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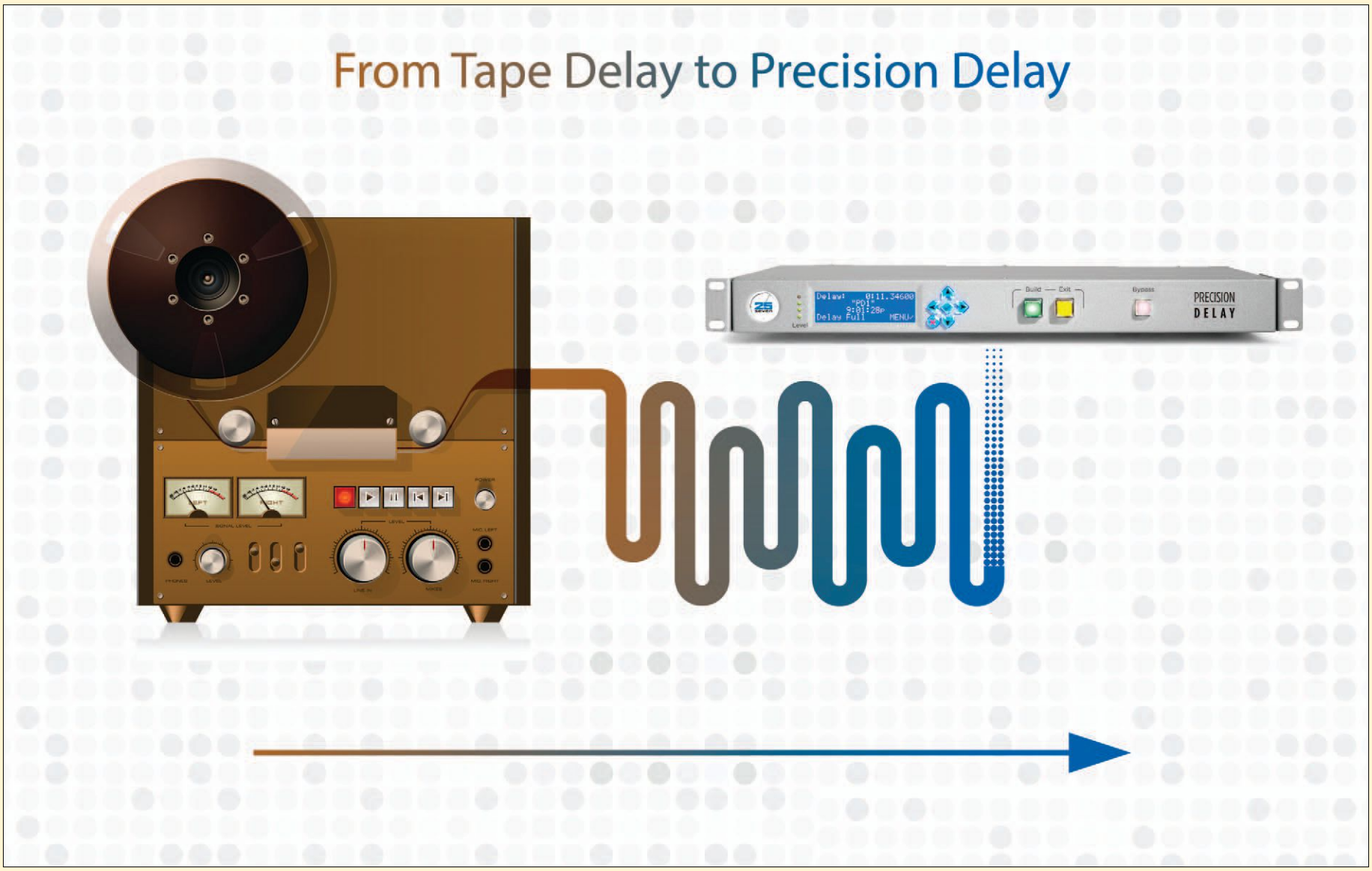
July-August 2013 – Vol. 21, No. 4

Audio Time Management for Radio



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Radio Waves

by Ray Topp – Publisher

In This Issue

The FCC has opened a Low Power FM application window from October 15-29 and has also released the application form with detailed instructions.

In preparation for this "historic" event, we have included three LPFM-related columns in this issue – each with a unique perspective on information you will need.

1. In ***FCC Focus****, Peter Gutmann demonstrates to us that LPFM is not a foe – but rather can be good friend to the radio community, because of various eligibility limitations.*

2. In ***Transmission Guide****, Jim Turvaville goes for the tech side, and describes in detail what happens when an LPFM applicant requests an adjacent channel wavier, requiring contour protection analysis – bringing into consideration the "desired-to-undesired" or "U/D" ratios.*

3. In ***LPFM Guide****, the last of our LPFM-oriented articles has Leo Ashcraft bringing us up to date on the current state of LPFM radio.*

• In the ***Cover Story****,* Neil Glassman give us a bit of background on audio time delay history, then describes the concepts of modern digital audio time management, using 27-Seven's original approach as example.

• Steve Callahan describes for us the "D" word, in ***State of the Station****.* We all need to be on the alert for this word when discussing preventative maintenance planning and expenses with station management.

• Roger Paskvan goes to Alaska, in *Small Market Radio,* to find really small market radio stations.

– Ray Topp, Publisher

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Cover Story

What You Need to Know About Audio Time Management for Radio

by Neil Glassman

Neil Glassman is principal marketing strategist at WhizBangPowWow. Neil has worked with a number of radio's most respected technology companies and is honored to have been collaborating with 25-Seven Systems since just after its founding.

It probably comes as no surprise to the readers of **Radio Guide** that the first audio delays were tube based. But did you know that those tubes were garden hoses with a speaker at one end and a microphone at the other? The hose's length was calculated at one foot per 1 ms of desired delay. As you can imagine, it did not sound good at all.

Today, radio broadcasters can take advantage of sophisticated digital technologies for audio delay, as well as for shrinking and stretching program material. In this article, we'll take a look at some of the historical highlights and where persistence and innovation have gotten us today.

Tape Delays for Radio Call-In

Early FCC rules prohibited placing phone callers on the air live. Several on-line sources credit Frank Cordaro of WKAP, Allentown, PA, with inventing the tape delay.

A tape machine was modified to increase the tape path between the record and playback heads, so stations could claim the call was recorded, and bypass the FCC requirement. As call-in became more widespread, the tape delays, using reel-to-reel or endless-loop cartridge machines were used. Station engineers would "McGyver" a system where operators could hit a DUMP button to mute the tape machine and play some prerecorded filler until the operator switched back to the live program after the crisis had past.

Art Reed of SCMS's Bradley Division recalls using an RCA RT21 reel-to-reel when he was an engineer at KDKA, in the early 1990s: "The machine's head placement was modified and the length of the tape loop used provided seven seconds of delay. The oxide would quickly be ground off the tape, so the loop was replaced during the top-of-the hour news, when the delay was not in line."

Delays were also created using endless loop tape cartridge machines – both ITC and Spotmaster had off-the-shelf products for the task.

25-Seven Program Delay Manager

Delay Goes Digital

Attempts at improving audio delays include work at Bell Labs in the 1950s, using early analog-to-digital and digital-to-analog converters. The first viable digital delay – and the first commercial digital audio processor – was released in 1971. Developed by Francis Lee and Barry Blesser of MIT, the Delta T-101 was a breakthrough product from Lexicon, founded two years earlier. Among Blesser's other accomplishments are the EMT-250, the first digital reverb introduced in 1976, and co-founding 25-Seven Systems in 2003.

1975 saw Eventide introduce the BD955 profanity delay. This digital box used 16K RAM chips – 160 of them – to deliver a whopping 3.2 seconds of delay.

The Need to Improve Audio Time Management

Increased sophistication of both programming and listeners puts pressure on stations to better manage their clocks. "Live and local" happens, well, *when* it happens, and may not comply with the network feed. Stations may want to segue more smoothly between syndicated and local programming. And opportunities to run additional ads in an hour are tough to turn down.

These requirements created the demand for inaudible time compression/expansion, as well as seamless, inaudible transitions between time-processed and real-time audio. These features need to be managed without making operators crazier than they already are.

25-Seven Audio Time Manager

New transmission technologies present additional challenges. "HD Radio delay is around eight seconds, but there is no precise match among devices," one highly placed New York City radio engineer reports. "For any number of reasons, things drift and just a few frames is enough to be detectable, primarily on voice."

HD Radio delay has unique issues for stations that broadcast live sports that want to turn off their HD Radio diversity delay during games, so fans at the venue can listen in real time. Getting in and out of this "ball-game" mode means switching the HD Radio signal on and off without annoying listeners or impacting ratings.

FM single frequency networks (SFN) synchronize multiple transmitters, with overlapping footprints, to achieve broad, unbroken coverage. "To optimize performance of SFN, the basic concept is to synchronize everything," says Nautel's Chuck Kelly. "In addition to RF carrier frequency and pilot frequency/phase, we've got to make sure the audio content amplitude and phase is synchronized."

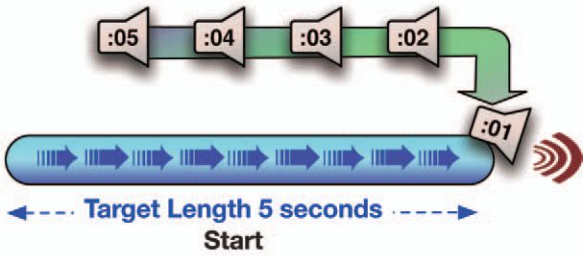
How Advanced Audio Delay Tech Works

Here's our audio delay line, shown as a "conveyor belt." Individual moments of audio come in one end, work their way down the belt, and come out on the other end some time later. In this example, as the :16 mark is injected, second :11 is played out.

Normal Delay

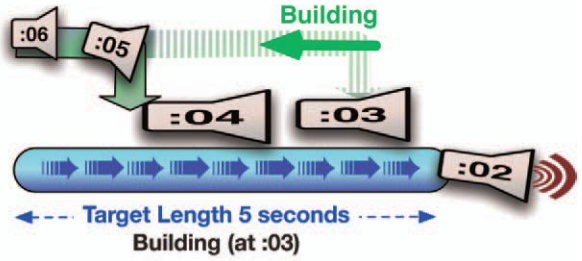
In real-world radio, stations need to enter and exit this delay, such as when a profanity delay dumps a caller's inappropriate language or a station enters or exits ballpark mode. Without the advanced audio time compression-expansion algorithms found in 25-Seven products to process those transitions, entering delay will result in repeated audio, while exiting delay will cause audio to be lost.

Let's look at how 25-Seven achieves precise, high-resolution delay and smoothly ramps delay up and down. If you set a 5-second target delay, the full 5-second delay line is reserved. Audio is injected at the end of that line. Second :01 goes in and comes out almost immediately.



Start

Then the injection point starts moving earlier, building the delay and gradually making it longer. To avoid gaps or interruptions, it stretches each moment of audio a tiny bit, as they are leaving the delay line "conveyor belt."



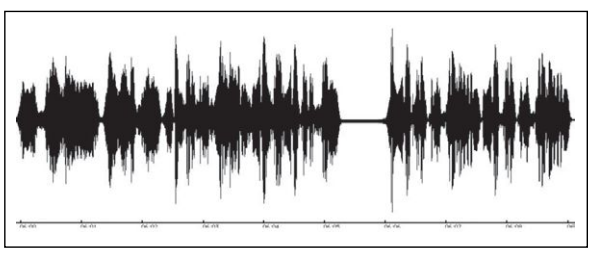
Building (at :03)

When the injection point reaches the target length, audio is fully delayed. There's no more need for stretching. The delay then behaves like a fixed digital delay until you choose to exit. To ramp down delay, the injection point moves to later in the delay line, audio is subtly sped up and the delay shrinks until it reaches zero.

Many audio professionals equate time compression and expansion with the pitch change that results from making sound waves faster and slower. When audio pitch is changed, especially on voices, it can turn off listeners who may then turn off your station.

