The Local Oscillator

The Newsletter of Crawford Broadcasting Company Corporate Engineering

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AM Translator Window

The FCC is opening a one-week window the end of this month for new translator applications. Only class C and D AM stations that did not participate in the prior two ñ250-mileò windows are eligible to participate in this particular window.

Within our company, we have just one station that is eligible, and I plan to file for a new translator for that station.

The mechanism of this window is considerably different than the prior two. It is an ñauction window.ò After the window closes, the FCC will cull out all the singleton applications and release the list in a public notice. Next, the agency will determine which applications are mutually exclusive (MX) with other applications, and they will publish a list of those in another public notice. A brief window will be provided in which MX applicants can work together to resolve the MX condition, through site relocation, engineering changes or withdrawal of application.

Whatever is not resolved will go to auction, and the MX applicants will have to bid on their own application facilities, presumably sometime this fall. The winners, after paying up, will be issued CPs and the losers will have their applications dismissed.

In spectrum-tight areas, there are bound to be MX situations, so this will undoubtedly be an interesting process.

My understanding is that there will later be one more window in which AM stations of all classes that did not participate in the prior windows are eligible. We have two stations that fit that criteria. It remains to be seen whether I can find spectrum for translators for these stations.

Base Insulator Replacement

I have had a few occasions in my career to replace base insulators under AM towers. Itôs always an interesting process, and as you can probably imagine, there is considerable risk involved.

Back in 2000, we upgraded our two Colorado Springs stations from 5 kW and 3 kW to 15 kW each. These stations were to be diplexed into a single tower, but the existing insulator was a small, conical Lapp of just a few inches in height. Clearly it would not work with the voltages that we would be applying at the tower base.

I purchased a much larger insulator from Austin Insulator, and we hired a local crew to ñpickò the tower and swap it for the old Lapp. The crew decided that the best way to do this was with a crane, and given the limited size of the concrete base pier, I agreed.

On the day of the project, the crane was brought in (that was a project in itself ï we had to cut some trees to make room), and a steel cable was run from the pick point about 200 feet up the tower all the way to the base. Tension was taken on this cable to keep all the tower sections in compression. We were concerned that with the sleeve-type section mating, it was possible that some of the bolts that had been in place since the 1960s might shear off. That would be ugly.

The pick went very well, although I remember watching from a few hundred feet away and noting how the tower, hanging from that crane, looked like a piece of pasta snaking in the breeze. The top and bottom mounting plates were installed, the new insulator was set in place, and the tower was lowered onto it. After that came a plumb and tension of the guy wires, and we were done.

Then several years later, we had an insulator crack on one of the four-legged free-standing towers at KKPZ on Mt. Scott in Portland. Those were some old insulators, no longer available, but I found one that had been salvaged on the P&R Tower lot in Sacramento. The good news was that the insulator

KKPZ tower with one of the insulators removed and jacks supporting the leg.

was an exact match. The bad news was that the hole pattern (and there were a LOT of bolt holes, top and bottom) was totally different.

The crew from P&R engineered a means of jacking that tower leg just a bit, then they cut the tower leg just above and below the old insulator.

The P&R crew hoists the replacement insulator into place at KKPZ.

They fabricated a couple of adaptor sections and mag drilled the cut tower legs to match their bolt patterns. After that, it was a matter of bolting in the replacement insulator, letting down the jacks and painting the new fabricated pieces. The job could not have gone any better.

And so it was that I called P&R Tower when we discovered that the base insulator at KLTTôs tower #2 had cracked and was leaking oil. We ordered and received the replacement Austin insulator last fall, so it was just a matter of getting on P&Rôs schedule. The crew arrived on Friday, June 16 and spent part of the weekend putting extensions in the guy wires right at the anchors. On Monday morning, they used four 20,000-pound capacity bottle jacks to lift the tower a few inches, pulled the old insulator out and put the new, identical replacement insulator under the tower. They were done before lunchtime, but it did take a little while to get proper plumb and tension after the base work was done.

So why did the original (1995) insulator crack? It was because one of the bolts holding the bottom mounting plate to the base pier was too long and was in contact with the porcelain on the underside of the insulator. As the tower pivoted around in the wind, the end of that bolt eventually created enough localized pressure to create a crack. Amanda checked all the other mounting bolts on the

KLTT Tower #2 up on four bottle jacks during base insulator replacement.

other three towers to be sure we didnôt have the same situation elsewhere. Thankfully, we did not.

