The Local Oscillator

The Newsletter of Crawford Broadcasting Company Corporate Engineering

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More Projects!

As we hit the middle of the second quarter, I find myself wondering where the first quarter and the whole month of April went. I started out the year with a goal of staying ahead of the calendar by getting major projects out of the way early. We did get a good number of projects done in January and February as chronicled in prior issues of these pages, but now we find ourselves looking at another wave before we've fully caught our breath from the last one.

In several markets, we are taking advantage of the FAA's latest revision of marking and lighting rules to change to dual medium-intensity white day/red night LED systems, thus eliminating the requirement to paint those towers. Used to be that we could get ten years out of a paint job back when we had real paint. The watered-down non-toxic stuff we have to use now lasts only 3-5 years, even less in areas with lots of industry with pollutants that attack the pigments in the paint.

Tower painting is expensive and a pain. We have to reduce power or go off altogether when workers are in the vicinity of radiating antennas. If we can avoid this, we're way ahead. Add to that the power savings – a 300-foot tower with one beacon level and two marker levels will consume 1,680 watts or thereabouts. Accounting for duty cycle and allowing for an average of 12 hours operation per day and you're looking at close to 400 kWH per year per tower. If you have two, three or more towers in an AM array and that really adds up.

So, between saving on the cost of painting and power consumption, you're talking about a short return on investment for these systems, assuming that they are reliable – and they had better be. We're going with top-shelf equipment with which we already have seven years of experience.

These projects are not all slam-dunks, however. More on that later.

Then we have some studio projects in the queue, one in which I will be personally involved. At KBRT, we will very shortly convert the rest of the studio facility to AOIP using Wheatstone equipment, namely an LX control surface in the control room and an E-6 surface in the remaining non-Wheatstone production room. The equipment has all been ordered and should ship by the time you read this. Amanda and I plan to make a trip out to the west coast to do the project.

Elsewhere, we have Wheatstone projects pending in Buffalo and Chicago. Our excellent engineering crews in those markets will take care of those installations.

Tower Light Monitoring

One of the really great – and really irritating – things about new LED tower light technology is that it consumes so little power that it is impossible to monitor by simply measuring AC power draw on the tower light circuit at the transmitter building. This is even more the case at AM sites where the hysteresis loss in the Austin transformers ends up consuming more power than the tower lights themselves. And these LED systems use low-voltage switching power supplies, too, which also tend to mask changes in load current back to the primary.

Because of the low power consumption – typically 50-75 watts – of the lights, fault monitoring must be done on the tower in the controller unit. Alarm contacts are provided to alert the tower owner/operator of fault conditions on the tower.

At FM sites, particularly those with the tower base located in close proximity to the transmitter building, this is a convenient and easy transition. Simply connect the fault alarm contacts to

a remote control status channel of the remote control (with appropriate lightning/surge suppression) and you're off to the races. FM sites with towers located some distance from the transmitter building may require some buffering of this closure, perhaps a relay. Still, it's no big issue to monitor LED systems at such sites.

The KLZ transmitter site. Note the two tall (450-ft.) towers, four short (200-ft.) towers, and the above-ground line supports to the two tall towers.

AM sites, however, are a horse of an entirely different color. We have to not only get the fault closure across the base insulator, but we also have to get it back to the transmitter building, which may be hundreds of feet distant from the tower base.

I have put together a simple circuit using a fiber-optic transmitter and a few other components on one end and a fiber-optic receiver and opto-isolator on the other end that does a good job of getting the closure across the tower base. We had a stack of custom printed circuit boards made and I built up the little devices, one of which (the transmitter) goes inside the controller box; the other (the receiver) goes off the tower somewhere. We put the 1 mm fiber in all-PVC liquid-tight flexible conduit between the controller box and ATU, tuning house or whatever enclosure houses the fiber receiver.

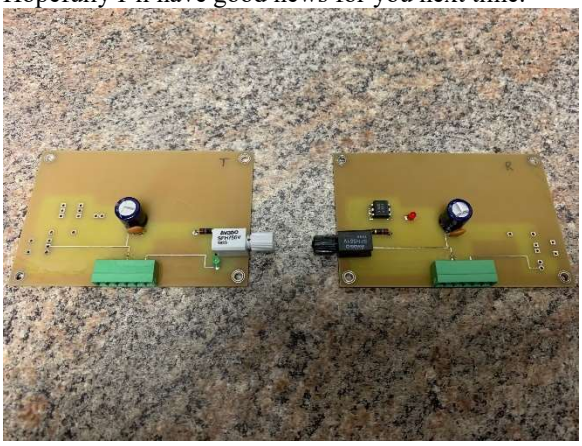
If we have a spare pair (or even a spare wire) in the control wiring at a tower base, we're golden, but what happens when we don't? We have a couple of choices. One is wireless, using a 400 or 900 MHz wireless alarm contact transmitter/receiver to get the signal back to the transmitter building. I've done that in the past with results that weren't all that great. We got lots of false alarms from interference on the wireless frequencies.

The other choice is to run a new and separate monitor wire from the tower base back to the transmitter building. Depending on the situation, we might have to trench this in underground in conduit, or we might fly it above ground along with transmission and sample lines. In the latter case, we will likely have a bunch of RFI to get rid of on the wire before we can safely tie it into our remote control system.

This is exactly the situation we find ourselves in at KLZ in Denver. Two towers some 400 feet from the transmitter building. Trenching in underground would involve cutting ground radials for several of the collocated KLVZ (810) night towers and possibly getting into their transmission/sample lines as well. Or we could run a new wire above ground using the existing (but no longer used except for AC power) support poles, messenger cables and conduits.

