I'm calling it because that's what it is.

Krister has been mentored by some very good broadcast engineers over the last couple of years or so, and I know that because I know them. It would be a crying shame if he would abandon his dream because some snotty career advisor seems to think that a career doing the one thing that I and a lot of us dedicated engineers felt born to do is unworthy of his talents and training. Now understand that I don't have an EE myself, or even a degree from a technical institute as many of my colleagues

(including my boss) have. My degrees are in Broadcast Arts and Sciences, and I am proud to have come into the business from that side of things. Never mind the Masters Degree. I'm still happy to be here, doing what I'm doing.

Still, I want to know if the kind of treatment that Krister is getting from his advisors is any kind of trend in academia these days. And if it is, somehow, we in this business have to put a stop to it. And if, indeed, this sort of thing is the trend, then someone up there in intellectual-land is really missing the boat.

RF is still extremely important, and it still should be taught, and maybe as a requirement, for an EE degree. But for those who think that life revolves only around the '1's and 0's' crowd, let me tell them (I don't need to tell you; you already know) that there is more than enough room in this business for people who know their way around computers and networking. Frankly, we need more people who can do both, not people who discourage their students from doing one or the other. Not only is a mind a terrible thing to waste. So is a dream.

Wire Management, the Caster Oil of Engineering

I'm going to bite off more than I can chew here because I'm going to discuss a concept that we all should know, but that only a minority of broadcast engineers really think about. And Lord knows that I'm not doing well in the 'practice what you preach' department here. Suffice it to say that I'm working on it, as of recently. However, having seen nothing on this subject in print recently, I figure that maybe it's time to fill the void.

I'm talking about 'wire management.' Wire management is, to properly define it, the practice of installation of the interconnections of your station in a way that is well organized, well documented, and easy to deal with once it is installed. It is both an art and a science.

Good wire management is, at least to us geek types, a rare and beautiful thing. It is also seldom seen. I know of two examples in my experience of outstanding wire management, one of which is still in existence, the other of which is long since gone.

The latter was at the old Merchandise Mart facility of WMAQ-TV here in Chicago. Back in the 1940s, when the facility was built, a permanent position was created within the engineering department for the sole purpose of wire management. Understand that there were maybe around 75 folks employed in the WMAQ-TV engineering department there at that time, so this job wasn't something out of line.

The person who filled this position didn't ever have to lift a soldering iron or use a Simpson 260. This man, when the corn was shucked down to the cob, was a clerk. He maintained a meticulous (with a capital 'M') set of records, comprising volumes of data, on what every wire in the place did, where it started, where it ended, what kind of wire was used, what kind of connector was used, pin numbers attached, and every other detail one could think of. No wiring work was ever done without this fellow doing the documentation first. When there was no further need for a wire, or the wire became obsolete or damaged and had to be replaced, this guy made the assignments and the changes in documentation. In the days before computers, this was all done by hand, which made it a huge job. Of course, the advent of the mainframe computer and then the PC made the work of the wire manager much more manageable, so to speak, but still, in a major metropolitan television station, this was the only way to prevent sheer chaos – making one person in charge of all aspects of wiring.

Around Chicago at least, a number of stations, both radio and TV, have been wired based on this model. Maybe a lot of stations were, I don't know. I remember being involved once in the wiring of a major Chicago FM station which used this model, and as part of my work, I needed information of a certain signal path routing. In short order, I had the entire list of the wiring involved, brought out from the Chief Engineer's wiring database. It made the job a lot easier, and that was a message.

The other station where outstanding wire management was practiced from the outset was, and still is, WBEZ-FM, Chicago's public radio station. I was in on this station's construction project, if only briefly, back in '95 or '96, when the station was moved to Navy Pier on the Chicago lake front. I'll give credit where credit is due here: Chief Engineer and designer of the project, Al Antlitz, is still in Chicago radio and is the best at what he does. But the real kudos for the beauty of this job go to the two men who actually wired the facility, Al Mix and Bill Meyers, both of whom are retired and loving it. Their job was made easier, to be sure, by the introduction (since the WMAQ-TV facility was built) of multi-pair cable. Al, Al and Bill used the biggest multi-pair cables that both Gepco and Clark Wire made in those days, and they laid out their wiring beautifully. (I tried to get photos of this installation, but so far, I've not been successful.) So carefully was the wire management planned and installed in that facility that, to this day, the wiring is still a thing of beauty to behold. I attended a recent local SBE chapter

meeting at which I met a staff Engineer at WBEZ, and he told me that the facility was still the best-wired he's ever seen, and still almost pristine. Indeed.