Natural, Transparent Audio Using Stretch and Shrink

Imagine a sound, in this case an announcer reading copy. The marks below the waveform indicate one second.



(Continued on Page 32)

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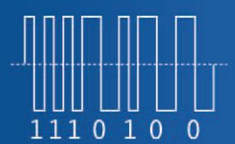

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You Say You Want a Revolution

The Final Vinyl Chapter Remains Unwritten

George Zahn

I had to fight the desire to bust out my tie-dyed t-shirt, or scavenge for the beaded curtains and black light peace sign and Hendrix posters in my storage bin, but I thought it would be fun to revisit one of the long-buried ghosts in most studios, the venerable turntable. For many of us, they remain under the sturdy box cover or in a nicely made coffin-like wood cabinet, but if you've heard recent sounds emanating from those secret hiding places which have long since become studio counter tops, it's because there's something calling to them: the American music market.

I am not here to eulogize these intrepid transducers that brought us great radio terms such as disc jockey and cueing. I am here to say it's OK to get them back out, tune them up, and be ready to play some of the new stuff. No matter what trade publication you check, vinyl sales and production are up each of the last three years, and 2013, so far, has been a boom year for the vinyl album. It's gone beyond indie and hipster labels, and you can even find some classic titles in jazz and rock being reissued on heavier 180 and 200 gram, high performance vinyl – which makes the old 90g cutout bin LP's sound and act like the flimsy Eva-Tone Soundsheets (the original "floppy" discs?) plucked from a 1960's magazine.

It's All in the Technics

If your studio has been around long enough, it's quite likely that somewhere under the cabinetry (or at least in the engineering closet) there might just be one of the staples of the turntable industry in the 70's and 80's – one of the lines of Technics turntables made by Panasonic. The quartz drive models were the workhorse of radio, especially on the FM side where not all songs may have been relegated to carts in the AOR days.

The SL-1200 launched in 1972, but was laid to rest by Panasonic in 2010. To use one was to love one, and most DJs who play vinyl are still using these old beauties. It quickly replaced solid, old idler shift brands such as the QRK and Russco. The future was "now" in the 1970's and Panasonic made some changes over the years with the MK2 (1979), MK3(1989), and later MK models of the 1200 – all the way up to 2008 with their MK6 models before "pulling the plug" in November, 2010.

Technics SL-1200

So here we are with vinyl coming back, and for some, it's like Cinderella trying to get to the ball without a crystal coach. If you want to play vinyl (or at least transfer the vinyl into your hard drive delivery system), and you don't have a functional old Technics direct drive (the belt drives I own at home did not fare as well – I have two SL-B2s which I cannot get to run true to speed, even with new belts), you don't need a fairy godmother to wave her wand.

There are a number of affordable turntables still on the market, if you want to experiment with some of the new vinyl available. My station still has four solid Technics performers, and we actually have a show, appropriately called "Friction," that features very, very early recordings – even 78s. If you're not as fortunate as me, here are some ideas if you're looking into turntables.

Taking a Test Spin

First of all, a quick search for turntables will bring you a panoply of contraptions, including one that will even hang on a wall and play your records vertically (ION Vertical Vinyl). Let's drop the conversation pieces and get to what works in the studio. Many have bells and whistles that weren't even considered when the first QRK, or even Technics, came off the assembly line. These include built-in RIAA pre-amps and USB outputs for transferring audio to computers.

Because turntables are being marketed more for consumer use than for studio application, the USB models may have very basic software discs included with elementary audio editors such as Audacity, but the USB output from these newer turntables can be a real help. Unless the plan is to again cue burn the vinyl, most stations will play the record once and transfer it into the station's music delivery system.

A quick sampling of vendors selling turntables reveal a price range from under $100 to about $900, with some audiophile models ranging in the $2,500 neighborhood – and even one "touchless" laser player which starts at about $8,500 and can top out at $16,000. Oddly, the laser player can only "read" black vinyl, so forget about those flashy collector's LPs on yellow, red, blue, or even multi-colored vinyl.

The realistically priced models begin with the sub $100 level, which includes models such as the Audio Technica AT-LP60 and Numark TT USB. These play 33-1/3 and 45 RPM, with either built-in RCA line-level outputs or USB outputs and accompanying software. Some of the low end models even include some pitch adjustment controls. If you want USB output on the Audio Technica, it'll cost about thirty bucks more. As with "ye olde" days, the lower end turntables are more than likely going to be belt drive.

Audio Technica AT-LP60

The direct drive, professional quality level will start closer to $200-350 and go up from there. The Stanton T62B continues the legacy of cartridges and styli that many swear by. This direct drive model also is used by house DJs and has settings for mix and battle setups (which we may or may not need in our studios). It's always best to shop for prices and shipping deals, as many turntables often sell for far below list.

The Spirit of 78

If you intend to spin 78s, you'll need to up the ante a bit (or be lucky enough to have an engineer that can build a 78 RPM turntable). For example, the Stanton T92 USB in the $300-$500 range plays 33-1/3, 45 and 78 RPM records with both USB and RCA outputs, with most other features of the T62B, plus units I've seen listed also have a light version of Cakewalk Pyro Audio software. Audio Technica comes in at this level with its comparable ATE-AT-LP1240 USB.

Those of us longer in the tooth remember the wonderful joy of a remote start for the turntable. It's good to look into this on each model, but one of the Stanton Models actually featured a review in which at least one broadcast engineer pointed out that he was able to cross the start/stop switch and create a remote start. This was on the relatively heavy, but well-rated Stanton ST150, which lists for $999.00 but was listed for sale in the $600 range on at least two places I visited.

Stanton T62B

There are others for the audiophile, probably well worth the price, but likely out of reach for most broadcast budgets. A few of note are the Vestax PDX-3000mkII with a list of $1,199, the Denon DPAA100 100th Anniversary Turntable (list $2,500) and the ELP laser turntable LT-500 which enters at a list of $8,500, and the LT-1000 3-speed model at $16,000.

So if a turntable is in your future, and your old Technics cannot be resuscitated, it is very important to shop around and determine if you're riding the crest of a short-lived fad or making a truly long-term investment. To some extent, you get what you pay for. When shopping, you're looking for the reliability of the mechanism and ability for accurate speed at start up. It's important to have a stable turntable that will not easily transfer vibration noise from the cabinet that holds it.

Back in Stylus

Many turntables come with their own company's proprietary cartridge, and that can also come into play when making a decision. Selecting the right stylus (needle for those using the old terms) is also very important and doing research is a key here. Certain styli are much better for transferring archival material such as 78s or even paper discs. Know the primary use of your turntable before buying an off the shelf stylus.

And the old argument about straight tone arm or S-shaped tone arm is resurfacing. You may ask four engineers, and get five opinions, but in short, the argument for using a curved tone arm versus the straight arm is that the S-shaped arm aligns the stylus more precisely with the records groove, theoretically minimizing wear on the stylus and the record. Some of the models discussed here offer a choice of straight or curved tone arm. It's very important to look carefully at the unit you're purchasing.

Will vinyl make a resounding comeback? Not likely – at least not to the point of the album heyday and record stores when they were really *record* stores. There are arguments about the profitability of producing and distributing albums in this flash memory and download world, where even optical CDs seem headed to the La Brea Tar Pits. Yet in striving to offer something that makes us different from other programmers and radio sources, it might be a nice diversion from the digital media norm. The records are out there and so are the means to bring them to our listeners if we wish.

Are you playing a significant amount of vinyl? Have you begrudgingly been forced to stray from spinning 45's due to the age of digital? Are you considering adding some vinyl to your mix? If you've transferred first generation vinyl to computer delivery, how does it work for you? Your thoughts are always welcome and I hope to share some in future columns!

George Zahn is a Peabody Award winning radio producer and Station Manager for WMKV-FM at maple Knoll Communities in Springdale, Ohio. He is a regular contributor to ***Radio Guide*** *and welcomes your feedback. Share your stories with others by sending ideas and comments to gzahn@mkcommunities.org*

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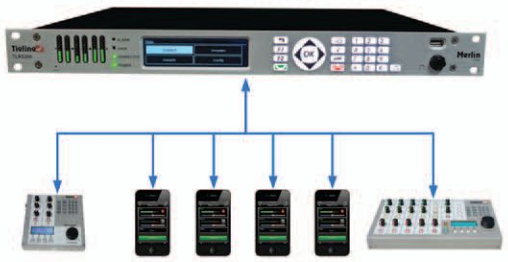

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Airing EAS Audio

Doing it Right or Doing it Legally

by Mike Callaghan

One decision we face, when hooking up our trusty EAS system to the rest of the radio station, is how we're going to get the tones and the audio out of the EAS receiver and into the radio.

The Rules say this unit must be in the program path so it will intercept whatever's on the air. This will allow the President or other luminaries to reach the populace at any time, even if there's no one at the radio station. That makes perfect sense.

I noticed, however, that some stations had been cited recently for not having it connected properly. They had it wired so someone had to physically be on-site for the President to go on. It was just a matter of time before these citations were issued, because many, many other stations are set up in exactly the same way. They need an attendant for a big-time National Alert to get on the air. These stations are *all in violation* – and most of them have a very good reason.

Why? Well, there are times when the authority that originates our Required Monthly Tests doesn't get it quite right. They might skip the final three duck burps. Or, as recently happened in a major market, they might send the same test twice, just a minute or so apart. In the first case, an LP1 station with the EAS wired correctly would continue relaying the silence following the test. Long after it ended, a bunch of diligent operators could be running dead air. In the second case, that one minute plus separation gives the tests different time stamps. So the LP1 would relay BOTH tests, and the stations monitoring them would also dutifully relay two tests. Don't laugh – this happened. We're supposed to inform the public, not confuse them!

To guard against such a faux pas, a lot of stations feed the output of the EAS box into the air studio console – the operator has to "pot up" the EAS system to put it on the air. Doing this protects the station against a problem with the LP1 or other originating authority from triggering an embarrassing train wreck.

Any number of "OMG" accidents have never gotten to the transmitter because stations maintain this control.

Routing the audio through the console also eliminates the problems that would happen if the EAS box were downstream from the studio. Those would include the delays from the ever-present profanity delay, as well as whatever delays using IBOC or HD might add. Instead, all the EAS events are run in real time. Required Weekly Tests can be scheduled just as easily as spots, and even be placed just like them on the log.

Finally, having the tests and alert audio on the board gives you the opportunity to record whatever comes through the EAS. You'd do this on the Voxpro or another studio recorder. This audio can be important, and could be impossible to grab if the EAS was inserted outside the studio's program path.

So, it becomes obvious that feeding the console like this makes good sense in a lot of different ways, and it's legal as long as the station *always* has an operator. So far, so good.

But if the operator is missing part of the time, things change. The Rules aren't being followed, since no one will be there to pot up the EAS system and relay a vital warning. A critical alert won't be broadcast at a critical time, and that's just not acceptable. And, finally, it's not in compliance with the Rules.

There is a way to work around this by adding an additional switch into the system. This, combined with a contact closure built into the EAS package, can operate a downstream insertion relay, and you'll have the best of both worlds. This manually-operated switch between the EAS box and the external relay determines whether the operator or the EAS system will control the insertion.

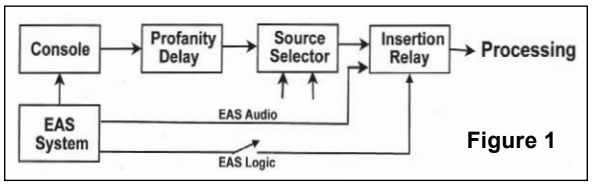

Figure 1

When the studio has an operator, this switch is open (or off), and the insertion relay does nothing. The operator launches the test manually using the EAS equipment. EAS audio and tones pass through the console and the operator gets to control the levels and the timing. He or she can fade it up into a stopset, fire it at exactly the right time, and fade it down after the duck burps so that it is the least objectionable and as integrated as possible.

