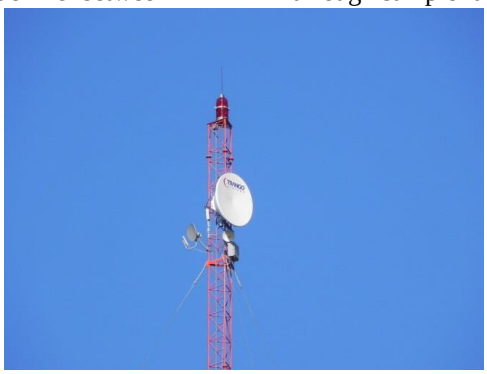
The Local Oscillator

The Newsletter of Crawford Broadcasting Company Corporate Engineering

APRIL 2014 • VOLUME 24 • ISSUE 4 • W.C. ALEXANDER, CPBE, AMD, DRB EDITOR

The Connected Transmitter Site

In the days not so long ago, having a ñconnectedò transmitter site meant that you had either an STL subcarrier and telemetry return link (TRL) combination , or a leased telco ñdataò line between the studio and transmitter site. The STL/TRL combination had the advantage of lower fixed costs, although it was often tough to find a TRL frequency in a metro area ï if I recall correctly, there were only eight frequencies in the 450/455 MHz RPU band available for that purpose ï and interference from land mobile, public safety and other two-way services with relatively high power output in close proximity to the studio was a problem. I recall having to install a bandpass cavity filter on one such link in Dallas just to keep the taxicabs passing by the studio on the freeway out front from swamping the front end of the Marti 450 MHz receiver.



The ñdataò that we transmitted to and from our transmitter sites consisted of low-rate remote control and telemetry, usually at 300 or 1200 baud and transmitted via audio frequency shift keying (AFSK). Some of us snicker at this a bit today, but perhaps we shouldnôt ï there are still radio stations in our company that are, as of this writing, still using piggyback low-bandwidth audio or RS232 channels to control their transmitters. That is about to change.

The advent of HD Radio changed everything for us. It brought the need for (relatively) high-bandwidth bi-directional data links to our transmitter sites, and we began employing such devices as the Moseley LANLink 900 to provide some amount of Ethernet bandwidth between studio and transmitter. In FM facilities, as the ñTomorrow Radio Projectò came online and stations began multicasting, we found that our 950 MHz composite and digital STL links were inadequate. We could get two stereo audio channels to the transmitter site on such a link but the sample and data rates were low and shoving that through sample rate converters, audio processing and aggressive HDC codecs often did not result in a pleasant listener experience. We needed more bandwidth.

Unlicensed 802.11 devices provided a good option for some stations a decade ago. In less populated areas, especially where the transmitter site was not a great distance from the studio, it was possible to get great bandwidth over a relatively inexpensive point-to-point unlicensed link. In urban areas or where the transmitter site was located some distance from the studio, such links often would not work because of interference or excessive path loss. In our Denver market, we used Motorola Canopy ñbackhaulò links to good effect for many years. In fact, we continue to use one such link on a short (seven mile) crosstown path without issue.

Then a couple of years ago, the FCC removed the ñlast-mileò prohibition on using Part 101 licensed fixed microwave links for broadcast studio-transmitter link applications. We were already using a few of these for that purpose (we found a work-around for the prohibition), and we moved into the technology in a big way once the restriction was lifted. Such links provided interference-protected ñcarrier gradeò connectivity between studios and transmitters, providing sufficient bandwidth for multiple digital audio paths, Ethernet-based remote control, security monitoring and more. In one of our facilities where there are no landlines at all within a mile of the site, a licensed Part 101 link provides all of the above plus the siteôs telephone service

(through a Vonage account).

About the time that the Part 101 restriction came off, Nautel, our transmitter manufacturer of choice, began producing AUI-equipped transmitters that could be communicated with via an Ethernet connection. That opened up a whole new world for our engineers, who could configure, control and monitor their transmitters from their desktops.

Somewhat concurrent with all this, remote control manufacturers began producing Ethernet-based remote control systems that could communicate over a LAN.

All this networking capability began to beg the question: What if we could connect all this to the outside world so we can control our sites and transmitters, and monitor security systems and video surveillance from anywhere? That certainly raised some interesting and exciting possibilities, and so we began working on ways to do that safely.

Of course a powerful firewall was a requirement to keep the unauthorized out of our stuff. Without providing any information in these pages that would in any way help those with evil intent, I will simply say that we employ the best firewall technology that money can buy ï so far even the NSA hasnôt gotten in.

With the proper network topology and an iron-clad firewall in place, we have options at connected sites that we have never had before. We can actually troubleshoot our transmitters and control our sites from our smartphones. We can monitor virtually every parameter at a site, even visually checking the site via a security DVR and camera array. Many times we can restore a malfunction remotely and maybe even avoid a trip to the site altogether with such connectivity.

This company now has ñconnectedò sites in several of its markets, but in several others we havenôt quite gotten there yet. In Buffalo, for example, every time Brian connects the Ethernet switch at one of the transmitter sites to the data link to the studio, the network bogs down. Clearly there is something wrong on that network. A loop is being created, something at the site is flooding the network with packets or otherwise hogging all the bandwidth. One of our priorities for this spring is to get to the bottom of the issue and get that site a network connection to the studio and outside world. In Chicago, we have some connectivity but are not where we need to be. Getting that market connected is high on the priority list for this spring as well.

Iôm really at the point where I no longer consider a connected transmitter site a luxury ï it is a necessity. Engineers cannot properly do their jobs if they do not have anytime/anyplace connectivity and access to every mission-critical device at every transmitter site. Without it, when something goes wrong, chances are a site visit will be required to remedy the problem, and that likely means hours operating at reduced power or with some other deficiency ï not acceptable.

The not-so-long-ago days of data lines and STL/TRL combinations are definitely over, at least in the major markets and for this company. We can all be thankful for the resources that our connected sites provide.

Tower Work

With the LTE rollout over the last few years, workers have been climbing all over towers, rooftops and monopoles from sea to shining sea. Sadly, this surge in tower and antenna work has resulted in a number of tower worker deaths, some 13 in 2013 alone, and already four in the early weeks of 2014.

