The Local Oscillator

The Newsletter of Crawford Broadcasting Company Corporate Engineering

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Spring!

Here in the Rocky Mountain region as well as out west and in many other parts of the country, it's been a long, difficult winter. Despite 70-degree temperatures, there are still piles of dirty snow in parking lots (and clean drifts of snow in my back yard). Driving on any road or in any parking lot is a treacherous endeavor, with large and deep potholes that many times cannot be avoided. Soon we will start seeing hubcaps lying in gutters where they get popped off when cars hit those potholes at speed.

So as spring makes an appearance, we get a little bit excited. Warmer weather, a slackening of the snow and ice, and maybe a chance to get a few of those potholes filled.

But as much as we look forward to spring, we also dread it. Along with spring comes convective weather. Here in Colorado, we've already had our first tornado warning. It was really not a lot more than a big dust devil, but it did some damage at a dairy farm up north of Denver. In more temperate regions, the tornado warnings have been happening for a couple of months now, and one storm tore up a town in central Alabama last month.

There's not a lot that we can do about tornados. There's no such thing as a "tornado repellant" that we can affix to our towers and transmitter buildings. About the best we can do is be vigilant and have a plan for where to go and what to do if a tornado comes our way. I think about that this time of year as I sit in my office in this high-rise office building, looking out my window as the storms move across the area from southwest to northeast. Sitting in this chair next to that wall of glass is not where I want to be if a debris-laden spinning cloud comes this way.

There is, however, a lot we can do about lightning, which is really the bigger danger to towers, broadcast facilities and equipment than tornados. While very few storms spin up tornados, just about every convective storm will have some lightning or lightning potential. We make things worse by putting up tall, conductive objects, which amounts to putting up a big Las Vegas-style flashing electric sign saying, "Strike Me!"

Towers, antennas and power lines are going to be hit by lightning. It's like death and taxes, one of the sure things in this world. Knowing this, it's up to us to prepare for that and take mitigating action. Countless papers and books have been written on lightning protection of broadcast facilities (I wrote one myself many years ago – it's still up on our website at: https://crawfordbroadcasting.com/Eng_Files), and these provide some good guidance on preventing damage from lightning strikes. We have made every effort to employ the recommended measures at all our sites, and the results generally speak for themselves.

Once every few years, however, we take a "grand mal" lighting hit somewhere that does a lot of damage, and it occurs at a site where we have employed good preventive measures and have not had any problems in several years (if at all). After our engineering crew gets Humpty Dumpty reassembled and all stations back on the air and playing the hits, they begin investigating. Invariably, they find the cause, some preventive measure that has long been in place that has come loose, come undone, become oxidized or been damaged. Had they made the discovery before the grand mal strike, there likely would have been little or no damage – the lightning energy would have been safely shunted off to ground before reaching any of our equipment.

The mere fact that this has happened in the past is an excellent reason to do a thorough inspection of all our lightning mitigation efforts at all our sites right now.

The #1 issue that we tend to find is broken ground conductors, usually where they tie into a rod, caused by a weed whacker. Large gauge ground wires are pretty strong and somewhat impervious to even large-diameter trimmer string, but over time, repeated hits in the same place can eventually sever a number of wire strands or the entire cable. Keep in mind that the current-carrying capability of the ground conductor is reduced for each strand that is cut. Sever enough strands and you no longer have a conductor capable of shunting lightning current to ground – instead you have a fuse that will blow at the leading edge of the strike, leaving your equipment to take the current for the remainder of the discharge. Look closely at each and every ground conductor, and if more than two or three strands are cut, replace the conductor or at least cut it off at the point of damage and reconnect it with all strands intact. And if weed whacker damage is a problem, consider cutting a short piece of ½" EMT conduit and sleeving it over the area that is regularly hit by the trimmer string.

A close second on the list is theft. Some scumbag copper thief will come in and steal the whole ground conductor, and its absence won't be noticed until your equipment is a smoking heap following an unmitigated strike. This is one thing that you need to look for at every site visit, not just once or twice a year. Copper thieves can come at any time, and they can keep coming back, stealing the new conductor you just installed. I recommend a security camera for any theft-prone tower base or ground block.

Almost in a tie with #2 is oxidation. This is common when a clamp connection is used on the rod. Such connections are not only exposed to the elements, they are also often wet and dirty, in close proximity to the ground. That's a recipe for rapid oxidation, and that produces resistance in series with the connection. I strongly recommend exothermic welds for such connections. You can do this yourself, but it might well be more cost effective to hire an electrical contractor to do it. But if exothermic welded connections are not practical or possible (in California, we don't make sparks or fire outdoors unless it's in the middle of a rainstorm!), make regular inspection, cleaning and tightening of clamped ground connections part of your routine.

Related to that is ground connections at other points. One of the worst grand mal hits we ever got at WMUZ-FM in Detroit was the result of a

Next time you have a climber on the tower, have him inspect the static dissipator for sharp points.

failed ground junction just above the base of the tower, where one wire connected to a transmission line outer conductor tied into the tower base ground bus. That connection was loose or oxidized (I can't remember which – maybe it was both), and we took a big discharge right through the transmitter and rack equipment. Such junctions are worth a good, hard look as we head into lightning season.

One other thing that bears mentioning is H-field mitigation. I learned many years ago what a tremendous magnetic field is produced during a lightning discharge through a tower. It can be a whole bunch of amps per meter, and that H-field can in turn induce damaging voltages into nearby conductors. Typically, we see blown input/output op-amps in analog gear, and damaged switch ports in networks.

Mitigating such damage is best done with clamp-on ferrite beads, which present a high impedance at the frequencies represented by a fast-rise-time lightning pulse. That high impedance reduces the current, hopefully to a point where it is not damaging. Snap-on ferrites are available from Mouser, Newark, Digi-Key and other suppliers. They're cheap – a lot cheaper than lost air time or replacement switches. This kind of mitigation is usually only needed where the tower is in close proximity to the building or equipment (i.e. in the high H-field zone).

Finally, one of my favorite movie lines is from *The Karate Kid*. Mr. Miyagi told Daniel, "Best way to avoid punch, no be there." That holds true for a lot of things, not the least of which is lightning.