My hat is off to the folks at P&R Tower for doing such a great (and fast!) job of the insulator replacement. We had to put KLTT on 1 kW non-directional at tower #4 during the insulator replacement work, so it was important to get done as quickly as possible. The guys from P&R really came through.

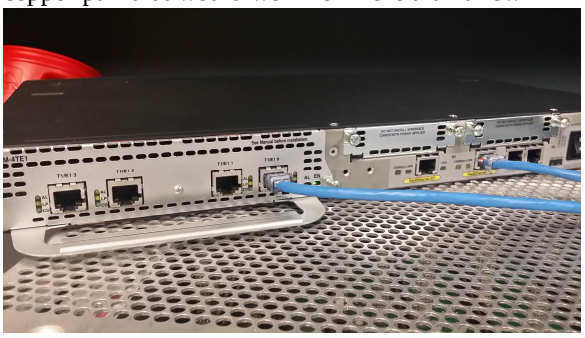
The Motown Update
by
Brian Kerkan, CBTE, CBNT
Chief Engineer, CBC–Detroit

Summer is in full swing here in Motown. Several exciting projects are underway, including planning and preparation for the new station we will be acquiring in the upcoming months.

I have been busy reviewing electrical and RF requirements at the new transmitter site. We have been looking into clearing space for the additional audio server at the studio and planning for our new STL path.

We have also had some really great events in the community so far this summer. We have a park area outside the station known as Crawford Park. Each year we have a party and invite the neighbors. It is a great time to connect with the people that live around us by providing music and fellowship. Several Gospel groups performed in the park this year.

I had been dealing with a lot of T-1 outages over the past several months. AT&T is the local carrier, and for some reason they could never find a copper pair that would work for more than a few days. They were completely unreliable. I decided to look for a better solution. Even if the T-1 was reliable, the telco is not keeping up their copper facilities. ISDN is also being phased out. There is more of an effort being put into the IP-based services.



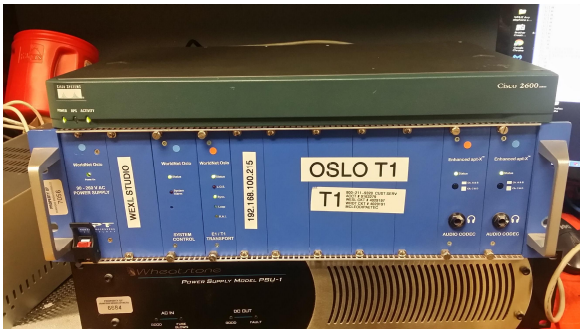
Cisco 4-port module

We have an IP codec that we use as our backup over DSL service for WEXL-AM, which in reality is more reliable than the T-1 at a fraction of the cost. It had been on the air more than the T-1 had been.

I decided to put in another IP connection via Comcast cable to provide redundancy and to replace the T-1. The Comcast connection is a fraction of the cost, but provides 10 times the bandwidth.

We have a set of Worldnet Olso codecs that were used with the T-1. I wanted to find a cost-effective way to reuse them over an IP connection. After some research, I found several solutions, some much more expensive than others.

While looking, I came across a number of Cisco documents that showed network deployments with CEM circuit emulation over IP (CEoIP). Cisco has specialized cards that provide a TDM T-1 interface. I was able to find a 4-port module, Cisco part number NM-CEM-4TE1, for less than $50.00 on eBay. I also found a compatible 2621XM Cisco router for $35.00. So, for less than $100 per endpoint, I am able to run TDM over IP and provide a secure VPN.



Worldcast Oslo with Cisco 2621XM router.

