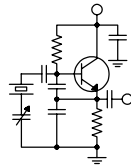


The Local Oscillator



The Newsletter of Crawford Broadcasting Company Corporate Engineering

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Something New

In the book of Ecclesiastes, the preacher writes that there is nothing new under the sun. What has been done will be done again. When someone says, “Look! This is something new,” whatever that is has been here already.

That statement, like everything in the Bible, is absolutely true. Take just about anything to its basest level and certainly the elemental atoms have certainly been around since creation. But on a higher level, there is very little that is truly new. We simply find new ways to apply science, thus creating “new technology” or new applications of existing technology.

Back in July, however, something new did happen, at least something new in the broadcast transmitter realm. I got to work one morning and found an email in my inbox from Kevin Rodgers at Nautel. The email stated that we had a PA module failure in our NX-50 transmitter at KCBC and that he was sending out a replacement under warranty. I pinged CE Steve Minshall and asked him about the failure. He had no knowledge of it, and neither did ops manager John Yazel. So Nautel, the transmitter’s manufacturer, knew about the failure and took steps to correct it before anyone at the station became aware there was anything amiss!

At first, I didn’t know how to feel about that. Should I be miffed at our local folks for not watching the store? I thought maybe I should, but then I realized that the transmitter turns itself on and off and

changes power levels using the internal scheduler. It will make full power with one PA out, so unless someone went into the transmitter room and physically looked at the transmitter, there wouldn’t be any reason to think anything was amiss. So that let Steve and John off the hook.

Once past that, the whole idea of the manufacturer keeping watch over the transmitter from afar started to grow on me. The failure mode that we experienced was no big deal, but what if it had been something more serious? Nautel customer support would have been way out ahead of us in troubleshooting and resolving the problem, probably saving us a day, maybe two, and who knows what else?

So how did Kevin know our NX-50 had a problem before we did? Simple: the Advanced User Interface (AUI) told him. We gave Nautel online access to the KCBC NX-50 so that when we have a problem they could assist us in



troubleshooting. Nautel took it one step further, using the AUI to keep an eye on the transmitter all the time. What a concept!

So is this really something new? It is in the broadcast transmitter world, but it’s been used for factory monitoring and support of other types of equipment for a number of years. For example, both General Electric and Electro Motive Diesel have for some time now remotely monitored the performance of their locomotives (you knew I’d get a train in here somewhere!). Closer to home, Active Power can, if the unit is so equipped, remotely monitor the

performance and operation of their flywheel UPS (such as we have at WPWX).

Still, bringing this level of proactive service to the broadcast transmitter arena is new, and it is especially valuable for smaller stations that perhaps employ a contract engineer who may not get out to the site more than a couple of times a month. My hat is off to Kevin and all the great folks in Hackett's Cove for another great innovation!

Challenges

Because of the confidential nature of some of the projects, I haven't written a lot in these pages about some of the challenges I have been dealing with over the last couple of years. Developing a new broadcast transmitter site has become exponentially more difficult in recent years, mostly thanks to added regulation and regulatory burdens brought about by liberal government.

Thinking back to as recent as 1996 when we built out the KLTT four-tower 50 kW site, it really was no big deal – at least in terms of getting regulatory clearance. The FCC construction permit was granted on the basis of the allocation alone (and our commitment to fence the tower bases at the appropriate radius). FAA clearance was based solely on airspace and distance to the nearest runway. And local clearances... well... we didn't really need much of any. We had to get a zoning variance for the towers, but because they were being built some distance from any residences, there was no objection. The building permit, which included the tower foundations (but not the towers themselves), was no issue at all.

Likewise, when we built the WYRB and WYCA towers in this decade, it was no big deal. There was very little in the way of local clearance required, and the FCC granted the CPs on the basis of the allocations and our §1.1307 showings.

Those truly were the good old days, and they're long over. I really believe that many of the current labyrinth of federal, state and local regulations has been carefully and deliberately crafted to prevent development of broadcast sites.

For example, with the FCC, the allocation is just the beginning. We now have to demonstrate compliance with NEPA (National Environmental Protection Act) and NPA (Nationwide Programmatic Agreement). Dealing with the FAA is also more difficult than it has ever been before, especially since so many GPS approaches have been published.

On the local front, a lot of zoning regulation has been written around the cellular/wireless industry

in recent years, and for the most part this has not been a good thing for broadcasters. Many of these regulations specify a maximum height that is relatively low (sometimes 50 or 100 feet), and in some venues, camouflage is required (is that really a flagpole?). When we come along wanting to put up a real tower for FM or AM, local zoning/planning boards want us to use a short monopole or tower that looks like a windmill or pine tree. We then have to ask for a variance, arguing our case before a board that is anything but sympathetic (they wrote those zoning laws to keep folks like us from building towers!).

As I alluded above, we are in the midst of some projects that require all these clearances, and it has been quite a challenge. It's even been disheartening at times. In the coming years as we continue to try to improve our facilities, keep them on the cutting edge of technology and transmitting the maximum signal that their allocations will support, I will have to continue fighting these battles. It really does make me long for the "good old days" of "just do it!"

Doing More

You've heard it before – we all have to do more these days. That is very true. With revenues down across our industry, we all do have to work smarter and do more.

For example, in years past, when an air conditioner unit failed, we wouldn't have given calling a service company a second thought. Now, our engineers have to look at it first and see if it's something they can fix. A condenser motor that's not running may be a \$12 starting cap that our engineers can easily install – that same repair by an HVAC contractor might be \$500!

Just to show you that this principle is at work at all levels of our company, we had a mower problem in Denver a couple of months ago. Amanda hit a stump hidden under some tall grass with our relatively new mower. That resulted in a bent crankshaft. A couple of quotes from repair shops indicated that it wasn't worth fixing.

Not willing to toss a \$300 mower in the dumpster and buy another, I ordered a new crankshaft, timing gear and pan gasket from Briggs & Stratton. Over a weekend, I tore the engine down and replaced the crank. With everything back together, the mower started on the second pull. Good as new.

So before you pick up the phone to call a service contractor, ask yourself, "Can I fix this myself?"

The New York Minutes

By

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

Hello to all from Western New York!

We as broadcast engineers are faced with a multitude of daily tasks to keep our facilities up and running. In Cris Alexander's April 2008 article in *The Local Oscillator*, he wrote on the topic of "What does a broadcast engineer do?" He clearly outlined the vast amount of occupational talents we must possess to keep our stations on the air, from board operation to legal matters, mechanical and structural engineering, electrical and civil engineering, and the list goes on and on. As Cris has dutifully filled the role of station Chief Engineer in the past, he knows what is involved in our job descriptions and has many times assisted us with advice or recommendations when faced with a particular problem when we have limited or little experience in that field. As market chief engineers, we are relied upon to come up with solutions to a wide array of problems and situations, some not even remotely associated with conventional hands-on engineering.