While we can't very well crank down our towers when lightning is in the area, we can take steps to make them unattractive to lightning and prevent that upward streamer from ever forming. In our facilities, we have installed static dissipation arrays on towers that are lightning prone. The thing is, those arrays only work if the points are sharp.

A loose lightning rod can be ineffective.

Over time, corona and wind erosion wear away the sharp points, reducing their effectiveness. The next time you have a beacon replaced, have the tower climber visually inspect the static dissipator arrays and even provide you with some photos. Those of you with drones and FAA licenses to fly them commercially should use them to periodically look at your static arrays. And on towers that don't have dissipator arrays, have the climber check the lightning rod(s) – those can get loose and become ineffective.

Again, the best time to find holes in your lightning defense is not in the hours or days after a damaging strike. It's when all is well and the threat is low. Let's make it a priority.

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

Hello to all from Western New York! It's that time of year that weather starts to change to more favorable conditions, and with the onset of good weather comes projects in many shapes and forms! We have several projects slated to begin this month in Rochester, and I'll get into those a bit later.

In a recent article in Radio Inc., Ben Downs of Bryan Broadcasting relates his perception of what is wrong with today's AM radio, and he shares his views on what needs to be done to "rescue" AM stations nationwide. Mr. Downs interpretation of the state of AM radio today is that the entire AM band is impossible to listen to because of the "noise." His proposed solution is relatively simple: convert all AM stations to digital using the HD MA3 mode.

While this will increase the fidelity of many AM signals, not all will have the finances to convert current analog to digital signals. Additionally, there are some AM facilities, primarily those that are multiplexed with other stations, that cannot broadcast in HD-R due to limited bandwidth on their antenna system.

It's really a gamble on station owners' part – spend the thousands of dollars on digital equipment that may or may not generate revenue that can pay for the drastic upgrades, or in a simpler manner, upgrade your current equipment with newer, state-of-the-art equipment that does not add to an already dirty noise floor.

There are numerous new audio processors out there that will do wonders with an analog signal, such as the Omnia.9, which we currently employ on WDCZ in Buffalo. Bandwidth limitations make it all but impossible for us to broadcast in HD-R, and we were mediocre as far as audio quality and loudness in comparison to other stations with the old Orban processor. After installing the Omnia.9 (and with Brian Kerkan's expertise in setting it up) we instantly became noticeable when scanning across the dial. The Omnia.9 gave us loudness without raising the noise or increasing distortion, and we got crispness and audio fidelity that the station never been heard before along with increased audio bandwidth that we previously could not achieve without exceeding the antenna systems bandwidth limitations. There are

certainly other ways to improve AM quality and fidelity without shelling out tens of thousands of dollars for HD compatible equipment.

In my opinion, the problem with today's AM band is not the quality of the audio, but the content of the programming. (Yes, I agree… there are numerous stations that sound like hammered sand.) Nearly 70 percent of AM owners elect to air satellite-delivered talk radio with no ties to the local communities which they are licensed to serve.

When I began my broadcasting career in 1969, AM was king and FM was relegated to "beautiful music" heard in the background in offices and malls. We had local personalities, local news and sporting events, local remotes promoting new businesses within the listening area of the station, and programming that the local listeners wanted to hear. We were active in the community by providing public service announcements and programming that affected the residents within the community which we served. Somewhere along the line, we lost that personal tie to the listener, the one who will spend hard-earned money with our advertisers, show up at our remotes, and call in and interact on important topics that affect the community at large.

All-digital HD is the only solution, you say? I say "hogwash." Operate and program your AM with the listener and community in mind. Provide content they want to hear. If you play it, they will come.

I had mentioned earlier that we are preparing to begin several projects at our AM facility in Rochester, NY. We are scheduled to have a new antenna and feed line installed by Patriot Antenna & Tower for our new FM translator for WDCX(AM) on Friday, April 12th. Cris worked diligently with American Tower Corporation to negotiate a lease for space to mount the single-bay directional antenna. Near the end of March, we received the "notice to proceed" from American Tower to begin the installation. The transmitter, audio processor and ancillary equipment have already been installed and programmed; the final piece of the project was the acceptance of the terms of the tower lease.

Another upcoming project is the frequency conversion of the newly-acquired Nautel ND-5 transmitter which we purchased from WPTR in Albany, NY. I will perform the frequency change from 1540 to 990 starting at some time this month. Nautel has informed us that the parts necessary for the frequency change are slated to ship sometime mid-month. Once I have the transmitter work completed, it will then be installed at WDCX(AM) in the capacity of back-up, replacing an 80s vintage Continental 315-R series transmitter.

There are also several outdoor projects that I anticipate beginning at some point this summer, projects that have been postponed for one reason or another over past years. Most of these are cosmetic and do not affect our ability to broadcast at all.

March was relatively quiet, with hardly any equipment failures on which to report. In Buffalo, I found a couple of grounding issues while performing my quarterly tower inspections for WDCX-FM and WDCZ. At the FM tower site, we had some loose ground connections between the guy wires near the anchor points, and I found two broken ground wires, which were caused by wind flexing the guy wires. Both were simple to repair with replacement parts on hand.

At the WDCZ transmitter site, I found a ripped ground strap between the bandpass filter cabinet and the ATU. I was able to make a field splice in the 4-inch copper strap for the time being, but I plan on replacing the ground strap altogether when weather improves. All of the towers' lighting fixtures were in excellent condition and operating according to FAA/FCC rules.

In Rochester, we have a couple of towers that have only one beacon lamp in operation on each, and the side markers are due to be replaced with LED lamps. On Sunday March 24th, tower contractor Don Boye and I met at the WDCX(AM) transmitter site to make the necessary repairs. Weather forecasts indicated favorable conditions for the tower work, but while making preparations for the climb, the wind picked up considerably, and sustained winds were strong enough for Don to decide that it was unsafe for climbing. We will reschedule this work as soon as the weather provides more favorable conditions.

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, have a blessed Easter, and happy engineering!

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

Greetings from Motown!

Last month ended up being a great time to put the Cleenfeed solution that I wrote about in the Local Oscillator to the test. We had a new client start their live broadcast from their offices on Saturdays throughout the month of March. Everything went well and sounded great. They took calls on the air, and the quality of the broadcast was as good as any of the other traditional codecs that we use. The best part of the Cleenfeed solution is how simple that it is to use.