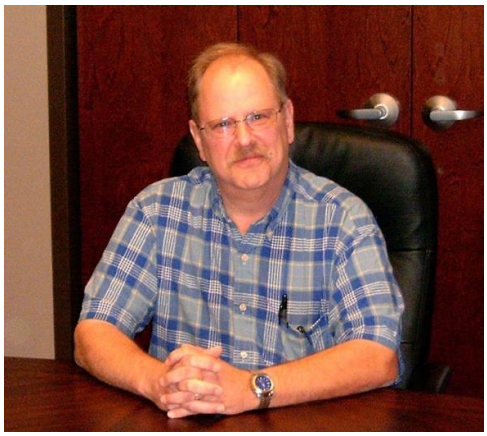
The NM-CEM-4TE1 module provides up to four framed or unframed interfaces. Timeslots can be grouped, or the CPE equipment framing can be sent as an unframed group over the network. The channels are defined as a CEM-GROUP, and are connected via UDP across the network. The UDP traffic can then be sent over a secure end-to-end VPN tunnel. There are many parameters available to tune the network, including buffering and adaptive clocking. Cisco equipment is built tough, and at this price it is easy to afford spares.

For anyone looking at extending the use of T-1 or ISDN based equipment, it might be worth looking into these types of options.

Until next time, have a great summer, and 73 from Brian, W8FP.

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

The world isn't ready for it, but Todd Dixon is now a grandfather. Eleanor Raspberry came into the world the morning of June 29th. Both mother (Emily) and baby are doing fine, and we thank God for that.



But as I write this, you can understand that Todd won't be sharing anything for this month's edition of the Oscillator. That's too bad, because he came up with (another) really neat use for the Raspberry Pi. If you need a print server for mobile devices, there's no need to dedicate a full PC. Given that the Raspberry can run Linux, if there's software available to do something, the Pi can probably do it. In this case, Todd set up a Windows- and Mac-compatible print server on the Pi, granting wireless access to all of the tablets and smartphones at our studios and offices.

Figure 1 - Todd is now a grandfather! Meet Ellie.

I'll have him write that up for us, but in the meantime, if you're interested, drop us an email.

I mentioned previously that the Raspberry intrigued me. Several really useful tasks that would formerly require a dedicated PC can be done with it. They seem reliable, too, even though they're dirt cheap. (And very small!) The previous use that I covered here was Todd using a Raspberry to set up a VPN equivalent between WYDE-FM's relay point in Warrior and the studios.

There's no truth to the rumor, however, that Todd is going to install Raspberries all over his house (they make excellent wireless access points, too!). He's a grandaddy now, after all, and must restrain himself.

Weather, Weather ...

The first week of June, I was recovering from cataract surgery. This is a very common procedure nowadays, and when people ask me if it's worth it, I say, "absolutely." If your vision is cloudy, having it done is like night and day. Don't put it off; it's quick and painless.

Mine didn't require full anesthesia. I was in a pain-free "twilight" state and recovered very rapidly after the surgery. They rolled me into the operating room, then back to my recovery area, in a total of less than 20 minutes. They wouldn't let me drive (they were adamant about that), so Todd drove me home, but honestly, I think I could have managed it.

I'm glad I had that week to recover, because the weather didn't give me much of a break. (I know,

itôs always the weather here, isnôt it?) We had a round of severe storms the first part of June. The third week of June, tropical storm Cindy decided to meander up through Mississippi and Louisiana, but she had basically fallen apart, so we got most of the rain. There were a couple of tornadoes as well, including one that passed very close to the WDJC-FM transmitter site.

But as Iôve mentioned here before, the big thing about tropical systems is that theyôre ... BIG. Those things can easily cover two or three states. The National Hurricane Center has finally gotten its mind right; they now warn people not to focus on the track of the storm, because damage can be experienced hundreds of miles away. That was manifestly the case with Cindy. The center was right on the LA-MS border, but we were getting flooded out with rain in Alabama.

The result of all these storms was a bunch of problems all over the place. Nothing major, thank the Lord, but we were running for a while. The data link between the WDJC-FM transmitter on Red Mountain and the WYDE-FM site in Cullman went down, but the backup kicked in after a minute. WDJC-FM also dropped onto its backup. The WXJCs (both AM and FM) went onto a mono backup, but we were on air. We had some phone lines knocked out at our transmitter sites as well. Weôre still repairing the damage, but weôre on air.

A Smoky Cap

From time to time, WXJC, 850 AM, apparently gets lonely. It will just go haywire to get us out there.