I have not worked under a great number of station owners and managers in my 40-year career, but I must admit that most of those I did work for did not have a clue as to what broadcast engineering entails. Most see our position as an expense until the station is off the air. Then, suddenly, you become the most important asset that the company has. The long hours, overnight maintenance, being called out under the worst weather conditions, the missed dinners and time with the family -- all these represent some of the downsides of our profession, but they are conditions we readily accept because we are broadcast engineers. It comes with the territory.

I have often said how much I wished that _____ (fill in the blank) would spend just one week doing what I do, walking in my shoes. A clearer understanding of what broadcast engineering entails would certainly result, but in no way would the full

scope of my job description be realized in just one week.

Our jobs are constantly changing, and we

must be able to keep up with those changes in order to sufficiently keep our facilities operating at their best. We are asked to find ways to cut operating costs, to do more, to spend less, and work "smarter not harder." Considering today's economic situation, this certainly is not a monumental request.

To say that the broadcast engineer is the backbone of any station's

success would not be too far out of line, for the chief engineer must provide the sales staff with a marketable and desired product to sell. While we do not generate revenue for our stations per se, but we are charged with keeping the operating costs of our station(s) within a reasonable budget, and with constantly looking for ways to keep our revenue safeguarded from unexpected expenditures and wasteful spending.

WDCX-FM – Buffalo, WDCX(AM) / WLGZ-FM – Rochester

This past month, we here in the Northeast have experienced some of the strangest weather I have seen in quite some time! Last month, in close proximity to Buffalo, the NWS has confirmed that five tornados were spawned during thunderstorm activity in our region. The severity of the storms was what you would expect in late spring/early summer, not at the end of August! And tornado activity in our area is rare indeed! One of the Citadel stations in Buffalo was hit hard with lightning damage. A lightning strike took out their main transmitter, causing the plate transformer to actually catch on fire! After getting back on the air with their full power auxiliary transmitter, they were again hit by lightning, which caused severe damage to the aux. I, along with a couple of other engineers in our market, was on



standby to assist them in getting back on the air if needed. It's certainly nice to know that reliable help is available in the event of an off-air emergency. The engineers in our market are a close-knit group, and none would hesitate to lend a hand or a piece of spare equipment to get another station back on the air when called upon.

The WLGH-HD transmitter went down during one of these storms, but damage was minimal, and we were able to get back on the air at reduced power until I could get to Rochester to troubleshoot the problem. We had one of the modules fail in the BE FMi-201 transmitter, but I was able to repair the module on site and get the transmitter back up to full licensed power. A shorted electrolytic capacitor and blown 25 amp fuse was all the damage I found.

Another storm on the 13th temporarily knocked out the WDCX-FM C-band satellite receiver. The board op called me at midnight when one of our satellite programs was scheduled to air live, but no audio was going out over the air. I had him check that the sat receiver was on the correct channel, and after verifying that it was, I knew that a trip into the station was in order. At the station, I rebooted the receiver, but still no audio. I noticed that after rebooting, the Unity receiver was stuck in the installation mode. This indicated that the problem was the LNB, not the receiver. I found that the external power supply that powers the LNB had failed. After troubleshooting the power supply, I found that the regulator transistor had failed. After

making the repair to the power supply, another reboot was in order, and the receiver came up with no problems.

As I reported last month, the relatively new rebuilt 4CX15, 000A tube in the WDCX-FM transmitter was experiencing problems with numerous PA screen overloads. While examining the PA cavity, I found that the tube Freeland had sent me was not an "EEV," but a standard A- series tube. I did not notice this when I first installed the tube. Freeland Products graciously agreed to exchange the tube for an "EEV" series, and on Saturday afternoon, the 8th of August, I made the swap. The EEV tube required a lot less screen voltage and drive to make licensed power, so I had to re-tap the screen transformer and reduce drive from the exciter. It has been almost a month since installing the tube, and I am happy to report that the transmitter has been working flawlessly since.

This year undoubtedly was the easiest inventory I have done since I began working at CBC seven years ago. Everything was where it was supposed to be, and there was no missing equipment to track down. I was able to get all three stations inventoried in less than 2 days, a far cry from previous years' inventories!

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

The Motown Update

By
Joseph M. Huk, Jr.,
P.E., CPBE, CBNT
Chief Engineer, CBC–Detroit

Back to Basics, Suppression and Power Conditioning

During my first two months at CBC-Detroit, I have found myself troubleshooting issues that are intermittent and sometimes, on the surface, without a good explanation as to their root cause. Have you ever experienced equipment such as computers and other audio gear that mysteriously lock up or reset at random intervals? These issues remind me of concerns I worked on at Ford Motor Company and Visteon within the noisy automobile environment.

Commercial utility power can have transients and/or dips that can propagate through our broadcast equipment and cause issues with the microcontrollers and audio circuits. Most often, these transients are caused by motors (inductive loads) or noisy devices on the same branch circuit. These perturbations can cause a momentary disruption to operation or serious damage to the electronic equipment.

Good transient suppressors have multiple stages of protection. Some transients are short in duration (i.e. microseconds) and have high voltages (>100 volts). Fast-reacting schottky barrier diodes are effective at clamping these low-joule (energy) fast-acting events. For longer acting events (i.e. milliseconds), metal oxide varistors can absorb more energy (joules) but do not react as fast (attack time) as the schottky barrier diode suppressor. For long-lasting, high-joule transient events (like a lightning strike), neon lamps can be used as a suppression device. Incorporating all of these levels of protection is essential in mitigating damage due to surge issues.

Make sure that the surge protection you implement takes into consideration these possibilities.

When planning power conditioning for your broadcast plant, one has to consider the possibility of a power outage or “brownout” (low voltage) condition. Devices called power battery back up units, which usually contain surge suppression, need to be properly sized for the application. To ensure good success with your protection plan, take time to create a load or power budget. This will answer the question as to the capacity of the power backup unit. If you want good protection, you don’t want to exceed the capacity of the backup unit. Always follow the recommendations of the manufacturer to

ensure proper operation.

In our plant, we have started to make power budgets of our most critical broadcast equipment. Our IT manager and coordinator, Larry Foltran, and I identified all the critical loads in our audio delivery area and made sure we did not exceed the capacity of any one power backup unit. We have found over time that the unexplained surge-related events were eliminated.

Larry said to me that the work we were performing reminded him of the movie and real life story of Apollo 13. I replied that he hit the nail on the head. All mission-critical loads need to be assessed to ensure a good, safe flight. So whether your life is at stake aboard a space ship or you want to be on the air at all costs and maintaining your audience base (business life), make sure you do a power budget! Until next time, be safe, and if all goes well, we will be reporting to you from the pages of *The Local Oscillator* next month. Best regards.