OSHA has taken notice, and in February, David Michaels, the Assistant Secretary of the agency, sent a letter of warning to ñCommunications Tower Industry Employers,ò essentially putting tower contractors on notice that they will be under greater scrutiny and held responsible for any and all rule infractions. In this letter, which is available for viewing on the OSHA website, a shot was fired across the bow of tower owners as well, warning that OSHA will be paying particular attention to contract oversight, and warning that contractor selection should include safety criteria and close oversight of subcontracting.

The immediate effect of all this is that the days of a single worker coming out and climbing a tower to replace a bulb or fix an antenna are gone. Failsafe fall protection is required for all workers, and safety zones must be established and supervised on the ground.

For us, this means that each climb will cost three or four times what it once did, and each climb will take much longer than it would have in the past.

In order to mitigate these costs, we will from this point forward be looking for ways to cut the number of climbs performed on our towers. That will likely mean LED tower lights all the way around, perhaps a change to dual white/red LED systems on galvanized towers that now have marking (painting) requirements, and we may invest in permanently-installed safety climb devices on some towers.

Anytime the government gets involved, our costs go up, and that is certainly the case here. Of course we recognize the need for safety protocols and require anyone working on our towers to comply

with such. What aggravates me is that a ñone size fits allò approach is taken by OSHA with respect to telecommunications worker safety. But I suppose this is the world we live in. We are going to have to adjust and adapt.

While weôre on the topic of tower work, it has always been a challenge for engineers on the ground to check the work of tower crews in the air. While we never supervise tower crews (and there is a definite distinction here), we do provide direction as to the scope of the work, e.g. ñMount this antenna on the southwest leg at the 350 foot level and point it just north of west. Mount the radio on the back of the antenna like thisé ò

Since we are not on the tower observing their work, however, we often do not see the end result, and occasionally the work product may not be at all what we wanted or expected. Sometimes this is immediately obvious (because something does not work or does not perform as it should), but most of the time it is impossible to detect from the ground.

Figure 1 - Note the unused data port was left uncapped, and note the missing ground wire at the unpainted connection point to the left of the unused port.

Recently in Birmingham, we were having difficulty getting an 11 GHz microwave link to work properly. Try as we might, we could not get within 30 dB of the target receive signal level. Something was definitely wrong. The tower crew we hired to do the work, which was the successor to a company we had done business with since the late 1970s, was unable to get the signal any better, and this despite a crystal clear path.

In addition to the low receive level on both ends of the link, there were some warning signs. Observing from the ground, our engineers observed the tower crew ñbumpingò the dish to try and improve the signal instead of making a smooth pan with the azimuth adjustment screw provided with the antenna mount. We wanted to see the pan go through the sidelobe, the main lobe and the other sidelobe, all three of which are within a span of just a few degrees. We never did get that because the guys on the tower were panning the antenna by hand. The same was true in the vertical plane, except that they did not seem move it in that plane at all.

To get to the bottom of the situation, we hired another tower crew, one that specializes in carrier-grade microwave links. This crew went up the tower on both ends and took a lot of photos. As I looked at the photos, it quickly became clear that the original tower crew did not properly assemble the antenna mounts, they did not follow the manufacturerôs instructions, they put one of the antennas some fifty feet above the licensed height, and they left the unused data port on the radio open to the elements. We would have known none of this had we not hired another crew to inspect the installation and provide us with photos.

This situation is being taken care of by the original contractor, and hopefully we will have a good, working link with the expected receive level on each end very shortly.

There is a lesson here for the rest of us: insist on a good set of project complete photos at the end of the work. There is no reason that a tower crew cannot carry a small digital camera up the tower and photographically document their work. The engineer in charge (as well as the tower crewôs supervisor) can then review the photos and determine whether the work was done properly.

Going forward, all our engineers will insist on photos at the completion of any tower work. Itôs the only way we have of being sure things are done right.

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

Hello to all from Western New York! We as engineers all have someone who guided or helped our careers along. I have had many through the years that have assisted me in some way to get to where I am today. I have often and respectfully mentioned to them how much they have helped me through the years in many different ways.

One of my first mentors, Marvin Mahoney, chief engineer of what was WKOA/WKOF in Hopkinsville, Kentucky, was a man passionate about radio engineering, and took me under his wing so long ago in 1969. Marvin passed away on March 9th at 86 years old. My intentions here are not to eulogize him, but to reflect on the many things he taught me through the years. Of course, engineering was always the first topic of conversation, but he taught me many things well beyond the scope of engineering a radio station.

To say that Marvin was a patient man would be a gross understatement. His philosophy was learning by doing, and making mistakes along the way was expected. His way of thinking was that you learn more from your mistakes than you would if you didnôt get it right the first time. He often quoted that Thomas Edison experienced thousands of failures before he was able to perfect the invention of the light bulb.

I recall one instance where he had me rewire an old Gates dial-up remote control. When I finished, (in record time), together we performed the checkout and everything performed as expected, except for two things. First, I did not document any of the wiring I did, and secondly, it looked like a rats nest at the end of a long winter. He didnôt get upset at my shortfall, he simply explained why documentation was so important and also explained that projects done in a hurry almost always end up being redone. There were so many instances such as this, way too many to mention here, but always Marvin was there to explain and teach me the right way of doing things.

Engineering is much more that fixing/maintaining equipment, he would say. His most important attribute was how he treated his co-workers, from the GM on down to the DJs. He treated everyone with respect, looked the person in the eye when speaking to them, and never spoke negatively about anyone. He always looked for the good in everyone, and Marvin seemed to bring out the best in everyone he met.

I often think back on those days and the lessons he taught me, and I hope that along the way I have helped someone along on their journey. I have no doubt that I am a better man having worked with Marvin, and to his family a big ñThank Youò for sharing him with us for so many years. Rest well, my friend.

This winter has been exceptionally long here in the Northeast, with record setting snowfalls. It will go down in the record books as one of the windiest winters in decades. We have experienced two official blizzards this season, an occurrence that has not been seen since record keeping began back in the 1800s.

During one of our recent windstorms, we lost half of our tower side markers on the WDCZ five- tower array. The first two towers have been retrofitted with LED side markers; the remaining three still have incandescent bulbs.