So, what does it take for good wire management? At the risk of insulting more than a few intellects out there but for the enlightenment of those who are relatively inexperienced at the facilities-development game, let me give you my list.

1. Plan, plan, plan. And not just at the time of initial installation. Every time anything gets changed, from additions and subtractions to just moving pieces of equipment in the rack, you have to see what ramifications there will be to present wiring from what you're about to do. I'm currently having to do a complete re-rack.

2. Document everything. And that doesn't mean just the wire list, either. See about getting a wire-labeling device and marking each wire with where it starts, where it ends, and a catalog number. Cuddle up to your local database program, if possible, and configure it such that, in case you have to run a signal path from beginning to end, you can do it with just a few minutes and a few keystrokes. This takes an awful lot of time up front but pays dividends later. Schematics of the installations are a huge help later. One thing I do in all my projects is to document the signal path, then commit it to a program which will 'make the picture.' I personally use Excel or its Open Office counterpart, Calc, for this purpose because, despite its flaws, it's relatively easy to learn and quick to use. I also post an enlarged copy of the schematic on the transmitter room wall at each site to make it easier to change or troubleshoot.

3. Use multi-pair cabling whenever possible. Better yet, try to get management to invest in equipment which uses CAT-5 or CAT-6 style wiring for its interconnections. Interestingly, IP interconnection is the future trend of the industry. Not too long ago, we here in Chicago had the thrill of tearing out six sets of 25-pair wiring which we replaced with two CAT-6 cables. It sure lightened the load on the wiring ducts, not to mention that it's a lot easier to attach the connectors. The soldering iron may just be on the verge of going the way of the dodo bird, folks. Talk about future shock!

4. Try to make it pretty. There are a couple of tricks to this. First, estimate what you think is the size for any wire duct or rack egress hole, and double it... at least. You never know what the future will hold. And, believe me, when we built our present facility over ten years ago, we never anticipated anything of what we have now, or the demands which would be placed on our physical plant. We've gone

from three racks to six and have totally outgrown our original concept. By that, I mean that we no longer have the luxury of putting one or two rack units of space above or below any piece of equipment. Sizing for exponential growth at the outset will help keep things manageable at least into the foreseeable future.

5. Another idea for keeping it pretty is to try to keep long wire runs to a minimum. Where a particular piece of equipment sits in a rack helps determine if there are going to be long or short wire runs going to it. Obviously, try to mount the equipment, whenever possible, as close to all the equipment it's going to be attached to as possible. Having said that, I've found that saying it is a lot easier than doing it. I've been able to reduce a lot of wire clutter in my racks by simply changing the locations of certain pieces of equipment within it. And having said that, proper planning still involves keeping equipment which has a great deal of interaction close to eye level, such as the modulation monitor, while keeping the equipment which can be easily forgotten either higher or lower on the rack. You've got a lot of balancing to do in that rack planning project. All this equipment change can become a real pain across time. It may become necessary, every so often, to just flat out rewire the rack. Horrors! What a time-burner, especially with the necessary overnight hours. But the bigger horror, I have discovered much to my horror, is the mess which accumulates across time as equipment changes and wiring is added. I don't know about you, but less than 25% of the equipment which populated the racks in our studio site rack room is still around. Most of it has been replaced by digital equipment. But note that the amount of equipment hasn't decreased one iota. Actually the opposite is true. Anyone else notice this?

6. There is no virtue in the concept of the long AC line cord, unless it is a non-modular part of the equipment. In that case, it's not cool to cut such cords. You have to just grin and bear that. However, one of my favorite tricks is to not throw away those Euro-style modular IEC-type AC line cords with the large, rounded-pin prongs on them. Rather, I prefer to cut them to a more manageable size and use just the IEC end that goes to the equipment. Throw the other end away, obviously. Cut the cord to a length such that you can pull the piece of equipment all the way out of the rack a few inches, just in case you need to. This may vary depending on which side of the rack the electrical outlet is, relative to the location of the AC inlet on the equipment. Then wire a new AC plug onto the other end, and replace the original line cord. The 'removed' cord can later get the same treatment.

