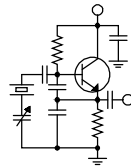


# The Local Oscillator



*The Newsletter of Crawford Broadcasting Company Corporate Engineering*

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OCTOBER 2024 • VOLUME 34 • ISSUE 10 • W.C. ALEXANDER, CPBE, AMD, DRB EDITOR

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## **A Virtual Thing**

In early 2023, we made our first foray into the world of broadcast infrastructure virtualization. It came in the form of a Telos VXs for our new Buffalo studios. The old phone system had reached end of life, and we wanted the best option for airing and recording callers. That meant Telos... something, but we didn't know what.

It took me a while to get over the mental hump so that I was ready to accept that whatever new on-air phone interface we would purchase would not, for the most part, be hardware based. That was no small feat.

When I started in broadcasting, the way we did on-air phone interfaces was to "jeep" a speakerphone, one of those two-piece gizmos that you rented from the phone company, taking audio from the speaker and using feeding send audio where the mic normally connected. That worked amazingly well, but it was half duplex, one way at a time, and if you wanted any caller "ducking," you had to provide it yourself with the fader or rotary attenuator.

Then, in the early 1980s, a guy named Steve Church invented a device that interfaced with a 1A2 phone system. It was amazing, a quantum leap in its day. I installed our first one in our then-new Costa Mesa studios at KBRT, and call quality improved immensely.

In the years since, we have used an array of broadcast phone interfaces, almost all of them manufactured by Telos. Some were better and more reliable than others, but all had great call quality, and features were added or improved with each new generation.

For most of 40 years, I had the mindset that to provide quality call interface in a broadcast environment, you needed a piece of rack equipment with an outboard tabletop control panel. Phone lines would connect to the rack unit via RJ connectors,

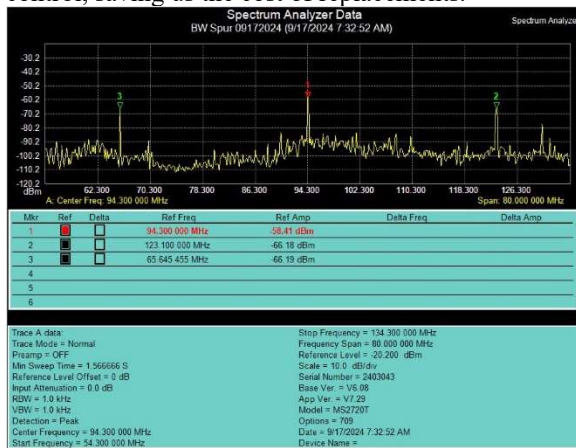
caller audio would come out on XLR connectors as either analog or AES and send audio would go in the same way.

But then came the day when our friends at Telos told me that they were going the virtual, "containerized" route with their phone interfaces. I really gave some thought to whether I wanted to go that route or not. It was completely foreign to me. But I eventually got aboard, mostly on the recommendation of the good folks at Inrush Broadcast Services, and it was Shaun Dolan who installed our first Telos VXs system and provided me with some initial training on it.

While I was not in Buffalo and able to try the new system out firsthand, I did find a way to "test drive" it from my office in Denver. I was able to VPN into our Buffalo network and connect to the VXs using the XScreen2 call screener program and actually operate the system, dialing my office number remotely. With that, I could test audio in both directions as well as see how the interface would look to our folks in the market. It didn't take me long to become a believer.

Since then, we have installed VXs systems at both KBRT and WRDT. I ordered the servers and had them shipped to me in Denver, installed the OS (Ubuntu 22.04) and "spun up" the Docker container and VXs. To do that, I had to make some changes to the Wheatnet system in our Denver cluster, installing a grandmaster PTP clock and changing the system from 44.1 to 48 kHz. Our very capable telco consultant, Steve Solton of Convergence Solutions, fixed me up with some temporary SIP lines I could use to test with. In both cases, I was able to ship the server to the market with everything installed, and once it was in place in the facility, it was a simple matter of setting the multicast addresses and configuring the VXs for the SIP.

One of our Telos HX6 units in Denver reached the end of its useful life this year (and we know our U/L estimate is correct because we recently started having trouble with those units). We had budgeted for a VXs to replace the aged-out HX6, and since our Wheatstone system was already configured to work with AES67 sources and destinations, it wasn't a lot of work to get the VXs running. The difference was that Telos now does the Docker installation (using Portainer) and initial VXs setup themselves via VNC, TeamViewer or whatever. That was no problem for us. I got Ubuntu installed and running on a new server that we can use for any number of containerized applications, and Telos got the container spun up in just a few minutes with VXs running. It didn't take long for Steve Solton to get SIP server licenses installed on our Avaya system, and we had the VXs ready for prime time in short order. And we were able to use our existing VSet6 desktop directors with the VXs for screening and control, saving us the cost of replacements.



**A spectrograph of the BW TX600V2 output at full power. This was taken using a telescoping antenna on the analyzer, so the noise floor is high and you see all the other FM broadcast signals. But the two spurs are evident.**

Our Denver hosts and producers immediately noticed the improvement in caller sound quality, consistency in caller levels, the clarity with which callers can hear the host and one another, and some operational improvements as well. As a listener, I was having a hard time deciding if a guest on the afternoon talk show was on the phone or in the studio – the caller audio was that crisp and clear.