Years ago, the incandescent bulbs would survive these type of winds, as they were built more robustly and with more filament supports than those available today. For whatever reason, bulb manufacturers have decreased the number of filament supports, some down to just three as compared to as many as six supports in older bulbs. The problem is that when the filament begins to get hot, it sags, and the further spaced the supports are, the quicker (and easier) it is for any type of movement or vibration to cause the filament to break.

Cris and I are discussing the possibility of converting the remaining three towers over to LEDs,

and most likely we will do so when Don Boye gets back to the tower painting project we began late last summer.

Another project I am gearing up for is the replacement of our remote controls at the WDCX-FM and WDCZ(AM) transmitter sites. Cris has ordered new Burk ARC Plus IP-based remotes for each station, and these sites will be linked together via our LAN and the Internet. Iôm told that the FM site install will be a breeze, as the new units have a retrofit that will enable us to reuse the existing IP-8 relay panels, thus saving a great deal of time in rewiring. The remote at the WDCZ site is a Gentner VRC-3000, which will be totally removed and replaced with the new Burk. I have already performed the wiring documentation for the remote, so I am anticipating a problem-free installation.

Another project, which is scheduled to begin April 9th, is the modifications to the air handling systems at the WLGZ-FM transmitter site. Negotiations with the contractor have been slow going, and work has finally been scheduled to start, but not without several rewrites of the work contract. Finally, everyone is on the same page, and hopefully we will be able to adequately handle the heat problems we experienced all last year.

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!

News From The South

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

This month, Iôve got a bunch of pictures. Most of them are not good news. (*Photos are at the end of Stephen's column – Ed.*)

Weôve all noted over the past few years how rapidly things are changing in our industry. The case in point this time is our company-wide transition from the old 950 MHz STL systems to the newer microwave data links from Dragonwave, Trango, and other companies.

What I didnôt realize, and had to learn the hard way, is that the tower crew weôve used for years apparently wasnôt quite ready for that transition. Letôs be honesté at 950 MHz, you can sometimes cut corners and rig the hardware. Even on a big 10ô grid-type dish, the beamwidth just isnôt that narrow, and youôll usually find a nice, broad peak when youôre aligning the thing. While itôs not a walk in the park, itôs just not that critical.

That is most emphatically not the case with 11 GHz and 18 GHz microwave links. The 11 Gig system that weôve been working on for Tarrant is the subject of this article. With 4ô dishes, the beamwidth is about 1½ degrees. The side lobes are only about 2½ degrees to either side of the peak. When youôre shooting a signal 14.7 miles, it will take forever to find that peak the old fashioned way. You canôt turn that dish by hand ï you *must* use the provided fine-adjustment screws.

We ran across this with the tower crew in question when we did the 18 GHz link between Red Mountain and the 1260 AM site downtown. That shot was only about seven miles, and it took two days to get it aligned. We kept yelling at the crew to use the fine adjustments; they finally got the message.

I had assumed that they had learned their lesson. Since we did the 1260 link, theyôve done dozens of other installations and have a bunch of new test equipment, including a ñpath boxò that lets them do the alignment without the Dragonwave or Trango ñradiosò on the dishes.

We had tried several times to get the Red Mountain to Tarrant path aligned without success (the receive signal was 30 dB below where it should be). I finally told the tower crew to take a break and brought in another company to take a look. What they found was, to quote Cris, ñdisturbing, to say the

least.ò

Neither I nor Todd or Jimmy can climb towers. We have to depend on professionals to do the job for us. When we discover that the ñprofessionalsò are anything but, it is indeed, ñdisturbing, to say the least.ò And weôre not even talking about the number of times that we have questioned *ourselves*: Were we doing something wrong? What were we missing? Was it *our* fault? We were about to go crazy!

Admittedly, these links are more critical and more difficult to align, but itôs still not rocket science, right? The manufacturers include those fine adjustment screws for ñAZò and ñELò (azimuth and elevation) for a reason. If you combine some common sense with those handy screws, it might take a half-day to get two dishes peaked and pointed at each other.

Or so youôd think, anyway.

The Red Mountain End

Dragonwave and Radiowaves include step-by-step instructions that are pretty hard to get wrong. The installation manuals have big, clear illustrations with labels: ñconnect this first, then connect that ... and DONôT use a wrench here.ò You canôt possibly get it wrong ...

... but the first tower crew did. Iôll start with a picture of the EL adjustment at Red Mountain, which has seized and stripped. The manual clearly warns, ñUse no wrenchò on the bottom screws, but it is obvious that this was ignored. That bracket is now useless and will need to be replaced. Thereôs no way to adjust elevation. (Hold that thought.) See Figure 1.

The next problem is that the fine azimuth (ñAZò) adjustment is mounted on top of the bracket, rather than below. This might not seem important, but the way Radiowaves designed this thing, the heavy bracket (and thus, most of the weight) is supposed to sit atop that nice, beefy and polished stainless steel U-bolt. Instead, the bracket is sitting on a very thin galvanized collar that makes AZ adjustment more difficult. You canôt loosen the clamps on the main bracket very much while youôre turning or the bracket will slip off that narrow collar. This adds time to the job (and risks damaging the AZ fine adjustment), costing us money. See Figure 2.

Now For The Tarrant End

The biggest problem at Tarrant was that there was no azimuth adjustment at all. (!!!) The original Radiowaves/Dragonwave hardware had been replaced with some flat clamps (evidently waveguide clamps) and all-thread. The provided AZ clamp was never even installed. See Figure 3.

The bracket sits on a cheesy clamp, just like at Red Mountain. Without an AZ adjustment, though, we were paying a tower crew to manually turn that four-foot, 11 GHz dish, to find a peak as narrow as a pencil! See Figure 4.

Todd and I repeatedly told that crew that these dishes could not be aimed ñby hand.ò You cannot simply loosen the clamps and ñturnò the dish on the pole; you have to use the fine adjustment screws provided. And yet, *we clearly saw the crew moving the dish by hand at Tarrant*. When we complained to the crewôs supervisor about it, he insisted that they DID use the fine adjustment screws.