It occurred to me, as I was shopping for a jacketed, shielded, UV-rated two-conductor 18-guage cable for this application that we might run fiber from the tower all the way back to the building, placing the receiver right in the equipment rack. That would be an elegant, zero-RFI solution if it works, and that depends on the amount of loss in the fiber.

I've ordered a spool of fiber and will bench test it before we go to all the trouble of pulling it in and affixing it every few feet to the power conduit. Hopefully I'll have good news for you next time.



Home brew fiber-optic transmitter (left) and receiver (right). I printed boards that will work for either, so just stuff them with components for the desired use. Total cost: less than $50 for a set.

Unintended Consequences

We tend to use Denver as a test facility for new equipment and technology. That gives me a chance to get a firsthand look at equipment and

systems and get thoroughly familiar with it before we start installing it in outlying markets.

Last month, we took delivery on a stack of Eventide BD600W+ profanity delays. This was a budgeted purchase to replace the no-longer-supported BD500 delays that we have used so successfully for years. The "W" in the model nomenclature signifies WheatNet enabled, which means that we can plug the delays directly into our WheatNet system, route audio to/from the units and route dump and other logic functions as well, no AES or outboard remote control needed.

While there's nothing difficult or out of the ordinary with a profanity delay, this would represent a change in audio chain architecture, and Amanda and I had to do some thinking to figure out what we were going to do. It turned out to be simple – and not simple. You can read more about our adventures in Amanda's column later in this issue.

The great news is that we were able to get the new units installed and integrated, using WheatNet to route audio and remote control. The rear panel connections were limited to AC power and WheatNet. And without the conversion from AOIP to AES and back, we simplified our air audio chain.

This is one more step toward making our facility all AOIP. We have a couple more years left on our Wheatstone TDM system, and when we do make the move, we won't have to mess with our profanity delays, since they're already in the AOIP world.

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

Hello to all from Western New York!

The FM translator for WDCX(AM) in Rochester is finally on the air! After weather conditions forced us to reschedule the installation on Friday the 12th of April, the crew from Patriot Tower completed the installation of the new antenna/feed-line on the tower on which we rent space that belongs to American Tower Corporation on Monday, April 22nd.

All went well, except for the fact that the ½-inch feed-line was 24 feet short! I had almost 28 feet of Andrew feed-line left over from the Buffalo installation last fall, which I saved, so I only had to order a male and female connector to get the job completed.

On Thursday the 25th, I returned to Rochester and completed the installation of the coax. Cris then immediately filed the FCC license application, giving me the go ahead to power up the new FM on 107.1 MHz.

The coverage appears to be very solid throughout the city of Rochester, along with a very good signal east and west of the transmitter site. The beginning of May, I will be able to devote more time and travel north and south of the city to check coverage in those areas. I suspect that I will find that our signal will be pretty close to the predicted contours that Cris had plotted several months ago.

I was a bit concerned about an oldies station on 107.1 located across the lake in southern Ontario that I was able to receive while traveling the New York State Thruway several months ago, but it appears that they are not an issue, especially throughout the more heavily populated areas of the city. By next month, I will be able to give a more detailed reception report and analysis of how well the antenna is performing.

We are creatures of habit, and one of my rituals while performing maintenance at my transmitter sites is to run the auxiliary transmitters into the dummy load monthly to insure proper operation in the event of a failure of the main transmitter.

In late April, while performing my monthly check of the WDCZ(AM) Harris MW-5 transmitter, it would not power-up beyond filament on. Thinking that there was an issue in the control ladder, I pulled out the schematics and began tracing out the circuits to see where the issue could lie.

After what seemed like hours, I was still not able to energize the plate on circuit. I had checked virtually every component and found nothing amiss. I then decided to trace out the wiring to see if there was perhaps a burnt/broken wire somewhere. I carefully removed the wiring harnessing and traced each wire from its connection, point-to-point.

After another hour or two, I discovered the issue that was keeping the plate circuit from being energized: one of the wires that went to the coil of the plate contactor was not soldered onto the coil lug! The wire was wrapped several times around the eye of the lug, but had never been soldered!

I recall the previous engineer stating that this transmitter would randomly shut the plate down, and they never could identify the cause of the problem. Amazing that this had gone undetected since the transmitter was installed in the late 70's!

So I cleaned the lug with alcohol, trimmed back the installation on the wire and soldered it securely to the coil. Next try, the transmitter came up without incident. If I had not checked the transmitter's operation, it could have been a disaster some point down the road if the main went down and we went to use the auxiliary and it would not come on. To me, there is nothing worse than hearing silence on the frequency!

Hopefully at some point in the next few weeks, I will receive the parts needed from Nautel to begin the frequency change on our recently-acquired Nautel ND5 transmitter, to be used as an auxiliary at WDCX(AM) in Rochester. Initial estimation from

The WDCX(AM) 107.1 MHz translator antenna, assembled and ready to hoist.

Nautel was mid-May for the parts to be shipped. I understand that we're waiting on the crystal for the new frequency.

It seems like winter is never going to go away! We are still experiencing days with temperatures at or near freezing, with sleet/snow at times. I have numerous outdoor projects I would like to begin, but warmer temperatures must prevail before I can begin most of them. We were hoping for an early, dry spring to get a head start on many of these projects, but mother nature has other plans. I hate having to wait for the weather to finally turn the corner. The winters are long enough in western New York!

That about wraps it up for another month here in the great northeast, so until we meet again in these pages, be well, and happy engineering!

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

Greetings from Motown! We have been busy updating our Nexgen systems to Windows 10 over the last few weeks. I held off this conversion for a while to make sure issues were worked out.

A lot of consideration has been given to testing and making sure that we wouldn't interrupt programming or operations. We set up a testing area to allow for each system to be upgraded and tested prior to them going back into production. We cloned each system prior to upgrade to allow for a fallback plan. With the help of RCS and their tweak tool, we were able to successfully update all of our machines without issue.