The administrator of the broadcast sends an email to the remote location, all they have to do is click the connect button. No IP address or proxy configuration is needed. The solution works on Windows, Android and the iPhone.

More than one site can connect at a time, and our client has already used this feature in one of his broadcasts. Each site can hear the others and the studio mix-minus feed. It has worked out well for us.

We recently upgraded some of the off the air monitoring for our AM stations at our studios. The Inovonics mini series receivers worked out great for us. They have carrier and audio loss alarm contacts available making the installation simple.

We sent a Nautel AM-IBOC HD exciter that had developed a problem back to Nautel for repair. It required factory service to replace and reflow one of the chips on the motherboard. Nautel took care of us, and the repaired unit is now back in service.

We continue to improve the security monitoring for our sites by adding cameras giving us better views throughout our various facilities. The new high-resolution cameras are so much better than what we had in place.

The extreme cold weather over the winter caused a failure in one of our fiber receiver boards on one of the WRDT transmitter site tower light monitors. We were able to get out and make repairs now that spring is here. It is nice to get back outside and have days that are above freezing again.

There are a number of projects that are coming up that I am looking forward to in the upcoming months, including rebuilding our main talk studio and one of our control rooms. I enjoy digging in and making things easier to work on, and better to look at. By moving our facilities over to IP blade (AOIP) technology, we have been able to eliminate a real mess of cables.

I have been installing HD receivers at our AM transmitter sites to act as a backup audio source for our STLs. Some of our sites only have public IP connections. The remote control uses these connections. The POTS telephone line is also provided via the cable modem. If the connection drops, we lose connectivity and control.

I plan on using our FM HD multicast signal as a backup source for audio and transmitter switching. Our HD2 and HD3 channels carry two of our AM stations' programming. In a situation where we lose our IP connection, I will use DTMF signaling for basic functions. I will have DTMF control tones available to insert into our automation system to perform the functions needed such as audio and transmitter switching. It could also be used for power cycling equipment. A DTMF decoder will be set up to listen to the HD channel for control tones.

Until next month, best wishes, and '73 from Brian, W8FP.

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

There are many things that I love about my job. The company itself is the first: the great people, from Mr. Crawford on down, and our mission. I feel like I'm part of something important.

In Engineering, not only do we have the best Corporate DOE in the business, the job is never the same from one day to the next. With all the storms that we've had in March, there have been plenty of aggravations, but what I really love is creating solutions. This company allows us plenty of free rein to try new things and to think outside the box.

We were among the very first to use AM Stereo, and later, HD Radio. Both of our AMs have FM translators now. Cris Alexander was right in the middle of the AM directional rules changes that would permit MoM model proofing, and I was privileged to work with MoM on 850 (WXJC) AM's array several years ago. It was a blast.

Todd and Jack, my two able assistants, are also among the best in the business. I'm very good at building things, but when it comes to the hardware (read: making the holes match up!), I believe Jack is better than I. Todd, of course, is the Gnu-ru of All Things Open Source. He has been playing with Raspberry Pi devices for some time now; he's used one to set up a print server for our offices, for example. He has used another one to set up a special display on the big screen television in one of our control rooms.

Micro-Controlling

My programming background is in device drivers, embedded systems and automation, so it's a little surprising that I'm late to the Raspberry party. I've tried some micro boards over the years, including the Basic Stamp from Parallax and a Z80-based micro from Zilog. The Stamp just wasn't ready for prime time, and the latter had a huge learning curve. I never had time to do anything with it. It's still sitting on a shelf in our shop, still in the Zilog packaging.

I mentioned last month that we were unable to get 1260's new NX5 to sound good at 41 watts (our post-sunrise power), so we needed to use an attenuator to allow us to run at a higher power level and some control and timing circuitry to make it work. Cris suggested using a Raspberry Pi, and with Todd's help, we ordered one and got it running.

For those of you who haven't played with these yet, they're pretty slick. They'll run a variant of the Debian Linux operating system (called "Raspian," of course). You get a nice GUI desktop to play with. More importantly for control applications, there are all sorts of GPIO pins that are directly addressable by the microprocessor, and which you can use as digital inputs and outputs. Software libraries are available to do all sorts of serial communications, from good ol' RS-232 to I2C.

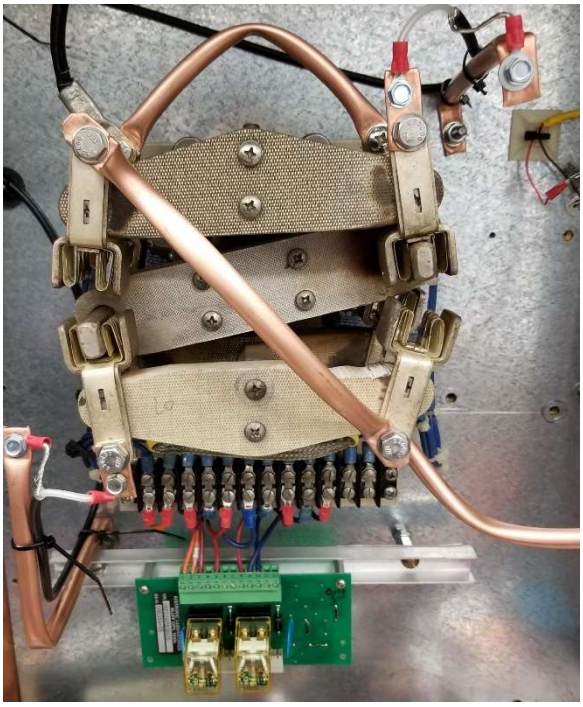


Figure 1 - The RF contactor that switches the attenuator for 1260 AM.

Ethernet and WiFi are supported, assuming you buy a Pi with that built-in. Todd once built a Raspberry Pi access point that would use wireless, pass everything through to Ethernet (i.e., "bridge" it), for use as an STL.

Figure 1 shows the work in progress on the RF contactor that will engage or bypass the attenuator. The relays in the NAX90 attenuator are only rated at 1,000 watts, and in the bypass mode, the full 5 kW transmitter power will pass through them, so I had to use our spare contactor from 850 AM's five-tower array in Tarrant. If you look closely, you can see the aging and scorch marks on it. Cris says he's going to send us some contactors salvaged from one of our other sites. (Yay!) I used a spare Kintronic slave relay board, running at 24V, to switch the 208V to the contactor's solenoids.