There is no bigger source of confusion in a rack full of equipment, than to have fifteen or twenty line cords that are three feet too long, no matter whether they are either coiled and tied up or just left hanging, they just look slovenly and lead to a lot of confusion when you're trying to trace wiring.

7. As much as possible, don't try to bring coax into a cabinet without a bulk head connection of some sort on it. We have several of those here, left over from our original installation, and it simply looks bad. The best way to treat a large coaxial cable, such as 7/8" Heliac, into the rack is to go to a high-quality jumper first, then to the bulkhead, then into the rack jumper to the equipment. Yes, you lose a half dB with each connection, but that's why high-quality connections are a must.

8. If you're using an over-the-rack wire trough, don't short-cut the wiring in it. Make sure the wiring is long enough for all of it to stay in the trough. This is where, all too often, emergency installs of wiring that had to be done yesterday goes so wrong. I have multitudinous problems with this right now in my own studio racks, and I'm going to have to go in there and replace all those wires, one at a time to make it neat....if I can.

9. Don't ever keep wiring around when the need for it leaves. In fact, when going into a rewire

project, the first task is to get rid of unused wiring first. It isn't any big deal to replace it later if you need to have that same run again, and in any event, you'll be installing it more neatly the next time, won't you?

10. Especially if it is a new installation, try to plan so that you're using only half or at most two-thirds of your rack space. This is so much more easily said than done, but frankly, not only will this allow your equipment more room to ventilate, it will make the job of wire management so much easier by reducing the amount of wiring per square foot to begin with.

By the way, I refuse to say that my rack wiring, bad though it is right now, is the worst I've seen. There are some examples of that in some rural stations I've worked at that are actually prayer list material. I'm sure you have seen some, too. I wouldn't even waste the print space on pictures of them. I'm sure you all know what I'm talking about. That's all I can think of for right now. If you have any tips or tricks on wire management that you think are worth adding, drop me a line. I'll print them. Heck, I'll even give you the credit. I'm not proud. My e-mail address is areis@crawfordbroadcasting.com. Until next month, enjoy your mandate!

The Portland Report

By

John White, CBRE

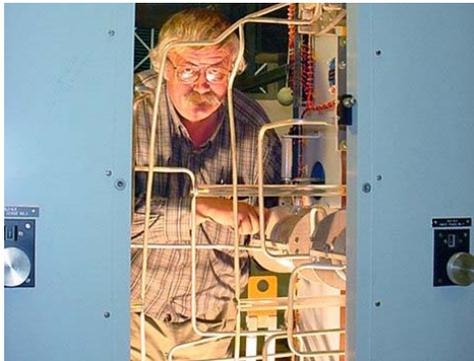
Chief Engineer, CBC-Portland

"Sometimes it's time to shoot the engineer and release the product."

Now that I have your attention, it's time for a bit of background. Many years ago, I worked for a manufacturing firm doing quality assurance testing. Later I worked with engineering development of third-party vendor products to be re-branded.

Product evaluation can be complicated. The modem "AT" command set is an example. The AT command set specification I was working with was well in excess of 80 pages including the

asynchronous and synchronous modes. I found that *none* of the third-party modem vendor's products was in full compliance, including the products based on self-contained "AT" chip sets from Texas Instruments, Motorola, Lucent, and Rockwell.



How can that be you might ask? Well, the computer code is complicated with complex interactions. In addition, software programmers are not exactly famous for understanding communications and hardware. When you add into the mix that manufacturers

often copyright known existing art requiring

workaround or work-alike solutions, the chance of bugs grows geometrically.

An example of the latter is the "AT" command set copyrighting use of the "break." Old timers in radio who remember AP or UPI mechanical Teletype printers will recall the "break." These printers used 60 mA current loops. When the line went open, the printer would continuously try to print null characters ringing the bell in the printer. Clunk ding, clunk ding, clunk ding.