The testing allowed us to find an issue with the video card we were using. It did not have a Win10 driver, but there were several people that had installed the Win7 driver with success. We did test the driver and found that it would load and seemed like it was going to work. We discovered that changing the display resolution would cause a blue screen. We were able to repeat the issue. After changing the video card to a Win10 certified card, the issue was resolved. Everything has been running great since we completed the installation.

We plan on doing some updates to our studios this month. The carpet has been in need of replacement for quite some time. Now that we have a carpet vendor and approval, we plan on dismantling the WCHB and the WRDT studios to allow for the carpet to be installed properly, to clean the cabinetry, and to rewire.

When we did this in the WMUZ control room, it was a great opportunity to thin out the old analog wiring that was no longer needed. For troubleshooting purposes, it is a lot nicer to work with clearly labeled cables that are easy to trace and identify.

We have been working on storm preparation. Looking into small things like having fresh batteries in flashlights, and big things like having good batteries in UPS systems and in our generators. I always try and take a “what if” outlook on things.

What if we would lose both links to our transmitter. In this case, we have installed HD receivers and could use our HD multicast channels to feed the transmitter.

With more facilities going to AOIP using blades or nodes for audio distribution, it is a good idea to think through what would happen if you would lose a large part of your studio infrastructure. Our studios are located right next to our tower. Even though we have taken precautions to minimize damage due to lightning, we have had surfaces and cards effected by it in the past.

If it is an absolute failure, it is a good idea to store programming on an SD card. They are small, portable and could be used in a number of devices to play audio. One of the great features of the Omnia 9 processor is file-based playback. You can send files via FTP to your processor and play them in a failure.

I have a great story that happened to me around 15 years ago. I worked as a CE at a large TV station. The company decided to move the transmitter operations to a new building at another area on the property. The original installation was served by the utility with two separate feeds from the grid. The new installation was wired with only one feed. I had asked why and was told that they NEVER lost power on the main feed. They did not have a generator either.

Well... a few months after the new transmitter installation was completed, the power went out. Power was available on the other feed and was powering the studios. This station had a local news operation, and the outage happened in the middle of the live coverage. After this happened, they invested in a Caterpillar generator.

My point is to never say things can't happen. They can, and when they do it’s better to be in a position to have options then to figure it out during a crisis.

Even if you have a generator and exercise and check it regularly, issues can still come up. Between tests the temperature could change, causing

a perfectly good battery to fail. I have had this happen. It's good to have a set of jumper cables available just in case.

Most problems tend to happen overnight, or at times when stores are closed. For areas that can flood, have a wet-dry vacuum and a sump pump to get water out quickly.

I wanted to give an update on my motorhome. It has been running great, and other than maintenance, has served me well so far. Hamvention is around the corner and will be the next long journey for the Lesharo. If you are going and would like to meet, send me an email at bkerkan@gmail.com.

Until next month, 73 from Brian, W8FP!

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

Another month has passed, complete with the usual severe storms. You may have seen national coverage of the tornadoes that munched on parts of Mississippi and Alabama, tragically killing a number of people. None of the twisters directly threatened us, though we certainly felt the effects of the storms themselves.

The 101.1 FM transmitter site in Cullman lost power during one of the storms in early April, and we had a time getting Cullman EMC to the correct site. They're a great Membership Cooperative, and we've had a good relationship with them in the past, but they have apparently been sold to a larger company. As often happens, records can become mixed up during the transition.

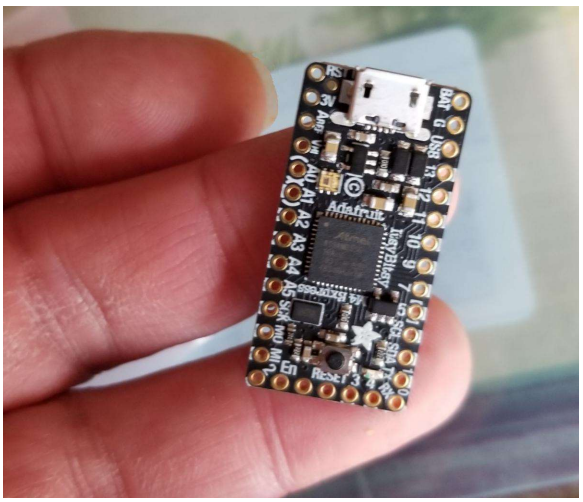


Figure 1 - Adafruit's ItsyBitsy Arduino-style controller.

Under the old management, we could call in a power outage and the nice lady at the other end of the line would say, "Oh yeah, y'all have that big tower near Good Hope." They knew us and their line crews knew us. But this time, they had the wrong address and I had to carefully explain how to get to the site. To their credit, they made it and restored power before we ran the generator dry. Todd called their office the next business day and got everything straight with them regarding address and contact info.

(One tense moment came when the representative told us that we'd been disconnected for non-payment. That's when we *knew* they had the wrong address. Todd got that straightened out, too.)

A couple of weeks later, the generator came on again. Our remote control sent some confusing messages, but I immediately went in for a look. The Relio showed that we had power, so I figured we were good. The generator came on again a few minutes later (I think – like I said, the messages were confusing), and this time, it ran until it was out of fuel. We were dead off the air around 11 PM. I drove to Cullman to determine what was going on.

I can normally see the tower lights many miles from the site, but now all was darkness. There were no storms that evening, so I was puzzled. When I arrived, sure enough, the site was dead. Thanks to Todd, this time, the rep at the call-in number knew about us, knew where we were and was ready to dispatch a crew. I didn't see anything wrong on the pole, but then, it was dark (around midnight) and let's face it, I ain't a utility lineman. When the real lineman arrived, he circled the pole a few times with his flashlight and pointed out the issue. One phase

had burned off of one of the three transformers. Within an hour, it was fixed, and we were back on air.