News From The South

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

An Open Invitation

When the last C-band satellite transponder finally dies, can we have a party? Everyone is invited!

Over the years, I've come to loathe C-band satellite work for any number of reasons. Back 15-20 years ago, you could get by with a simple 8-foot mesh dish that was relatively light for its size. You and an assistant could easily build it on the ground and then slip it onto the pole. Adjustment was also easy and for the same reason.

Nowadays, with 2-degree satellite spacing and the need for high-gain, highly-directive (read: huge!) dishes, it's a major job just to set one of these up. Those of you who've been in the same location for years and who've been using the same dishes for years shouldn't automatically be jealous of those of us who've moved to newer facilities. Trust me, relocating an existing dish is a major job that will take time, sweat and treasure. Building a new dish is actually easier -- but "easy" is a relative term.

As I write this, we're installing a new 3.7-meter (over 12 foot!) Prodelin antenna to replace the aging Patriot that we've used for years for Unity and AmbOS. The dish itself was actually easier to assemble than the new Patriot that we did last fall for ABC/Starguide programming. The Prodelin uses eight fiberglass petals (the Patriot had 16 smaller steel ones). But you do have to wonder what they were thinking at times. For example, the feedhorn is held in position by four rinky-dink metal tubes that must be adjusted for correct focal length and position. Do they really believe that I can accurately measure 54" from the center of the dish to the feedpoint? That I can accurately eyeball the position and ensure that the LNB is at the focal point? *While hanging off a ladder 10-12' in the air?*



Once you get it built, you meet the next headache: it takes a major effort to get these monsters aligned. If you think that cranking the nuts on the threaded rods will do it, be prepared to bust knuckles and do a lot of straining. (And possibly even strip the nut.) If you try to lift the dish to make it easier to adjust the nuts, you won't be able to hold it steady and it still takes a long, long time. Our solution is to use a small jack; the one in your car or truck might work. When you're ready to start adjusting, bring a collection of 2x4 lumber scraps and some clamps so that you can position the jack as needed. The goal is to let it do the work; it'll not only raise or lower the dish with a lot less effort, it's smoother -- you can crank the jack slowly up or down while watching the Eb/No or AGC figures from your receiver. Once you get it nailed, you simply tighten the nuts and clean up.



So Close ... And Yet So Far

But I've got to rant for a moment. (I know you're astonished.) Why can't the manufacturers make these huge dishes easier to set up and align? All

they care about is breaking it down for shipment; once it arrives on your property, you're basically on your own. Just getting that monstrous Prodelin onto the old pole was a major job. We used "come-alongs" and hauled like monkeys to get it into position, but as the photo shows, we just couldn't quite get it that last few inches. We bent a 1-inch threaded rod and destroyed a come-along before we decided to bite the bullet and bring in the heavy equipment. A call went out to Danny Dalton, who has helped us many times in the past. He brought his brand new tractor with a lift. Using that, we had it on the pole and pinned down in less than an hour.



Danny & His Magic Tractor to the Rescue!

Give me a good old Ku-band dish anytime. Years ago, I would've said the opposite, primarily because Ku was so temperamental, but I've changed sides on that argument. Nowadays, you can mount a 1-meter dish and tweak for best Eb/No in a matter of minutes. But here's the real irony: these little dishes usually come with a built-in scale to help with positioning to the desired elevation. All you have to do is ensure that the pole is "plumb" (i.e., at precisely 90 degrees to the ground). And yet, these giant 12-foot monsters don't even have that? And best of all, the instructions will invariably say something like, "pre-adjust your elevation to 50.3 degrees." Very few inclinometers -- even the expensive ones specifically intended for satellite work -- are that accurate or can resolve a fraction of a degree!

I realize that C-band is a legacy delivery system now, and that the only reason it's still in use is because there are still plenty of C-band transponders overhead. But honestly, when the last one finally goes dark, I, for one, will be a very happy man!

Cutting Edge: Virtualization

Those of us who use alternative operating

systems like Linux have faced a big problem for many years now. Even though things have gotten a lot better in recent years, there is still a lot of stuff that won't work properly on anything but Windows. Our own audio streams are a great example; I'm sure you can think of others.

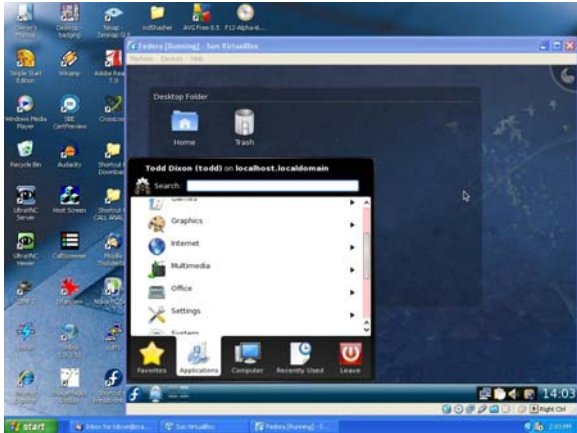
Until recently, I used the brute-force solution of simply rebooting on those rare occasions that I was forced to use Windows. OpenSuSE will set up your system this way by default: when you reboot, you can choose whether to go into Windows or Linux. While this certainly works, it can be inconvenient at times, having to wait for the computer to completely restart.

Another solution that has been available for years is Wine (which, with typical Free Software Foundation correctness, stands for "Wine Is Not an Emulator") that will allow you to run some Windows software on Linux or MacOS. Some ... but not all. I've tried it and was even able to get Internet Explorer to work under SuSE so that I could listen to our streams, but performance was poor and it was prone to crashing.

Enter: virtualization. This has actually been around for decades; not only have large mainframes used it since Moby Dick was a minnow, Windows 3.1 used a virtual machine manager to run Windows in DOS box #1 on 386 machines. (Yes, Windows 3.xx was a DOS application; most people didn't know that!) Java is another well-known application that uses virtualization.

In the past couple of years, several generic, OS-agnostic virtual managers have appeared that will allow you to run completely different operating systems at the same time. The one that we're using here now is called VirtualBox. It was developed by Sun, who is best-known for the Solaris flavor of Unix and their rock-solid SparcStation servers (not to mention Java!). Sun has jumped onto the Open Source bandwagon and permits VirtualBox to be downloaded and distributed for free. A commercial version is available that adds a few extra features, but for our purposes, the free download works just fine.

VirtualBox worked right after install, but there were a few twists, such as getting the sound to work. Like most free, open-source software, it takes a little tweaking, but once you get into this sort of thing, it becomes second nature to read the documentation, do a Google search or post a request for help in an online forum. The good news is that there's plenty of help available.