The first problem is one that I touched on last time: intermittent readings on the antenna monitor. Some good, honest ohmmeter work showed that the sample loop up on tower #5 (the reference) had a bad connection. Todd used his fancy digital camera with zoom to take some pictures, and it looked like the wire from the inner loop to the center pin on the N-connector was indeed barely touching.

When a PI-1900 has no reference, it typically just drops to all 0s in the display, because without a reference, nothing else will mean anything. We brought in a tower crew, they pulled the sample loop, Todd resoldered the wire to the N-connector and the antenna monitor was happy.

Then, before Cindy passed through, Bob Ratchford, who keeps an eagle eye on the WXJCs, let us know that 850 AM wouldnôt go to high power. I dropped Sandy off at work and headed to take a look. As soon as I walked into the building, the familiar, acrid odor of baked mica capacitor flooded my nostrils. Yay.

I glanced inside the phasor and immediately spotted the problem: the shunt capacitor in tower #4ôs phasing network had blown. Better still, it had dribbled and oozed solder all over one of the coils for tower #1 (at the bottom of Figure 2). Later, we discovered that the input capacitor to the T-net in #4ôs ATU had melted down as well. The bottom line was, we had work to do.

We ordered the indoor capacitor from Kintronic Laboratories. They didnôt have the vacuum unit for the ATU, so I ordered that from Richardson Electronics. We were on air at reduced power with some spare mica capacitors that I had on hand. Cindy hadnôt officially arrived yet, but there was still a lot of rain. We worked as we were able and finally got the caps in. The transmitter came back up at full power and life was good ... until we discovered that tower #5 wouldnôt switch to day. Long story short, that contactor had an opened solenoid coil. Yay again.

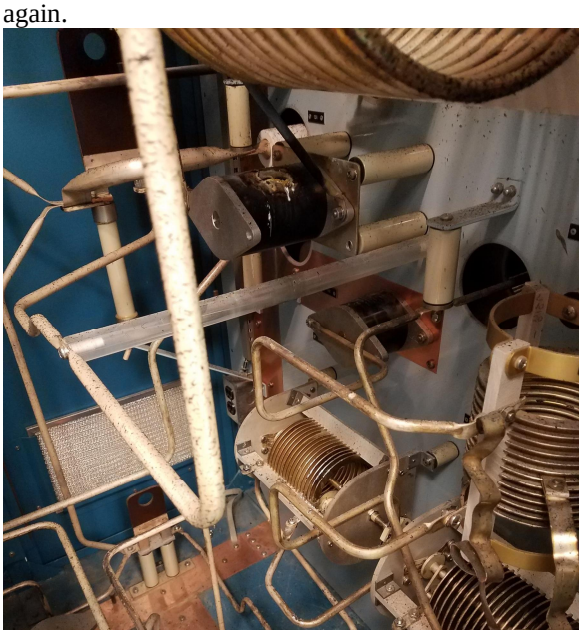


Figure 2 - This capacitor melted down and spit trash all over the place.

I ordered a replacement coil, installed it, and everything was fine ... until the following Monday, when it failed to switch again. As a clue, I noted that one of the microswitches seemed to be arcing. With that in mind, I think I know what happened to tower #4. Those microswitches have some age on them. Itôs possible that the system tried to switch to day, high power, the interlocks were confused, and tower #5 never actually made the switch. When that happened, 50 KW of power was distributed haphazardly across

the rest of the system. The XL60 immediately folded back, but not before damage was done to the tower #4 chain.

At any rate, we're going to embark on a program to replace all of the microswitches. They're old enough to justify that as just common-sense, preventive maintenance. The next thing we want to do is to go through the system and carefully rebalance and retune everything.

A New AC For 92.5

In Alabama, air conditioning isn't just a nice thing to have, it's essential. This isn't so much to get rid of heat (although that's certainly important), but to keep the humidity down around our transmitting equipment. Among all of the other joys associated with the storms, 92.5's air conditioner decided to die. The AC tech replaced the blower and it worked fine for a few days, then stopped cooling again. This time, it was the evaporator coil.

This is always a (frustrating) judgement call. Do you repair, or replace the entire unit? In the past few years, we've replaced the compressor, the evaporator coil (yes, it had already been replaced once) and, as just mentioned, the blower. But after a lot of talk and cogitation, Mike Cary and Cris Alexander decided that the best thing to do would be to replace the unit with a new one. After all, that is the original, installed in 2001.