I'm more a believer than ever, now that I've had the opportunity to experience a virtual telephone interface firsthand. It's a winner.

So what's next? I'm hearing all kinds of things. Telos, of course, has a whole catalog of containerized products, and we may find ourselves using some of those going forward. In Detroit, Denver, as additional HX6 units age out, we'll purchase additional licenses for the VXs to provide additional studios and shows, adding lines and "hybrids" as needed, no new hardware required.

I expect that in the next few years, we'll continue to see hardware-based broadcast equipment replaced with virtualized products, and that's probably a good thing. And if you can convince an old guy like me that virtualization is a good thing, I'll bet such products will make great gains into the broadcast infrastructure. I'm excited to see what's coming.

### Still Got our Spurs On

Last issue, I told you about a BW Broadcast TX600V2 that had developed a spur in the 121 MHz aviation band. We sent the unit to Progressive Concepts to see if they could do anything with it. They replaced the PA and some capacitors and sent it back to us. A quick check with it installed back at the transmitter site showed that the spur was still there, and we were smelling something burning inside the unit, so back it went.

Progressive worked on it for a while, finding that the burning smell was some insulation on the wire feeding the PA fan that had gotten pinched when the lid was reinstalled on the unit. Running the unit into a dummy load, there were no spurs being generated, which is what we were seeing in the field as well – it has to be running into the antenna before the spur would make an appearance. Still, they did some other work to see if it might help and sent the unit back.

We reinstalled it and fired it up into the antenna, and... yep... not one spur, but two, 28.65 MHz on either side of carrier. The frequency of the spurs can be changed by adding transmission line. Below about 400 watts, the spurs disappear.

I'm through throwing money at this thing, which is relegated to backup status anyway, so we set the power just below where the spurs make an appearance, and it's otherwise ready to put on the air with the push of a button, albeit at a couple of hundred watts below the licensed TPO. Still, a 30% power reduction would make very little difference in the signal within the primary coverage area, so better than being off the air altogether if we ever need to use it.

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

Hello to all from Western New York!  
Intermittent: in\*ter\*mit\*tent {adjective}: coming and going at intervals: not continuous, also: problems that drive engineers crazy! That pretty much describes the events I experienced the month of September.

It all started on Saturday the 7th when we experienced a rare power outage at the WLWZ transmitter site in Rochester. I was unable to log into anything at the transmitter site pertaining to Legends 102.7. However, our AM translator was on the air with no issues!

Ed Smith, our office manager, was kind enough to drive to the transmitter site to be my eyes and help determine what could be the issue. Upon arriving, Ed immediately reported that there were no lights in the building, but he could see that some of the racked equipment was lit and operating. I had him try and bring up the Continental 816R-2C transmitter, but after hitting filament on, only a loud buzz occurred. That told me that we were experiencing a brown-out, missing phase(s) in our incoming commercial power. Ed also noted that our neighbors (Audacy Radio) were on the air, but their standby generator was running.

Instead of waiting for power to return, and risking an issue, I decided to make the trip over and be there when power was restored. We were without commercial power for almost six hours, and luckily, no issues were noted when I was able to get everything back up and operating.

Not long afterwards, we began experiencing issues with the Omnia.6 processor that was borrowed from Buffalo. It would freeze up, and someone would have to make the trek to the transmitter site to power cycle it. This happened several times, so the next trip over to Rochester, I examined the programming and found that the Failover had somehow been activated to occur after one second of silence. The failover

option simply switches the processors input over to a second input source if the main audio signal fails. I am not sure if this change happened when we had the power outage, but I reprogrammed the system menu to deactivate the failover option (since we have only one audio feed to the transmitter site). Since that time, there have been no further issues with lost audio on Legends.

Continuing with our Rochester stations, on Monday the 9th, I installed our new Nautel VX-300 transmitter on the WDCX(AM) translator 107.1

MHz. I am really impressed with this new transmitter, and the ease of programming and operation. After I received it, I put it on the bench and pre-programmed all that I could before the actual installation, to save down time, and once hooked up, I only had to set the modulation and power output levels.



**The Nautel VX300 on the air and happy.**

All of the equipment for the translator is located in a Middle Atlantic wall-mounted rack, and after installing the new Nautel, I discovered that the

rack could not be closed completely due to the depth of the new transmitter. Additionally, there was not enough air circulation in the rack enclosure to ensure adequate cooling of the transmitter and ancillary equipment.

I have several full-sized equipment racks that I saved when we moved to Amherst from downtown Buffalo, so I loaded one of those up in my Jeep and took it to Rochester to relocate all of the translator's equipment. I will provide photos of the new installation in next month's report.

After returning to Buffalo that evening, I received a call from Earl Schillinger that the WDCX(AM) signal was down, but the FM translator was up. I called the WDCX(AM) Burk remote control to see what's up (we do not have internet at this transmitter site), and all transmitter readings were normal, indicating some sort of STL issue. Earl called back several minutes later and reported we were back on.