Once again, Todd and Jack stepped in while I took a vacation day to care for my mother. The generator was refueled, and Todd re-primed it so that it would crank. That's a messy job, so I won't say anything like, "Better him than me!" (But I will think it – and thank him.)

At any rate, setting up this rest of this article: failures like these in the recent past, and the potential for an even more costly failure at the WDJC site on Red Mountain in Birmingham, have caused me to do some thinking and building.

Microcontrollers

I know there are differences between "Single Board Computers" (SBCs), MPUs and all that other stuff. But since I'm a grumpy old dinosaur, I'll just call them "microcontrollers." I look at what they do and try to use them accordingly. But, as I mentioned last time, the latest crop of mini-controllers and micro-computers is pretty amazing. They have built-in I/O and can be programmed quite easily in C/C++ or Python. The Raspberry Pi is a complete computer that can run Raspbian, a derivative of Debian Linux.

The biggest question is a practical one. Todd, Jack and I are very careful with Mr. Crawford's money. Included in that is my time. If it takes me several hours to do something, even working in the evenings and on weekends, I'd better be able to justify that against the cost of an equivalent, ready-to-go device from a broadcast vendor. But keeping us on air legally is top priority. Being off the air, or paying fines for illegal operation, are expensive things, so that factors in as well.

Fortunately, in this case, I have a lot of experience with embedded and micro control. If things had turned out differently in my life, I'd probably be working for a large company that makes things. As it happens, I'm very glad (and blessed) to be where I am, but I do have that experience. I can design and build a little custom solution pretty quickly, so in many cases, it *is* cost-effective.

Why would you use a microcontroller like the Adafruit ItsyBitsy (Figure 1)? There are any number of reasons; here's one: Most of our equipment expects a *momentary* closure for remote control. The old BE FM-30 series, in fact, will actually disable the remote control inputs if you leave one tied low for too long. You have to drive to the site and manually fix the issue. (Ask me how I know this.)

But most alarm conditions are *not* momentary. They can last from many minutes to several days. Loss of utility power is a prime example. These can last for many hours, but we need a way to provide a momentary closure to send an alert, lower transmitter power, whatever.

In the past, you might do this with your site remote control itself, but I've found over the years that this isn't 100% reliable. (Again: ask me how I know this.) I freely admit that I may have misunderstood the horrible documentation for the Relio controller that we're using at 101 in Cullman, but it appears that it just sends email when it can and when it wants to. If it can't or won't, it queues the alert for later.

Enter more hilarity. If we've had a power glitch or a rain fade, *at that moment*, the data link to Birmingham may be down. The Relio is on a good UPS, of course, but if there's no link, it can't send. Once the link returns, the Relio won't reliably send the queued email. It appears to wait until the next alarm event occurs. The net result is an email that says, in essence, "By the way, we lost power last night and it just came back on." Better yet, the email will often contain a jumble of alerts that aren't in chronological order.

But back to translating a sustained event into a momentary closure. A pair of relays could be used; I've done this before. Relay #1 lowers the power, then relay #2 opens relay #1 once the transmitter emits a status signal that indicates that the mission has been accomplished. That's two relays and a few solid-state devices to translate the low power status output to drive that second relay. A microcontroller can not only send email (and keep trying until it is, in fact, sent!), it can do the momentary switching less expensively and with much better control – including several re-tries of the command. In C-style pseudo code:

```
int been_done = 0;
if( input shows a problem )
{
 if( been_done == 0 )
  {
   lower_power();
 if( at_low_power )
      been_done = 1;
 delay(1000);
  }
}
```

Not continuously sending the "lower power" command is important with the Nautel NX series, because they actually go off air for a moment during the switch. But a tiny little Arduino-type controller

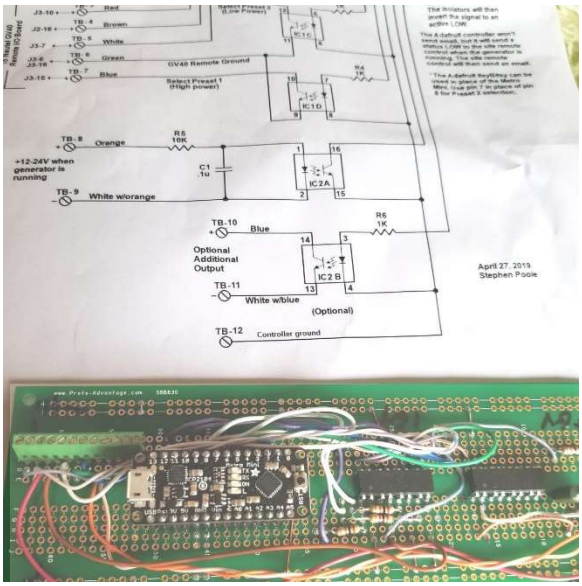


Figure 2 - The Adafruit Metro Mini runs this controller for 101.1 FM.

can easily handle this for you, and with greater flexibility. You could add a timeout ("check or try this x number of times"). You can watch for different conditions and use finer control. The key difference between this and using a remote control like the Burk ARCPlus is that *you* make the rules. Plus, speaking from experience, it's *much* easier to write a controller program that can check power level, react to alarm conditions, and etc., etc., than it is to program a typical remote control system.

(And trying to do something like that on the Relio is an exercise in frustration, believe me. They win the award for the most uselessly-complicated "scripting" language in the business, in my opinion.)

The drawback, of course, is that you need to know how to program, but the Raspberry Pi and Arduino folks have got you covered there. A host of inexpensive books, online courses and "how to" videos are available online. As a long-time C/C++ programmer, I was a little apprehensive about using Python on the Raspberry controller for WDJC-FM (101.1, WXJC-FM, uses Arduino), but I picked it up and was programming like a boss the first evening. Besides, I'm not writing a complex program; it's a simple, "if this, do that" type of thing.