For the controller, I needed something that could detect the presets and power level in the transmitter and bypass the attenuator at higher powers. Conversely, when we go to 41 watts at night, I needed it to briefly mute the transmitter, switch in the attenuator, and then re-enable the PWM in the NX5. We decided to use a separate controller because the NX5 is such a new transmitter, it's too fast and smooth on power switchover, and I was afraid that the PWM Mute function built into the NAX90 attenuator just wouldn't inhibit quickly enough.

In the past, of course, I would have done this with time-delay relays. I had to rebuild the controller at 850 AM some years ago, and that's exactly how I did it. With prices collapsing on little micro boards like the Raspberry and the Aduino, though, there's no need to go that route nowadays. It just doesn't make sense. What we're using is shown in Figure 2: the Raspberry Pi (the smaller board) and a relay board that stacks atop the controller. I wanted to keep the 24V switching voltage isolated from the Raspberry Pi.

Lord willing, I'll have a completed project, with photos, for next month's issue.

Some Tips

There's no reason why you couldn't use one of these little micro boards in your projects. But based on my years of experience with embedded systems in hostile environments, I do have some suggestions.

1. I'm gonna use this Raspberry Pi, since that's what we have on hand, but in retrospect, the Arduino would have been the much better choice. The Raspberry is massive overkill, what with its complete operating system and GUI. Like any full-blown computer, it should be properly shut down before powering off. For small, one-off, "I need a switch to click when this happens," the Arduino is much easier. On power up, it just starts running whatever control program you've loaded in it.

2. As with most Open Source/Hobby/Community projects, the

Figure 2 - Raspberry Pi and a Relay "Hat" for contactor control.

documentation ranges from bad to horrible. Oh, there's plenty of software, stuff that will let you flash blinky lights, set up a WiFi access point, do serial communications, Ethernet, you name it. But if you're doing something outside the box, you've got some reading and experimentation to do.

For example, I needed to know if my relay board would "argue" with any of the GPIO pins that I wanted to use. I concluded that the answer was, "no," but I had to do quite a bit of digging to arrive at that conclusion. If you're going to be using more than one "hat" or "shield" (i.e., add-on board), YMMV.

(The fact that this relay board only brings up the first 26 pins of the 40 pins on all newer Raspberry Pis is an added aggravation, but that's an aside.)

3. For any of these controllers – Raspberry, Arduino, BeagleBoard, whatever – you want to be very careful about interfacing directly to external equipment, especially at a transmitter site. If you simply take the position switch closures from your

RF contactor and connect them directly to the GPIO pins, that board is going to fail ... and sooner rather than later. The tiny little inputs on those tiny little chips will take no abuse whatsoever. Use opto-isolators, or small signal relays (with diode and capacitor snubbing on the coils), or at least some transistor buffers built out with resistance. Don't connect directly.

Figure 3 - Top: Before. (Ugly.) Bottom: After. (Pretty.)

Since I'm an official Old Timer now, I can share a story on that last one. Years ago, before I took this job with Crawford Broadcasting, I was doing some contract work for a company in Kalamazoo, MI. I was programming a controller for them, but they knew I had a lot of hardware experience. They showed me a schematic for something they'd been working on and asked my opinion. They were using a CD4066 analog switch to select different control lines, and it was directly connected to the output terminals. I told them to add some 100-220 ohm resistors in series, at the very minimum, to prevent spikes and electrical noise from getting into that (unreliable, at the time) CMOS chip.

At any rate: if you're thinking of doing something in the studios or office, I'd say the Raspberry is better. Todd can help you with the OS and software for things like print servers and all sorts of neat tricks. If you want some hardware control for a transmitter site, go with the Arduino and I'd be glad to help.

Jack's Headphone Plates

Another example of doing things on a budget. Figure 3 is the before (top) and after (bottom) in WDJC's control room, using a Wheatstone headphone station that was too small to fill the holes left by our old Broadcast Tools units. Jack custom-cut some panels and painted them. I think it turned out pretty nicely, and it sho' do hide a bunch of ugly! (And yes, the holes matched up perfectly. That's Jack for you.)

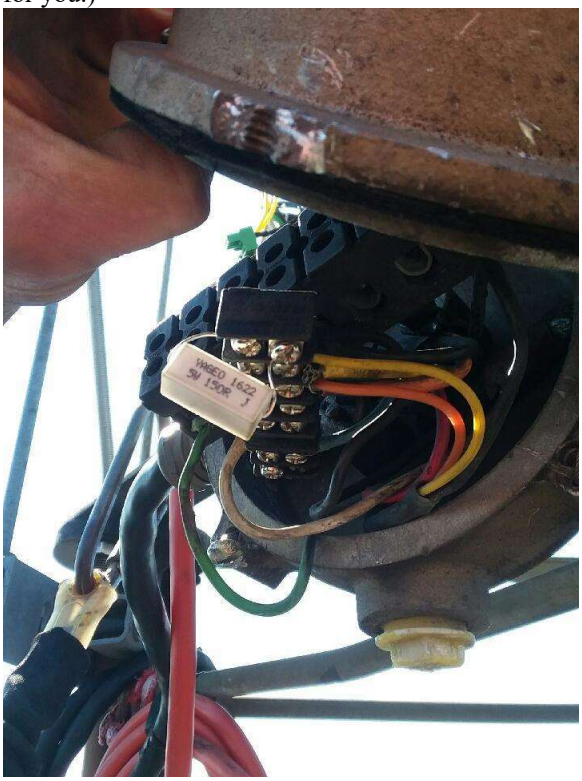


Figure 4 - This junction box needs a make-over.

Cullman Tower Lights

Back down to earth – or rather, over 1300 feet in the air. The never-ending woes continue with our tower lights at WXJC FM, 101.1, in Cullman. In March, we called in a tower crew to carefully examine the connections at the top of the tower. Figure 4 shows the old, corroded junction box and the wiring.