Both AP and UPI used the "break" as a 10-bell breaking news alert.

So how does my opening comment apply? Consider a modem product marketed to the PC market. Will the modem be used in a synchronous application? Is it worth the vendor's investment to get synchronous operation perfect? Probably not. As my engineering manager said, "Sometimes it's time to shoot the engineer and release the product."

As Tom Gardull mentioned last month, he and I are evaluating the APT Oslo digital STL product as a replacement for the existing CAT-Link previously used in some Crawford stations. An early problem was a defect in handling the AMI protocol, in particular the bit stuffing for long strings of 1s or 0s. While talking to APT field tech Rolf, I learned the defect was a result of the programmers not fully understanding the AMI bit stuffing requirements. AMI is seldom used these days (except for the CAT-Link) and APT had made the reasonable decision to release the product knowing that AMI was not working properly. That word unfortunately didn't get to the APT field people, so the follow on fix did not get implemented.

Having worked with product development as a large end user, I learned that often the real measure of a vendor is not the product being perfect off the shelf the first time. The best measure is how the vendor responds to a problem. In this respect I am favorably impressed with APT. Rolf responded with an interim fix within days and personally installed the change here in Portland and Detroit. As Rolf said, fixing the problem is important and the BBC can wait a few days

How is the APT Oslo doing? One limitation with the interim fix is I have half the T1 bandwidth to

work with. I can't implement the digital AES/EBU transport yet, so the APT is configured as an exact copy of the old CAT-Link analog configuration.

Until recently I had thought the CAT-Link to be one of the more gentle conversion schemes. With all the processing and conversions that audio goes through, TSL, in studio, STL and particularly satellite programming, a major issue is the artifacts (grunge) on the audio. It's one of the first things

James Autry, our local station manager, noticed when our HDR signal was activated. James has HDR receivers and has been interested in HD and monitors and supports it strongly. When I install the Oslo, it seemed we had some grunge improvement. That was totally subjective on my part (it would be nice to have a Grunge Meter). It's really hard to do an evaluation when the evaluator is

contaminated by expectations. Something like a double blind test is needed.

I have had some interesting feedback from James. Late last month, James commented that he thought the HDR signal was improved. The only significant change has been the APT being on line. This is a significant observation for a couple of reasons. James had no expectations and noticed the change without prompting, as close to double blind as we can expect. I think that is a good positive indicator for the Oslo. I would expect a significant improvement when I can implement the AES / EBU digital transport working on the Oslo.

Product configuration is going to be a challenge for us. We are looking for plug and play configuration out of the box. Like Tom in Motown, I received the Oslos with digital cards in the card cage for one end and analog cards in the other. How crazy is this, I thought? That took me to the saga of reading the enclosed CD and printing the manual I mentioned two months ago. I spent time reading the manual and working with the configuration program getting to understand the APT. In the long run, time well spent. The Oslo is a highly flexible product, and with flexibility comes complexity.

Surprise, surprise, that configuration I received out of the box, analog at one end and digital at the other end of the same pipe, is a totally valid configuration. That's because the Enhanced APTx



KKPZ's APT Oslo System

algorithm is common to both analog and digital the Oslo will do an analog/digital conversion on the fly.

I now think a large part of the success of this product for us depends on our being able to properly configure the product to fit each stations needs at the time of order. On the analog side, there are at least eight variants of the analog audio cards. Three versions of the digital cards are available. And this does not include the specialty dual digital/analog cards. In addition to the types of cards, bandwidth assignment is also very flexible, which adds to the configuration considerations.

The first thing we need is to determine what is needed at the station. I think we are in excellent shape here. Our local engineers have an excellent understanding of each stations needs. One big plus is

we have a good back up with Cris to help coordinate. The only unknown is likely to be the crystal ball prediction of each stations future needs. Crystal balls tend to be cloudy.

Second, we need to understand what configurations are available with the Oslo and what they do for us. With the card/price list in hand, this is a fairly large but fixed and definable target, seemingly complicated but I think quite manageable. With those two items, we can determine the optimum system configuration which meets the station's needs, a must when ordering plug and play. That's a heads up to everyone to think about how program content is moved around our facilities as we move to the new digital age.