The 101 Controller

The two sites that most needed this were 101.1 WXJC-FM and 93.7 WDJC-FM. These are our two 100 kW stations. The WDJC-FM site is also the "hub" for everything in Alabama, with STLs shooting all over the place to our other sites. I actually did a rudimentary "send email" controller at WDJC-FM first, but then moved to 101, which I'll discuss here.

The biggest reason for doing this, whether with the site remote control or an Arduino, is simple: after severe storms, *the site will be inaccessible.* This has happened to us many times. If the damage comes at night while we're asleep, the generator could easily burn a half a tank of diesel before we're able to even walk up to the site (much less drive). By lowering power until we can access the site, we can dramatically reduce the fuel usage, greatly extending the run time.

For 101.1 WXJC-FM, I chose a miniature Arduino type. Adafruit makes several splendid little

```
101control
// Generator monitor program for the Nautel GV40 transmitter
// at WXJC FM (101.1) in Cullman, AL.

// Preset 1 is high power, Preset 2 is low power.
void SwitchToPreset1( void );
void SwitchToPreset2( void );
void NotifySiteControl( bool tf );

const int selectPst1 = 8;   // Output: Select GV40 Preset 1
                            //     (pin 7 on the ItsyBitsy)
const int selectPst2 = 9;   // Output: Select GV40 Preset 2
const int pst2sel = 10;     // Input:  GV40 Preset 2 Status
const int genRunning = 11;  // Input:  Generator running
const int notifySite = 12;  // Output: to remote control
const int ledPin =  13;     // the on-board LED

void setup() {
  pinMode(selectPst1, OUTPUT);
  pinMode(selectPst2, OUTPUT);
  pinMode(pst2sel, INPUT_PULLUP);
  pinMode(genRunning, INPUT_PULLUP);
  pinMode(notifySite, OUTPUT);
  pinMode(ledPin, OUTPUT);

  // Make sure all outputs are low.
  digitalWrite(selectPst1, LOW);
  digitalWrite(selectPst2, LOW);
  digitalWrite(notifySite, LOW);
  digitalWrite(ledPin, LOW);
}

// If the generator is running, we switch to preset 2 (low
// power) on the Nautel GV40 after a 10 minute timeout.
```

Figure 3 - A portion of the C program for the Metro Mini.

rascals for this. Figure 1 shows their ItsyBitsy and Figure 2 shows the finished WXJC-FM controller using their Metro Mini. Both are available for less than $15 and feature a bunch of input/output pins (you can assign them as you wish), serial communications and even analog-to-digital inputs. For this controller, I used opto-isolators to protect both the Nautel and the Metro Mini and programmed it in C (Figure 3). Made me feel right at home.

Are they reliable? Of course, only time will tell, but I'll say this: I know that Ed Dulaney tried something out in Denver many years ago, using a plug-in card in a standard desktop computer, that wasn't really satisfactory. But I've been pleasantly surprised so far. I've made mistakes, like accidentally shorting a pin, and they've taken it in stride. They're not very sensitive to RF interference. They can easily

provide enough current turn on an LED in an isolator, or to drive a transistor base. They seem to be pretty rugged, unlike some of the stuff I've used in the past.

WDJC-FM's Controller

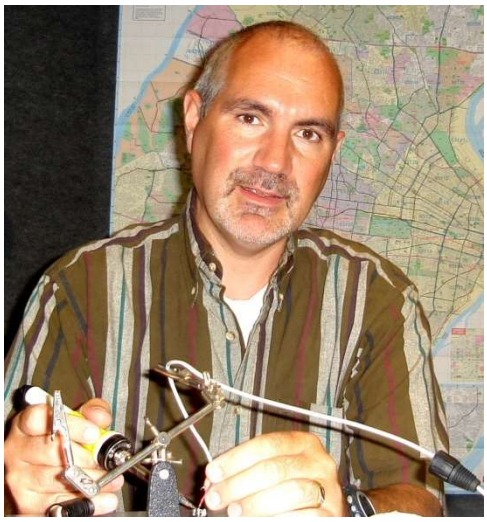
Because the WDJC-FM site is so important to all our operations, I elected to use the Raspberry Pi up there. As already mentioned, this is actually a full-blown computer. It can send email, we can go in remotely with SSH or VNC, you name it. Perhaps I'll post some pictures in a future issue.

Finally, when we do something like this, we have to *document it*. I always draw a complete schematic and write up at least brief description. In this specific case, I include the source code (Figure 3). Copies are kept at the studios and at each transmitter site, with electronic copies elsewhere as needed. Having to work behind modified and butchered stuff in my earlier career in contract engineering cured me. I'll be kind to my successor.

Until next time, keep praying for this nation!

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

Does broadcast engineering get in the way of life? Or, does life get in the way of broadcast engineering? I guess each of us has our own view on that question, and it may change in the given moment. Every broadcast engineer will go through the challenges of trying to handle the inevitable emergencies with the necessities of your personal life.



I recently had one of those situations. I was just getting ready to sit down to an over three-hour dental appointment when the program director for our Rockford station called to tell me he heard the station audio dropping out. I knew that it was most likely the T1 lines to the transmitter site, which is over 100 miles from our studio.

We have redundant T1 lines that carry the station audio to the site. That sounds great, but both of them can and will have issues at the same time. This was probably the case. Make your dental jokes here, but I was sincere when I told the PD, "I would rather be working that problem than where I am at this moment." Knowing that I badly needed the dental work, I called Brian Bonds, our chief engineer, and asked him to call the phone company to report the issue.