You could make the argument that they crew didnôt think mounting the bracket hardware ñupside downò was a big deal. What is indisputable, though, is that this tower company told us that they were using the fine-adjustments when that was clearly impossible. I donôt know about you, but where I come from, thatôs called a ñlie.ò

Lord willing, we are going to get this straightened out. Weôve ordered new brackets and are going to have to trust that first crew one last time to rework this job at their expense.

Todd Becomes a Repairman

Todd and Jimmy, our two engineering assistants here in Birmingham, continue to prove that theyôre worthy of the title. I bragged on Jimmy last time; this time, Iôll finish by boasting about Todd.

In a previous issue of the *Local Oscillator*, I discussed switched-mode power supplies. Theyôre everywhere now, including in computer monitors. Nowadays it seems that theyôll last for a year or two, then die.

One common failure on LCD types is the lighting assembly that actually illuminates the screen. This is typically a fluorescent tube or string of LEDs mounted to either side of the display. Itôs very common to lose the lights on one side: half the monitor display goes dark. Todd figured out a couple of years ago where to find the lamps and replaced a few himself.

The power supplies were a bit more of a challenge. But Todd is nothing if not a bulldog, and he searched the Web until he found some answers for that problem, too. From what he found online, the most common issue is that the capacitors go bad. The symptoms are that the fuse(s) probably wonôt be blown, but the supply just doesnôt work. I suspect that, without the caps, the voltage goes wonky and the protection circuits in the supplyôs controller just shut it down.

Look for ñpregnantò capacitors in the power

supply. When these things go bad, they get hot and the tops will swell. Eventually, if thereôs no protection circuit, theyôll explode and spew cap goo all over the place. Iôm sure youôve seen that. The aluminum atop that capacitor should be flat and smooth, with no bulge whatsoever. If you see anything amiss, try Toddôs ñshotgunò approach.

We selected some nice, high-frequency, low-ESR aluminum electrolytics from Digi-Key. Once they arrived, Todd got to work. With a good desoldering tool to get the old ones out, he was able to ñshotgunò all of the capacitors in less than an hour.

So far, as I write this, his success rate is two out of three monitors, brought back to life and back in service. I realize that flat screens arenôt that expensive now, but this still ends up being a net savings for the company.

Way to go, Todd! Until next time, keep praying for this nation!

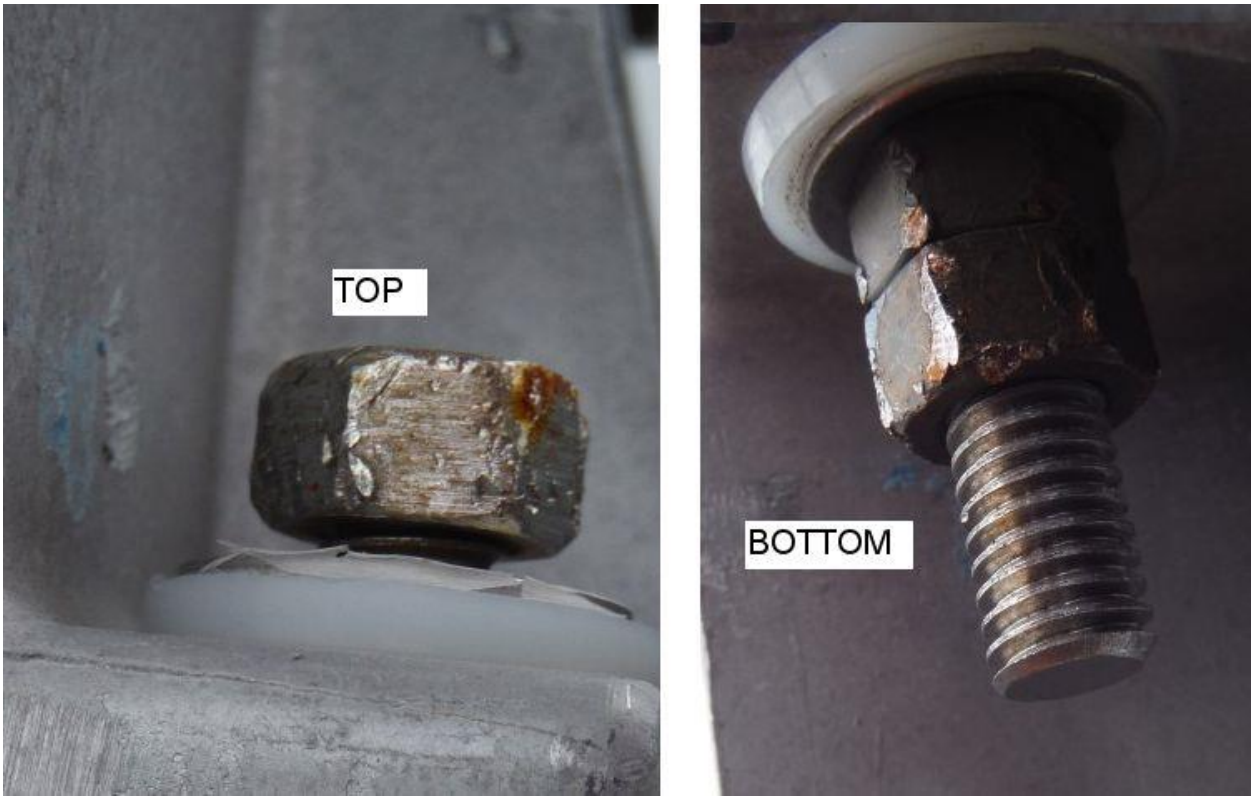


Figure 1 - Damaged EL adjustment and stripped nuts at Red Mountain

Figure 2 - Left: the AZ adjust incorrectly placed on top. Right: a cheesy, thin clamp supports the entire mount at the bottom

Figure 4 - At Tarrant, the factory-supplied hardware was replaced with flat clamps and all-thread