**Rocky Mountain "Hi"
The Denver Report**
by
Ed Dulaney, CSRE, CBNT, AMD
Chief Engineer, CBC - Denver

Routine

For the first time in many months, things have returned to the routine in Denver. No projects were on the agenda and most of the equipment behaved as it ought!

Although it's nice to not have a few thousand things on the agenda, somehow it made the month drag on longer than I expected. When you are involved in projects, the time flies like an arrow (and fruit flies like a banana, but I digress!). However, when things return to the routine, the days seem to slow down to a crawl. Not that I'm complaining, mind you!

AES Switching

We've been awaiting the release of the Broadcast Tools ADMS 44.22 for quite some time. Finally, after 18 months of anticipation, the first units have shipped. For those of you that haven't seen the units, this is a "souped up" version of the SS 8.2 switcher. There are still eight inputs, but now four of them are AES and the other four are analog. Additionally there are two AES and two analog outputs.

The reason for such anticipation is that the NexGen system in Denver was still running on the old Sine System ACU-1 switchers. Those are nice switchers, but they can't handle digital audio. That means that the audio comes out of the NexGen system as AES, goes into the Wheatstone router as

AES, and then gets turned into analog for the switcher before being converted back to AES by the Eventide delay, then fed into the STL. That conversion leaves some artifacts within the chain that I just was none too happy with!

Now that I've installed the ADMS 44.22, I can keep the entire air chain in the digital domain. Does it make a difference in sound? Probably

not to Joe Listener. But to my ears it eliminates some of the conversion artifacts that I'd occasionally hear on KLZ. The next step will be for us to purchase three more of these units to install on the other Denver stations.

Another Nighttime AM HD Review

Over the past month, I've really been



listening long and hard to the skywave signals that find their way into Denver. Some of them are broadcasting HD Radio carriers; others are analog only. And I've yet to hear any objectionable interference on any of the local stations, including the class C "local" signals. I'm now 99.9% convinced that HD skywave decoding is a complete impossibility, so we should never expect to hear digital broadcasts from Chicago here in Denver. But the HD carriers have not in any way impacted the analog coverage of those stations.

Those of you in the densely-populated east coast have experienced some interference from the HD carriers. And that was to be expected, as many of the stations in New York, New Jersey, Pennsylvania and other states have stations that are packed together tighter than sardines. Yet within the primary service areas, there are no reported cases of interference.

Only within the fringe contours were any traces of interference detected.

Unfortunately, this caused one broadcast group to decide to abandon HD Radio broadcasting at night. That's a shame. Actions like that do nothing more than set a precedent for the naysayers in the anti-HD camp. Interference in the fringes is not only to be expected, it should be tolerated as well. It's called "fringe" coverage for a reason, after all!

Shorty

This month, my column is much shorter than usual, as not much has happened here in the Rocky Mountains. Snow season is upon us and I am hoping for another nice, snowy winter.

Until next month... press on!

Product Review Dual XHD6420

By
Amanda Alexander
CBC-Denver

For the past couple of years, I have had a Kenwood KDC MP428 with KTC HR-100 HD Radio tuner in my 2006 Ford Escape. The radio served its purpose, allowing me to listen to our Denver market HD Radio stations. When I read online that Dual was coming out with a new aftermarket automobile radio with integral HD Radio tuner for just \$129, I jumped at the chance and bought one.

I received my Dual XHD6420 within a week of ordering it from Crutchfield Electronics (www.crutchfield.com). The vehicle-specific wiring harness and instructions provided by Crutchfield made the installation easy. I put together the harness as the instructions indicated, pulled out the Kenwood and plugged the Dual radio in. It was a piece of cake.

This radio features a removable faceplate, a CD/WMA/MP3 player as well as an auxiliary input on the front panel (for personal MP3 players, etc.).

There are 18 FM and 12 AM presets. I am happy with the number of presets on this particular radio, although on the FM side I have a problem filling all the presets; on AM, I can finally add all of my favorite AM stations that I previously did not have room for in the Kenwood. Switching between preset banks is very simple. Just a touch of a button will take you to FM1, FM2, FM3, AM1 and AM2.