I knew that this issue would pop up again, and it did so late the following evening. I had Earl go to the WLGZ-FM transmitter site where the STL path originates to see if there were any visible signs of equipment failure. After talking him through several tests, everything pointed to a problem at the receive end of the STL path. I returned to Rochester and headed directly to the AM transmitter site.

Noticing no audio on the Omnia processor, I went out to tower #4, where the Moseley PCL6030 receiver is located. There, I found there were constant faults and BER faults on the DSP6000 digital decoder. I installed the spare decoder, and it immediately smoked as soon as power was applied.

Not having any other options, I had to drive back to Buffalo to find another working set of DSP6000s that I had saved from our Buffalo STL upgrade, which were stored at the WDCZ transmitter site in Hamburg. After returning to Buffalo and locating (and testing) two sets of working encoder/decoders, I wanted to return to Rochester and get them installed, but it was getting close to 2:00 AM and I did not feel that driving another 1-1/2 hours would be a wise decision, so I opted to get a few hours of sleep and tackle this at morning's light.

I returned to the WLGZ transmitter site about 7:30 AM and installed the replacement encoder, and headed off to the am tower site to replace the decoder. I installed the decoder, and it locked up immediately and we were back on the air! I decided to hang out for a while to ensure that everything was stable, and after four hours with no dropouts, I was confident that this problem was resolved.

Wouldn't you know it, I had just entered the Buffalo city limits when Earl called and reported that we were off the air again, same STL issue! I turned around and headed back to Rochester to see what could have happened. Earl was hanging out at the WLGZ transmitter site, awaiting my call, and I was returning to tower #4, where the STL receiver is located.

Once on site, I again noticed that there were excessive and constant faults on the digital decoder, and additionally, the audio meter on the Moseley PCL6030 STL receiver was pinned. Suspecting a receiver issue, I installed my spare receiver and noticed identical readings on the spare receiver. After a few minutes, the audio meter on the receiver went to 0db audio level, the DSP6000 showed signal lock and was passing audio! Normal operation lasted less than one hour, and it went off again, no lock on the decoder, and the STL receiver's audio meter pinned full scale. I was beginning to suspect that we were receiving some sort of interference from an outside source.

I called Derick Abbey, the CE of Audacy in Rochester, to see if there was any new equipment installed recently on the tower close to where our STL dish is located. He reported that there were no additions or modifications made recently on the WRMM tower, so I ruled out that possibility.

Next, I contacted the site manager of the trucking company located next door to the tower site to see if they had any two-way equipment installed recently. That would make sense, as our issue was intermittent, consistent to two-way communications, but that theory was dissolved when they reported no changes to their radio system.

The intermittent operation continued through the afternoon, and I was by then wishing I had my spectrum analyzer with me to look at the spectrum around 950 MHz.

During one of the outages, I had Earl turn off the STL transmitter while I was watching the receiver's audio level, and when the STL transmitter was shut off, the receiver level went to full quieting, indicating that the receiver was not receiving any interference from an outside source, the problem was in the STL transmitter!

I did not have a spare transmitter in Rochester, so another trip back to Buffalo and the Hamburg storage site was needed! I found a transmitter on 950 MHz, but there was no RF output when I bench tested it.

I found another transmitter that had previously been used for Birmingham's Red Mountain backup STL. It was set up for 951.500

MHz operation, so I retuned it to 950.000 MHz on the bench. Output was about four watts and appeared steady. I installed the transmitter, and as of this writing, it has been stable with no drops, or even blips heard.

The defective 950.000 MHz Moseley transmitter has been sent to Kevin Winn at Winntronics located in Solvang, CA for repair. Moseley Corporation is no longer, and Kevin's company is repairing all of the older STL equipment and has parts in stock to keep these legacy radios going.

Cris and I have been discussing options with this STL path and I will continue to explore our options on replacing this obsolete audio delivery system.

Inventory went very well this year. Earlier in the spring, I was able to get rid of a LOT of older computers and obsolete analog equipment that was replaced after the studio upgrades and move to Amherst in 2023. A lot of the older equipment was being stored at the WDCZ transmitter site, and most of it was never going to be used again, nor had any resale value, so out it went! I was glad to get rid of this junk, and clean up our inventory, making accountability of what was where, much easier.

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!

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**The Motown Update**  
by  
**Mike Kernen, CSRE**  
Chief Engineer, CBC–Detroit

**The Michigan Update**

Summer being officially over makes me sad. Summer in Michigan has always been my favorite season with all that it brings... boating, water skiing, motorcycling, rock climbing... Okay, I don't do any of that, but I do enjoy getting stung by bees, and this year, cutting down trees.

Due entirely to stubbornness and some incredibly bad decision making on my part, when my wife and I had our house constructed, I insisted on keeping the ten full growth trees on the west side of the property. The builder offered to remove them at no cost, but I loved the ambiance they created and their shade. We picked this property because of its unique feel, odd shape, and that there could never be a house directly behind us.

After nineteen years of misery caused by the trees, we finally had them removed. Their downsides had been overwhelming compared to the simple shade and atmosphere that they added. Leaves, seeds, sticks, branches, squirrels, birds, spiders, yearly trimming, roots, the threat of one falling on the house -none could be tolerated any more. For years, my wife had been running her own smear campaign against them too.