Figure 3 - The AZ adjust at Tarrant swings gently (and uselessly) in the breeze

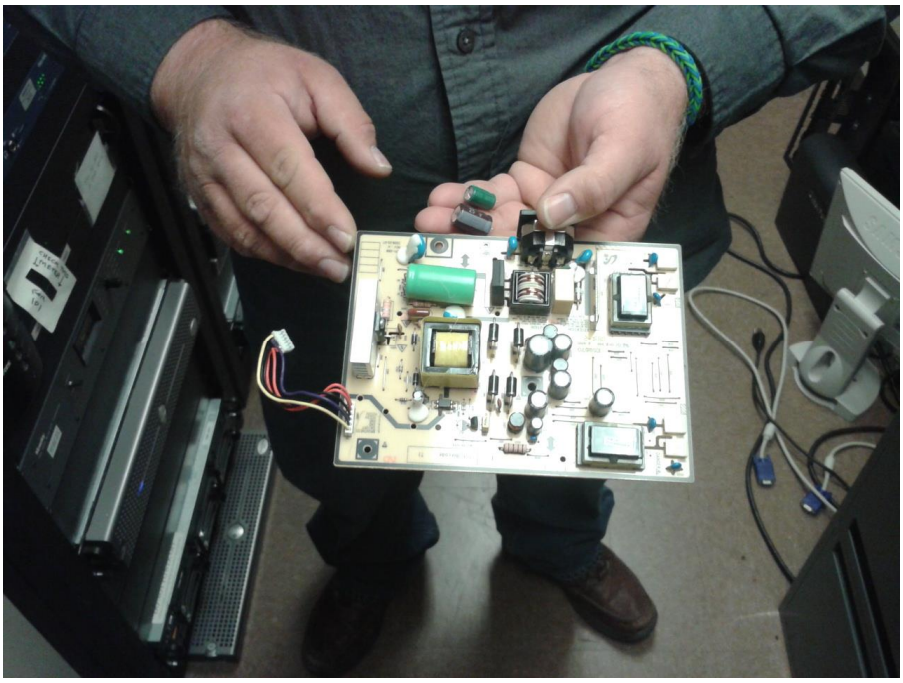


Figure 5 - Replacing the caps in a Samsung flat screen monitor

---

The Chicago Chronicles

By
Art Reis, CPBE, CBNT, AMD
Chief Engineer, CBC–Chicago

More on Using the Digicart/EX as Emergency "On-Call" Audio Source

Back in February, I featured an article in *The Local Oscillator* on emergency audio backup for our WYRB site. This project involved using a local emergency audio source, with music and image liners, in case of the failure of both of the T-1 feeds from our studios. We can't have been the first to do this sort of thing, but I've heard from nobody else who has done it. It would be nice to hear *something*, because we after that article was published, we ran into a problem which called for some measure of creativity to solve.

Succinctly put, when the regular program audio failed, the DigiCart/EX, which is the device we chose for the backup audio source, would start, reliably, but the audio transfer relay wouldn't always switch the audio to the DigiCart/EX from the air chain. As a matter of fact, the success rate was less than 50%! This required some investigation, and what we learned might surprise you. The information I collected went to RDL's Customer Service folks, too, and it was news to them.

For those whose memory needs refreshing, the RDL ACR-2 is a flat-pack, audio controlled relay. It stays in the "latched" state as long as *analog* audio is fed through its input terminals, then reverts to the "unlatched" state when the audio fails. The LCR-3 is a relay which takes an incoming long pulse, either negative- or positive-going, and converts it into two short pulses, one as the input is changing state, and a separate pulse when the input changes state back again.

As to the nuts and bolts: The ACR-2's interface terminal strip features two Form-C relay contacts, using three connector pins each, for doing the actual switching of audio; two power supply pins for +24 volts and ground; and three pins, including

ground, for audio in. There is one "control pin" which serves as both an output and an input, called "slave", and another ground pin.

The "slave" pin is found on most RDL flat pack products. Its function is to attach several RDL relays together to perform common logic switching. As such, "slave" is designed to function as both an input and an output. As a "logic state" device, it operates at close to supply voltage in the active state, and at near ground potential in the inactive state. I discovered the hard way that the key property of this pin is that it can sink some current coming into it while in the low state, but cannot *source* current in its high state.

The DigiCart/EX control inputs ("play", "stop", etc.) are configured to accept only the *trailing edge of a short pulse* before acting. Therefore, it won't recognize either the leading or a trailing edge of an "active high" long pulse. That's why the LCR-3 is there. The LCR-3 has two inputs, only one of which may be used at a time, for high-active and low-active pulses. Here's the trick: At the "low-active" input, the voltage is *not* at the supply level, but rather at 5 volts. The "high-active" wants to see 5 volts in order to run. Therefore, the "slave" pin on the ACR-2 and the "high active" input on the LCR-3 must be attached but actually electrically isolated from each other. I learned this the hard way with Plan A, namely, when I tried to use an opto-isolator as an interface. The LED inside the opto draws too much current from the "slave" output's high state to allow the ACR-2's relays to operate. So, it was on to Plan B.

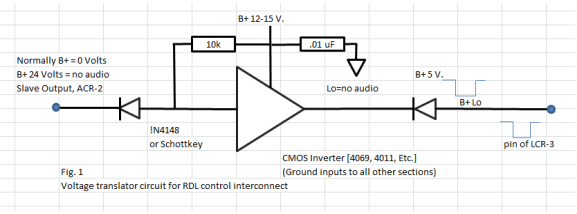


Fig. 1
Voltage translator circuit for RDL control interconnect

For this, I decided to resort to a simple CMOS logic device, and diode isolation. Check out the schematic in Fig. 1. In effect, it's just a voltage translator. Any simple CMOS NAND or NOR gate or inverter device will do for this. I used a CD4011BE because they were handy. The idea is to feed the output of the ACL-2 to the input of the inverter through a diode, configured with cathode toward the ACRL-2's slave pin, and bias the inverter input high (to its own B+ supply) through a 10k resistor. I used 1N4148-type diodes, but a Schottkey would be better. For the CMOS's B+, I simply tapped off the RDL's own supply through a 7812 regulator. The system is "low-active". With the "slave" pin in the high state, the two pins don't actually see each other.

The inverter output then feeds a second diode, again with cathode toward the gate output. The anode connects to the "active low" pin on the LCR-3. Again, this isolates the +15 volt output of the CMOS from the 5 volt input on the LCR-3, and the gate output doesn't "see" the LCR-3 input in the high state. But they do see each other when the gate output is low, and that's all we care about. That completes the two-stage voltage transformation.

It does work on my workbench. I'll let you know how consistently this works in the field next month, but it should be okay.

Don't tell a Broadcast Engineer that He Can't Do That!