The dentist came in and numbed my mouth for the three procedures. While waiting to get numb, I got on my phone and checked the emails, hundreds of them, as we had three audio feeds with the main station and also the audio for HD2 and HD3. Add in that we have six audio codecs for all of this, each sending its own emails reporting they had disconnection issues. Oh, and I almost forgot that the remote control was also sending emails whenever it would switch between the T1 audio and our backup Internet feed. That's a lot of emails.

I may have had a numb mouth, but I could still figure out that the T1 lines were going up and down, what the phone company techs like to call "bouncing." I also could be a hundred miles away and not able to hear the signal and know this was an issue despite having the Internet feed backing up the T1 audio.

We use the Broadcast Tools AES Silence Detector/Switcher to automatically handle the audio failover at the Rockford site. Once we have ten seconds of silence on the T1 feeds, it switches to the Internet backup feed. In order to prevent bouncing with the lines, the switcher has to see 90 seconds of solid audio on the T1 lines before switching back to them. Despite this arrangement, we were still getting the "bounce" effect on air due to the fact that the T1 lines were good for about two minutes and then would drop out for about a minute.

Without being able to listen but interpreting what I saw wading the through the hundreds of emails, I knew that we were going silent for ten seconds about every 2-½ minutes. The station had nearly as many cavities as my mouth!

So, while the dentist was off numbing some other patient, I grabbed my phone to call Brian again. Now at this point, one side of my mouth was working fine, and the other side was drooping to my shoulder. I think there may have been some cotton balls in there too, but that just might have been the way it felt. Thick tongue and all, I managed to somehow get Brian to understand my request to pull the audio cable out of the main audio codec in the rack room.

Since our automatic switching was set up to switch on silence, the effect of pulling the audio from the T1 feed caused the bouncing to stop on air. Once we knew the T1 lines were stable, we could put the audio cable back in the main codec and wait for the Broadcast Tools switcher to restore normal operation. In the meantime, we would run on the Internet backup feed.

There was a slicker way of doing this. We could log into the audio codec's configuration web page and switch the input from the digital input to the analog input. Since there was no audio on the analog input, it would have the same effect. However, with half a mouth, it was a lot easier to say, "Pull the audio cable." I might add that you might want to be careful using the word "pull" while sitting in a dental chair.

By the time I finished with the dental appointment some 3-½ hours later, the T1 lines had settled down. I somehow had managed, with the help of my staff, to get through a dental appointment involving fillings in two teeth and a third tooth being bored and a titanium pole installed for a root canal, while managing T1 issues.

What's worse than T1 problems? Having T1 problems during a three-hour dental appointment. Or should it be, what's worse than a three-hour dental appointment? Having a three-hour dental appointment while having T1 problems. Or perhaps that time when I was at the DMV and having transmitter issues.

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

No witty references to songs on the radio this month. After another snowy winter, we are seeing better weather. With the weather comes all the repairs and activity preparing for summer.

So, there I was, at the KKPZ driveway with the dream of spring flowers and warm days… or was that a hallucination? I press the button… ring-ring… and I learn the electric gate opener isn't working. Fortunately, the gate was open when the gate operator stopped working.

To make a long story short, the problem was a small circuit board called a service pack, which was added to comply with closing safety requirements. Although the gate operator will work mechanically for years, the board is needed for it to work. For want of a nail is an old saying that applies. Doubly so as this model is not made any longer and the service pack board is no longer available as a new part.

After some searching, we were able to find a working used board. That got the gate working for the short term. Although the gate operator has many years of mechanical life left, I kept the old board for potential repair. Inspection of the old board supported the conclusion of moisture damage as a problem. I am working on cleaning up and repairing the old board as a spare.

The end of sales life does bring up a problem with the "modern" electronics industry. Today's automated surface mount technology has driven manufacturing costs lower. With many products, the cost to ship a new device off the assembly line is lower than stocking spare parts and providing a repair manual. We are seeing this with most broadcast electronics these days, and the trend is now moving into the industrial sector.

At KKPZ, we have completed this year's

FCC-required occupied bandwidth measurements. This year, we were again dealing with weather constraints. Weather has an impact in more than one way. Over the years, the measured harmonic and mix products between 1330 and 1640 have been growing. With all the nearby towers, I suspect this is caused by passive intermodulation sources. I have seen this with VHF land mobile frequencies at Mt. Scott as well. Ah well, guess it's time to go looking and DFing again. Since many of the mixes have a 60 Hertz hum component, I will be using one of my trusty adjustment tools, a.k.a. a big hammer. Whack on a power pole. If the problem goes away, that's the location.

It's spring cleaning time again, and that applies to computers as well. We had one that was running slow. I traced that to a multi-gigabyte hard drive with 10 Megabytes of free space. It's fun when the computer responds that there is not enough space to delete a file!

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

New HVAC

We finally got a new HVAC system at the KLTT transmitter site. The old one had begun to give us grief. In recent years, nearly every 90-degree day, it seems something would go wrong and it would quit cooling. We bid it out last year and decided to replace the old, unused HVAC that was on the roof and keep the current unit as a ready spare. That old, unused one used to be our spare, but years ago, a hailstorm destroyed the condenser coil (it had no hail guards), and it was done for. They took that unit off and replaced it with a new one. The installation went fairly well, with only a few minor issues that were easily fixed.

While the mechanical contractor was out there working, a guy drove up in a flatbed wrecker with a skid loader on it. I guess he mistook our address for where he needed to be to deliver the skid loader for a local rental yard. The guys working on the HVAC unit told him the address, and when he figured out he was lost, he proceeded to try to turn around in the front yard of the transmitter building.