When the studio is empty the switch is closed (or on). Now, an incoming alert starts timing out, and if no one intervenes to send the test manually, the EAS system will trigger the relay to interrupt the program path, and switch in the alert. EAS audio gets inserted into the path just as the Rules specify. Afterwards, the relay drops out and the normal program continues. This configuration is also beneficial when the station is running directly off a satellite or syndicated feed and there's no studio involved in the broadcast.

Most EAS systems have both AES-3 and analog outputs. This allows the analog to feed a console input, and the AES-3 to feed the downstream insertion relay. This assumes the downstream feed to the processing is AES-3.

If you use analog for both the console input and the processor feed, you'd be wise to add a small DA to split the EAS unit's output. The console feed can obviously be mono (it will be a very long while before we need to worry about disaster alerts coming through in stereo).

Using the switch to control the insertion also means you can test the EAS system and not have it go on the air. With the switch off, and the EAS audio potted down, practice tests can be launched, operators can be trained, and the EAS system can be evaluated without affecting station listeners.

Earlier I mentioned the importance of being able to record EAS audio in the air studio for later playback and likely use by your newspeople. One thing to note, if you operate a Primary Entry Point (PEP) station, is that this audio will probably be received and inserted at the transmitter. It may be available through the air monitors on the consoles, but not necessarily where it could feed a recorder. You'll get this from a real RF-receiving radio of some sort, or you could bring a feed back from the transmitter's modulation monitor through a T-1 backhaul. In any case, you should have a way of recording your own station off the air.

To sum up, there are many different ways to set up and automate sending required weekly tests. The Commission really doesn't care which way you select. Their primary interest is making sure critical alerts reach the public. It follows that keeping your system as simple, yet still as versatile as possible provides the greatest security in accomplishing this important goal.

Mike Callaghan is the Chief Engineer at KIIS-FM in Los Angeles, CA. His email is: mc@amandfm.com

Editorial Sidebar – Why Bury EAS Tests?

Originating a Required Weekly Test doesn't have to be difficult.

It's just some operators that make it that way. These seem to be the ones that feel exposing listeners to even one short RWT will blow a hole in the ratings from which the station will never recover. So they're dead-set against running tests when anyone's listening.

What to do? Well, they insist on running the RWT in the middle of the night. And that's when the station is likely to be on autopilot, with no one there to push buttons or run the console.

The fix for that inconvenience? They resort to automating the tests. With many automation systems, you can derive a contact closure that will fire off the EAS box. While that gets the test started, the program audio ahead of and behind the test might have to go through a profanity delay, or even get slowed down more by an IBOC delay. This leads to extra tricks inside the automation, to advance or retard the EAS contact closure in some way. This is so the various delays and the EAS tones theoretically meet up correctly in the listener's radios. All this effort flies in the face of the famous mantra that dictates we KISS, or "Keep It Simple, Silly." And there's nothing wrong with that mantra.

To fear audience loss due to EAS tests during prime time is unrealistic and illogical. Many listeners consider radio as an important source of news and warnings. The EAS system confirms and validates the importance of radio in spreading significant information. There is nothing that can get the word disseminated as quickly. Even more recent developments, like reverse 911, can't be as swift. An example? In Los Angeles, when we have an earthquake, radio is the *first* source the public seeks to learn details of the calamity. Not television, and certainly not the Internet. We have the upper hand in this, and there's no reason not to remind the public of that.

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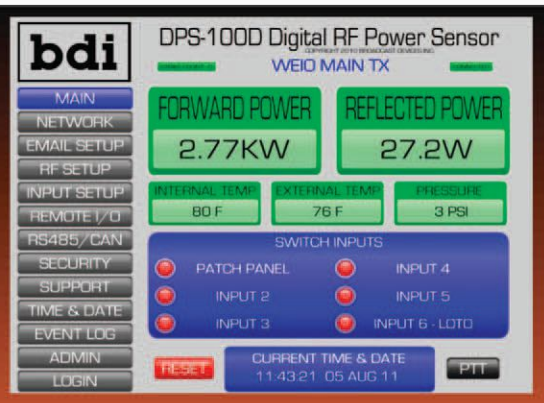

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bdi

State of the Station

The "D" Word

by Steve Callahan

We have all heard the "D" word and we are hearing it more and more in recent years. Station management and ownership are hyper-focused on revenue but they are often overlooking the fact that equipment does wear out and it demands our attention, either before it fails or after it fails. The "D" word is, of course, DEFER and we've all been asked to defer necessary repairs and upgrades to next year's budget or beyond.

Not too long ago, I was called to a station to perform a due-diligence inspection for the owner. I actually like to do these inspections and I've learned that the main reason I'm called by a station owner is that he or she is contemplating selling the station. They want to know how much is wrong with the physical plant before they are told by the prospective buyer's due diligence agent.

After spending a couple of hours at this station, I found that this directional AM station had a lot wrong – three pages worth. Page one was just the immediate problems that could be fined by the FCC. Page two had problems that were not finable but should be corrected. Page three had suggested improvements which would help in overall station operation and performance.

New Fence Post = Cut Sample Line

I presented the report to the owner and waited for the inevitable explosion that was sure to follow. After a week I called the owner, who was very quick to tell me that my recommendations were too expensive to implement and that I had no idea what it was like to own and manage a radio station. I never got the chance to tell the fellow that I have been a station owner for almost 30 years and that I have been on both sides of the checkbook when it comes to costly radio station repairs.

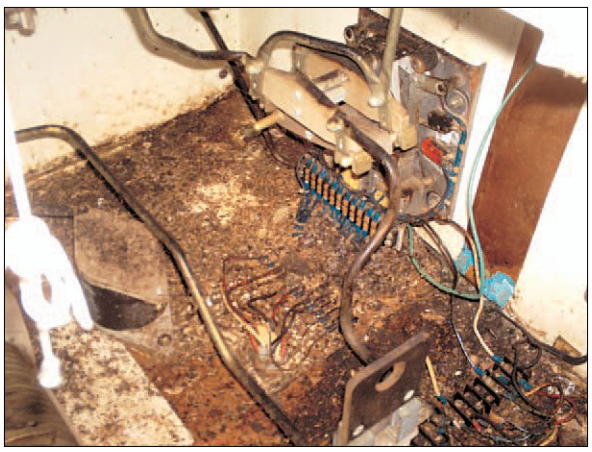
The Sale Dragged On

That owner went on to try to dump the station on a buyer from out-of-state. The sale dragged on for over a year and was hampered by many of the shortcomings I had reported to the seller. After an extended period of time being off the air, the new buyer was saddled with the "sins of the father" and had to spend a lot of time to just get the station back on the air. The seller had to practically give the station away with an unrealistically low price.

Unfortunately, that station suffered through several owners who deferred any needed repairs or upgrades to the next owner. If the problems had been dealt with one or two a year, the station wouldn't have been so rundown and decrepit. Older AM stations are now reaching a point in their lives where repairs are more expensive than they would have been 5 or 10 years ago.

Half Power and 20% Modulation

I got another call from a station where I had been the contract chief at back in the 1980's. I guess I got called because I was the last person to ever get their directional array working within legal parameters. When I got to the station, I found a transmitter unable to achieve anything more than half power and 20% modulation. The coax to one tower was cut and lying on the surface of the ground, the inside of the one working antenna tuning unit was covered several inches – yes that's *inches*, deep with mouse excrement. All of these problems were due to neglect and ambivalence on the part of an absentee owner who refused to spend even one dollar on periodic maintenance.



One very neglected antenna tuning unit.

Every radio engineer I know considers the radio station in his or her care to be something personal to them. They treat the station they work for as if they owned it themselves. You, as the engineer, know more about the inner workings and needs of the station than anyone else. You bring the transmitter back to life when it stops running. You keep the station legal and sounding competitive. However, all of this comes at a price which is often waved away with the "D" word. As radio engineers, we all have developed the ability to make-something-out-of-nothing and make "temporary" repairs, which often become permanent. This is often necessary in the short-term, but it's actually harmful in the long-term because ownership or management expects us to continue to "McGyver" the equipment forever.

I visited a 1 kW non-directional AM station last month that had a vintage 1950 tube transmitter with bias voltage power supply issues. When I got the back and side panel off, I saw a lot of "temporary" repairs and quick fixes such as jumpering out defective components with alligator clips and replacement parts that bore no resemblance at all to the original part. This particular transmitter should have been retired back at the turn of the last century, but I'll wager that the engineer at the time heard the "D" word when he asked to buy a new solid state transmitter and retire the old tube rig to stand-by auxiliary status.

Does your station owner or manager know about the time you got called to the station on Christmas Eve to replace a noisy hard drive that finally failed? Did you tell management that you got called away from your child's little league game to finally replace a filament breaker that was finally becoming overly-sensitive? Both of these problems could have been more efficiently, and economically, dealt with on your schedule rather than the equipment's. However, I'll bet you heard the "D" word when you went to management and asked for the funds needed to replace the drive and the breaker before they actually failed.

Yes, *only* that rope is holding the ATU upright.

I can't count the times that I have been to stations that were off-the-air, and the owner told me to do anything I could to get him back on no matter what the cost. Why pay top list price for a transmitter blower, and pay for overnight shipping to get it there fast, when a new, or rebuilt blower could have been sourced locally and purchased for a fraction of the cost of a new blower – and then it would be sitting on your shelf when it's needed? Well, I'll bet the "D" word was probably uttered when a forward-thinking engineer asked if he could look for a spare blower motor.

No owner wants more expenses or costs, but some costs are smarter if you make them now rather than later. Your time and inconvenience, and unplanned off-air time, costs real money and it can be avoided. Talk to your manager and explain that you need a regular budget line item every month for replacement parts. Don't be shy to tell him or her that the 50 year old transmitter that you have kept running with parts from the local hardware store really does need to be replaced before it goes up in a ball of flames. It doesn't need to be a lot of money, just enough to keep up with equipment that's getting older every day.

If you have seen yourself any place in this story, and your management or ownership uses the "D" word excessively, leave this copy of ***Radio Guide*** open to this story and on their desk. I hope that if your owner or manager reads it, it will spur some discussion with you as to how you can help them spend smarter and wiser on the things that your radio station needs to stay on the air.

Steve Callahan is the owner of WVBF, 1530 AM, Middleboro, Mass. and may be reached at wvbf1530@yahoo.com

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FCC Focus

LPFM – Friend, not Foe

by Peter Gutmann

As is well known by now, the FCC has opened a Low Power FM application window from October 15-29 and has released the application form with detailed instructions.

Potential applicants are enthused over this opportunity – after all, it's been over a decade since the last LPFM window and there's no solid prospect for another in the foreseeable future. Attitudes among broadcasters, though, are decidedly mixed, ranging from bemused tolerance to abject fear that the FCC is driving another stake through our proverbial hearts.

At the risk of heresy, I would humbly suggest that broadcasters just might want to actively support and encourage LPFM applicants in their areas. Rather than being viewed as a severe competitive threat, perhaps these new stations could serve as allies in maintaining public interest in the traditional aspects of our medium that we exalt. LPFM could turn out to be especially helpful for smaller broadcasters, who have yet to fully embrace the newer distribution platforms and are eager for their listeners to remain tethered to their radios – you know, those bulky old plastic things that sit on a desk or night-table.

Let's recognize that LPFM is not only low-power, but also low-budget and low-resources, and thus hardly likely to snatch away audience from experienced, professional, well-established media. Why? Just consider the eligibility and comparative criteria that will determine who is likely to become an LPFM licensee.

In that light, it seems highly doubtful that any successful LPFM applicant will prove to be a genuine competitive threat. Rather, we should look to LPFM as largely complementing the role of full-power radio. Indeed, LPFM is poised to make a major contribution toward bolstering public perception of the value of traditional broadcasting.

Eligibility

First and foremost, let's consider the strict eligibility restrictions for the new LPFM applicants. All must be nonprofit and must document their status. Beyond that, only three types of entities may apply, and two are highly specialized.