A couple of my how-tos were picked up recently by John Bissett for his "Workbench" column in *Radio World* (thanks, John!) and at one point in the article he mentioned how a certain vendor's maintenance man told us that "These things can't be repaired in the field." John's response (not mine, but I agree) was, "That's not something you tell a Broadcast Engineer." Well, here's another example of that.

We recently experienced problems with our Ubiquiti Networks Bullet-M 5.8 GHz unlicensed STL, on a path between our Lansing and Beecher sites. The Beecher unit went berserk and unilaterally changed its login password to something we couldn't crack, and it wasn't about to share. That meant that the unit had to be reset to factory parameters. An email to Ubiquiti Networks brought about this terse response: "The unit itself, up on the tower has to be reset." That requires a tower crew. For what *those* cost, there's no way that's happ'nin', unless the job can be bundled.

My assistant, James Kelly, begged to differ as well, and he went out to do something about it. Here's what he did. This sounds convoluted, but it works:

He first went to the tower and tried to reboot the unit by disconnecting it from its POE. He did it a number of times, to no avail. He then took his laptop to the tower. He found a "pinhole reset" button on the POE, disconnected the tower-top unit from the POE and *then* pressed the pinhole reset on the POE. Then he reconnected the tower unit, and pressed the pinhole reset again after the unit booted up (there is a LAN LED on the POE which allows the user to see when the tower top unit has finished re-booting). He then plugged the unit back into the switch, connected to the laptop, and when the login screen came up, the

unit was back to its factory default password. He reconnected the system, and logged in to re-configure the tower unit.

Yes, it sounds a bit clumsy, but it worked. It shows us that, just because the factory says ñYou canôt do thatò doesnôt mean you canôt. It may mean that you know more than they do.

Until next month, blessings!

The Portland Report

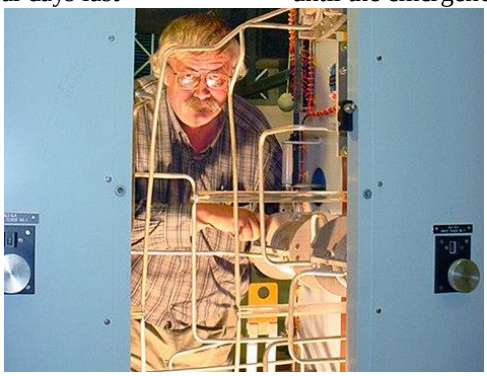
By

John White, CBRE

Chief Engineer, CBC–Portland

Hear ye, hear ye come one come all! Welcome to ice bomber radio! Behind this big top, see the huge chunks of ice bomb and pelt the ground from 300 feet!

Thatôs how it felt for several days last month. Although we avoided having ice punch holes in the roof as has occurred in the past, I did have damage at one ATU when an inductor adjustment clip was knocked loose when an ice bomb landed on top of the cabinet. After reconnecting the clip I thought I was home free. I should have had more faith in Murphyôs Law. If anything can go wrongé go wrongé go wrong.



A few weeks later we detected an odor of something hot. Looking around, we found a hot coax cable at a ground inside the building. Briefly we had some excitement, but no actual damage as the cable jackets were self extinguishing materials.

Years ago I visited a local 250-watt radio station. Its tower was connected with a wire that slanted down from the tower where it connected to the end of the coax cable. I learned this station used a shunt fed tower.

Now here is whatôs interesting about that early experience. Antennas or towers are reciprocal devices. They receive energy just as well as they transmit energy. During the ice storm, falling ice had damaged the bonding of one coax feed line to ground at the tower. The result was a shunt feed receive antenna intercepting the RF energy of the AM stations with the outer shield of the coax acting as the shunt conductor.

Although there was much more excitement than any real emergency, the experience does illustrate that unexpected problems can occur with seemingly benign situations.

In last monthôs column, I described a new committee at the local SBE chapter here in Oregon. The intent is to encourage emergency preparedness within the broadcast industry. In particular, we are targeting response needs after the EAS warning and until the emergency is stabilized when the response transitions to the recovery phase

As usual during an emergency, communications is a major issue. At our last meeting, we discussed development of a draft operational communication plan. Those primary needs are expected to be in two forms.

First is the need to communicate and coordinate between engineers keeping broadcast signals on the air. Then there is the critical need is to communicate information for the public from emergency responders to broadcasters. It does no good to keep a signal on the air if there is no information to put out on the signals.

Our first communications routes would probably be by cellular and landline through the public switched telephone network, if available, after an event. Beyond that, we will have to rely on private radio systems or Amateur Radio as a last resort.

The broadcast industry has VHF and UHF RPU channels that can be effective and used to meet some of those emergency needs. With the communications goal in mind, we are planning to position facilities for emergency use. We also are looking to support and coordinate with Amateur Radio emergency groups (ARES / RACES) that are actively working with local emergency planners. Our goal here is to work with and contribute to those resources.

One example is the expansion of the Local Relay Network (LRN), which relays EAS alerts from local emergency agencies. Currently implemented as a simple cross band repeater, the system is under review to determine the most useful enhancements.

These and other existing facilities that can be repurposed are a resource that can be used with proper planning.

The plan will include a list of RPU channels and repeaters that can be used and broadcaster agreements to share these facilities during a disaster. It will establish primary, secondary, nets for management of traffic and messaging including emergency information for the public. This would make use of similar protocols to those employed by ARES.

Here locally, we have encouraged broadcast engineers who are also amateur operators to enroll in ARES and take advantage of the excellent emergency communications training.

Another major project within the committee is a program to provide emergency credentialing for engineers. *Emergency Management* magazine in August of 2011 framed the issue for us:

Here's a scenario: An emergency occurs. Barricades are set up. Behind the barricade sits a radio station transmitter site. The emergency has taken the station off the air. An engineer is dispatched to get the station back on, but law enforcement officers are only allowing public safety officials with proper credentials to get by. The engineer is stuck. The station remains off the air. A valuable conduit to the public is out of commission.

During both hurricane Katrina and Sandy this problem was a major impediment. The availability of fuel for broadcast station emergency generators was disrupted, and a vital information link with the public was harmed.

I have some information about two ID programs. One in Illinois and another in Wisconsin.