Last year, we had a new roof put on that building; as part of the job, the roofing contractor installed and sealed a vent fan to help cool the building in the event of an AC failure. Jack had it running, but we still had to reduce power to get the temperature in the transmitter building down under 90 degrees. Have I mentioned that Alabama is hot? AND humid?

But as I write this, the new unit has been installed and life is good.

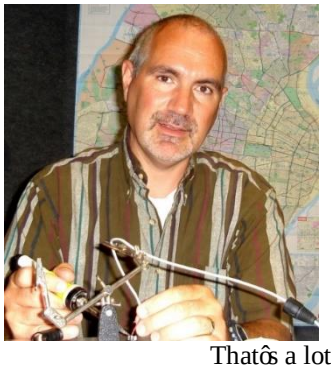
We're not done with 92.5, either. It's under a NOTAM; the top beacon has failed. Jack rebuilt the old beacon that we had pulled from WDJC-FM last year, and now it's earmarked for WXJC-FM's tower. It only remains to get a tower crew to install it.

And speaking of NOTAMs, the storms knocked out WDJC-FM's tower lights, and we're still working on the tower lights at WYDE-FM in Cullman. We hope (and pray) to have all of these resolved shortly.

Until next time, keep praying for this nation!

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

We have been seeking better suppression of surges at our Hammond studios. Additionally, the surge protection at our Burnham transmitter site for WPWX was outdated and we could no longer find parts for the unit.



In both cases, we were looking for a three-phase 240 volt system that would react quickly. After a lot of searching we settled on the Apex I Max unit made by Transtector. Those of you who have Ethernet Microwave installations are very familiar with Transtector because the LPU (Lightning Protection Units) we use at the base of our towers are made by them.

The familiarity with the products that we already use was a plus, but so was the fact that the unit had more than one type of protection against surges. The unit has the familiar MOVs (Metal-Oxide Varistors) that are prevalent in most surge protection devices. They work by clamping higher than normal peak voltages to ground before they get to your equipment. The big advantage to MOVs is the amount of current that they can handle over a relatively long time period.

The other type of protection this unit features is SASD (Silicone Avalanche Protection Diodes). It also works by clamping over voltages to ground. While this is more expensive than the normal run of the mill MOV, an SASD is much faster in reacting to a surge. While the typical reaction time for an MOV is about 1 ns to 10 ns, the SASD will react in 1 pSec to 10 pSec. That's a lot quicker when you have very sensitive servers at stake. An additional advantage for the SASD over the MOV is that it works nearer to the normal peak voltage. So again, it will catch spikes that an MOV might not.

The Apex I Max has both of these type protections combining the speed of the SASD and the

Front and inside view of the Transtector Apex I Max

ability of the MOV to handle larger currents over a longer time period.

I am a fan of the layout of the box as the parts are fairly easy to get to. The front panel has LED indicators that clearly show the status of all three phases and the protection of each individual MOV and SASD. A big plus in this unit is that it will give a relay closure when one of the MOVs or SASDs needs to be replaced. So, with open status on your remote control you can be quickly notified when a part needs to be replaced.

With the unit at the Burnham transmitter site, it was basically a replacement for the older, obsolete unit there. This was wired in parallel to the breaker box where all of the equipment circuit breakers are located. So it was not at the utility power entrance but closer to the load where the SASD protection is most effective.

At the Hammond studios, we already had a small MOV-type protector right at the utility entrance. I wanted to add this unit closer to load with the SASD protection. It really was a no-brainer to add this in parallel to our isolated ground breaker box which has all the breakers for the studios and rack room circuits. Since the most sensitive and mission critical equipment is on this breaker box.

Since installing these units recently, we have noticed a difference in our UPS units in the rack room making a lot less noise. It used to be that when we had storms in the area, we would hear the clattering of the relays on the UPS units in the racks.

Now that we have the Apex I Max in place, we havenôt heard that sound nearly as much. This might just be coincidental, but I believe having this in place and closer to the critical load is having an impact.

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

Lately, we have been looking for interference impacting a VHF repeater at a water facility tower in close proximity to KKPZ. The water facility tower is detuned and home to a large number of public service and public safety services. I initially got involved because there is a complicated mix of several signals that includes the KKPZ AM signal. The mix creates spurious signals which impact a fairly wide band of frequencies, including several other systems.