A Tribe must be recognized as such by the federal government. A Tribal Organization also is eligible, but it must be majority-owned by one or more Tribes. Such applicants must provide a detailed description of the noncommercial nature of their proposed programming and, if possible, program schedules.

Public Safety Radio Services must either be a state or local government or at least incorporated, registered or otherwise recognized by a state. They must describe their public safety radio program and how the proposed station will be used to protect the safety of life, health or property. Their services cannot be made commercially available to the public.

Nonprofit Educational Organizations are eligible only if they are public entities, or if they operate a bona fide full-time school in their proposed community of license, or if they can demonstrate how the proposed station will be used to advance their educational purpose. (Admittedly, this is the same standard used in EFM licensing, which the FCC has been quite lax in enforcing – "educating" listeners about different types of music seems to pass muster.)

Legal and Technical Requirements

Beyond basic eligibility, there are several additional criteria that narrow participation even further.

Localism – Each type of applicant faces severe geographic restrictions. Tribal applicants must serve Tribal Lands within their proposed service area. Public Safety applicants must have jurisdiction within their proposed service area. Educational institutions must be physically headquartered, or have a campus, or have 75% of their board residing within 20 miles of their antenna site (10 miles for top-50 markets).

Multiple Ownership – Applicants may own just one LPFM (although Tribal applicants may own two) and no more than two translators, whose contours must overlap the LPFM. Other than certain board members of educational institutions, and certain local branches of national organizations, no party to an LPFM application can have an attributable ownership interest in any other mass medium. That includes any full power AM, FM or TV, low-power TV, cable system or daily newspaper. The restriction also applies to immediate family members (spouse, sibling, parent, child) who have been involved in preparing or financing the LPFM application or who will be involved in its operation. Compliance with this restriction is determined by the Commission's established attribution rules, which generally include all officers, directors, 5% voting owners and non-insulated partners. Any interest that would violate this prohibition must be divested prior to commencing LPFM operation.

Protection to Existing Authorizations – The LPFM rules require minimum spacing to all co-channel and first-adjacent channel facilities and applications pending as of June 17. Second-adjacent channel separations can be waived only upon a showing of no actual interference to any populated area, including through use of a directional antenna. Although not required, third-adjacent channel spacing is desirable to minimize efforts otherwise required to alleviate interference complaints. Some sites may require environmental protection studies and showings.

Selection Criteria

There are even further considerations – the criteria that will be used to select among mutually-exclusive LPFM applicants. These, too, seem calculated to reduce the threat of the winners to established broadcasters.

One comparative point is to be awarded for each of the following:

Established Community Presence – All but Tribal applicants must certify (and educational applicants must document) that for the prior two years they continuously had the attributes they rely upon for their local eligibility.

Local Program Origination – The applicant must pledge to originate at least eight hours per day of local programming (defined as being produced within 10 miles of the antenna site). As examples of qualifying programming, the Commission cites local event coverage, call-in shows and music selected and played by a DJ on site. Automated or repeat broadcasts are not counted. The Commission claims that it will conduct random audits to ensure fulfillment of such pledges.

Main Studio – The studio must be staffed at least 20 hours per week, be publicly accessible, have local program origination capability and be located within 20 miles of the antenna site (10 miles for top 50 markets).

A further point is awarded for those entitled to both local program origination and main studio points.

Diversity of Ownership – No attributable interest can be held in any other broadcast station. (In view of the strict eligibility ownership limits, nearly all applicants should qualify for this point.)

Tribes get a point for locating their antenna sites on Tribal Lands.

Tied applicants are to be given an opportunity to enter into voluntary time-sharing agreements, a highly undesirable outcome. If they decline, then the FCC will impose time-sharing.

Of course, there is no way to predict how often the Commission will be called upon to apply its system of points. That will depend upon the level of interest in filing LPFM applications, the extent to which applications are considered mutually-exclusive (a function of their proposed channels, sites, heights and powers), and whether settlements occur. But most applicants probably will strive to maximize their chances.

Practical Considerations

Even beyond the application phase, there are further considerations. One factor is risk. Like translators, LPFM is a secondary service that must either remedy actual reception interference within the protected contours of full-power FM stations, or be required to cease operation. So as the FM band becomes increasingly cluttered, and as full-power stations continue to maximize their facilities, LPFM authorizations face increasing risk of being bumped or shuttered, perhaps permanently.

Also, even LPFM applicants must recognize that building and operating any radio station is an expensive proposition for which professional help often is needed. Indeed, careful planning is required. For example, due to the secondary nature of LPFM, it is important to find not only a currently-available frequency (and the FCC has a helpful program to check potential locations) but one that is unlikely to be snatched away by a full-power station at some point in the future.

Putting all this together, there is little chance for those positioned to become involved in LPFM to pose a meaningful competitive threat to existing stations. Rather, the eligibility restrictions and comparative preferences seem well-calculated to ensure that LPFM authorizations go to local nonprofit institutional newcomers, as well as those dedicated to public safety or serving discrete tribal audiences. Put another way, is a thinly-funded, inexperienced, largely volunteer staff really going to drain away significant listeners from a long-established, professional-sounding, station with wide-spread appeal and a far larger footprint – unless, of course, that station has consistently ignored or alienated local interests?

This is in no way a slight upon those who feel that their particular interests need greater attention than the mass media routinely provide. Nor does it belittle the sincerity of those who are prepared to dedicate their time and resources to serving their communities. But the very nature of the LPFM service, as defined by the FCC's eligibility and selection criteria, means that the successful applicants will either focus their energies on niche areas that most commercial stations cannot afford to serve to any significant extent or be faced with the daunting task of trying to beat established broadcasters at their own game, but without the experience or resources to do so effectively. Either way, broadcasters shouldn't feel threatened.

At the same time, LPFM just might revitalize radio in a way that can only benefit the industry. When an enthused listener proclaims that she heard it on the radio, doesn't that help us all? When she tells her friends about an stimulating comment or event that was broadcast, won't that enhance the reputation of the entire medium?

So instead of cowering in fear of an onslaught of new LPFM stations, perhaps broadcasters should encourage local groups to apply for these facilities for our mutual benefit.

Peter Gutmann is a partner in the Washington, DC office of the law firm of Womble Carlyle Sandridge & Rice, LLP. He specializes in broadcast regulation and transactions. His email is: pgutmann@wcsr.com

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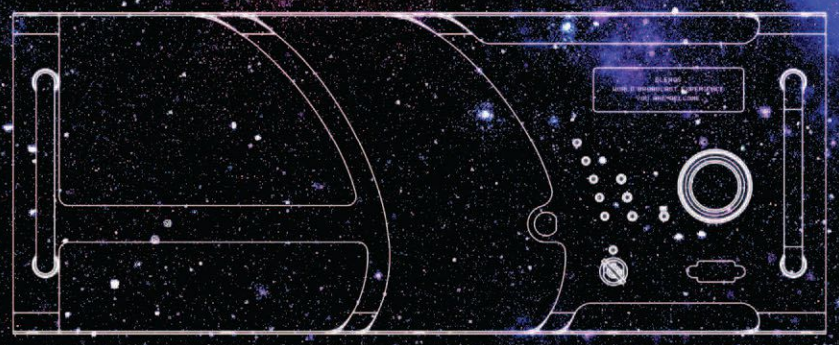

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Safety and Security

A regular column on protecting property and persons.

PCBs and Old RCAs

By Jeff Johnson, CPBE

Think of complex, sophisticated, high-powered equipment that has been in constant operation for 54 years. Impressive for sure! Take a look at the photo. This is an RCA BTF-10C that was new in 1959 – back when Cadillacs had moon rocket fins. Since those days this transmitter has been continually on the air at WPFB-FM, now WNKN, Middletown, Ohio. Its output is combined with that of its "baby" sister – a 50-year-old BTF-10D.

Look again. Notice the "PCB" label? Oh, oh! Trouble? Just what is "PCB"? According to the EPA: *Polychlorinated Biphenyls (PCBs) belong to a broad family of man-made organic chemicals known as chlorinated hydrocarbons. PCBs were domestically manufactured from 1929 until their manufacture was banned in 1979. They have a range of toxicity and vary in consistency from thin, light-colored liquids to yellow or black waxy solids. Due to their non-flammability, chemical stability, high boiling point, and electrical insulating properties, PCBs were used in hundreds of industrial and commercial applications including electrical, heat transfer, and hydraulic equipment; as plasticizers in paints, plastics, and rubber products; in pigments, dyes, and carbonless copy paper; and many other industrial applications.*

How old are your transmitters?

Note the date – 1979. It can generally be assumed that equipment manufactured after that year is PCB free. But, don't be too sure. Always double check. The oil filled capacitors in these RCA transmitters are surely PCB filled.

What to do? Well, nothing – if there is no leakage. Usage in a "totally enclosed manner" is allowed. EPA information is at: www.epa.gov/epawaste/hazard/tsd/pcbs/pubs/about.htm

PCB Regulations:

Current PCB regulations can be found in the Code of Federal Regulations (CFR) at 40 CFR 761. The CFR is updated as of July 1 each year.

For Transformers and Capacitors:

www.epa.gov/epawaste/hazard/tsd/pcbs/pubs/stordisp.htm#xformerdecom

The author was involved in a PCB filled capacitor disposal situation a few years back. A newly acquired, but used, transmitter older than from 1979 was found to have its original capacitors. There was no leakage, but the transmitter had been sold to us and moved. We decided to be on the safe side.

The local electrical utility was called, and a disposal company was recommended. They sent a cheap, ordinary plastic trashcan, a roll of duct tape, and stick-on labels warning of hazardous materials. On an arranged date and time, a truck arrived and loaded the trashcan containing the PCB capacitors. Now comes the important part: papers were supplied and signed attesting to the pickup of the hazardous material (the capacitors). Keep the papers!

What if there had been leakage? Download this document: www.epa.gov/region8/toxics/pcb/pcbidmgmt.pdf

From this EPA document: *Examine the equipment for leaks and clean up any leaks or spills potentially containing PCBs. A common concept of a leak is a drip, sometimes referred to as a weep or seep. However, a leak is defined in the regulations as any instance in which a PCB article (including a transformer, voltage regulator, capacitor, lead cable, or fluorescent light ballast) or container "... has any PCBs on any portion of its external surface." This means a leak can be an oily film or oily dirt near any port or opening in the equipment. Leaks should be cleaned up and the equipment repaired or the leaking equipment containerized, moved to safe storage, and replaced. PCBs that have run off the equipment onto the concrete or soil below should be cleaned up and stored pending disposal. Personal protective equipment and cleanup materials may be contaminated with PCBs and require proper disposal.*

It appears from these EPA instructions that cleanup can be done by ordinary personnel, but all cleanup materials must be disposed of in the proper manner with the equipment.