Todd running Fedora Linux on his Windows XP system

Virtual Box will work on either a Linux or Windows host, so it's your choice. The photo here shows Todd running Fedora Linux in a "box" on Windows XP. He uses it all the time to test new Linux distributions or "beta" releases without having to commit to a full-blown installation. A really nice feature is that VirtualBox allows you to take "snapshots" of each guest. You can then restore to the last known-good state from that snapshot, if you should blow something up.

Two things to keep in mind: First of all, virtualization isn't free; it still requires resources. If your machine has 1 Gig of RAM and you create a box that uses 256 Meg, that leaves 768 Meg for your main "Host" operating system. If a guest write a 2 Gigabyte file to your hard drive, that reduces your free drive space by 2 Gigabytes. Second, there's no easy way to virtualize an *existing* OS installation. For example, I couldn't just install VirtualBox in Linux and expect it to "pull up" and run my existing Windows; I had to install XP in a newly-created "box."

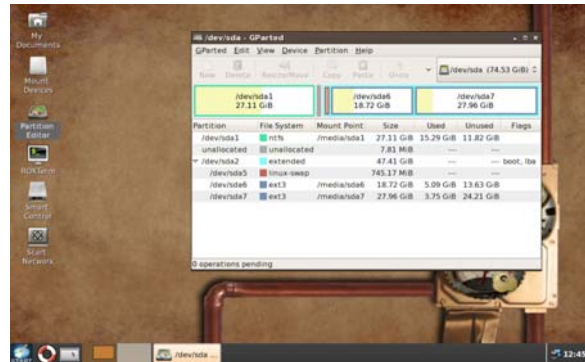
But all that aside, I highly recommend it. Download and try VirtualBox at www.virtualbox.org.

Another Marvelous Find

Speaking of free and open-source software, here's an update to an article I did a couple of years ago about using a Linux LiveCD for system recovery. As it turns out, there are much better tools available now, some of which are specifically targeted to set up, repair and restore your computer. One of the best, in my opinion, is called Parted Magic.

You simply download the ISO (about 85 MB at present) and burn it to a CD, then boot onto it. Parted Magic can be loaded entirely into RAM,

freeing the CD/DVD drive for other uses. The photo here shows Parted Magic running on my laptop, which has Windows XP and Opensuse installed in separate partitions. The Parted Partition Manager is running, which is a splendid tool for moving, resizing, deleting and creating partitions on a hard drive. Considerably more advanced than plain ol' FDISK ...



Parted Magic on a laptop with Windows and Linux installed

With Parted, you can even right-click on a partition and, as long as it's accessible, you can "mount" that partition and then view the files in a browser. Have you ever been partitioning a drive and forgotten where you were at? This is the cure. For example, if I were to mount and view /dev/sda1, I would immediately see all of my Windows files and folders, including "Program Files" and "Documents and Settings." I'd instantly know that I was, in fact, looking at my Windows installation. This is handy when you're moving and deleting partitions, because you don't want to nuke the wrong one!

Parted Magic also includes a host of specialized tools for file recovery, editing and even networking. The latter is especially handy if you're working on a damaged hard drive and need to do a quick Google search. You simply click the "Start Network" button, wait a minute or two, and (assuming your network is available, of course), you'll be online in Mozilla Firefox. You can even take screenshots and send them to others: "I'm having trouble with this hard drive. Here's what I've got, what do you think?"

This fellow ought to be in every engineer's toolbox. Download it, burn it, run and learn it. You can find it at www.partedmagic.com.

That's it for this time! Until next month, may God bless you and may God bless America!

Gateway Adventures

By

Rick Sewell, CBRE
Chief Engineer, CBC–St. Louis

“Any sufficiently advanced bureaucracy is indistinguishable from molasses.” – Unknown

Who doesn't have his own story or stories of dealing with entrenched and unworkable bureaucracies? I certainly have had my share but I am not sure that I have encountered one like the nightmare I experienced this past month.

The T1 line that we use as the link between our studios to both transmitter sites was under a five-year contract that we knew would expire sometime in 2009. Over a year ago, I inquired to make sure I knew exactly when the contract would expire and was told by the phone company that the expiration date was September 30th.

As summer began this year I remembered that the T1 would expire by the end of summer so at the beginning of June, I called the phone company again to start the conversation about renewing the T1 for another five years. I was really trying to be proactive with this, knowing that wheels always grind slowly with this company.

At that time I was told that I needed an account manager and that no one was assigned at the time to our account. I was assured that it would be addressed and someone would get back to me. Once again I was told that the contract expired September 30th.

Feeling that I had at least been proactive in getting the ball rolling on this, I went back to the day-to-day routine of my job. That was my mistake. I should have been calling back on a weekly basis to make sure that someone in the bureaucracy of the phone company actually cared about our account.

Fast forward to early August. The renewal was once again on my mind knowing I was two months away from the renewal. I hadn't heard from them and figured it was about time to find out what was going on. Coincidentally, at the same time we

got a bill for the month of July for the T1 and the cost was about three times the normal amount. This of course raised the alarms at Corporate.

I came to find out that the contract had actually expired on June 30th even though I had been told twice that it was supposed to be expiring September 30th. The billing was now on a month-to-month basis so it was costing a lot more than the contract rate.

This problem was obviously now priority number one. Now I won't bore you with the gory details of spending a day on the phone with the phone company. At

the end of the day, when I had been passed on to about the tenth person who would try and tackle the problem, I began to wonder if there was anybody qualified to take care of this renewal.

The final person I talked to confessed that there was no one there who could open up the account on their computer. *They couldn't even open up the account!* This wasn't someone in the billing department. This was someone working in the department that actually took care of provisioning of T1 lines. He did agree to try to investigate further and asked me to fax a copy of the bill.

At the time of this writing, it's been a week since then and of course I haven't heard anything from the phone company. I am sure that if we didn't pay the bill we would hear from the cancellation department quite promptly.

We are at the point now where we are looking into alternatives. While I am amazed by a corporate bureaucracy that gets so big that it becomes unworkable at some points, I am sure there are those who have even worse stories of either corporate or government bureaucracy. That makes the thought of surrendering even more of our lives to a large bureaucracy even scarier.



Catalina Tales

By
Bill Agresta
Chief Engineer, KBRT

Greetings from Santa Catalina Island!

The last week of August has been a frustrating one for sure. It has me wondering what could happen next as issue after issue all seem to be hitting at once, from bizarre computer issues to vehicle issues to stuff with family and friends, etc. Thus far, none of these issues has affected KBRT's air presence, so I am going to bed tonight giving God a big thank You for that!