This tower has a 24-inch top section (a "stinger") that runs up 80 feet. The ERI antenna is mounted on this section. The AOL, of course, sits at the very top of this "stinger" and blinks. It's supposed to, anyway. The aforementioned junction box is at the bottom of this 80-foot section. The control wiring uses an RS422 balanced line arrangement, terminated at the top and bottom with 150-ohm resistors (75 ohms total load). We're unable to see the resistor at the top and now, none of the

flash heads on the tower will sync up or report status to the controller. We're going to check the wiring from bottom to top, and I'm going to redo that junction box just on general principle.

No, I won't be using an Arduino, not 1326 feet in the air! It's intensely frustrating that we can't get the actual service information, or details on the serial protocol used by the lighting controller. But some kind of how, we're going to fix it. (Lord willing!)

Until next time, keep praying for this nation!

Can You Help a Brother Out?
Todd Dixon

Being "fairly" well known as a computer guy, I often have people call me and ask if I can help them with their computer problems. I can usually walk someone through it without seeing their screen by asking the right questions and trying my best to visualize what I know they are seeing.

The problem with this method is it often takes so long to get to the root of the problem because, let's face it, if they knew where to go in the operating system to solve the problem, they wouldn't need to be calling me in the first place, and you really don't want to sacrifice any relationship over the amount of hair you pull out of your head while trying to get to their solution. Actually, seeing and controlling keyboard and mouse strokes is the best way to go. It is faster and probably what is preferred with the non-tech types anyway.

We've been entrenched using Ultr@VNC for a while in Birmingham. It works, it's fast, it's secure, and it doesn't rely on other companies to pass remote access to computers. Of course, the down side is that you have to have port forwarding set up in the other person's router or firewall, and that is not always a luxury that is available.

Teamviewer is also a solid option. After the user downloads a client version and installs it, you can make a secure connection through their servers by passing along a code to the user to input that bypasses firewalls. There is that pull on your conscience when you know you are doing "business," but tell them it is for personal reasons.

In the last couple of weeks, I have had to help with a couple of issues at our corporate office, for Todd Stickler in California, and I have also had to help my mom out of a jam, and I have found a program that works great on Windows 10 and it is built into the operation system. It's called Quick Assist.

You can pull up Quick Assist via the search bar in Windows 10. One caveat is that this is strictly a Windows 10 to Windows 10 connection. It works similar to Teamviewer in that you're essentially establishing a secure connection through Microsoft's servers to the remote computer.

Teamviewer has a number of features that Quick Assist does not, but the ones that count (remote access) work efficiently in QA and get the job done. There is also a remote reboot feature that will connect you after a reboot.

When QA comes up, you have the choice to "Get" or "Give" assistance. If you're the helper, choose "Give" and you'll get a six-digit number that represents a session ID that is available for 10 minutes. If it takes longer than 10 minutes for the "Get" person at the other end to get QA going, you'll have to run it again when both of you are ready to continue. Once the code is entered on the "Get" side, they'll have to confirm your remote access, but then you have complete access to the remote system.

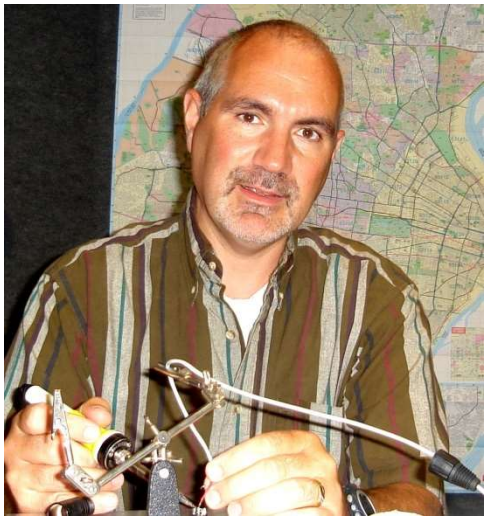
The drawback of QA is that the initial connection is not meant for unattended access, whereas both Teamviewer and Ultr@VNC do not necessarily require interaction to get access.

Hopefully, with Quick Assist, you'll be able to help friends and coworkers with their computer problems and still remain friends and coworkers. I know that I have had to rethink my evaluation of Windows 10 lately because of this one program alone.

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

Visual Radio

Radio has had a love-hate relationship with the Internet. I can remember back in the mid- to late-nineties when satellite radio was the supposed threat to terrestrial radio, and just becoming aware of the fact that some radio stations were already experimenting with streaming their audio. Essentially, this was listening to the radio on the phone, as most Internet users were using dial up to gain access to the World Wide Web.



Not really a threat since the audio provided by streamers wasn't much better than if you would have just listened to the station over an analog feed on the actual phone. Still, it was interesting to hear other radio stations from around the country. The other aspect that kept this from being a real threat at that time was the limited amount of streaming providers. If you ran your own server to provide the audio stream, you were very limited to how many listeners could actually listen at one time.

At the turn of the century, as broadband Internet became more accessible to the general population and streaming providers increased, the idea of quality audio available to the masses was now a reality. It wasn't hard to see that terrestrial radio had a new competitor. You could easily envision anybody with a decent computer might now be able to have their own radio station. Still, at that time we owned the vehicle. Of course, technological advances never stop, and we now live in an age where people watch TV in their cars… while driving!

The competition is obvious. Consumers have a lot of choices and traditional terrestrial radio has to fight to stay relevant. I always say, "If you don't embrace the future, you won't be a part of it." Radio has to continue to do this. In my mind, the concept of radio is not just audio anymore. The attention span of the consumer is short, and they expect multi-platform presentations.

Certainly the efforts to keep radio first of mind on the Vehicle Dashboard are very important. Two of our stations in this cluster feature album art and have opened up sponsorship possibilities that have already been realized. But the evolution has to go beyond that. The vehicle dashboard is relevant to the older demographic. Not so much to the younger generations. Their world is in their hands. If you're not relevant on the one device they use the most, you're not really relevant at all.

Just having your audio on a stream is most likely not enough. Web pages and apps are a good start. Social Media must be a priority partner to radio. We've come to a place now that PPM numbers are not enough. Advertisers look at the numbers of air personalities Social Media platforms just as much as the ratings before investing in advertising with that daypart.

Just a few years ago, we saw radio stations begin to use services like Facebook Live to have their jocks get more exposure. For the most part, this was the jock using his or her smartphone to talk on some topic for about ten minutes. Some stations were using video more extensively with multiple cameras and as a supplement for their audio channel.