Ask your local electrical utility for their disposal recommendations or see a list EPA approved waste handlers at: www.epa.gov/epawaste/hazard/tsd/pcbs/pubs/waste.htm

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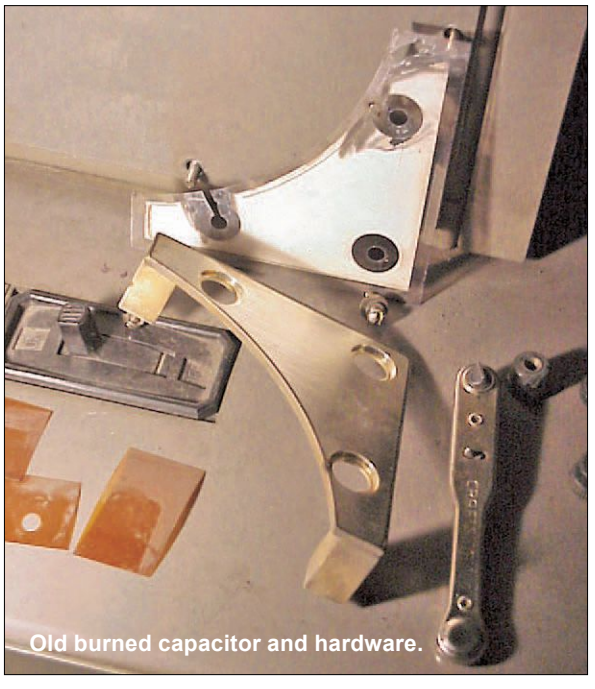
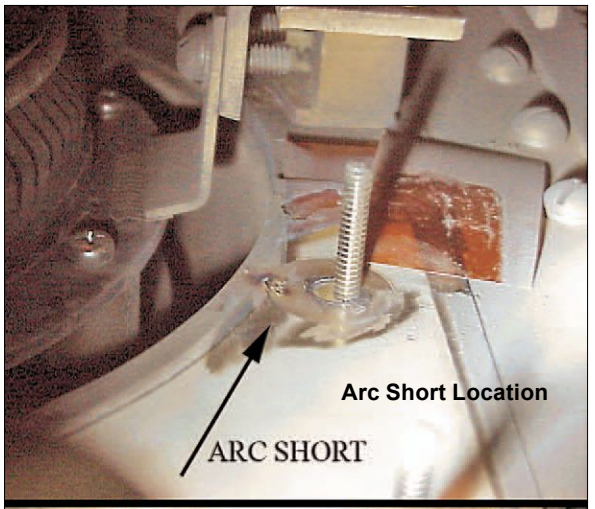
Now for the fun stuff – maintaining 50 year old transmitters. These 50+ year old RCAs have long since been orphans. They were maintained in recent decades by Jim Wagner, and before that by other engineers in our area. I've heard from a number of the others at SBE meetings who "husbanded" them in times past. One described replacing the 8008 rectifiers with early solid-state stacks. Another spoke of the tricky tuning required of the combined pair.



Old burned capacitor and hardware.

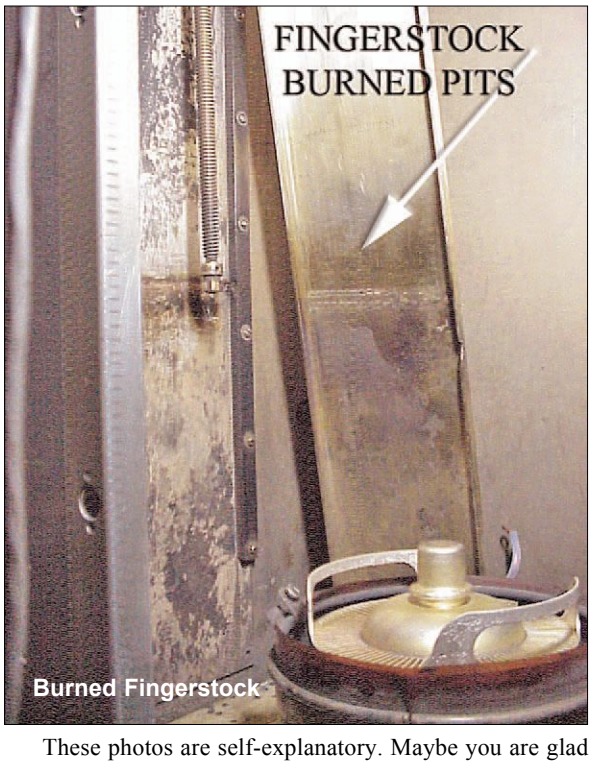
Within the past year, one of the silvered mica screen bypass capacitors needed replacing due to an arc short. Before that, one on the sliding inductor shorting bars burned its fingerstock.

Carefully smooth the inductor surface with Scotch Brite. New fingerstock is clamped in the holder pictured. Replacement fingerstock is available from Surplus Sales of Nebraska. www.surplussales.com



Location of capacitor in cavity.

Tight quarters during repair.



Burned Fingerstock

These photos are self-explanatory. Maybe you are glad these are not your worries – or your fingers?

Jeff Johnson can be reached at: jeff@rfproof.com

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Tech Management

An Engineer ... on Vacation?!

by Chris Tarr

Engineers are peculiar people. I find that they're driven by a deep sense of responsibility and pride. Often they put the burden of running the radio stations on their shoulders, being available 24 x 7 x 365 to take care of anything that comes up. They take that responsibility seriously, and it's the only job in the building where a night or a weekend isn't truly their own.

While that is a noble cause, nobody has ever said "I wish I had spent more time at the station" on their death bed. That's why a little balance is a good thing.

Even if you're one of those "Lone Wolf" types whose life revolves around radio, you lose your edge if you don't take some time off now and then. It's incredibly important – it's also incredibly difficult to do in our line of work.

So, how to we set ourselves up to have a hassle-free vacation? It's all about creating a solid foundation, well in advance of hitting the road.

Problems will happen. It's a fact of life, and often Murphy dictates that some of these problems will happen when you aren't around. However, if you've done some planning, you should have an easy go of it. It's important to set up a functioning system ahead of time and make sure that it's running full speed when you're ready to go.

Call the Engineer!

First off, be sure to set reasonable expectations with your staff. Often times the "default" response to even the slightest problem is to call the Engineer. That just won't cut it during vacation. Be sure to very clearly identify what constitutes a call to you versus an email, versus a call to someone else. Even better, ask your GM to be a "gatekeeper" and set the rule that he or she is the only one you'll be accepting calls from.

Second, heed the advice I've given in this space in previous issues about liberal use of documentation and easy-to-use "how-to" guides. Identify common failures and clearly document how to deal with them. Make sure the staff understands the instructions and can follow along. These should be as complete and easy to find as possible. Remind office staff that 99% of computer issues can be solved by a simple reboot. The hope is, that the "self-service" option will solve the problem long before your phone rings. The hidden benefit with this part of the plan is that it can often carry over after you return. People tend to feel empowered when they have knowledge. There's a very good chance that people will continue to fix the easy, little things on their own from there on out.

Find a Friendly Engineer

What if you're the only Engineer on staff? That in itself is a problem that should be fixed. Use vacation time as an excuse to solve it. The best case scenario is if you can find a "friendly" Engineer in a nearby market and make an agreement to cover for each other. Make sure that you occasionally meet at each others sites so that you understand the equipment that's being used. Even better, create "cheat sheets" of how to use the transmitter remote control and how to solve "typical" problems. Also, make sure you have some sort of mechanism to ensure that it's a fair trade. I have some of these types of agreements in my market, and it's great to know that, in the event of a major failure, your vacation won't be cut short.

Another thing to consider is having a contract Engineer available. It's good to have one in your address book anyway (I call these the "People who are smarter than me.") for second opinions and emergency help. You can often pay a retainer to have them "on-call" while you're away and then pay a per-hour fee for each incident. What's great about contract Engineers is that this is what they do. They get paid to fix problems at radio stations on a contract basis, and as long as you have an agreement in place, it becomes their responsibility to help keep you on the air. If you haven't already put that fee in the budget, do it now. Even if you've never needed one in the past, it's a good idea to have. Think of it as vacation insurance.

Time to Fix It

Now comes the preparation in advance of leaving. Remember that patch you did on that equipment a month ago? You knew at the time that it may come back to bite you, but heck, you knew it was there. Time to fix it! I remember a situation where an Engineer had a remote control that wasn't responding to touch-tones. He wasn't too concerned because there was a remote control at the studio. He lived near the transmitter site, so when the studio was unoccupied he could just run down to the transmitter site and take care of the problem. Well, he left town and sure enough – the transmitter tripped off. The guy who was backing him up had to drive all the way down to the site just to hit the "Plate On" button.

Be sure things like common spares, tubes, and manuals are easily found by your backup. Remember, the easier you can make it for the person backing you up, the less your phone will ring. One of the great things about the old Bell System was that every site was logically arranged in a way where any worker from any plant could walk right in and immediately know where everything was and could get right to work. Make sure anyone who covers for you has that familiarity with your site.

Locate the Backup Equipment

It's also good to over-communicate in the weeks before you leave. Weekly reminders, starting three weeks out that you will be gone, will hopefully trigger your staff to get in touch with you about important things before you leave. Check the promotions calendar for events happening while you're gone. Test the equipment to make sure it's working. Make sure the promotions staff knows where the backup equipment is located. Talk with the General Manager to see if there are any planned staff changes while you're gone. If so, can someone make the necessary email, server, and phone changes?

I can't stress enough to make sure that everyone knows that you will be gone and unavailable. Take the time to visit with each department head a day or two before you leave to make sure there's nothing that needs to be done. Remind them that anything that isn't brought to your attention before you leave will need to wait until you return.

That leads me to my next point: Be consistent. Set the standard – you are on vacation. I really can't stress this enough. If people know that you'll answer your phone and offer your sage advice while you're on vacation, guess what? They'll call you and ask for your sage advice while you're on vacation! My personal vacation rule-of-thumb is that all non-transmitter calls from work go to voice mail. I generally will check the message right away just to make sure it's not a true emergency, and if not, I'll return the call later on.

It's All About "Training"

Eventually your staff will learn that while you're responsive to emergencies, non-emergencies will take a back seat and may or may not be dealt with right away. It's all about "training" the staff. I know of an Engineer who even on his days off will have his phone ringing every few minutes. Why? Because he answers it! They know that even though he's "not available" he actually is. Why wait for the Engineer to get back when you know you can call and get the problem solved now! I realize that it's a hard habit to break, but it's an important one. It's kind of like teaching your kid how to ride a bike. You want them to occasionally fall a little so they know what it's like, but be confident that you'll be there if wheels fall off.

The same goes for email. While it really is impossible to get away from email these days, we can shield ourselves from it a bit. Only check email once or twice a day. If you have a smartphone, set your email to "manual" so that if will only check your mail when you tell it to. That will eliminate the Pavlovian response to look at your phone every time you hear a notification.

The last thing is to get yourself in the right frame of mind. This is really important, since you are not on vacation if you're thinking about work the entire time! We all like to think that the station can't survive without us, but the truth is that it will. It functioned before we started working there, and it will long after we're gone!

We Know the Truth

In fact, I like to believe that the fact that it can run a week without me being there for a week is a testament to my work and diligent planning. Plus, we know the truth: Any station will run OK for a little while without us. I like to remind myself that the station will have a lot more problems if I end up in the hospital because I worked to much and there's nobody around who knows what to do. Setting up this infrastructure is a good idea for many reasons.

Engineers suffer from a high rate of burnout. We tend to deal under a certain amount of stress every day. There are moments when we can't afford to just throw up our hands and walk away if things go bad. We're on call all the time, and something as simple as going somewhere away from town for the weekend is often very difficult. So it's important that everyone (including ourselves) understands that vacation time is extremely important to recharge the body and mind. We're more effective workers when we've had some breaks. We remain mentally and physically healthier, and our relationships stay stronger when we turn off work every once in a while.

Let's put the relaxation back into vacation!

Christopher Tarr CSRE, CBNE, DRB is the Director of Radio Operations/Engineering for 88Nine, Radio Milwaukee. He can be reached at chris@radiomilwaukee.org

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Practical Engineering

Monitoring Generator Temperatures Helps to Reduce Down Time

by Warren Shulz

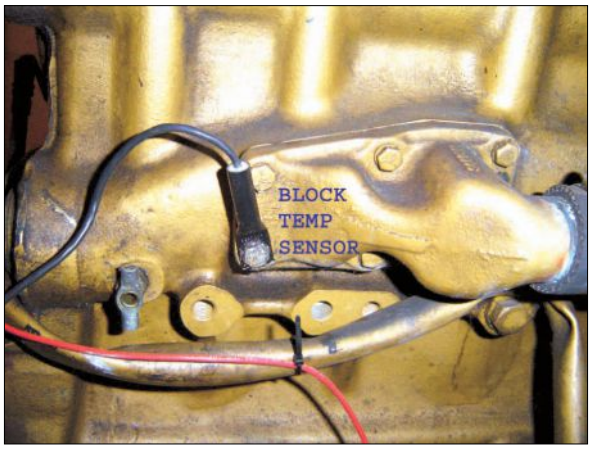
Most radio stations have backup plans to deal with equipment failure, so they can stay on the air. Generators can solve the problem of loss of commercial power – but only if they are kept in good running order. Warren Shulz shows why checking the generator requires more than just turning it on from time to time.