The first week of August, I sustained a back injury while trying to gain a good vantage point so I could take some pictures to document a situation I was working on. Basically, I had climbed to take some pictures of the roof and fell, landing on my back. Though I am expecting a full recovery, the pain was bad enough for the first couple of weeks that it slowed me down quite a bit.

I had laid out a bunch of computer stuff and was prepared to remedy some issues we have been facing since the Catalina wildfire. AT&T has refused to repair our DSL since the fire, and we have been making do with a satellite Internet service. Our main issues with this service were the latency, unreliability and lack of a static IP address. Lately, the connection seems to be a bit more reliable, and now they are offering static IP addresses for a reasonable rate.

As you might remember, I had been trying to get my Verizon mobile connection to work up here, but thus far, no go. I am not done trying, as this would provide a more cost-friendly solution, but for now, I am doing what I can to make things a bit more functional. Anyway, with this I decided to wire up a local network and get our NE-IBOC exciter online as well as a few other devices in our rack. I am just now getting back to this more than two weeks after laying everything out to begin, and wouldn't you know it, I get hit with some bizarre computer issues before I even get done.

My Go-Book-3 laptop decided it did not want to supply power to its wireless network card, so

I ran a CAT-6 and moved on until I could get back to finding the reason. Then, just as I finished this month's *Local Oscillator* column as well as a bunch

of other work, it decided it did not want to boot, even in safe mode. So, on to get the operating system CD and try to boot from that. I turned it on so I could get the CD-ROM drive to open, stuck in the CD-ROM and pushed the power button to reboot, but... nothing! The power supply is working, the battery is fine, but no lights... nothing!

So, here I am on machine number-two writing *Local Oscillator* column number two and starting to redo my inventory, hoping this machine does not get the same idea as my laptop.

One of the situations I have to deal with here on the island is parking our truck whenever I need to go to the mainland. The city has decided to close all the parking places we once had, and the Island Company charges premium rates to park on any of their properties. I had worked out a deal to park behind a small hotel near our boat terminal, but the area is not well lit at night and it's right next to our not-so-nice park. Now it seems I have a new "friend" to make the situation even more enjoyable, someone who likes to draw obscene pictures on our truck. Since the Conservancy decided to remove the asphalt from Airport Road, leaving a dusty dirt mess, keeping our truck clean has become plain un-doable. So now some guy has decided to draw all kinds of nice stuff every time I park behind the hotel.

Then, while I was still dealing with wiping as much of this obscenity off the truck as I could before driving through town, I learn that the hotel has just been sold and I can no longer park there. A couple of days later, I had to make an emergency trip to take my dog to the vet, so I parked behind the park on Island Company property – I simply had nowhere else to park. Well, seems our new friend found me yet again, but this time, since there was not much



dust as I had squirted the truck off when I left the transmitter site, he decided to draw using some kind of oil or something that has been very hard to remove. Just another fine island factor!

It's not all bad, however. Things at the KBRT transmitter plant continue to function well, as long as I shield them in prayer, God keep them protected from the island factor!

The added dust is certainly taking its toll, so I have done all I can to seal the plant up better and must now keep the doors closed, even on a nice cool day. My dust filters that used to run for over a year

before needing replacement are hardly keeping up now.

As long as I can protect everything from the awful electrical power we seem to see here every so often and from the dust, I am hoping we will get by for awhile... that is, until our new artist friend decides to take a trip up here to the plant.

Until next month, the Lord bless you and keep you; the Lord make his face shine upon you and be gracious to you; the Lord turn his face toward you and give you peace.

The Chicago Chronicles

By

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

Leftovers from Last Month

Our question from last month involved that indispensable item in the Engineer's bag of tricks, Great Stuff, and the question is: What is the solvent for Great Stuff? I wouldn't have guessed this unless I looked on the can, but here's the answer: Acetone! Yes, dear old acetone like mother used to make, available at your local hardware store – that is, until the government finds a reason to ban it!

Now, for our question for this month, we're back to vacuum tubes again, and it involves an incomplete answer from our question of two months ago, "When do you know when your final amplifier tube is about to the end of its useful life?" I mentioned last month that when a tube's emission falls off even when the filament voltage is at the tube's ratings, that was one clue, but there's another. What is it? The answer, as usual, next month. For old timers, this should be an easy one.

Some Thoughts on What Might Have Been

Among my other activities here at Crawford Broadcasting Company, I am also a member of the editorial board, which is something that I enjoy doing immensely. Partly for this reason, I have pretty much refrained from mentioning within these pages anything of editorial nature outside of the Engineering venue. Others columnists have, mainly

Brian Cuuningham and Bill Agresta, but they are, in my mind, entitled since they don't have the public outlet for their editorial views that I do. After all, fair is fair.



But a recent tour of another local station's transmitter site of by a bunch of Chicago area Chief Engineers elicited a story from one of them which has served as a springboard for something that I'd like to pass along. This guy is the ultimate "veteran's veteran" of CEs in this market, and he was recently

called upon to "decommission" the old Paul Harvey broadcast studio on Michigan Avenue in the Loop. This is one historic place, not the only one which Paul used, but it was his last in Chicago, and he used it for over twenty years until the occasion of his last illness and the death of his beloved wife Angel in 2007. After that, Paul originated his last broadcasts from his Arizona "hideout" until his death last February. According to my colleague, to say that the place was overbuilt is a major understatement: McCurdy console, mega wiring all over the place, you could have originated any kind of broadcast, including a choir concert, from there, if only because of the extent of audio wiring. And all this was used just for Paul, who himself needed only a microphone and a cart machine or other such audio source to originate his morning newscast open and close.

In the discussion of what it took to take that place apart, it began to occur to me that the events

which have taken place in this country in the last eight months might have taken a somewhat different turn had it all taken place under the eye of a younger, more vigorous Paul Harvey. By the time the Campaign of 2008 had come to the point of decision, Paul was in the throes of the massive emotional process of grief and a deteriorating physical state, something with which you all know me to be just too familiar. When your mind and your spirit are in the midst of coping with the loss of the most important other living being in your life, the ability of any normal human being to deal with anything outside of that process is limited. And, at age ninety, Paul couldn't have had the energy he had even ten years ago.

But if Paul had been able to better point up what was going on and give his view of where the country was headed, would it have made much difference in the eventual outcome? I like to think so, because Paul Harvey in his prime was indeed a force to be reckoned with to help this country stay the course. He would have certainly been one to openly question what kind of change we were getting, and I suspect that we would have listened.

However, you say, we have the likes of Sean and Rush and Mark, and *they* couldn't make the difference. True enough, but there was something about Paul Harvey, the one who'd been doing this for sixty five years, in his homespun way, which would have made the alarm sound less strident and more a folksy, gentle call to action. I may be wrong, but that's the way I see it. I do know that, just when we need him the most, right now, we're going to have to learn to get along without him.