I began taking notice of what was going on in our facilities. What began as small excerpts soon grew into near hour long to two-hour long videos with thousands of views.

Our morning show would actually use one phone at a time to be on the station Facebook page so each host could get their time on the live video feed. This made things a bit clunky and excluded half of the morning show during each hour they went live.

I really felt like there had to be a better solution that would allow us to have multiple camera views and be on multiple platforms at one time and

give us the ability to put graphics into the feed so that we could add sponsors and monetize it as well. The other thing we wanted was to have something that would be easy to use because we didn't want to hire somebody to run video.

I found the HDV Mixer package from insoftUSA. This package, which included software and hardware, checked all my boxes. It has the ability to do multiple camera views which can be controlled by closures from your audio equipment so that when a mic is turned on, the corresponding camera will instantly be a part of the feed. More important to me was that it also includes auto views that are controlled by mic audio. The Smartcam feature uses thresholds on the mics so that when someone is talking on the mic, the corresponding camera is included in the view.

As noted, this is a very important feature for us, since our hosts were not doing live video as a supplement to the audio stream. Rather, they were creating separate content while the main station audio channel was playing music. Some of the content still ends up air. For example, when they take callers live on the video feed but use the audio on the air later. So, we had to include caller audio as well as the mics. We had to have strict control of the audio that makes it onto the feed – since our stations are primarily music stations, we can't put the main audio feed on the air because we don't have licenses to play music over the social media platforms like Facebook live.

The other aspect of having this auto feature for camera views means the board operator/producer doesn't have to be involved with running the video. We wanted their focus to remain on running the main audio channel. About the only function they had to add to their duties was to start the live feed. Once that is done, they don't have to do anything else unless the hosts involve them in the video feed content wise.

The HDV Mixer includes the ability to go onto multiple platforms, as many as 25 at a time. So, you can have a feed running to the station Facebook page as well as the host's page at the same time. You could also go on YouTube, Periscope and other platforms. If you have the ability, you can feed your web page as well.

The software features over 30 layers of graphics, which gives you plenty of opportunities to get creative with the graphics. This should allow you the ability to monetize the feed with sponsor logos. It

Facebook Live screen shot of the WSRB 106.1 video feed.

also works with media players so that you can insert video files, which could be used for sponsor's TV spots. Another aspect of the software is the ability to bring up remote video with services like Skype so you can add a guest or host to the feed who is not in the studio. Your next remote broadcast just might include video!

We purchased two of the systems and started with just two of our radio stations. I will admit as a radio engineer there has been a learning curve to all the video tools. However, the software creator, Alex Bonello has been great with support. He comes from a radio background, so he understands what we are trying to do.

We are now up and running live on both stations. As with most new things, we are going through some growing pains as we learn the software and develop the approach to getting the most out to of the system. It's just like any media platform – you're only as good as the content. It has to be something people want to watch or listen to, or no matter how good the presentation is, you won't have much of a following.

We're still working through getting the other features like the media player working on our systems. We purchased the computer for the system separate from the package, and this may have been our issue with getting these features working right.

It has been very exciting moving the stations in this direction. The staff has really been impressed with what it can do for their video feeds. The goal of taking what we were already doing and making it better has certainly been achieved. I am sure the goal of monetizing the feeds will follow shortly.

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

Have snow shoes – will travel. That was how the month of February ended. Little did this intrepid engineer know that more show was to come, much more snow. As the first few weeks of March produced more snow, the true meaning of EOL became known.

End of the Line. No that's not a song by the Traveling Wilburys, nor a 2007 horror movie. Historically, End of the Line referred to the last stop on a bus or rail line. When you were at the end of the line, your only choice was to get off or go back. You can't go farther.

For KKPZ at Mt. Scott, end of the line has a whole new meaning. At the top, our facility is at the End of the Power Line. Also known as EPL with emphasis on the End of Power!

The Portland area has an abundance of trees. Couple that with a profusion of drivers and vehicles unequipped for winter driving, then add to the mix a winter snow and an ice storm, and the results can be "interesting." Something like the Chinese curse, may you live in interesting times.

As I write this, we are in the second of two Portland winter storms. Trees laden with snow and ice are a poor mix with power lines. The tree falls, and snap-crackle-pop, the lights go out. Then Portland's winter-savvy drivers slam on the breaks, and BAM! Right into a power pole. The power goes out.

KKPZ has a generator, so the transmitter and studios stay up and on the air. That's the good news. The bad news is that we are at the end of the line. Every car crash and tree down must be fixed for us to have commercial power restored.

Ice is an even larger problem for broadcasters. Tower icing leads to ice fall punching holes in roofs. That has been a problem at Mt. Scott. We have a new roof coming, but not yet, I will hold that project until the icicle and falling ice are banished for this spring.

A local land mobile provider had an unusual ice experience with a tower in the Coast Range. Following a low radio signal complaint, he drove up in the fog to check out the problem. As he rounded the corner to the facility, he stopped, looked at the tower, and then made his way back home.

The tower was a Rohn 45, which is about 18 inches on a face. What he saw was an icicle about 24 inches on a side. Solid rime ice.

As the weather warmed, the tower began to shed ice with large chunks hitting the guy wires. Eventually, one of the guy wires broke, taking the tower down.

Well, it's time to go check the transmitter. Have umbrella – will travel. Have you heard of rain?

At this year's Oregon Emergency Management (OEM) emergency management workshop, local Oregon broadcasters presented a seminar titled, "Local Broadcast Before, During, and After the Disaster: A Powerful Tool for Emergency Managers in Preparedness, Alerting, Response, and Recovery." In disasters across the country, broadcast radio has remained on the air, providing a lifeline that wireless and internet can't provide when infrastructure is damaged.

I had the opportunity to attend that broadcast seminar and another describing earthquake warning systems. Local broadcasters were well received at this year's workshop. I will have additional information to report next month.

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

Bomb Cyclone

That is what they called the blizzard that hit us here along the Front Range of the Rockies the second week of March.

One thing you learn living in the Denver area is that you don't necessarily believe the news when it comes to weather forecasting. So often, we get these big forecasts, massive amounts of snow will be on its way, yet somehow, at the last minute, things change and we get a light dusting of snow, if anything at all. So when they began forecasting a blizzard for us, I had my doubts.