The fundamental symptom we see is that something happens which causes the output signal of the repeater to produce a spurious response at the system input. The feedback locks the system on with an audio feedback modulation. Most notably, the interference doesnôt happen until after dusk. To a degree, thatôs a blessing, as the communication demands on the system are lower at night. So far we have tested several obvious dusk-to-dawn events. We have eliminated the night power change of AM station 1,640, tower light activation at KKPZ, and the tower light activation at the water facility tower. Stay tuned for more to come.

Occasionally I have to apologize for a slip of profanity. In advance contrition, I find the need utter that word é COMPUTER.

In the computer world, the geeks seem to need to change, enhance, alter, and transform every platform and application. At KKPZ, we have a need for a simple basic audio editor to trim long-form programs. That seems straightforward, as the legacy application we currently use does exactly that.

Which reminds me of an old rock song, ñThen along comes Jones.ò We are happy doing our work with the tools we haveé then along comes a computer change that breaks our tool. A perfect image of the principal of creeping elegance in action.

Donôt worry ç there is a new tool. One you can rent, and one that requires cloud connectivity and even more computer resources. In that old rock song, Jones came along to rescue the damsel in distress. Where is Jones when needed?

Many third-party applications have been installed on one or another of the Windows platforms. A majority of these legacy applications are dependent upon a stable, consistent, and reliable platform which doesnôt arbitrarily change over time. Fortunately, the computer resources needed by these applications is also stable over time. KKPZ has four systems that fit that description. These computers were high reliably hardware platforms that proven reliable over time. The hardware has more than enough computing power for the application.

The computers have performed perfectly until recently, when we began to see occasional thermal event messages on one machine. I pulled that system and performed a complete cleaning. When the messages continued, I looked further and found four capacitors with bulging tops (see Figure 1). This is the same kind of problem we had with flat panel monitors and the HD importer. Disassembly of the computer and replacement of those capacitors has corrected the problems.

For the most part, the capacitors we see that fail appear to be used in voltage inverter circuits which a have high-frequency switching component. In these circuits, the ripple current range of the capacitor is a critical factor. A replacement capacitor with a low Equivalent Series Resistance (ESR) and high ripple current rating is a must.

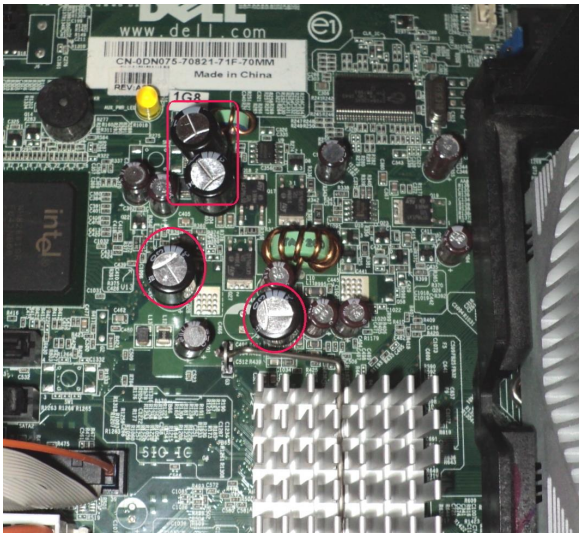


Figure 1 - Caps with bulging tops.

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

All Sorts of Work

What a whirlwind of a month! All the major work weôve been waiting to get done finally happened, starting with mowing at KLTT. We were able to move the tractor out there from the KLZ site one evening and Keith began mowing. We had to have him first start on the south side of the canal that splits the property because we needed to clear a path for the tower crew to replace the base insulator at a tower on that side. It took him a couple of mornings of mowing to get it done before he moved on to the other side. Thankfully, this year the growth hasnôt been too bad.

Then the crew from P&R Tower came and replaced the KLTT T2 base insulator. This was my first experience with something like this. They showed up a few days early and wanted to do the work, but we had to put them off because we would be out of town. So they got things ready instead so that Monday they could do the work and be done. What I thought was going to be a long day turned out to be just a few hours of work.