Nautel NV-40 Over-Heatin' Beaten

I've been tangentially involved with two Nautel NV-40 FM/HD transmitter projects since the end of last year, one in Detroit, where I actually got to give a brand new one a pat and a kiss, and the other a project here in Chicago, where WFMT, my favorite non-Crawford station, got a new one a few months ago. In both cases, the main issue with them was the amount of heat those big boxes put out. That litany has been earlier chronicled in this column and by Cris as well, but it appears to have been solved. I received an email recently from my friend Gordon Carter, CPBE, CE at 'FMT, telling me that Nautel traced the problem to a *biasing* issue in the amplifier stages. Of all things. Anyway, since all of this is in software anyway (who would have think that adjusting the bias of an RF final amplifier would ever be a *software* issue??) Nautel just sent along the upgrade on a chip and Gordon's transmitter site

associate just stuck it in and rebooted the rig. Or did you just do the upgrade remotely, Gordon? Nah, don't tell me it can't be done. Anything else is possible by digital remote control, nowadays. Why not this? As Gordon tells it, the front panel of the rig is still plenty warm, but the air coming out is a lot cooler than before, so there you are.

Ain't digital technology just grand? Whaddaya mean, what's next? Don't ask.

Necessity is a Mother of a Tool

Well, almost. This is one of those cute little "hints and kinks" like many of you who are hams would read about in *QST*, or maybe in a John Bisset column in *Radio World*.

Credit for this goes to our remote Engineer, Warren McFerren. He had an assignment recently to replace the talkback buttons in a few of our Wheatstone G-5 control surfaces, which get used absolutely to death. Now, this is a great example of where a perfectly straightforward project can get turned into a nightmare, just for the lack of a proper tool. In this case, the sticking point is the knobs for the pots and switches which are located on the monitor panel. All of those knobs have to be removed so that the circuit board can be separated from the panel, just to facilitate the repair. The problem is, the knobs are of such design as to require the use of a certain special tool, which seems to be available only from the factory. Cost? A mere sixty-five dollars. What?!?!? You saw right, do I have to spell it out for you? Okay, then, \$65.00!! Now that that's settled, except for your stomach, the first reaction of both myself and of Warren was, "We ain't payin' it". That part took just one second. Except that Warren said it with more conviction than I did, because he was the one with the idea. He set about looking for a replacement.

And he found it, too. It was on the back of the typical telephone butt set, the kind we use for handling line checks, or at least used to before the advent of the Zephyr IP boxes. It's that big hasp that connects the butt set to the belt loop... of the butt, if you will. The hasp was just the right thickness to get into the notches on either side of the shaft to loosen the ferrule that holds the knob in place. Remember, you have to first lift the top of cap off of the knob to see all of this. That takes a knife or at least a thin piece of metal. Once inside the cap, the modified tool will slip right over the notches, allowing you to turn them until the knob just slides off the pot or switch shaft.

Anyway, the pictures below tell the story. Figure 1 is the hasp before the surgery. Modifying the



Figure 1



Figure 2



Figure 3

hasp is done by expeditious use of both a Dremel tool and a set of small jeweler's files to create the tool from the metal of the belt hook. Remove the hasp from the butt set and have at it..... carefully. That includes *saving the screws which hold the hasp to the butt set*. When you're done, you should see results similar to that of Figure 2. Try it out on a knob on the control surface. Hopefully, the tool's working notch is still a little bit small and you can fine-tune it for a perfect fit. Then, when you're done using it, you can quickly re-attach it right back onto the butt

set. See Figure 3. Not only will the full utility of the butt set be retained, you'll know where to find the tool again when you need it. Handy, right?

Two more thoughts

Another something which came out of that transmitter site tour I mentioned earlier was an experience which another Engineer had with a surface mount PC board located in a transmitter. I've never heard of this. Maybe you have.

It seems that the fellow started having intermittent problems in the transmitter. He traced the problem down to a particular PC board in the rig. This was vertically mounted board with all sorts of surface mount devices on it. The board also had a couple of power parts on it which were generating considerable heat. They were mounted on the bottom end of the board. That was the clue. On a tip from the factory, the Engineer took the board out and began examining it with a magnifying glass. Bending the board slightly revealed little cracks showing up in the solder mounts around some of the parts, particularly around some of the surface mount capacitors which were located near the heat-sourcing parts. All it took to fix the problem was to re-melt the solder traces with a small iron, and maybe add a little solder to some of the traces.

Morals: First, it should not be considered good practice to mount surface mount PC boards vertically, *unless* the amount of solder used to hold the surface mount parts in place is adequate, and nobody seems to want to do *that*; Second, it should not be considered good practice to mount heavy current drawing devices on a PC board which has a lot of surface mount components on it anyway. Third, it should *really* be considered a no-no to do both at the same time.

Now for the other story. This happened very recently to a brand new five kW AM transmitter, on the air for two weeks and owned by one of my best friends. On this particular digital power supply PC board was mounted a very large electrolytic capacitor. Shouldn't be an issue, right? Well, it is when the capacitor decides that it's going to open up a bunch of cute little pinholes along its side and spew forth liquid aluminum and electrolyte all over the board! I've frankly never heard of this failure mode, either, unless the capacitor is mounted in the wrong polarization, but you can just imagine the shorts happening all over the board, especially between IC pins, as this aluminum lands and hardens. For that matter, the factory hadn't heard of this failure mode either. My friend didn't touch the board other than to remove it from the rig and send it in to the factory

under warranty.

Wasn't there a time back when a company tested their components before installing them in the equipment they were building? I know there was.

I've seen the test jigs. Or, maybe you can't test for this kind of failure mode, so rare it is. I don't know. You tell me.

Until next month, blessings!

The Portland Report

By

John White, CBRE
Chief Engineer, CBC-Portland

Some years ago, I remember reading a science fiction story series which involved a small group of individuals who were adept at solving seemingly impossible problems. These individuals were usually called in after a government or business concern had made a real mess of things. The mess usually started with calling in specialists, the top experts, whose suggestions only made things worse – usually much worse.

So with great reluctance and typically no other choice, the decision would be made to hire a JOAT, short for jack of all trades. The story would typically open with the JOAT's arrival and having not one clue about the problem. The JOAT would wonder around talking to people and asking questions... sometimes stupid sounding questions.

I visualize a JOAT as a bumbling Columbo-like character who keeps asking "Just one more thing." At the end of the story the JOAT would solve the problem by taking small seemingly unimportant threads, weaving them together into a picture no one else saw.

It's the struggle of specialist verses generalist. Knowing everything about nothing or nothing about everything. As specialists in broadcast engineering I have come recently to appreciate the tensions between those two extremes.