The biggest reason for the failure of a diesel generator to pass a four hour, full-load test is overheating; this problem is usually found during the first hour of testing. I would like to share a few proactive maintenance steps that will provide monitoring of two critical temperature points – and which just might save the day for you.

Temperature Monitoring

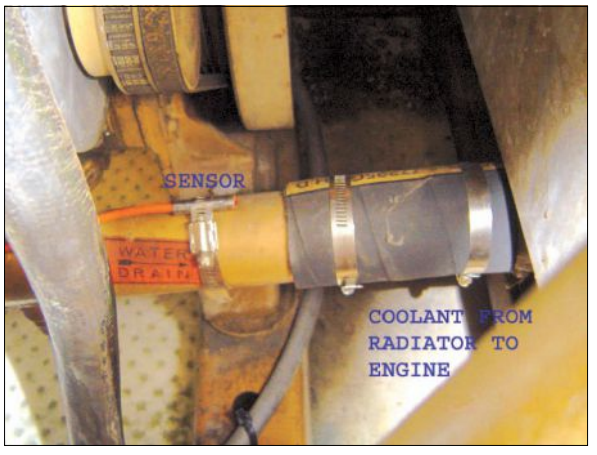
A generator has a hard time starting when very cold. The usual solution is an engine block heater, which keeps the engine warm and ready. Untimely failure of that block heater can be a real pain.

We added a Burk temperature sensor to monitor our diesel engine block temperature. The normal reading is about 120 degrees (with the sensor mounted near the heater discharge). We set the status alarm for this first sensor to a lower temperature reading in order to check for a block heater failure.



Temperature sensor is bolted to the engine block just above the block heater output pipe.

During the "run" condition with a 50% load, the block temperature at the point monitored rises to 160 degrees. The temperature of the coolant entering the top of the radiator when the engine is running is approximately 190 degrees, controlled by the thermostat.



The second sensor is clamped to metal radiator outlet pipe.

A second temperature sensor then was added to the radiator return line to observe the heat dissipation of the radiator.

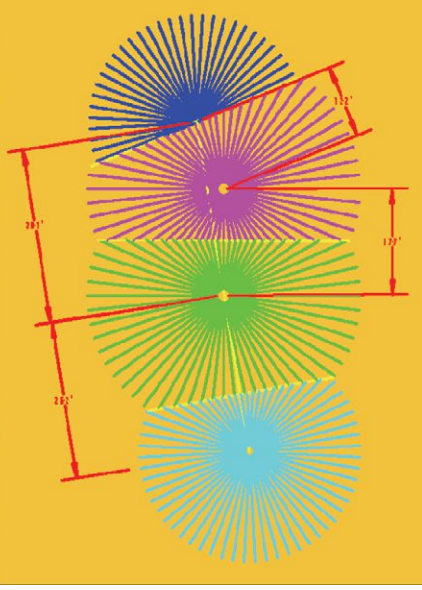
Once the generator is at the nominal run temperature (that nominal 190 degrees, as controlled by the engine's thermostat), the radiator return temperature gives an indication as to the condition of the radiator dissipation, the load on engine, and if an over-temperature shutdown is imminent.

Hooking It Up

Of course, it is necessary to ensure there is sufficient intake air volume for the generator to operate properly. So, in this installation, we use motorized louvers to provide the ventilation.

During operation, the louver control box opens the louvers – and confirms they actually are opened. Failure for the louvers to open causes a local alarm. Two pairs of wire

(Continued on Page 22)



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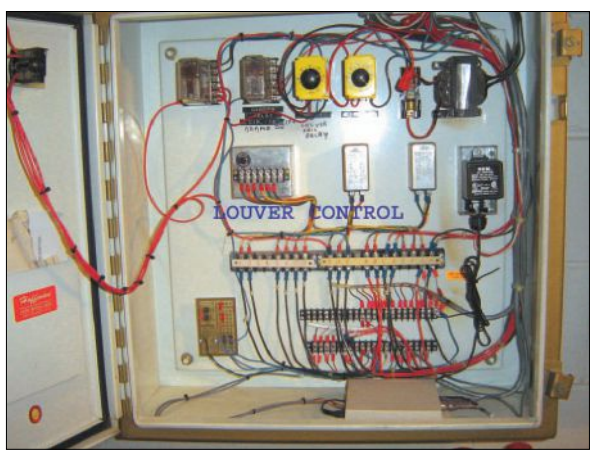
– Continued from Page 20 –

run from the Burk temperature output box to the Burk control chassis in the rack on the main floor of the transmitter room.



The louver control box with the temperature sensors attached to the box at the bottom.

Typical Telemetry

Here are some examples of the past testing results of the radiator return water temperature – measured with an infrared non-contact thermal readout:

- **April 2002:**
  129 degrees after a four hour full-load test.
- **November 2003:**
  126 degrees after a four hour full-load test.
- **September 2005:**
  171 degrees after a four hour full-load test.
  This reading seemed to indicate the radiator flow was being restricted.
- **July 2006:**
  120 degrees with a 50% load after one hour run.
  This reading was taken just after the radiator was cleaned.

The temperature probes are connected to the Burk processor, installed in Louver control box.

Radiator Fin Cleaning

In May 2006, during a service call to change hoses and coolant, we found the diesel motor stopped with an over-heat shutoff while supporting a 40% load. Our follow-up investigation showed that the coolant level was low as the air pockets had worked their way out of the block. The fluid level was restored with about three gallons of antifreeze.

At the time, it was also noted that the radiator fins appeared to be blocked with debris. The radiator had been installed in May 2001; since then the generator has accumulated some 300 run-hours. A water pressure power-washer with a pre-soak of 409 soap was used to clean the fins. After the power wash you could now see light passing through the passage ways.

Dirty air and oil leaks can rapidly deteriorate the heat dissipation capability of a radiator.

We determined that to reduce debris problems in this installation, it might be preferable to add air filters on the generator room inlet air supply duct. If you have any oil engine leaks, it is good to realize that this tends to coat the radiator, collecting more dirt.

Take a look at the used radiator above, going to the recoring contractor. Could a good fin cleaning have "bought some time" before it needed to be replaced?

Calibration

The Burk Temperature package uses a three-lead IC pack for the sensor. It outputs one millivolt per degree Fahrenheit.

When connected to the Burk ARC-16 remote control unit, there is a "DEG" mode for this sensor output to read the temperature directly in degrees without the need to calibrate the reading. For this feature, Burk gets an A+ from my grade book.

Using this system we have been able to observe the generator system operation closely (in addition to the temperatures sensors, we measure the generator operating voltage and current). This way, we have an early warning about any issues that might prevent the generator from being available when we most need it. *– Radio Guide –*

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Under One Roof at Last in Portland

We talk with DOE Chris Weiss about Clear Channel's seven-station move

FACILITY PROFILE

BY SCOTT FYBUSH

ON AIR

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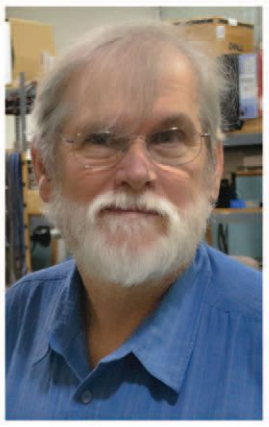
Engineer's Epinion...
Interoperability: Is Radio Ahead of the Game?

By Andrew Calvanese, VP Wheatstone



While other industries are just waking up to the idea of passing audio over an IP network, we have complete interoperable systems today. Broadcasters understand that it is not whether an individual device can stream AoIP, but rather the point is the integrated system itself. Can I route audio where I need it? Can I control it so it plays when I want, how I want? Can I make rapid and substantial changes in the system layout and flow without rewiring or re-patching everything? Can I organize and control my system from one centralized application that manages all the routing, streaming, mixing, logic, and control? With today's latest generation broadcast AoIP system, you can. In that regard, broadcasters are way ahead of the interoperability game.

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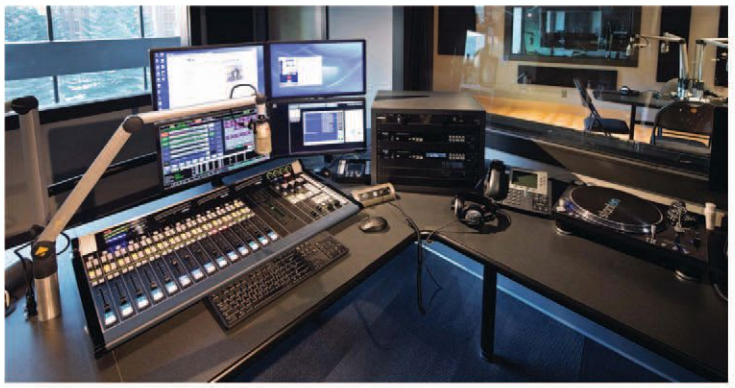
Wheatstone Central to CKUA's Epic Move



For the CKUA project, we set up our WheatNet-IP AoIP networking around a central production studio surrounded by control rooms, voice booths and newsrooms that share I/0 and line-of-sight between them. Kris Rodts, Director of Engineering, IT, and Facilities for CKUA, gives all the details in the cover story of the June issue of Radio magazine. You can download a reprint below, courtesy of Radio.

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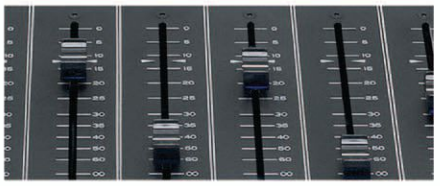

8 Things You Need to Know About IP Consoles

There's just something about that subtle "click" of the controls and the way those Penny & Giles glide up and down. Are we right? Yeah, we've been known to cop a feel every now and then, too, and we make them — hundreds of Wheatstone and Audioarts consoles every year. There's actually some pretty cool stuff we've discovered... Get the whole story here: 8THINGS.wheatstone.com

Winner's Circle

Wheatstone's goal is to give you the best possible tool set to become the best possible station in your market. WheatNet-IP represents an incredible leap forward in AoIP technology and is truly the next generation. More people are hopping on this platform every day and it's making a world of difference in their operations.

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Chief Engineer

No Fingerstock – No Air – No Output

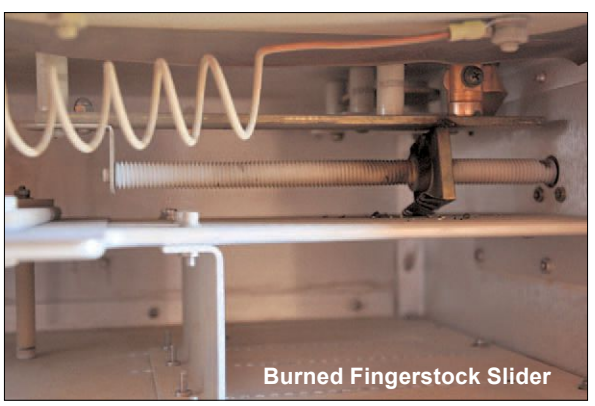
by Scott Schmeling

Most transmitters are very reliable and, dare I say, "trouble free?" But every now and then they all need a little attention. In fact, sometimes they're like a child misbehaving until they get the attention they crave.

Recently, one of our usually well-behaved transmitters started throwing some little hissy fits and going off the air! The first one happened about 5:00 a.m. in the morning. (Why is it, they hardly ever wait until a convenient time to fail – like, after lunch?) The transmitter is a Harris HT-10, operated out of our Marshall group of stations. The site is about an hour and a half from my home, so Keith Wright, the Operations Manager, drove to the site to check things out. He found high plate voltage, no plate current, and no RF output. Some serious cranking on the LOAD control would produce a little (very little) output. So Keith shut the filaments off and I hit the road.