I checked the forecast numerous times a day to see the changes, and once I realized things weren't changing, I figured we were probably going to be hit. It was forecast to start raining the night of the 12th, with rain turning to snow around 9:00 AM the following day.

Okay, the question was, do I even try to get to the office? The last blizzard we had, I had made my way to work and waited a little too long to go home. I ended up driving home in whiteout conditions and found myself off the road and in a field because I could not see a thing as I was driving. This time, I opted to stay home and wait out the storm. I knew I would be busy that day because of the winds we were to have, and considering the temperatures, it'd be a wet snow which might cause issues for our satellite feeds.

It was raining hard when I got up that Wednesday morning. Around 9:30, I was doing dishes at my kitchen sink, which has a window that looks out front, and I kid you not, it was like the flip of a switch: rain off, big snowflakes turned on.

To make things worse, the winds were crazy. Wednesdays are trash/recycling days in my neighborhood. Everyone had theirs out at the curb. We finally got notice that they were not going to put the workers at risk and weren't going to pick up the trash. I was going to leave our stuff at the curb because of how bad it was. A little later, I began seeing neighbor's trash flying, their bins blown over. Both our trash and recycle bins were full. so I braved the weather and brought them inside. In those hurricane-force winds, I had the hardest time bringing the stuff up the short distance to our garage. With winds like that, I was worried we would have fences blown over and maybe even the FM antennas at the KLTT and KLVZ transmitter sites blown off axis.

About 11:00 AM, I got a notification that the generator at KLZ was running. Okay, that was the first hit. I figured it'd happen because with wind and snow comes the ice and they were already reporting thousands without power on the news. Thankfully, the generator had a full tank of fuel – that big diesel generator has a 140-gallon tank and burns about three gallons an hour – so I knew we could run a significant amount of time, at least a day. This was a good thing, since there was no driving in that weather.

A little later, I noticed KLTT was at "lightning power." This is something we have set up so that when the transmitter gets enough SWR trips in a certain amount of time, it will protect itself and go to 10 kW (mostly to protect the smaller transmission lines in the 50 kW system). We usually see the transmitter go into this mode in the springtime as storms cause us issues, but sometimes, when the winds or dry snow produce enough static, it will trip it at other times of the year.

Shortly after that alarm, the transmitter began going off and on air. I began watching it and it would not stay on for more than a few seconds with high VSWR. I tried both day and night patterns, high and low power with the same result. So we turned off the transmitter, thinking perhaps the issue was something catastrophic. With the winds we were facing, there was a real fear that a tower could be on the ground. Our cameras at the site were covered with ice so I could not use them to check on things.

After an hour or so, we began messing with the transmitter and found we could keep it on air at a much lower power – 1 kW. While it wasn't the 50 kW at which we normally operate, it was at least

something to get us through the storm. Later in the evening, when the storm began calming down a bit, we tried putting the transmitter back to 5 kW, then 10 without any issues and normal directional parameters. That was a pretty good sign the towers were still standing. After running at intermediate power for a while, we put it back to full power and thankfully, it held. Chances are, ice built up or debris flew into the tower causing the issue. It's been trouble-free ever since.

All in all, all eight of our signals held up great during the storm. KLTT was the only one with a real off-air issue. Once the storm had passed, we found it had left a wide range of snow depth, depending on location and topography. We got just a dusting at places like KLTT where it's open fields and with the wind, the snow couldn't accumulate in one place. But then in town, in the neighborhoods, at my house, we had several feet of snow. Some places had some pretty gnarly drifts, the remnants of which are still visible several weeks later and after a week of warm weather.

On the day after the storm (Thursday), my husband couldn't go into work because of the various road closures – a lot of roads were closed because of blowing and drifting snow, even under relatively clear skies. I knew I had to try to get to the KLZ transmitter site to refuel the generator.

The initial plan was to make our way to the office to get the engineering truck so we could use it to haul our 50-gallon transport tank for refueling. I decided that wasn't going to happen and asked my husband about using his truck. He was fine with it, so we made a plan. We picked my dad up – thankfully he lives just a few miles south of me and the roads to his neighborhood were open.

The roads reminded me of the first season of The Walking Dead with all the abandoned cars. They had to close down several roads until they could get cars towed and out of the way. We were able to make our way to the toll road, which is near our neighborhoods, and used that to get to I-70. Would you believe the drive to KLZ that day was actually better, easier and took less time than during a normal business day with traffic?

We got to the site and pumped what was left in the 50 gallon transport tank, probably 20 gallons, into the generator tank. We then loaded the tank up into my husband's truck and took that to a local gas station to fill up. We had to make two trips in order to get the generator's 140-gallon tank topped off filled up, and we left the transport tank at the site, full of diesel.

The estimate for getting the power back up was 11:30 PM Friday! The amount of fuel we had would get us to probably sometime Saturday morning. I also had my doubts that Xcel Energy could get things up and running. How many times have any of us dealt with a power failure, gotten the ETA, and hours after that initial time passed, it finally gets restored? It seems like more often than not and with tens of thousands of customers all over the Denver/Metro area without power, I honestly thought it would be several more days. The thing is, we could easily see the issue – two phase fuses on the 7.2 kV feed to our site were blown and hanging down. Undoubtedly the conductors had blown together in the big wind, popping the fuses. It would be a ten-minute fix, but when would Xcel get to us? Could be days.

I had Keith go out on Friday morning to pump the last of the fuel in the transport tank into the generator tank. That nearly topped it off, giving us another day and a half. Then at 10:30, I got an email from the KLZ board op saying KLZ was off the air. I knew at that moment, for some reason, that commercial power was back on. It was transitioning from generator to main power which causes a reboot of our microwave link and producing a minute or so of silence. Once it rebooted, audio came back up. I was so grateful – they got power back up 12 hours ahead of their estimate.

I am very grateful for the people at Xcel, working as hard as they did to get power to hundreds of thousands of customers back on. I get that it is their job, but no doubt it was no fun having to navigate all these places, dealing with poor conditions, bad roads, deep drifts and freezing temps in trying to get all the power restored. It is, no doubt, a very thankless job, so I do want to say a very big "Thank you Xcel Energy!"