The Illinois program is a First Reporter statute. There are two important factors here. First, the program is a First Reporter program. The second is that the program is based on statute. Comments from Michael McCarthy in Chicago clarifies understanding for these distinctions:

Illinois' program a.k.a. "First Reporter Statute" is designed to permit key broadcast personnel access to their facilities for sustaining operations and reporting critical news and information to the public during an emergency. Illinois' law is more broadly applicable to include staff beyond engineering.

Michael compares the First Reporter approach to the restoration approach:

It's [Illinois program] also broader than the Wisconsin program, which specifically and exclusively is aimed at engineering folks gaining access to restore and sustain the technical operations of a station.

Michael has some concerns about defects and limitations with the Illinois program:

Where Illinois' program is significantly lacking, however, is credentialing and providing passes to gain access past hard road blocks and check points. There is no provision in Illinois's statute for any type of state issued ID which local AHJs [Authorities Having Jurisdiction] will honor. Illinois system is simply a registration list which each AHJ will look-up for permitting passage of a given individual to their studios and transmitters. ***In my opinion, that is a complete stopping point as no police or other ESDA/ARES/RACES* officer will radio their dispatch folks in the middle of an emergency to check that clearance.*** *It's a complete non-starter limitation and renders the whole program ineffective. (* ESDA is Emergency Services & Disaster Agency, ARES is Amateur Radio Emergency Services, and RACES Radio Amateur Civil Emergency Service.)*

Michaelôs comments show the difference between the First Reporter approach and the restoration approach:

*Any statute which will create a first restorer (go ahead and use that if you want… with attribution) should have a recognizable credential issued by a supervising or superseding authority, such as the state. It needs to be made crystal clear to the local AHJs that ***the state*** (emphasis added [by Michael]) has specifically pre-cleared specific individuals….*

The credential program should carry authority beyond simple transportation for access. Michael adds:

And that they may escort a specific service or product provider to either sustain or restore operations through that specific person's on-board equipment or product. Such as fuel for a generator, a tech to repair that generator, or a rental company towing a generator.

Michael also had comments about the scope of the program:

The law should be very specific and prescriptive about what type of professional will be granted access. Beyond select engineering management and/or critical technical staff would be the News Director, Program Director, a single news talent for TV. A skeleton crew whose only mission is to restore operation and air official call to action news and information. Wisconsin's law, on the other hand, is very prescriptive and limited to engineering folks only. A limitation I happen to agree with for the most part.

The Wisconsin program was developed as a memorandum of understanding (MOU) and had more flexibility for modification and update. It is limited to critical engineering personnel and includes a credential component along the lines advocated by Michael McCarthy.

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

Wheatstone Project

As we began preparations to upgrade our production rooms and audio servers for the Wheatstone blade system, we are figuring out that this project may not be as much of a headache as we initially thought. Our computers need to be running Windows 7 to operate as well as we would like. We have some nice HP workstations that we purchased back in 2007. When those came out, they were made to be compatible with Windows Vista. This means that Windows 7 should, for the most part, work fine.

When we moved from the old studio/office location in 2010, we lost two production rooms, giving us two extra workstations as spares. I always keep one at the studio and the other two at the KLZ transmitter site in storage due to lack of space at the office. I grabbed the spare at the office and installed Windows 7. Our biggest concern was the sound card. With Wheatstone, we will not need a sound card; however, we are not upgrading the control rooms, so we will need to possibly upgrade the sound cards if one fails. Our goal is to get at least one more year out of the computers and to start upgrading in 2015. These computers have, for the most part, been working very well.

After I installed Windows 7 on the spare, I found that at times it would hang up. I went ahead and tested it with the Windows 7 driver for the Audio Science card we have. The card is outdated so we werenôt sure it would ever work with 7. Thank goodness it does! The computer did hang up loading things from time to time. I decided it was a RAM issue. The computer only had 1 GB, and while the Windows 7 requirements, according to Microsoft, say it should be fine with 1 GB, it isnôt. I went to Micro Center and purchased 4 GB of RAM for the computer and it is like night and day. Since this experiment worked, I should be able to upgrade our audio servers to Windows 7 with no issues. We have already purchased two new computers for the production rooms, and I am hoping to purchase one final one for the last room since those computers get used more often than the audio servers.

KLTT Power

I was sitting in my office one day in March and decided to randomly check the transmitter sites using AutoPilot. I immediately noticed the KLTT site was not connected. I hit the connect button and nothing. I turned my radio on in my office and heard silence. So assuming that the microwave link was down, I ran to our engineering room to try and get it on backup ISDN. KLTT runs block programs and is sold out pretty much from sunup to sundown and then some, so being off air canôt happen at noon!

The ISDN would not connect, so I tried several other things and nothing worked. Since the ISDN would not connect and the ARC Plus would not answer when I dialed in on the phone, I decided that it must be a power failure. I tried calling United

Power, but they could not find our address in their system. It turns out the address in their system is not the real address for the site.

So I headed out to the site, and when I was just a few miles away, I saw several big trucks with yellow flashing lights. They were United Power trucks driving around, evidently trying to find some problem. I went ahead and went to the site instead of talking to one of the truck drivers. As I was unlocking the door, I began hearing a woman talking inside. United Power must have found the problem right up the street and fixed it. The station came back on without issue and I was hearing the air monitor.

Thankfully the power outage didnôt do any damage. That night we did have a power module fail in the NX50 transmitter. That could have been because of the power outage or it could have just happened because it didnôt like us. It was a brand new module just installed a couple of weeks before. Read oné

NX50 Power Modules

At the end of February, we received a shipment from Nautel containing a full set of brand new power modules for the NX50. They wanted us to replace all of the ones currently in the transmitter. The reason: Since about a year after it was installed, that transmitter has experienced about one ñblue skyò power module failure a month (ñblue skyò because the failures were unrelated to thunderstorms or other external factors). Every once in a while we would go two months between failures, but there was definitely something wrong. Nautel has been very responsive on this issue, having us replace the drive cables and try other things, but we still had the failures. Evidently, Nautel has since updated the design of the NX50 power modules and wanted us to start over with a fresh set.