So, I'll admit, I shrugged off advice from the realtor, the builder, and my own wife, all telling me to remove them prior to construction which again, would have been free. I insisted they'd be nice; they were everything but. The property looks way better without them and I'm really loving all the extra light we get inside the house. My wife will never let me live this one down!! By the way, bids for tree removal vary wildly – always interview a few if not several arborists before hiring one.

**WRDT Twilight Authorization**

I'm happy to report that the ARC Plus has been faithfully performing the twilight power change routines I've created with the Jet flowcharts. The fact is that I've been so pleased with Jet that I've begun to convert all the simple macros I'd created over the years to Jet flowcharts. Jet makes them easier to understand when you have to review them. Something I do to verify a macro will do what I expect it to.

One thing I leverage macros for is to make certain alarms from offline transmitters are suppressed. You don't need to be alerted if the power output is zero on a transmitter you're not using. These I run at unit startup, and are called from other macros, using a condition to decide which meters and





### **The restored Austin transformer at WRDT T2.**

statuses should be active for alarms and which should be muted. Another great use of macros is to automate complex tasks i.e. pattern changes or power changes. I've created Jet macros to switch a site from one transmitter to the other, to switch sites for maintenance, even to flash the doorbell light in the control room.

### **WCHB J1000 Transmitter**

The Nautel J1000 transmitters in service at WCHB and WRDT each have a device incorporated within them called an NXLink. The NXLink is essentially a NetBurner that's been loaded with custom software to tailor it to Nautel's unique needs. It supplies a network link to the transmitter and is used in a few other Nautel products.

NXLink supplies an HTML web GUI (Nautel calls it an AUI), SNMP, and FTP (for updates) and can send email for alerting. It also supports access to event logs.

Recently, the HTML portion of one of the NXLinks started to lock up. A reboot of the entire transmitter was necessary to restore it, but it wouldn't work for very long before locking up again. The curious thing was that SNMP and FTP functionality worked normally.

Nothing I tried mitigated this problem, so the solution was to replace the NXLink, which is tucked on the underside of the transmitter, requiring its complete removal from the rack. Naturally, reprogramming it was necessary, too, but that was not too difficult nor time consuming. The new NXLink is working like it should.

### **Austin Transformer Restoration**

One of my summer goals was to have all the Austin ring transformers in Monroe at our 560 kHz four-tower array in decent shape and thoroughly re-weatherproofed. I had restored the one at tower 4 in 2022, and this year we had a complete failure of one at tower 2. That one, you may recall, required replacement and was a bit of an adventure to do because of its awkward shape, weight, and delicateness.

An Austin transformer restoration procedure is simple. Very carefully peel away any loose old wrapping and paint, then paint on a new layer of adhesive Glyptol, wrapping it with cotton cloth like a mummy, then painting the cloth. It is as messy as it sounds and takes a lot of paint. It also takes a bit of time, but looks like new once it's finished.

**News from the South**  
by  
**Todd Dixon, CBRE**  
Chief Engineer, CBC–Alabama

**Budgets and Planning**

One of the things that I really like about fall, particularly with Crawford Broadcasting Company, is the opportunity to think about what might be available in our budget in Birmingham and planning for upgrades for the next year. With that in mind, some of the things that you get are time-based, auto-renewable things like computers and other normal run of the mill capital expenditure items and they are handled in the normal budget cycle that Cris has set up.

Fortunately, we also get to clean up any equipment issues that might be a problem in our individual systems. Items that, when justified, might need to be added to our system to make it better and more reliable. One of those things that Cris has already told most of us is that we will be upgrading our automation systems from RCS Nexgen to their Zetta platform in several markets next year (<https://www.youtube.com/@rcsworks/videos> if you want to get ahead). I'm pretty excited about including this upgrade in the budget for next year.

One of the things I'm really hoping for with Zetta is that it will end up correcting the issue that we have with NexGen and our WDJC-FM ASERV dropping itself into local database mode with about a five percent chance that we will simply be off the air.

When I have spoken with some of the best techs at RCS in the past about the issue, they've always made it seem like we were the only ones having that issue. As it turns out, I have found out recently after talking with Brian Cunningham and Josh Myers in Buffalo and they are having some of those very same issues there as well. Two stations just within Crawford Broadcasting means we are likely not the only ones, and strangely, I find some comfort in that.

The reason I am optimistic about the upgrade has to do with the change at the database level in the RCS software. The programmers of Nexgen had to use a database that was available to them when it was created – and I think I am correct in saying this – the database that they chose was the Borland database. It is what was available at the time,

so no shade being thrown on RCS, but database technology has come a long way since that time. They are faster, multi-threading, and in many instances, self-healing. Zetta uses Microsoft SQL. I expect SQL to handle the data that our systems push around then network better and faster than the older database that Nexgen uses.



Pulling all of this together, one of the items I was really considering this fall as part of our planning for next year was an upgrade to a new 10 gigabit, 52-port network switch for powering our Nexgen network. The network switch that we have is the only piece of hardware that we haven't replaced,

and yet our dropping to local database issue has persisted. We've changed the ASERV computer, our file servers have been upgraded, we've done multiple network cable swaps, and the thorn still remains. That really only leaves a couple things that could be source of the issue in my mind – either it's an actual database problem or it's a network switch problem.