On a fairly regular basis, we as engineers are called on to adopt new technologies. Study and

master them. Become specialists. Yet this month I have come to recognize the opposite face of that coin.



A project here has required me to consider the aerodynamics of droplet dispersal in a turbulent medium. Or in ordinary terms, when painting tall objects, will paint fall on other objects? That subject may sound mundane but it's more complicated in reality.

Is it necessary to notify neighbors? Will notification simply raise unrealistic concerns? Will some activist come up with the idea of painting the towers sky blue? How can the project be structured to eliminate those problems?

So now that I have the project of painting the towers, all of those questions enter the picture.

I see the same generalist questions with the remodel project at Mt. Scott. We have a nice building with space for studios and offices. Consolidation would eliminate many logistic issues while providing a significant reduction in operating costs. While it seems like a slam dunk, it's not so simple.

Zoning regulations, planning regulations and building regulations all impact the project. I am now finding much of the engineer's job involves translating between various specialties to coordinate everything. Interesting.

Hmmm... that was an old Chinese curse: "May you live in interesting times."

**Rocky Mountain Ramblings
The Denver Report**

by
**Amanda Alexander, CBT
Chief Engineer, CBC - Denver**

August has absolutely flown by. Perhaps time is just moving faster for me, or perhaps it's the fact that I missed a week of work so I could go on vacation. Either way, it *flew!*

The first week of August really dragged on because I knew vacation was just a few days away. I decided to spend the week getting things done on my list. I finally installed the last three color security cameras at the studios. We've been living with a mixture of black and white and color cameras for the last year. I've had the color cameras on the shelf for well over six months and decided it was time to get them installed. Now every camera is the same. It's nice to look on the monitors and see everything in color.

This was the only major project I did. The rest were small things. I cleaned up the wiring from the NexGen on-air workstation and the AssistPro (Telos) computer in a control room. The wiring in so many of the studios looks like bird nests. If you look behind the work area, there are seemingly hundreds of cables intertwined. I am taking it one step at a time and slowly getting each room cleaned up. KLZ will be next. I will get it looking good again.

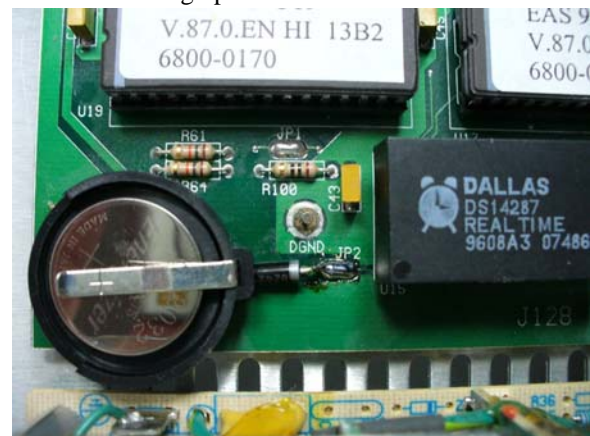
You might remember me mentioning making a change to a TFT EAS 911 unit we'd been having problems with. We did it and it works. The U15 chip had quit retaining the memory when there was a power outage. The only solution TFT would give me was to replace the chip (at a high cost, I'm sure). The newer units have lithium batteries to hold the memory. I ordered the parts and my dad and I put it together. It's run great ever since. No more reprogramming! If you want to know how I did it, look in the Engineering Forums in the "Studio Engineering" section.

We had more T1 problems in August.

Twice, Qwest (telco) did not tell me what the problem was. After the third time, they told me it was a "bad coil."

We had a severe storm on Monday the 17th. The storm hit out east, near the KLTT site. It was more of an electrical storm and dropped very little (if any) rain. During the storm, it got to the point where the transmitter would not stay on at all, high or low power. After the storm passed, I tried bringing the transmitter up again. It came on, but within just a few seconds it

went into VSWR shutback and turned itself back off. I was worried about possible damage and immediately headed to the site. Thankfully everything was fine. I guess it was just the tail end of the storm that was producing lightning that kept the site from coming up.



TFT EAS911 lithium battery mod

The next day the T1 went down again. I called Qwest and it looked like the storm had fried some more coils. They replaced them. So far so good since then. It's been just a little over a week as I write this. We've had storms pass through three

days in a row and it has held solid.

Vacation was great this year. No major issues to deal with this time around. While our friend Robert had a few minor issues with his new ATV, everything else went smoothly. I was lucky enough to catch five fish this year, a high for me. Usually my dad is the one catching all the fish. The ATV rides were also fun. I got to do a lot more driving this year than last. It was a learning experience. My dad even let me drive the ATV all the way up to Engineer Pass. He drove the trip down.

Back at work, I have been spending my time doing inventory. This year has been a lot easier getting through it since it's just me doing it. Only a few things have yet to be found. I am hoping at least one thing will be found in another market. If any of you happen to have one of our Garmin GPSMap 60c units, please let me know. I don't remember sending it off, but I might have and just don't remember. The nice thing about doing inventory this year is I am seeing where everything is located. I am updating the list, and once it is complete I will keep a copy around to keep track of where items are shipped or moved to. I think this will prove beneficial when I need something.

Keith Peterson has been working hard at KLTT trying to get it looking great again. While I was on vacation, he spent time mowing, weed eating, painting and mopping. The base at KLTT tower 1 is what we call a swamp. No, it's not like a swamp with alligators and Spanish moss all over the place. It just always seems to have standing water, at least when we've had a month of rain. I was unable to get to it before vacation because of all the rain we had. After several days of dry weather, Keith was able to get out there. He didn't complain about it being muddy, so I assume it was relatively dry. Either way, he got the base area – which is quite large because of the power in that tower -- mowed.

The interior of the KLTT transmitter building has begun to look run down. The walls just look dirty, there was a bad trim job around the transmitter, the walls are dirty and the light fixtures were full of dead moths. We had contractor Mike Kilgore redo the trim inside back in July to get that looking good and sealed up tight. While I was on vacation, Keith painted the wall around the transmitters and equipment. He also stripped, mopped and sealed the floors. Typically we don't have enough water to do the entire floor properly, so where we start the floors are really white and by the time we get to the other side of the room, the floor is a few shades darker because of the dirty water. Unfortunately, after years of doing this, I think it is permanent for the most part. Keith has done a great job with keeping the site cleaned up. The floor looks great. I can almost see myself in it. Next, we will most likely paint the rest of the walls inside the building.

My next project is trying to get KLZ mowed again. We don't have to worry about the entire field, but the area around the gate, building and road is grown up quite a bit. Some of the tower bases have grown up quite a bit as well. We will also begin "spring cleaning" in September (better late than never!). The weather has been great this summer with not one 100-degree day. The weather will still be nice in September, and I might as well start cleaning the transmitters and antenna tuning units. I also plan on cleaning out the storage room at the office again. In about a year or so, I won't have the room I do now for storing items at the office. I plan on keeping the majority of things at the KLZ transmitter site. I'd like to keep only a few pieces of spare equipment at the studio for emergencies. It will no doubt be a busy month.