While I was driving, Keith called to tell me he had opened the PA cavity and the tuning area. He said I wasn't going to like what I saw – he was right! The loading slider is a piece of brass, with fingerstock on the top and bottom that "rides" on a threaded rod. The fingerstock on the top was completely gone – as in *melted!* The fingerstock on the bottom was mostly there, but just barely hanging on.

I called Harris tech support and talked with Jeff Griggs. He said it was most likely caused by age. He also e-mailed me a service bulletin that included drawings of the cavity and tuning area with all the part numbers. This was invaluable, since this drawing is not included in the manual. Thank you, Jeff!

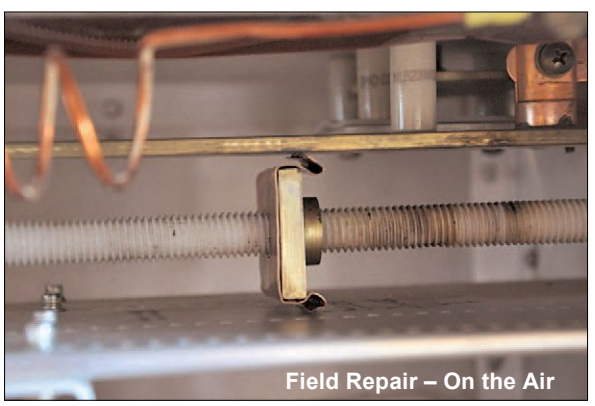


Burned Fingerstock Slider

Needless to say, I did not have a loading slider in my box of spare parts. And with all of the top fingerstock gone, it could not make contact with the top and bottom loading bar surfaces. I started looking around to see if I could field fabricate something to get us back on the air. Usually I can find at least a small piece of copper strap, but there was none there.

What I did find was a short piece of 7/8 Heliax with a grounding kit installed – we had saved the grounding kit from a line that had been replaced. It had been weatherproofed with layers of electrical tape over at least an inch of butyl. I've gotta tell ya – that's some messy stuff!

After pealing away the tape and butyl, I was able to get down to the copper strap. Using a wire brush and some solvent and rags, I got the copper relatively clean. Then I cut a piece the size I needed. My plan was to bend the copper as tightly as possible around one side of the loading slider brass block, with enough sticking beyond the top and bottom to bend into a contact surface. I would also have to drill a 1/2-inch hole in the middle where the threaded rod goes.



Field Repair – On the Air

The end bracket that holds the threaded rod in place had to be removed and the loading control turned, and turned, and turned ... to get the block off, then on again after being "field modified!" Quite frankly, I think *that* was the hardest part of the whole procedure. I had marked the position of the slider before moving any-

(Continued on Page 28)

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Chief Engineer

No Fingerstock – No Air No Output

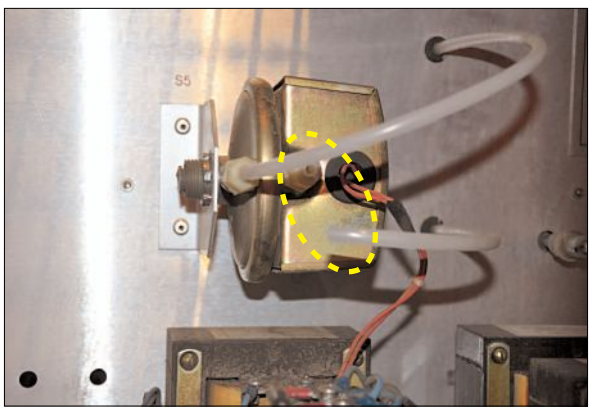
– Continued from Page 26 –

thing, so now that the copper had been bent into place, it had to be returned to the same position.

Once the loading slider was in position, everything was reassembled and closed up. Then the moment of truth. I press the Filament On button, and after a proper warm up, the Plate On. The good news – it worked! The transmitter came up to full power with readings fairly close to normal. I didn't try to adjust the loading after the transmitter was back on, because I didn't trust that the bent piece of copper would stay in place. Besides, this only had to work until the replacement arrived from Harris.

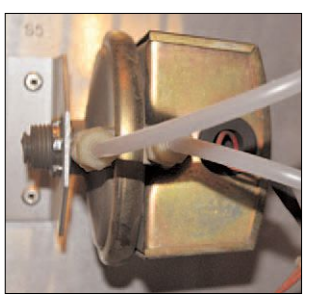
A couple weeks later, the same transmitter shut down again. This time, Keith went out to check and found the AIR led lit up – but the blower was running. The tubing that goes from the PA cavity to the air pressure switch is a whitish poly plastic and gets brittle with age and heat. Luckily, there was enough extra for Keith to cut off the end reinsert it into the pressure switch fitting. That was a nice quick *easy* fix! If only that were the end of it ...

Just a few days after that, the transmitter went down again. This time on a Saturday, and Keith was (as we say in Minnesota) "up North." We assumed that either the tubing Keith had trimmed last time might have been too short and pulled out of the switch fitting, or the other piece of tubing had broken. I just happened to be at the hardware store so I bought a few feet of 1/4-inch OD polyethylene tubing so I could replace both pieces with new. This tubing is commonly used in reverse osmosis drinking water systems and is easily found.



A Broken Pressure Tube

When I arrived, I did in fact, find the end of one of the pieces of tubing had broken. With new tubing in hand, I pulled out the proper lengths and cut them off. Installation was very easy. The fittings are nylon, and all I had to do was unscrew the fitting and pull the remnant of old tubing out. There was a compression sleeve over the tubing which grips the tubing when the fitting is tightened. The sleeves went over the new tubing and onto the fittings. The other end of the tubing slid through grommets on the cavity wall.



Good As New

Once completed, I pressed Filament On and watched the AIR LED extinguish. After proper warm up time, I pressed Plate On and the RF Output climbed to 100%. It was a beautiful thing!

I mentioned near the beginning that I had called Harris tech support. Factory tech support is a wonderful resource. They know their transmitters and, most likely, they have already dealt with the exact same problem you may be having. Don't be afraid to call them. That's what they're there for.

The factory web sites are also a very valuable resource. The service bulletin Jeff Griggs e-mailed me is also available on the Harris website. In fact, they have a very extensive library of service bulletins and other documentation for nearly all of their products. The address is www.harrisbroadcast.com. Choose Services and Support, then Customer Support Portal. You will have to register, but it's definitely worth it.

Continental's web site also has some great information about their product line, too. That address is www.contelec.com. Choose Support, then Knowledge Base. While you're there, check out the document "AM/FM Transmitter Maintenance." It's a general guideline for troubleshooting that stresses safety and knowing your transmitter's control circuitry. Many times, the problem keeping you off the air is not RF, but *control circuit* related (like the tubing to the air switch).

Many of us are one-man engineering departments, but we're not alone. Tech support is there for us.

I hope you all have a fabulous rest of your summer! Until next time ... stay safe and keep it between 90 and 105!

Scott Schmeling is the Chief Engineer for Minnesota Valley Broadcasting. You may email him at: scottschmeling@radiomankato.com

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Transmission Topics

LPFMs and The Allusive U/D Ratio

by Jim Turvaville

With the release DA-13-1385 by the FCC on June 17th, we are all trying to digest the procedures for the coming LPFM filing window. Some of the technical parameters were already known, including allowing LPFM stations on second-adjacent channels of full power stations. In Spectrum Limited markets, those second adjacent waivers will be automatically considered, but in other markets it will be on a case-by-case basis. In all markets, the proposed second-adjacent operation must demonstrate no real-world interference potential in the original application – the same process that has been used for over a decade for FM translators. An understanding of how that is calculated will be helpful to all broadcasters, and allow them to decide if an LPFM application or a translator modification application has interference potential to their station or warrants serious review.

While fully spaced commercial FM stations protect each other with a mileage separation chart based on their class of operation, all short-spaced FM stations, FM translators and NCE full power stations protect each other by contour. The proposed LPFM stations will be required to comply with a simple mileage separation chart as well, with a varying distance to other full power stations based on those stations' class. Only when an LPFM applicant requests an adjacent channel wavier would a contour protection analysis for the application be triggered and the "desired-to-undesired" or "U/D" ratios come into consideration.

The protection between FM signals has always been based upon the FCC Predicted Signal Contours and their relationship to each other. That FCC Predicted Contour, unlike an actual field contour one might go measure, is based upon an average of the terrain in a specific direction (azimuth) measured at a distance only from 3 km to 16 km from the tower. That means terrain less than 3 km from the tower, and farther out than 16 km is totally ignored. That has some odd advantages in skewing the FCC contours if the tower is located very close to or just far enough away from a major obstruction. Here in Colorado, a non-commercial full power station has a large FCC interfering contour that has to be protected by adjacent channel NCE stations. Because this tower is located just the right distance away, the small 14,000+ foot tall bump called Pikes Peak is ignored and an adjacent channel facility on the other side of the mountain has to respect that FCC contour, in spite of the fact that any real signal from the station most certainly does not exist.

Signal contour protection between FM stations is based on a ratio that is dependent upon the frequency separation between the signals. Specifically, whether they are co-channel, first, second or third adjacent to each other, there are differing protection ratios. Co channel signals have a -20 dB separation required, in that the proposed 60 dBu (50,50) contour cannot overlap the other station's 40 dBu (50,10) contour, and vice versa. First adjacent signals have a -6 dBu separation required, in that the proposed 60 dBu (50,50) contour cannot overlap the other station's 54 dBu (50,10) contour, and vice versa. Second and third adjacent signals have a +40 dBu separation required, in that the proposed 60 dBu (50,50) contour cannot overlap the other station's 100 dBu (50,10) contour, and vice-versa. These signal protection ratios are standard across all FM signals, except the actual contour values are slightly altered for Class-B facilities which fall outside Zone I-A.

A key variation between the different broadcast services is that FM translators are allowed to receive interference but not cause it to another station. Because FM translators are classified as "Auxiliary Service," their technical standards are written in this way, and this allows that service to exist where other full power signals cannot. Through this technical rule, the interfering contour of another full power station overlaps the primary contour of a translator, but the interfering contour of the translator cannot overlap the primary contour of another station. In the real world, this means that a translator on a co-channel with a full power station will be permitted inside the 40 dBu (50,10) interference contour of that full power station, but the 40 dBu (50,10) interference contour of the translator cannot intersect the protected 60 dBu (50,50) contour of the full power. A translator on a first-adjacent channel with a full power station will be permitted inside the 54 dBu (50,10) interference contour of that full power station, but the 54 dBu (50,10) interference contour of the translator cannot intersect the protected 60 dBu (50,50) contour of the full power.

Logically one would assume that would mean that a translator on a second or third-adjacent channel with a full power station will be permitted inside the 100 dBu (50,10) interference contour of that full power station, but the 100 dBu (50,10) interference contour of the translator cannot intersect the protected 60 dBu (50,50) contour of the full power. Because this ratio is inverted (a positive instead of a

(Continued on Page 31)

Transmission Topics

– Continued from Page 30 –

negative offset), this first half of that scenario is a physical impossibility to exist in the real world, and translators simply had to keep their 100 dBu (50,10) outside the 60 dBu (50,50) of full power stations to meet these technical requirements.

Beginning in the late 1990s, translator applicants began utilizing the letter of the law stated in CFR 74.1204(d) which states:

The provisions of this section concerning prohibited overlap will not apply where the area of such overlap lies entirely over water. In addition, an application otherwise precluded by this section will be accepted if it can be demonstrated that no actual interference will occur due to intervening terrain, lack of population or such other factors as may be applicable.

The first part of that regarding signal overlaps over water were commonly evoked where possible. But it was realized that "actual interference" was a mathematical variation, depending on the "actual" signals being considered, and utilizing the "lack of population" demonstration could allow a translator to exist within the 60 dBu (50,50) of an adjacent channel station. The NCE translators seemed to began this practice first, but after the Auction 83 filing in 2003, the practice became widespread on all translator applications.