While I am happy to say that the problem only occurs every couple of weeks (extended from when it was happening every three or four days), the network switch has never shown any network collisions or evidence that anything is wrong with it.

What I was beginning to suspect is that our network was beginning to exceed the 1 Gb port capacity that the switch could handle. I know it sounds like a wacky idea since 1 Gb switches and network interfaces are so ubiquitous, but the truth is that network speed and technology continue to progress. 2.5, 5 and 10 Gb ports and interfaces are becoming more common every passing day.

When I began to think about it, we have 22 Nexgen workstations (including file servers), we have Cambium radios and tower sites on that same LAN segment. When Nexgen is constantly checking and building as-run folders on each machine for redundancy on control room and ASERV machines and any number of other tasks, is it really out of bounds to think that maybe our network switch was reaching its capacity?

Consider that the maximum throughput for

gigabit traffic is about 118 MBps (bytes) or 940 Mbps (bits). All of this traffic on our LAN is additive. The closer we get to those maximums, we may simply have times where the network traffic we're passing exceeds its capacity or speed requirements and we hit a stop sign in Nexgen. It happens on WDJC more, in my estimation, because it is our 24/7 music station, and its on-air workstation is hitting the database/network for more data than the other machines on the network and the random nature of the timing leads me closer to a conclusion like this.

My thought for now is that when the newer, faster database in Zetta gets on board that maybe everything will get handled more efficiently on the network side of things.

While that is my hope, a managed Cisco CBS (business class) 10 gigabit switch that would have the same number of ports as the one it would replace is \$7800 (!). It certainly would offer more network headroom on our network, but I'm willing to watch the price come down a little and see if the software upgrade will solve our problem.

Just like most complex issues like this, you continue to narrow down the possible variables until you start to run out of options for why the problem is happening. I'm hoping that changing to Zetta will bring an automatic change to better reliability and that I'm wrong about the network capacity of the switch being the bottleneck.

In October, Jack Bonds and I will be

installing several Nexgen rack workstations in our engineering room. We also have tower painting on the calendar for our directional five-tower WXJC-AM site, and we expect that that will probably take five or six days to get done. It's a big project. As always, we want to be sure that we're doing all that we can to meet or exceed what the FCC and FAA regulations require.

In a personal vein, on the evening of September 24th we were watching our 7-year-old granddaughter cheer at a game, and I freakishly broke my right thumb in a way that only Todd Dixon could! It's already taking quite a bit of getting used to, and for a lot of this article I used the Apple iPhone Notes app and dictated to it. Then I shared that file via email to myself and have only had to do the minimum of editing the resulting file. What a great find!

While I wait on my thumb to get set and a 4-6 week healing process, I always believe that God has a purpose in everything that happens to us. God's gonna teach me a lot about how He's more in control that I am. I appreciate times like that sometimes when we're really forced to think about things in a different way and forced to do things in a different way to encourage us to rely on outside of ourselves.

So with that, I pray blessings on the work of your hands (and my left hand) until we visit again next month!

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### Tales From Cousin IT

by

**Stephen Poole, CBRE, AMD**  
**CBC Corporate IT Specialist**

As I write this (insert newsy teletype sound effect), Hurricane Helena has formed in the Gulf of Mexico and should miss us. If the track pans out, it's gonna gnaw on Georgia instead. I'm planning to fly Delta through Atlanta on October 4th to attend my nephew's wedding in mid-state NC, so I'm still keeping an eye on it. May she get her mind right and weaken.

I don't really like Atlanta, but that doesn't mean I want to see anyone hurt. (Or my flight canceled.)

#### Have Some More Pi!

Todd has been using the Raspberry Pi for a few years now. He's the master of open-source

software, and he's done everything from print servers to WireGuard hosts. Cris has been coming up with all

sorts of things to do with the Raspberry Pi himself. Designed as a single-board computer with networking and graphics, along with a 40 pin I/O connector that can do everything but walk to the moon, it makes a winning combo.

I do have some suggestions if you want to move into Pi land. I invite Cris to insert anything I might have missed. The first general warning is that the pinouts can be confusing if you're writing your own

software. Like most system-on-a-chip (SOC) designs, the processors in the Pi family can have multiple





functions for each pin and each must be told how to act. But here we go ...

1. I'd stick with the Pi 3, 4 and 5 families, but have extras of each on hand. An 8-channel relay board that Cris and I are playing with won't even light up on my Raspberry Pi 5. It works fine on my 3B+.

2. Beware of Pi "clones" (i.e., supposed copies of the original). They may or may not work for a dedicated controller application. Ask Cris and Amanda how they know.

3. You'll want some HDMI and USB adapters. You'll also need Digikey or Mouser on Speed-Browse, because you'll invariably need one that you don't have on hand. Amazon is quicker, but the descriptions and photos can be misleading. Quality is iffy, as well.

4. A typical phone charger won't do for serious applications. It might work for a while, but the Pi will get thirsty for juice when it gets really busy. Raspberry recommends at least 2.5 amps. I just order the Raspberry-provided ones myself, or a Pi "kit" that includes a supply.