The display on the radio is very easy to read, no matter the light conditions. The PAD display will only show one thing at a time, but a single

front-panel button rotates the display between time, frequency, title, album, artist...etc.

One of the biggest differences I noticed is that the controls are not as sensitive as on the Kenwood. I can switch to the different displays without any problems. If I hit a bump while trying to change the display, it doesn't go somewhere I don't want to as the Kenwood did. It will allow me to find



the display I want.

I have enjoyed this radio so far. The sound quality is great (50 watts peak/channel). The radio does not require turning the volume up to 20 to get good sound. A volume level of 5 or 6 is more than sufficient. The HD reception is

great. I don't have to worry about the heat causing the unit to overheat and make it lose its HD connection as the KTC HR-100 occasionally did. Everything is very easy to use on the radio. I don't have to worry

about looking at the radio while I'm driving because everything is just a button away, not several menus deep. I am also happy with the removable faceplate. I am able to take it off when I leave my car and know that the radio will not work without it. The auxiliary input has become a very much used part of the radio because I can plug my MP3 player in and have 500 songs at my fingertips instead of having to search through my stack of CDs.

The only thing I don't like about the Dual XHD6420 is that the display only shows one thing at a time. One thing the Kenwood does that the Dual does not is, if you select to display the title, it will scroll the title, then the artist. I like having both on the same screen instead of having to flip to the artist then back to the title to find out what I'm listening to.

As I mentioned, I bought the radio from



Crutchfield Electronics. This was a good experience because of the customer service. Every person that I spoke to from Crutchfield was very helpful. They did everything in a timely manner. I never had to wait more than a minute on hold and the people were very

friendly. I had to return the first unit because of a defective CD mechanism. I called Crutchfield and the man I spoke to was very apologetic and quickly sent me another unit. I received the second unit within a week of this and it

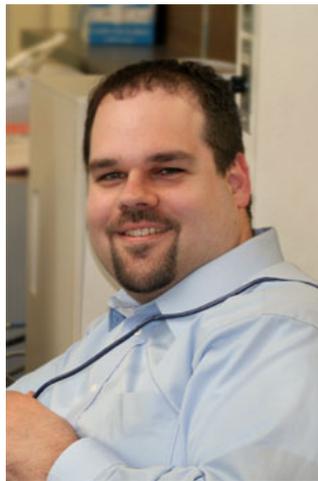
seemed to work fine. After a while, I noticed the auxiliary input was not properly working (it would only work on the right channel). I tested my MP3 player in a different car with the same radio and it worked perfectly. I called Crutchfield again and the man was very helpful as before. He sent me another radio, which I just recently received.

Despite my few problems with the radio, I do recommend it. I know of one other person with the same radio and he has had no problems with it. This is a budget-priced radio that works like the best of radios. If you want a good aftermarket radio with a built in HD Radio tuner, I suggest the Dual XHD6420 or the XHD6425. The only two differences between the two is the XHD6425 includes a USB port as well as Bluetooth capability.

Digital Diary
by
Larry Foltran
Corporate Website & Information Technology Coordinator

Back in March, I touched on the subject of wireless access security within the office environment and at home. This month, I thought I'd share a little about my most recent related project.

As you may recall, I explained the use of wireless encryption security to restrict network access to those with the proper password. But when that password is passed around to visitors without first considering the potential network security risks, it can lead to a significant concern. Not only does that user have access to our network and files on the attached servers, but the potential is there for them to spread any infections



lurking on their system. Granted there are a lot of "ifs" in that scenario, but why risk it?

That brings me to step #1 of our new security scheme. The majority of newer wireless hubs allow you to restrict wireless access based on the machine's MAC address. For those who aren't familiar with MAC addresses, they are basically the computer's NIC (network adapter) license plate. Each machine has a unique identifier, arranged in an alpha-numeric string of 12 characters. To see what your PC's MAC address is:

1. Open a DOS command prompt.

(Run > cmd)

2. Type *ipconfig/all*
3. Scroll down until you find the information titled Ethernet adapter Wireless Network Connection and your MAC address will be shown to the right of the Physical Address title.

Keep in mind that only machines with wireless capabilities will have this specific entry. Desktops will be different, but I'll cover that a little later.