So until next time, that's all folks!

Digital Diary
by
Larry Foltran
Corporate Website & Information Technology Coordinator

Checklists... Not Just for Airplanes

Earlier this month, I had the opportunity to help Joe Huk, our Detroit Chief Engineer, as he developed a better power distribution strategy for our servers and related broadcasting equipment. Although I'll leave the details of this project for Joe to share, I would like to touch on the execution of this plan and idea that stemmed from it.

After discussing and documenting in detail what would need to be done during this power "re-distribution," we decided on a 4 PM start time to complete the necessary changes based on the type of programming that would be airing on each of the three stations. Because our entire server system would need to be shut down during this operation, we knew that we would need to work as quickly as possible to bring the system back to 100%. After double checking our notes and performing a dry run of our plan, we were ready to go.

As Joe unplugged the equipment from behind our rack system, I stood by on the operating side waiting for the go ahead to power up. And so it began...

One by one, I booted up our servers and confirmed that the other equipment was active. The brief silence from the momentary ceasing of the equipment fans gave way to the call of one of the silence alarms. As everything continued to boot up and stabilize, I expected the silence alarm to stop... but it didn't. Joe and I quickly began to scan the equipment, looking for the culprit. It didn't take too long during our quick inventory of operating versus non-operating equipment to discover that the server associated with our HD2 signal had been missed during the boot up sequence.

That wasn't a major issue on that afternoon, but what if someone unfamiliar with the equipment needed to boot up the system in an emergency situation, such as after a power failure? In fact, we had such an issue only a week later. Thankfully, only a couple of the machines powered down, and it was

during the day while both Joe and I were nearby. But as you know, problems can occur during any hour of each 24-hour period.



In hopes of covering all of the bases, I've begun work on a checklist to ensure no equipment is overlooked during a boot-up sequence. Hopefully it will never need to be utilized, but I prefer to be ready for those "what if" situations.

There are actually two parts to the overall checklist packet that I am developing. The first part is a photo of the rack with each piece of equipment numbered and labeled. In a situation that someone unfamiliar with the equipment placement would need to perform a certain task, such as a server re-boot, they could receive instructions remotely from our Chief Engineer and easily cross-reference the equipment name via this illustration. In fact, I helped develop a similar system during my days at General Motors and it proved to be very valuable on several occasions.

The second part is actually a checklist, similar to what you would see on aircraft flight decks. It is essentially a step-by-step list, guiding the user through a complete reboot of the system. I'm quite confident that all of our Chief Engineers could do this with their eyes closed, but the primary intent of this checklist is the use by those who aren't as familiar with the equipment and as necessary during an "emergency" situation.

I hope to complete this checklist in the near future and will be happy to send a copy to anyone within Crawford Broadcasting Company interested in taking a look. Although I hope my checklist will simply collect dust in our rack room, I always prefer working with detailed documentation over simply "winging it."

Please Stop the Spam!!

We simply can't get away from it, can we? I receive at least one call per week relating to spam in one way or another. The most recent call was from

Chicago's Art Reis looking for suggestions on desktop based spam-blocking software. My pick in this category... Cloudmark Desktop.

I've been a Cloudmark Desktop customer for the last three to four years now and I love it. Cloudmark Desktop is an application-based spam blocker that can run within Outlook, Outlook Express, Windows Mail, and even Mozilla Thunderbird. It is a subscription-based application that costs \$39.95 per year, but it's worth every penny especially, if you're accustomed to receiving a large number of spam messages on a regular basis.

Based on my knowledge of Cloudmark Desktop, it's a community-driven application that utilizes user feedback to identify spam. Once installed, Cloudmark Desktop resides within your email client of choice in the form of a menu bar. If you receive an email that is spam, you can simply select it and classify it as spam. You can also classify "safe" messages as "not spam," ensuring that messages from the specific sender arrives in your inbox the next time around. One thing I like about this application is that it moves any suspect emails into a dedicated spam folder for review. Although it is generally very accurate, I still prefer to make sure there isn't anything legitimate in the spam folder. Another huge benefit that Cloudmark enjoys is its very light use of system resources. You won't even notice that it's running.

In all fairness, I should also mention MailFrontier Desktop, Cloudmark's direct competitor. Although \$10 cheaper, MailFrontier only supports Outlook and Outlook Express as mail clients and suffers in the accuracy department.

“Perventing” Computer Infections

Just a week or two ago, one of the folks here in Detroit called me over to his office because he had received a virus warning. As I sat down at the machine, I quickly realized that this was not a

legitimate virus warning because it wasn't labeled with the anti-virus software's title that we use. Another clear indicator is that it “recomended to use special antispayware tools to pervent data loss.”



Just because I was getting a fake anti-virus warning didn't mean that the computer wasn't infected with some sort of malware. Whatever was on the computer had also disabled the machine's actual anti-virus software. After an in-depth scan using two different anti-malware / anti-spyware applications, several instances of Trojans were discovered and eliminated. Simply another reminder to all computer users that you should watch where you go on the Internet, what you open via email, and what you click on in terms of pop-up windows.

You should also be skeptical when any type of virus warning comes up on the screen. 1. Always check to see if the name of your primary anti-virus software appears somewhere in the warning. 2. Check the spelling and grammar used in the warning. 3. Finally, if the warning is instructing you to download or purchase a “solution” to the infection, it will typically be fake. Some legitimate computer security software will occasionally prompt you to download an update, but I've never seen such a prompt as a result of an infection. Keep a close eye, because these tricky rogue software developers are sneaky. Maybe someday, they'll even invest in a dictionary.

...until next month!

The Local Oscillator
September 2009

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

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

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

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

KLZ • Denver, CO
560 kHz, 5 kW-U, DA-1

KLDC • Brighton - Denver, CO
1220 kHz, 660 W-D/11 W-N, ND

KLTT • Commerce City - Denver, CO
670 kHz, 50 kW-D/1.4 kW-N, DA-2

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

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

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

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

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

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

WLGZ-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, 6 kW/65m AAT

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

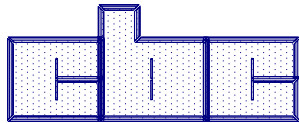
WYDE • Birmingham, AL
1260 kHz, 5 kW-D/41W-N, ND

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

WXJC • Birmingham, AL
850 kHz, 50 kW-D/1 kW-N, DA-2

WXJC-FM • Cordova-Birmingham, AL
92.5 MHz, 2.2 kW/167m AAT

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