5. I don't normally use a case because some Pi boards can get very hot. I like to let them breathe and will add a fan if I have doubts. You'll need to mount them, though, or you could short out the board on a conductive surface.

6. Hardware: you'll want plenty of 2.5mm standoffs and screws with nuts and washers, in a number of different lengths. I also suggest some extenders for the I/O pins. Do a search for Adafruit #2223 to get an idea.

7. At a transmitter site, don't connect remote I/O directly to a pin on a microcontroller. A suggested circuit for analog input is shown in figure 1. This will divide the incoming by 2, but that's a good thing. Most analog input boards ("hats") for the Pi are limited to 3V. Adjust the resistors as needed to keep the incoming voltage in range. The ferrite works for FM, but you may need a bigger inductor for AM.

8. At the studio, a breakout board (such as the Sequent Systems SM-A-001) will give you some screw terminals for wiring. And here's a cool tip: the I/O connectors for all 40-pin Raspberry Pi boards are old-skool IDE stuff, same as what was used in older (pre-SATA) PCs for hard drives. In a pinch, you can grab an old IDE cable and cut it, then separate and strip the wires.

9. The operative phrase in all cases is BE CAREFUL. Small controllers like the Pi don't limit input voltages or currents and can easily be killed. Check everything with an ohmmeter before powering

up. Watch your wiring! If you short the 5V and 3.3V pins together, you'll instantly destroy your Pi.

10. Not only should the Pi's supply be on a UPS, Raspberry recommends that you first enter "sudo shutdown -h now" in a terminal before unplugging. This isn't a big deal for simple controller applications, but you could corrupt the SD card if the Pi is trying to write data when the power is lost.

11. Keep some spare Micro SD cards, too. Burn the OS to the card, power on and set up your Pi. When you're satisfied, shutdown, then pull and make a clone/copy of that SD card. Label it and keep it in a safe place. SD cards don't last forever.

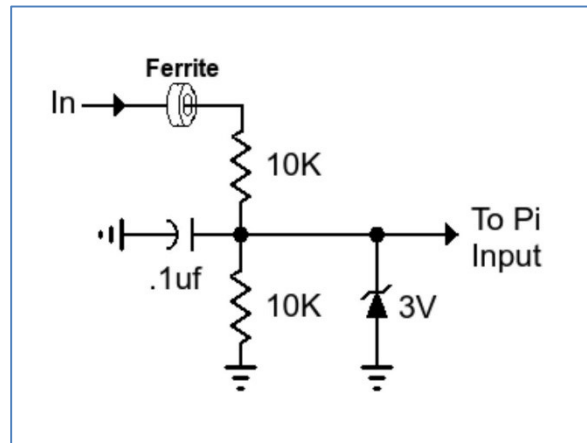


Figure 1 - Suggested protection for an analog input.

### A Well-Designed Universe

This will be something of a departure, and not every Believer agrees with what I'm gonna share here. Fine; we can disagree without being disagreeable. I'm focusing strictly on the first verse in the Bible: "In the beginning, God created the heavens and the earth." We're not even talking about the six days of Creation; from this point of view, they haven't started yet.

Non-believers have hammered us with the idea that there isn't a Creator God; certainly not the God of the Bible. Evolution and naturalism could explain our existence just fine without any help from a "book written by Bedouin shepherds." (I know, that characterization of the Scriptures is bogus; Moses and Luke, just to name two, were highly educated.)

In the mid-1990s, I frequented some forums on the old CompuServe, mostly related to religion and origins (creation vs. evolution). I had just read a mind-blowing book by Dr. Hugh Ross, a Christian astrophysicist, entitled "The Creator and The Cosmos." I went into those forums on a rampage.

(Heh.) I unintentionally blind-sided them; all they'd done before was pummel Young Earth Creationists. But I also learned a lot and ended up with a ministry specifically targeted to skeptics.

At the time, few skeptics were aware of the then-new Cosmological Fine Tuning argument. They were used to their familiar "appeals" and recycled old arguments about the fossil record, radiometric dating and the age of the Earth. As I say in the "Case for a Creator" section of my Website ([nuffzedd.com](http://nuffzedd.com)), it was a well-orchestrated dance, but with boxing gloves.

By the way, if you visit my site, be warned that it needs updating. There are some stale links. If you're a Believer, keep in mind that I wrote it for NON-believers. Skeptics. There's a flood of new info that I want to add as well. The old bromide that we live on an "ordinary planet in an ordinary solar system in an ordinary galaxy" is patently untrue. We are in a unique spot for life, starting with our location in the Laniakea Galaxy Supercluster. Our sun and solar system are remarkably unique as well. Dr. Ross covers this in his book, "Designed to the Core."

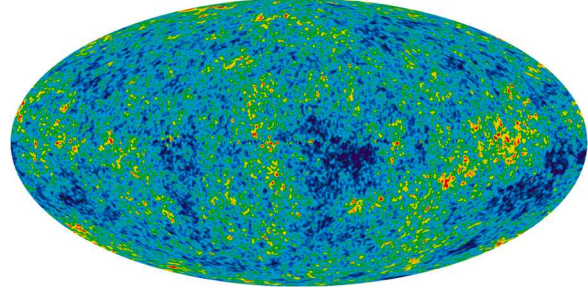
Our cosmos began about 13.8 billion years ago as a tiny and insanely hot point of pure energy (about the size of a proton and many trillions of degrees). It rapidly expanded trillions of times faster than the speed of light for a very brief time, then continued to slow and cool. As the temperature dropped, different atomic particles and forces began to appear, one at a time.