As I mentioned earlier, most wireless hubs will allow you to limit wireless access to only specified MAC addresses. In recent weeks, I've been collecting the MAC addresses for every station employee who connects wirelessly and entering this information into the hub. Once the MAC address security is enabled, any computer not on that list will not connect to our network. Keep in mind this affects those who have the WEP security password or not. In other words, there are two levels of wireless security in place. First is the WEP and second is the MAC address. We could simply open up the WEP and leave the MAC address security level in place, but why risk it?

Another benefit of this set up is the ability to quickly disable a computer's access to the wireless network without shutting everyone else down. If down the road there is a security concern related to a specific computer accessing the network, we can simply remove their MAC address from the list and their access is gone.

The second area of network security we are implementing is a result of a situation a few months back where I was receiving a large number of hub-generated blocked access alerts during the weekend evenings. These alerts are generated when someone tries accessing an Internet site containing specific keywords entered in the hub control panel. With the help of Rich Hanovich, operations manager here in Detroit, we tracked down the IP address to our FM studio computer. We scoured that computer for any trace that it had accessed the sites noted in the alerts, but the computer was clean. After a quick test, it was

obvious that whoever triggered the alerts had simply unplugged the Ethernet cable from the studio computer and plugged it into a laptop.

The next step would be to limit LAN access to a specific group of machines. Unfortunately, the MAC address based access feature on the hub can only be applied to wireless access and would be useless in this scenario. The hub does feature an option that limits LAN access to specific IP addresses or range of IPs. Because all of our desktop machines are assigned IP addresses when they are initially set-up, I could quickly implement this phase of network security throughout. Although this would prevent access in most cases, an informed intruder could simply change their machine's IP address to fall within the specified range or make it identical to the desktop they are borrowing the LAN connection from. MAC address to the rescue once again.

Our hub allows me to assign a specific IP address based on the machine's MAC address. This applies for any computer connecting to the network. Because we have already adequately controlled wireless access, it would only be necessary to apply the MAC/IP address configuration to our desktop machines. The MAC address for desktops can be found using the same steps as described earlier. In this case, you will be looking for the physical address of the Ethernet adapter Local Area Connection section of the output.

Once that hub is managing the IP addresses based on each machine's MAC address, I can limit access to those specific IP addresses only. Granted someone can still change their IP address to fall within the IP range used, but that information will be harder to find. We can also deploy the IP addresses randomly and apart from any set range. The assigned IP address is also no longer available on the machine itself and would only be available with access to the hub control panel, preventing IP address spoofing. Although I haven't applied this scenario yet, I'm fairly confident it will work well and will pass along any lessons learned.

Until next month...

The Local Oscillator
Nov 2007

KBRT • Avalon - Los Angeles, CA
740 kHz, 10 kW-D, DA

KCBC • Riverbank - San Francisco, CA
770 kHz, 50 kW-D/1 kW-N, DA-1

KJSL • St. Louis, MO
630 kHz, 5 kW-U, DA-2

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

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

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

KSTL • St. Louis, MO
690 kHz, 1 kW-D/18 W-N, ND

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

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

WEXL • Royal Oak - Detroit, MI
1340 kHz, 1 kW-U, DA-D

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

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

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

WDCD • Albany, NY
1540 kHz, 50 kW-U, DA

WPTR • Clifton Park - Albany, NY
96.7 MHz, 4.7 kW/100m AAT

WPWX • Hammond - Chicago, IL
92.3 MHz, 50 kW/150m AAT

WRCI • Webster - Rochester, NY
102.7 MHz, 6 kW/100m AAT

WSRB • Lansing - Chicago, IL
106.3 MHz, 4.1 kW/120m AAT

WYRB • Genoa - Rockford, IL
106.3 MHz, 6 kW/65m AAT

WYCA • Crete - Chicago, IL
102.3 MHz, 1.05 kW/150m AAT

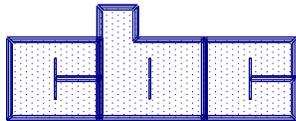
WYDE • Birmingham, AL
1260 kHz, 5 kW-D/41W-N, ND

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

WXJC • Birmingham, AL
850 kHz, 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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