KLTT has never been a site at which we would worry about getting stuck, at least not up by the building – we have a nice driveway comprised of road base that has been around probably since we built the site over 20 years ago. It had been raining periodically before the day the work was to be done, so the ground on either side of the driveway was a bit soft – not really muddy, but wet, soft sand. It was clearly not so soft that the crane used to deal with the old and new A/C units would get stuck… but somehow it was soft enough for this equipment rental delivery driver to get stuck. He buried his truck up to the frame.

To say I was irritated was an understatement. This guy could have easily backed out of our site, staying on the drive to avoid getting stuck. I am very grateful for our cameras we recently installed at the site. Had it not been for them, we may not have known about this and would have come out another day to our road and yard being all torn up. With the camera, we were able to see a logo with the name of the company he was driving for and immediately get on the phone with their dispatcher. They were able to relay the message the driver to stop trying to get out and making things worse. They also sent a wrecker out to pull him out.

In the process of trying to get unstuck, he unloaded his skid loader and tried to use that itty bitty thing to pull his big truck out. He only made the road worse, destroying our nice driveway. I headed to the site to monitor the situation and to make sure he fixed the road as he said he would. Once the wrecker pulled him out, he did bring his machine onto the property and worked hard to get things looking good. The problem was, the road base was buried, making our drive super soft. Soft enough that even I didn't feel good driving on it in my 4Runner.

My dad spoke to the rental company some more, and they were more than willing to make it

right, sending someone out the next day with another skid loader. They had two loads of road base delivered, and we now have a beautiful driveway. The guy spent all day at the site working on the driveway, making it good and rut free. You can't even tell a truck had ever gotten stuck at the site. We are very appreciative for that company being willing to make things right. They could have easily ignored the situation, despite the video evidence, and left the mess for weeks for us to deal with.

Site Visits at KLZ

I know that years ago, Mr. Crawford would require site visits for employees. This was an important thing, as it got the station personnel to the site to be able to see and get a basic understanding of how things worked. Those stopped at some point before I became an engineer, as I do not recall doing a site visit in my 17 years at Crawford Broadcasting. With the installation of the new NX-5 transmitter, I decided it was time. We used the opportunity of being out there several days to get things cleaned up. Not that the place was trashed, but let's face it, it probably wasn't as clean as it could have been. Keith did a great job getting the site ready, and I did several site visits in order to be able to get all station personnel to the site to see how things work. I do think they enjoyed it as well. They may not understand things 100% but they have a basic understanding of how things work, and they were able to see a bit of what we deal with on a daily basis to help keep the station up and running.

I do have plans to get each site back in pristine shape, looking better than great, and having the station personnel for each one out to see how their transmitter site works. Next up will be KLTT. There's a lot out there to do, however, and a lot of it is actually at the tower bases. The ATU's are in need of repair: new locks, new door seals, and a good cleaning. We are still in the season where it is sunny and 70 degrees one day and rainy/snowy and in the 40s the next day. Once we have some steady warmth along with a bit of dry weather, I plan on beginning this work.

PTZ Repair

One of our new PTZ cameras at the KLZ site was not working properly. After a while of running, the auto focus feature would stop. I'd check the site and notice I could not see the towers – the image would be blurry. I was able to log in to the camera itself and tell it to reinitialize the lens, and that would fix the issue for a while. I finally got tired of this, as the other two PTZ's we have do not suffer from this issue.

We found out the repair company we were going to have to send this to was actually mere minutes away from the site. We drove it there, described the issue and that evening I got notification they fixed it. Turns out there was something loose inside the lens. They could not say what, as they couldn't get to it, but the lens was focusing. It was just focusing on the wrong thing. They replaced the lens, and all has been working since. It was great having this company close, as it allowed us to only be down for one day.

Computers

Being an engineer at Crawford Broadcasting Company also means doing the IT work for the facility. This means dealing with all the computers, office and engineering. One thing we all have learned is not everyone should use technology. For whatever reason, their computers always have an issue and there is no clear reason why. Perhaps they just looked at the computer wrong and it got offended. It is this type of thing that irritates me the most about computers.

I was recently tasked with replacing two traffic computers, along with setting up a brand new one for a new employee. Not a big deal, right? I even purchased an image copying program to make things easier so that I could copy the programs over without having to reinstall each and every one.

On one computer, this went quickly and easily. On the second one, it went horribly wrong. I still cannot tell you what happened. All I know is it seemed to be working, then it wasn't, then the computer finally quit booting up. I returned it to Micro Center and got a different one.

This time, to rule out that program I used, I did everything fresh. Things worked great. I installed the computer and a short time later, I was told the person could not print or export the logs, which is a wee bit important, so each station knows what to play. I put her old computer back in and brought the new one to my office where I continued to work on it.

Marketron worked on it, and eventually, they were able to get it to print and export. YAY! Then a week later, the program quit working. Out of the blue, every time it would open, once you tried to do anything, it would freeze and eventually crash. Once again, I put the old computer back in and brought the new one to my office and continued working with Marketron. They decided they wanted me to do a fresh install of windows. Dell no longer includes media for this, but Windows 10 does have a reset option, which I used. I chose not to install any

program other than the Marketron stuff so as to rule out another program causing the issues. After a couple days, they were able to get things working again. I have no clue how, but all I know is the computer has been running fairly smoothly ever since.

Remember how I said some people should not use technology because trouble follows them? I never set a login on this computer, mainly to make it easier on me when working on it so I would not have to log in after each reboot. One day, while working on another project, this person came to me and lets me know she cannot log in. Odd. I go to look and found that somehow, the password got set (the user swears she didn't do it). I tried all the ones I could think of, to no avail. Thankfully, Marketron, in their troubleshooting, created a separate login that was an admin. I called and was able to figure out that password, so I was able to then go in and reset the other password. I also learned I need to go back to making sure I have a way into each computer. I plan on going to each one and adding myself in hopes of preventing this issue again.