A beginning strongly implies a Creator to start with. That's obvious, but it goes far beyond that. Out of literally hundreds of examples, I'll just share my favorite: as the early universe cooled, first the hadrons (protons and neutrons) were created, in both matter and antimatter. These annihilated each other like mad, releasing pure energy as gamma rays via Einstein's famous formula, "E=MC<sup>2</sup>."

Everything that you see around you is the leftover matter – a very tiny fraction of 1%! – that survived this catastrophic annihilation. But that's not the mind-bender! A few seconds later, the electrons appeared, also both matter and antimatter. Once again, they annihilated like crazy. But the result was EXACTLY the right number to force a proton-to-electron ratio so close to unity as makes no difference.

Simply put: protons and electrons were created in two separate events, each time destroying themselves in an apocalyptic, gamma-ray producing meltdown. Yet we ended up with the same numbers of each. Since the electromagnetic force is 10<sup>36</sup> times

stronger than gravity, even a teensy-tiny difference in the proton/electron ratio would mean that galaxies and stars couldn't have formed at all.



**Figure 2 - The famous COBE 'sky map' showing the cosmic background.**

That annihilation did provide the first strong evidence for a Hot Big Bang: "echos" that started as gamma rays and have since cooled and, as the universe has continued to expand, dropped in wavelength down into the microwave region. Figure 2 is the famous Cosmic Background Explorer microwave background map. (The false colors are enhanced and are misleading; the actual difference between the bright and dark spots is less than 200 micro Kelvins.)

When I started sharing this with skeptics back in the 1990s, they wanted me to hush and leave so they could get back to pummeling the Young Earth folks. And I got it from both sides; the Young Earthers accused me of being some kind of flaming "liberal" who didn't believe the Bible! Fun times.

Nowadays, skeptics who are aware of "fine tuning" have been reduced to arguing that there must be zillions of other universes (or realms, or "worlds"), each with its own physical laws. Our cosmos is simply a "lucky roll of the dice." The problem is that this is totally unscientific. These alternate "worlds" or "realms" must be taken completely on faith, because they cannot be observed.

Dr. Ross's Website is [reasons.org](http://reasons.org) (Reasons To Believe). Another name to look up is Dr. Luke Barnes. He and Dr. Geraint Lewis have written a highly recommended book from a neutral (non-religious) point of view called, "A Fortunate Universe." Barnes is a Believer, but Lewis is not; he leans toward the multiverse. Both have a great sense of humor and it permeates the book.

That's enough! If I get started on this stuff, I can't stop. Until next time, keep praying for this nation ... fully knowing that there IS a God, He created all of this just so you could exist, He loves us and sent his Son to redeem us from our sins!

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

**NV40 Update**

As I mentioned in last month’s article, we had devastating damage done by a suspected lightning strike that took out most of the 48-volt fan circuits in the PA modules in our backup transmitter at the Burnham, Illinois site. This is a 13-year-old Nautel NV40 transmitter that has served us well over the years. The event also caused several fans and power amplifiers to go out as well.

We were in the process of repairing several of the modules to only find that as we solved one issue another would show up, being masked by the original presenting issue. So, it has been several rounds of ordering parts and making repairs and then getting another order together.

At the time of this writing, we are awaiting what we hope is the final delivery of

parts to repair the transmitter. The good news is that we only have three of the 16 PA modules to repair. This means that we are able to use the transmitter if we must and can hit our current TPO on the auxiliary antenna.

I would have to say, in my time of repairing issues in transmitters, this would have to be the most damage I have ever seen. I’ve heard some of the horror stories, and this doesn’t come to close as some of those. Still, with the number of items burnt out and the time it has taken so far to get it repaired, it was the worst damage in my experience.

I will say this: despite the number of repairs needed, none of these repairs were extremely difficult. This is due to the modularity of this well-designed transmitter that made

servicing the unit so much easier.



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

**Lesson Learned**

Sometimes the hardest lessons learned are the ones that are most important. That couldn’t be truer in the sense of what I recently learned about Wheatnet.

We have had a multicast alarm for months. It is pointing to the blade that is the route master. I’ve checked with Wheatstone support on the issue and have done a few things they recommended. Setting the default blade for the route master and then changing the other blades so they take a much lower priority in the list.

In this particular call, it was suggested to reset the multicast, basically go in the system and change the number of multicast addresses. I did this, changed it to one below what it

was set to then almost immediately put it back. This did clear the alarm at long last, but what we didn’t expect, and what Wheatstone support didn’t expect, was that action took down all four of our stations! Technically, it took down eight stations (four AM and four FM).

After discussing with Wheatstone support, we figured out I was going to have to go through each crosspoint connection and remake the connection. Even though the connections showed they were there, they clearly were not working. The multicast addresses

stored in the crosspoints were undoubtedly wrong.