Keith, my dad and I arrived 30 minutes early so we could get KLTT in to non-directional mode. This required moving several J-plugs. Then we let the crew do their work, and when they were done, we put things back. I think I was back at the office by noon. Itôs a good feeling not having to worry about that base insulator anymore. I only wish I couldôve been there to watch the work be done.

Instead of getting to watch, I was out at KLVZ having Derek Jackson climb a tower. The week prior, we had our microwave link go down. We could see everything at the site from the building, we could see everything at the studio from the studio, and the two ends were seeing each other with a good signal. We just couldnôt see from one end to another (pass data). We prepared a spare radio to send up, but thankfully, when he got to the top, Derek found the connection on the radioôs data port was loose. He redid the RJ connector and found a way to secure it in place in hopes of avoiding this again.

When we went back out to KLTT to see the finished product, we noticed one of the FM antennas on tower 4 was pointing the wrong direction. No doubt high winds caught it. I called the company that hung it for us and they came out a couple days later and got things back in place and tightened up.

I had asked this company a few times when they could get us on the schedule to paint the towers out at KLTT. Three times, no word. Then on the last Monday in June, I got a call that they were out at the site ready to paint. As irritating as it was that I had no notice, I am grateful they came out so soon and are currently getting it done.

Upcoming

We are set to move the tractor out to KLVZ the weekend after the holiday, and I look forward to getting that mowing done. We had Jerry Ford, a longtime friend of the sites, spray for Canada thistle a few years ago, and so far, itôs held up well. We havenôt had to deal with the thistle. Once we get done mowing out there, the tractor will go live at KLZ again, where we can get caught up out there with the mowing. This time of year, once we mow, weôre done. Nothing grows back until next spring.

That about covers it for this edition so until next timeé thatôs all folks!!!

KBRT • Costa Mesa - Los Angeles, CA
740 kHz/100.7 MHz, 50 kW-D/0.2 kW-N, DA-1
KNSN • San Diego, CA
1240 kHz, 550W-U
KCBC • Manteca - San Francisco, CA
770 kHz/94.7 MHz, 50 kW-D/4.3 kW-N, DA-2
KKPZ • Portland, OR
1330 kHz/97.5 MHz, 5 kW-U, DA-1
KLZ • Denver, CO
560 kHz/100.3 MHz, 5 kW-U, DA-1
KLDC • Brighton - Denver, CO
1220 kHz/95.3 MHz, 660 W-D/11 W-N, ND
KLTT • Commerce City - Denver, CO
670 kHz/91.1 MHz, 50 kW-D/1.4 kW-N, DA-2
KLVZ • Denver, CO
810 kHz/94.3 MHz, 2.2 kW-D/430 W-N, DA-2
WDCX • Rochester, NY
990 kHz, 5 kW-D/2.5 kW-N, DA-2
WDCX-FM • Buffalo, NY
99.5 MHz, 110 kW/195m AAT
WDCZ • Buffalo, NY
970 kHz, 5 kW-U, DA-1
WDJC-FM • Birmingham, AL
93.7 MHz, 100 kW/307m AAT
WEXL • Royal Oak - Detroit, MI
1340 kHz/96.7 MHz, 1 kW-U, DA-D
WRDT • Monroe - Detroit, MI
560 kHz, 500 W-D/14 W-N, DA-D
WMUZ • Detroit, MI
103.5 MHz, 50 kW/150m AAT
WPWX • Hammond - Chicago, IL
92.3 MHz, 50 kW/150m AAT
WSRB • Lansing - Chicago, IL
106.3 MHz, 4.1 kW/120m AAT
WYRB • Genoa - Rockford, IL
106.3 MHz, 3.8 kW/126m AAT
WYCA • Crete - Chicago, IL
102.3 MHz, 1.05 kW/150m AAT
WYDE • Birmingham, AL
1260 kHz/95.3 MHz, 5 kW-D/41W-N, ND
WYDE-FM • Cullman - Birmingham, AL
101.1 MHz, 100 kW/410m AAT
WXJC • Birmingham, AL
850 kHz/96.9 MHz, 50 kW-D/1 kW-N, DA-2
WXJC-FM • Cordova-Birmingham, AL
92.5 MHz, 2.2 kW/167m AAT

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