We were initially told by Nautel to replace a few, modules, reboot the AUI and check to see that the transmitter sees them. After the second reboot, the AUI decided that it hated us ï it would not come up willingly. We decided to keep moving forward as the occasional AUI boot hang-up and power module replacement are two different issues. We have a reset button that allowed us to reboot the transmitter, plus we had access to the Web AUI.

Once we finished we were able to focus more on the AUI. We only had one new power module that did not work (it was dead out of the box), so we kept the original module in that slot and got a replacement ordered from Nautel.

Still dealing with the AUI boot-up issue, we tried several things and found that after waiting ten minutes or so, the AUI would come up working. We contacted Nautel on the issue and gave them access to remote into the transmitter. They got in and made some changes ñunder the hood.ò The next morning I went back to the site, did about five AUI reboots and all five times it came back up in just a minute or so. I donôt think anyone really knows what happened, but at least itôs working now.

Tractor

March 13th was a great day! That afternoon, our brand spanking new Kubota B3300SU tractor was delivered. It was great seeing it and hearing it run for the first time. We had spent a couple hours working on getting the old Massy Ferguson tractor ready for travel. It hadnôt been run all winter, so we cranked it up and let it run for a while. We unhooked the brush hog, and then hooked the blade up.

The delivery guy loaded the old tractor and tied it down (we traded it in on the Kubota), but still needed to get the big snow blower attachment on the tractor loaded. This was when the Kubota got its big shot to prove itself. The guy hooked a logging chain to the front-end loader and wrapped it around the snow blower. That tractor had no issue at all lifting it up the heavy snow blower. Thankfully he was able

CBC-Denver's new Kubota B3300SU tractor

to raise it high enough to put it on the trailer.

It was kind of sad seeing the beast leave on the back of that trailer, but now starts a new era with the Kubota. To be honest, we donôt miss the beast anymore. We have already flattened some prairie dog holes, covered up some ground screen near a tower that had been exposed, and smoothed out the debris field from where the canal people cleaned and dumped dirt and concrete onto our property. Now we should be able to mow that area this summer. The last

few years it grew up head-high, but with all the piles of dirt, concrete and debris under the grass there was no way to safely cut it.

We also had a new membrane roof installed on the KLZ/KLVZ-N transmitter building, and while we were waiting around to move the uplink antenna, it gave us time to hook the brush hog up to the new tractor. We found we needed some parts to make it work. We needed a pin, and we needed a shorter PTO drive shaft (the old drive shaft was about an inch too long ï it was also pretty beat up from rubbing on somethingé no telling what that was). We got to go to the new Tractor Supply store in Brighton and were able to find everything we needed. Everything works great now.

We are ready for spring and all the growth to go with it. Now, all we need is to find us a trailer to haul it. Our goal is to get a trailer small enough that we can haul it with our SUVs, but one long enough to fit the tractor onto. We have concluded that to do this, we may need to make two trips with a trailer ï one with the tractor and another with the brush hog, but at least we wonôt have to wait on or pay someone to come out and haul it. The way the new tractors work, if you have a B-series Kubota, you have a key for all B-series Kubotas. That means leaving the tractor outside overnight at a transmitter site wouldnôt be the best idea.

KLZ Roof

As I mentioned above, we finally got the roof replaced at the KLZ transmitter site. I must say, United Materials did a great job! Not only were they early showing up to start working, but they worked hard all day for two and a half days.

Our biggest issue going into this was the big satellite dish we use for the uplink. That antenna rests on a non-penetrating roof mount which is anchored with a bunch of sacks of concrete. We have several of our other stations that depend on us to send them certain feeds. We had discussed this a few times with the company, telling them that we would need to have it back in place by the end of the first day, meaning they needed to reroof that side first. They said okay, but apparently that didnôt fit with their work schedule. They started on the other side of the roof and let us move the dish around lunch time.

We were originally going to have a crane brought out to lift it, but because of the weather and the last-minute decision to roof that week, we couldnôt get one. Thankfully, after removing the concrete bags, several of the workers as well as Keith and my dad were able to pick the whole thing up and move it to the other side of the roof.

With the ballast removed, four guys (that's my dad on the right) were able to lift and "walk" the uplink disk to a new location on the roof.

I must say, I had my doubts about this roofing company at first, mainly because in my prior dealings with them getting the estimate and all that, most of the time they were late. The fact that they showed up early all three days was super impressive. They worked hard all day and took a short lunch break each day. The overall job was all done very well and we should have a roof that will last another ten years.

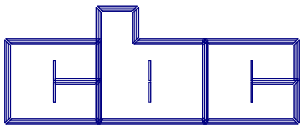
Looking Ahead

Thankfully that should do it for a month or so of the big projects. With NAB this month, many vendors will be out. I look forward to a time of relaxing and doing some general maintenance of the sites. If we get some hardware in soon I plan on installing the new ladder rack at KLZ and starting to make new wires and running all that so it looks good again.

But for now, that about covers it, so until next timeé thatôs all folks!!!

KBRT • Avalon - Los Angeles, CA
740 kHz, 50 kW-D/0.2 kW-N, DA-1
KCBC • Manteca - San Francisco, CA
770 kHz, 50 kW-D/4.3 kW-N, 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 • Rochester, NY
990 kHz, 5 kW-D/2.5 kW-N, DA-2
WDCX • 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
WEXL • Royal Oak - Detroit, MI
1340 kHz, 1 kW-U, DA-D
WLGZ-FM • Webster - Rochester, NY
102.7 MHz, 6 kW/100m AAT
WRDT • Monroe - Detroit, MI
560 kHz, 500 W-D/14 W-N, DA-D
WMUZ • Detroit, MI
103.5 MHz, 50 kW/150m AAT
WPWX • Hammond - Chicago, IL
92.3 MHz, 50 kW/150m AAT
WSRB • Lansing - Chicago, IL
106.3 MHz, 4.1 kW/120m AAT
WYRB • Genoa - Rockford, IL
106.3 MHz, 3.8 kW/126m AAT
WYCA • Crete - Chicago, IL
102.3 MHz, 1.05 kW/150m AAT
WYDE • Birmingham, AL
1260 kHz, 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

CRAWFORD
BROADCASTING
COMPANY



Corporate Engineering

2821 S. Parker Road • Suite 1205

Aurora, CO 80014

email address: crisa@crawfordbroadcasting.com