I began with the connections that were our on-air signals to get those going again. I was able to



get each station to a point where it was on the air and operational. Then that evening while at home, I went through and unmade and remade each and every crosspoint in the system.

The next morning, I came in and went to each studio and tested various things. In doing this, the only thing I found in two of the rooms was that the headphones in the main control room were not working. I worked on this for over an hour! Even Wheatstone support was at a loss. Then, in came Charlie Grimes, our ops manager for KLZ and someone who has been around for much longer than I. I mentioned it to him just to give him an update, and he was all like, “Oh, well when CUE is in use, the headphones don’t work.” [Insert blank stare here.] He cleared the CUE, and guess what? The headphones began to work! I felt like an idiot. I knew about the cue thing, but it just didn’t cross my mind. It is now forever burned into my memory, though.

I am grateful for the patience of Wheatstone support and all their help through this issue. In discussing it with them, we are a rarity. The alarm issue did come back, and we found out this is actually a bug in the Navigator program, and they are working to correct it in an upcoming release.



**The full crew installing the gate opener at the KLVZ daytime site. My mom, my dad, husband Jordon and even Dad's neighbor Kevin came out to help. It was hot!**

### Telos VXs

We upgraded the on-air phone system in the KLZ control room this past month. It was the oldest system, which isn’t saying much since all four were purchased at around the same time. But the one for KLZ was in the budget for 2024.

My dad had ordered the Dell server for it

and worked with Telos to get it set up. I didn’t do a whole lot.

Once we got the system in and ready to go, I had to get the XScreen call screener program updated to the latest version. After we did that, we made test calls and tested the screener program.

The biggest complaint was that the Caller ID was putting in the wrong info for location. After watching it during one of the live shows, I realized that on every call that came in, the displayed phone number was 9XXXXXXXXXX. That 9 was the issue. We have area code 720 in Denver and that 9 made the system interpret this as a 972 number out of Dallas, so the location was displayed as “Dallas” for all 720 area calls.

After poking around a while I found where this was coming from in the Avaya system and changed it. Now, any wrong info for caller ID is just because the system cannot track a cell phone and bases the information off what the cell phone company put in. It is better than nothing, and in most cases, it will be accurate for us.

Everyone who has used this new phone system absolutely loves it. We have even heard that they may quit using Cleanfeed for certain recordings because the phone is now equally crisp and clear. I love hearing from our clients/hosts about what they think when we install new equipment.

### Upcoming

As I write this, I am busy planning a Saturday work day. Last spring, we bought a solar-powered gate opener for the KLVZ transmitter site. We haven’t had time to go out and install it as it is more than a one-person job. Since I will be in town the last weekend of September, I have decided that we will install it then. I look forward to getting it done. There isn’t much room from the gate to the road, and when we are hauling the trailer, we end up having to block the very busy county road while we unlock and open the gate. The new opener will fix that issue.

Fall is also here and it will mean some windy days in Denver, God’s way of removing the leaves from the trees. It’s always bittersweet knowing my time in the mountains on the weekends is over, but it’s also a reprieve from the constant going. I will be able to stay home weekends and enjoy my time here, getting caught up on all sorts of projects and other things.

I think that about covers it for this edition. I pray you all stay safe and well.



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The Local Oscillator  
October 2024

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**KBRT • Costa Mesa - Los Angeles, CA**  
*740 kHz/100.7 MHz, 50 kW-D/0.2 kW-N, DA-1*

**KNSN • San Diego, CA**  
*1240 kHz/103.3 MHz, 550W-U*

**KCBC • Manteca - San Francisco, CA**  
*770 kHz/94.7 MHz, 50 kW-D/4.3 kW-N, DA-2*

**KLZ • Denver, CO**  
*560 kHz/100.7 MHz, 5 kW-U, DA-1*

**KLDC • Denver, CO**  
*1220 kHz, 1 kW-D/11 W-N, ND*

**KLTT • Commerce City - Denver, CO**  
*670 kHz/95.1 MHz, 50 kW-D/1.4 kW-N, DA-2*

**KLVZ • Brighton-Denver, CO**  
*810 kHz/94.3 MHz/95.3 MHz, 2.2 kW-D/430 W-N, DA-2*

**WDCX • Rochester, NY**  
*990 kHz/107.1 MHz, 5 kW-D/2.5 kW-N, DA-2*

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

**WDCZ • Buffalo, NY**  
*950 kHz/94.1 MHz, 5 kW-U, DA-1*

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

**WCHB • Royal Oak - Detroit, MI**  
*1340 kHz/96.7 MHz, 1 kW-U, DA-D*

**WRDT • Monroe - Detroit, MI**  
*560 kHz/107.1 MHz, 500 W-D/14 W-N, DA-D*

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

**WMUZ • Taylor - Detroit, MI**  
*1200 kHz, 50 kW-D/15 kW-N, DA-2*

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

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

**WYRB • Genoa - Rockford, IL**  
*106.3 MHz, 3.8 kW/126m AAT*

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

**WYDE • Birmingham, AL**  
*1260 kHz/95.3 MHz, 5 kW-D/41W-N, ND*

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

**WXJC • Birmingham, AL**  
*850 kHz/96.9 MHz, 50 kW-D/1 kW-N, DA-2*

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



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