Security Cameras

The security cameras for the KLVZ transmitter site were about 10-½ years old. I actually had to go back and look at some archived issues of The Local Oscillator to figure out that we installed the system in October of 2008 – I wrote about the project in the November 2008 issue. We purchased the system after getting hit by copper thieves. This was shortly after Ed Dulaney left and was the first big issue I had to deal with as chief engineer.

That video surveillance system has been a good one, getting the job done for us. But as we have installed new security cameras at two of our other sites, I began to realize we needed to upgrade. Once you go HD, you just cannot go back to good old

standard definition. I would never want to go back to an old tube TV. I love my 4K TV too much. It was a very noticeable difference.

We purchased new cameras and spent the majority of the day at the site replacing the old ones. I think we're going to still have to do some work as these cameras sit differently than the old ones, so we aren't able to get the height we need for a couple of them. It should be a relatively easy fix. It is much nicer now to look at those cameras and to be able to see clearly.

One thing these cameras already helped me with is checking the lights on tower #3. For months, I have been getting periodic false alarms about the tower lights going out on that tower. I would drive out there to check – and it's a long drive, too – but when I got to the site, all was fine. I could never seem to get to the site and have the alarm still indicating a light failure.

So we aimed one of the new cameras up the tower so we could see the beacon and marker lights. That first night, right after dark, I got the notification that the tower lights were out. I looked at the camera for a while, in case there was a delay, and found them working perfectly. Both beacon bulbs and marker fixtures appeared to be working normally. It's just an issue that comes and goes and it more of a nuisance, probably a sensitivity issue in the SSAC tower light monitor module. It's become a cry wolf situation where we see the alarm but almost ignore it because chances are the issue is not there. I am going to make adjustments to our remote control to allow for a longer duration of it being out before it notifies me. We can do this and still remain within the 30-minute window required by §17.48. Perhaps adding a little delay will cut down on the false alarms and only alert me when there is a real one.

Traffic Computers

If there's one thing I really don't like, it's having to replace a computer with minimal interruption. Ideally, I'd love to just turn off the computer I'm replacing, put it in engineering and then proceed with copying all the documents over. Then download and install all the needed programs on the new computer. Test the computer a bit before putting it in service.

Recently, I've thought about how helpful "ghosting" or "cloning" could be. I don't need Windows to be moved, just all the documents and programs. I found a program done by EaseUS.com. One license, good for two computers (old and new computer), is $49.95. With me having to replace our two traffic computers, I thought this would be a good opportunity to try it out.

The program allowed me to create an image file of the old computer. I was able to select what I wanted, so I chose all documents and all programs. Then I installed the program on the new computer, plugged the hard drive I used for the cloning and then proceeded to transfer everything over.

It was a bit time consuming. One computer took four hours to create the image and then a couple hours to transfer it over. The other computer took an hour or so to create the image and then two hours to transfer it. Still though, when you factor in having to set up a new computer, make sure all the updates are done, go to each website to download the software needed, then add any info such as logins to the various programs, you're looking at the better part of a day.

This program allowed me about a day to get things done. One of the computers just didn't like what I did. I cannot figure out if it was the ghosting or just an issue with the computer. I tried running a repair on the computer, and even that did not work. I had to return it and get another one that will hopefully work.

The EaseUs program could be some big help in the future, though. We also found when purchasing a solid-state drive for my dad's office computer that Samsung (the brand of drive purchased) has its own cloning utility. It allowed him, in a matter of minutes, to create the image of his current hard drive, Windows and all. He then unplugged the old drive, and everything was on the new drive, working. We may need to look into these programs more when it comes to doing a critical computer, like a server or a NexGen machine. If it can save hours of work, it seems worth it. Only time and more testing will tell.

Looking Ahead

Spring is finally here! I predict lots of growth at the transmitter sites due to all the snow we've received. I look forward to spending some time on the tractor mowing. We have lots of maintenance to do at the KLTT transmitter site, mainly tree removal. We have an irrigation canal that runs through the property, and it is our responsibility to keep it cleaned up, that includes keeping trees and other growth out of it. That being said, we have been lazy, and the trees have gotten out of control. We will start cutting them down in April and hopefully get ahead of it all in no time.

That about covers it for this issue, 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/103.3 MHz, 550W-U
KCBC • Manteca - San Francisco, CA
770 kHz/94.7 MHz, 50 kW-D/4.3 kW-N, DA-2
KKPZ • Portland, OR
1330 kHz/97.5 MHz, 5 kW-U, DA-1
KLZ • Denver, CO
560 kHz/100.3 MHz, 5 kW-U, DA-1
KLDC • Brighton - Denver, CO
1220 kHz/95.3 MHz, 660 W-D/11 W-N, ND
KLTT • Commerce City - Denver, CO
670 kHz/95.1 MHz, 50 kW-D/1.4 kW-N, DA-2
KLVZ • Denver, CO
810 kHz/94.3 MHz, 2.2 kW-D/430 W-N, DA-2
WDCX • Rochester, NY
990 kHz, 5 kW-D/2.5 kW-N, DA-2
WDCX-FM • Buffalo, NY
99.5 MHz, 110 kW/195m AAT
WDCZ • Buffalo, NY
950 kHz, 5 kW-U, DA-1
WDJC-FM • Birmingham, AL
93.7 MHz, 100 kW/307m AAT
WCHB • Royal Oak - Detroit, MI
1340 kHz/96.7 MHz, 1 kW-U, DA-D
WRDT • Monroe - Detroit, MI
560 kHz, 500 W-D/14 W-N, DA-D
WMUZ-FM • Detroit, MI
103.5 MHz, 50 kW/150m AAT
WMUZ • Taylor - Detroit, MI
1200 kHz, 50 kW-D/15 kW-N, DA-2
WPWX • Hammond - Chicago, IL
92.3 MHz, 50 kW/150m AAT
WSRB • Lansing - Chicago, IL
106.3 MHz, 4.1 kW/120m AAT
WYRB • Genoa - Rockford, IL
106.3 MHz, 3.8 kW/126m AAT
WYCA • Crete - Chicago, IL
102.3 MHz, 1.05 kW/150m AAT
WYDE • Birmingham, AL
1260 kHz/95.3 MHz, 5 kW-D/41W-N, ND
WXJC-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
WYDE-FM • Cordova-Birmingham, AL
92.5 MHz, 2.2 kW/167m AAT

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