Eventide BD600W+ Delay

We replaced our old BD500s (and one BD600) with brand new Eventide BD600W+ profanity delays. These news ones are WheatNet enabled (hence the W in the model number). I am so eager to get Denver to all WheatNet. It is a slow process, but any time we get new equipment that I can easily plug into the WheatNet side, and get rid of the old AES or analog cabling, I am happy.

Installing the new units was actually very easy. We had to rework the source of our pre-delay feed (which is whence we derive a processed, undelayed pseudo air monitor) because of where the new delays had to be inserted in the audio chain, but even that was easy.

We bought four new units, and of the four, one did not work. Ideally, they should all work, period, but at least in this case there was just one bad one. It would not boot up properly without us having to push some sort of reset button on the circuit board inside the unit. Not okay, especially when it will be in the rack. I am not going to take it out of the rack each time I need to reboot it, or there's some sort of glitch that makes it reboot. We were able to get a next-day replacement, and that one worked perfectly.

EAS Issues

While having dinner with my parents one night, both my dad and husband mentioned the EAS was out of order on KLZ. It was tones then the intro and outro. While eating, I grabbed my phone and brought up the logs for the day and saw everything was correct in the logs. I realized later that night that somehow the EAS was on the wrong side of the delay! Since we no longer had the delay on the TDM system but instead on WheatNet, it put EAS ahead of it, an unintended consequence. So, when the tones ran, they ran ahead of everything to no one's knowledge… coming through the board, it was all perfect.

It didn't take long to figure out the problem, but we realized that we needed to do some restructuring. This took all of a half a day to get done, if that. Now all EAS tests, on all four stations, should work normally.

I must say, trying to wrap my brain around the TDM system and WheatNet makes my head want to explode. It gets so confusing trying to figure all this stuff out. I look forward to being all WheatNet in the future. It will no doubt make things a lot easier, and cleaner too.

Coming Up

We will soon begin the process of having trees cleared out at the KLZ transmitter site. Years of not maintaining the ones up by the road have come back to bite us in the form of an abandoned homeless camp tucked into the woods with all the stuff you can imagine that goes with such a thing. We always left the trees because it allowed for some covering of our site. From the road, you can't see the towers, and that helped us when we applied for the permit to add four new towers for KLVZ at that site. But now, with theft on the rise and with the homeless camp appearing, it provides a whole set of new problems.

Our plans are to clear the trees and underbrush to make things more visible and less friendly to live there or do mischief, as the whole site will then be in clear view of the road and the housing development across the road. Then once this is all cleared out, we'll get a roll-off dumpster and begin cleaning up the camp. We have worked with a deputy sheriff from Adams County Sheriff who has given us permission, based on what he's seen, to dispose of what was left behind by the homeless. This will be a long, tedious process, but my hope is to be able to drive the tractor in, shovel a bunch of stuff into the bucket, and then drive it to the dumpster to dispose of. We will need to be careful, as we do not know if drug use was done at the site and we do not want to find any needles or anything else that could hurt us.

Hopefully May will bring us steady, warm weather… this bipolar Colorado weather gets old.

Then we can begin cleanup at the KLTT transmitter site as well as begin the mowing season, as the sites are already getting green. I do look forward to working outside as much as possible this year.

Staying cooped up in an office all day when it is beautiful outside is depressing.

That about covers it for this edition, so until next time… that's all folks!!!

KBRT • Costa Mesa - Los Angeles, CA
740 kHz/100.7 MHz, 50 kW-D/0.2 kW-N, DA-1
KNSN • San Diego, CA
1240 kHz/103.3 MHz, 550W-U
KCBC • Manteca - San Francisco, CA
770 kHz/94.7 MHz, 50 kW-D/4.3 kW-N, DA-2
KKPZ • Portland, OR
1330 kHz/97.5 MHz, 5 kW-U, DA-1
KLZ • Denver, CO
560 kHz/100.3 MHz, 5 kW-U, DA-1
KLDC • Brighton - Denver, CO
1220 kHz/95.3 MHz, 660 W-D/11 W-N, ND
KLTT • Commerce City - Denver, CO
670 kHz/95.1 MHz, 50 kW-D/1.4 kW-N, DA-2
KLVZ • Denver, CO
810 kHz/94.3 MHz, 2.2 kW-D/430 W-N, DA-2
WDCX • Rochester, NY
990 kHz/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, 5 kW-U, DA-1
WDJC-FM • Birmingham, AL
93.7 MHz, 100 kW/307m AAT

WCHB • Royal Oak - Detroit, MI
1340 kHz/96.7 MHz, 1 kW-U, DA-D
WRDT • Monroe - Detroit, MI
560 kHz, 500 W-D/14 W-N, DA-D
WMUZ-FM • Detroit, MI
103.5 MHz, 50 kW/150m AAT
WMUZ • Taylor - Detroit, MI
1200 kHz, 50 kW-D/15 kW-N, DA-2
WPWX • Hammond - Chicago, IL
92.3 MHz, 50 kW/150m AAT
WSRB • Lansing - Chicago, IL
106.3 MHz, 4.1 kW/120m AAT
WYRB • Genoa - Rockford, IL
106.3 MHz, 3.8 kW/126m AAT
WYCA • Crete - Chicago, IL
102.3 MHz, 1.05 kW/150m AAT
WYDE • Birmingham, AL
1260 kHz/95.3 MHz, 5 kW-D/41W-N, ND
WXJC-FM • Cullman - Birmingham, AL
101.1 MHz, 100 kW/410m AAT
WXJC • Birmingham, AL
850 kHz/96.9 MHz, 50 kW-D/1 kW-N, DA-2
WYDE-FM • Cordova-Birmingham, AL
92.5 MHz, 2.2 kW/167m AAT

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