Here is specifically how it works with sample signals and mathematical examples for a proposed translator on Channel 250 (97.9):

Station #1 is on CH 248, a full Class C2 located 20 km away. The signal is calculated to be 79.2 dB (50,50) making the relevant +40 dBu interfering contour 119.2 dB (50,10). The normal free space distance to that contour, utilizing a worse-case scenario of a dipole antenna, would be 24.3 meters; if the Channel 250 translator effective radiated power (ERP) was 10 Watts.

Station #2 is on CH252, a full Class A located 8 km away. The signal is calculated to be 82.1 dB (50,50) making the relevant +40 dBu interfering contour 122.1 dB (50,10). The normal free space distance to that contour utilizing a worse-case scenario of a dipole antenna would be 22.4 meters ; if the Channel 250 translator effective radiated power (ERP) was 10 Watts.

The variables in the calculation are: 1) the actual power and height of the full power stations on the adjacent channels; 2) the distance of the proposed low power signal from that full power adjacent channel station; and, 3) the proposed effective radiated power of the low power station. The resulting calculated distance to interfering contour comes from a rather complex logarithmic formula, while many of the other calculations are available on-line using the "Shortcuts" pull down tool located at http://transition.fcc.gov/mb/audio/. The rule of thumb is that the closer the adjacent full power signals are to the proposed low power operation, the higher the ratio and the less the likelihood of any real work interference occurring.

If, as in this example, the proposed transmitting antenna for the low power signal was at a height above ground of at least 26.3 meters (the larger of the 2 contours plus a 2 meter height of an average person) and there were no other buildings or public access points in that distance, then the showing would be essentially complete. Since we are aware that the FCC processing staff utilizes commonly available resources – specifically, Google Earth, Bing, etc. – to double check what the location *really* looks like, a good methodology is that you do the same up front; often submitting aerial photographs ourselves with the application. This also means that obtaining one of these waivers when using an antenna mounted on a building roof is next to impossible – the ratio is rarely high enough for that interfering contour to not penetrate the roof. There is also a particular bias with the processing staff against this practice of using roof mounted signals, so it is rarely requested and even more rarely approved.

Often, in the case of higher power translator (fill-in signals), the use of multi-bay or other specialized antenna arrays are needed to show compliance with the zero population declarative. These involve vertical radiation pattern data from specific antenna manufacturers that applies a field value (decrease in the signal level) based on the angle at which the contour reaches population. This skews the distance to the interfering contour sufficiently to demonstrate a zero population waiver request is warranted. These applications are usually given very close review by the processing staff and almost always require extensive technical showings, topographic maps and aerial photographs.

Then comes the marriage of engineer and lawyer with respect to the FCC filing – requesting a waiver of the rules based on a technical showing. In order for one of these applications to be considered, the mathematical calculations have to be presented which would demonstrate *"that no actual interference will occur due to… lack of population"* and then a specific legal waiver request has to be made (not just assumed based on the technical showing) in the application. While this is really a legal issue, it is most always incorporated into the Engineering section of the application with the technical showing, and usually comes from the consulting engineer using accepted legal language in the exhibit.

While all of this may seem daunting to the broadcaster watching his adjacent channels for LPFM or translator squatters, there is a final word of encouragement. Because of the legal and technical nature of both of those low power services, it should be noted that should any actual real world interference occur after the translator or LPFM facility is constructed, that licensee is required to promptly suspend operation of this station in accordance with 47 CFR. 74.1203.

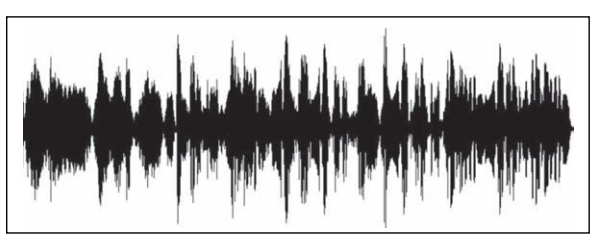
Jim "Turbo" Turvaville has been Director of Engineering and I.T. for WAY Media (www.wayfm.com) since 1999 and currently works in their Corporate Office in Colorado Springs, CO. He also maintains a small clientele of stations under his Turbo Technical Services (www.jimturbo.net) operation providing FCC application preparation and field work.

Cover Story

– Continued from Page 6 –

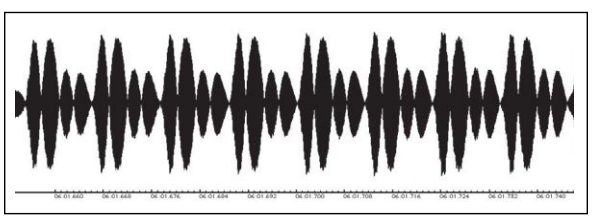
What You Need to Know About Audio Time Management for Radio

An approach used by some systems is to look for pauses – these are those places where the volume falls below a speficied preset threshold – and cut those pauses out. That's also problematic. It can, as you can see in the following waveform, completely destroy the pacing and delivery that your air talent works so hard to present. Since music rarely has pauses, it is impossible to effectively speed up music this way.



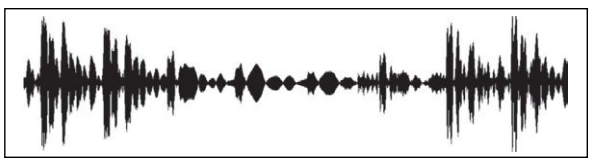
That's why 25-Seven takes an original approach.

25-Seven squeezes time imperceptibly by working on a much tinier scale – not syllables, words, and pauses, but individual waves. Let's zoom in on that sound, with each mark representing a millisecond.



Vowels like the one shown above, and sustained musical notes, consist of repeating patterns of waves. 25-Seven's algorithms recognize these patterns, and – using artificial intelligence – delete just enough repetitions to make the sound faster without making it sound different. Think of the process as making tiny, very precise splices in long, continuous sounds. Each individual wave still takes the same amount of time, so the pitch doesn't change, but there are slightly fewer waves overall.

Some sounds, including most consonants and almost all percussion instruments, don't have nicely repeating waves. The algorithms recognize these sounds, and apply psychoacoustic principles to make cuts only where the ear isn't likely to hear a change. A few kinds of sound, such as the short consonant "T" or the first part of a cymbal crash, don't get cut at all.



Technically speaking, we use variable-width analysis windows to simultaneously check the pitch, tempo, and spectral characteristics of the audio. Additional algorithms are applied to preserve musical rhythms and stereo placement.

The intelligent analysis and manipulation occurs thousands of times per second. Pauses are analyzed and processed the same way, so everything is kept in proportion and details of breath and pacing are never lost. The result is smooth, natural sounding time compression that is virtually undetectable to listeners.

25-Seven Precision Delay

The same time management algorithms used by all 25-Seven products to ramp in and out of delay are applied in Audio Time Manager (ATM) and Program Length Manager (PLM) to alter the length of programs or program segments.

Graphics, and some of the text, were appropriated from Jay Rose's awesome user manuals for 25-Seven products. The author wishes to thank Art Reed, Chuck Kelly, Barry Blesser, Eddie Cortez, Rick Sawyer, Geoff Steadman and an unnamed engineer for their assistance.

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Tech Topics

Phase Locked Loops - a Workhorse

by John Bredesen

The Phase Locked Loop (PLL) is a giant workhorse in many areas of electronics, including broadcast, computers and telecommunications. They can be utilized to generate a stable and clean frequency, from one with significant noise, allow easy channel agility for STL and RPU transmitters and receivers, and can be used as a demodulator for AM, FM and a decoder for DTMF – and more. Let's take a look at the fundamentals of this versatile circuit.

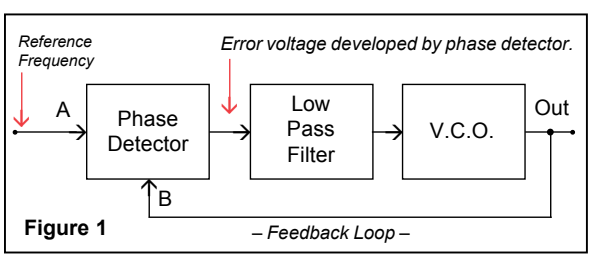


Figure 1

In Figure 1, note that there are four basic components in the typical PLL: 1. Phase Detector, 2. Low Pass Filter (LPF) (sometimes referred to as the loop filter), 3. Variable Frequency Oscillator (VCO), and 4. Negative Feedback Loop.

The phase detector is the heart of the circuit. This block has two inputs (A & B) and compares the frequency and phase of the inputs, and produces an "error" voltage which represents the difference between them.

Depending on many factors, the error voltage may contain "noise" and other high frequencies which are generally undesirable. It also contains an important varying low frequency component which extends down to DC, so the low pass filter is used to eliminate the undesired components. This cleaned up signal is applied to a voltage controlled oscillator (VCO) which is designed to free-run "close" to the desired output frequency.

A free running oscillator's frequency is usually determined by a resistor-capacitor or inductor-capacitor arrangement, the values of which determine the free running frequency. If a "varicap" (voltage variable capacitor) is introduced into the R-C or L-C frequency determining components, we can vary the frequency of the oscillator through an external voltage.

But, as they say, close is good enough for horseshoes and hand grenades. In this circuit, we're after a VCO output that's identical in frequency and phase to input A. That's where the negative feedback loop enters. A sample of the output from the VCO is fed back to the phase detector where the comparison is made. For the purpose of this explanation, let's take the output of the VCO which (for now) is close to the input frequency, and send it to input B of the phase detector. The phase detector senses that the two are not the same frequency, thus the output will contain an error correction voltage representing that difference. Passing through the LPF, it changes the tuning of the VCO (via the varicap) in such a way that the VCO frequency moves closer to the input frequency. After a brief period, determined mostly by the characteristics of the LPF, the VCO will lock to the exact frequency as the input signal.

That's the basis of a PLL, but what do you do with it? Let's take a look at a few examples. Here's how we can use it to demodulate an FM frequency.

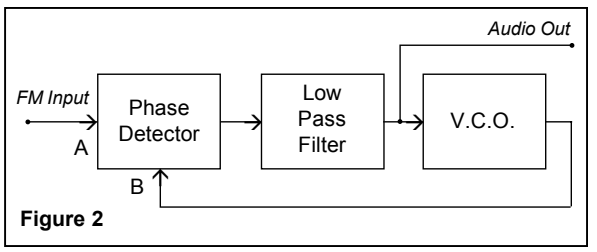


Figure 2

In Figure 2, since input A is now a varying FM signal, the error output of the phase detector will be constantly changing as the PLL works to keep the VCO locked to the incoming FM signal. The result is a VCO output that's a replica of the input because the feedback loop sends this VCO signal back to input B. Since we're using a PLL for demodulation of an FM signal, what we're actually interested in is the signal at the output of the LPF. As the error voltage varies to keep the VCO locked to the incoming FM signal, we find that it's a replica of the original audio signal that modulated the transmitter in the first place, hence FM demodulation.

Now, in Figure 3, let's take the same basic circuit to create an FM signal. This is actually the basis for many earlier (non-digital) FM exciter designs.

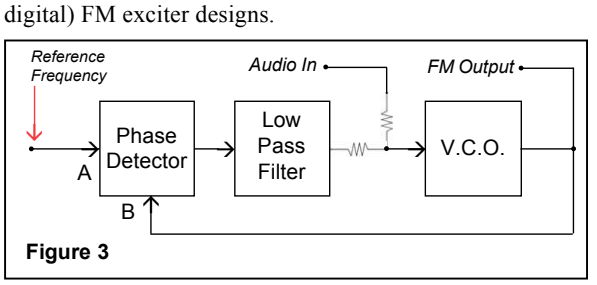


Figure 3

If we're designing a broadcast FM transmitter, the requirements for frequency stability are stringent, essentially meaning that the output frequency must somehow be referenced to a crystal controlled oscillator.

(Continued on Page 36)

Tech Topics

– Continued from Page 34 –

From a practical standpoint, it's difficult to successfully frequency modulate a crystal controlled oscillator. So how do we derive a stable FM signal? The PLL is one way of doing it.

Again, let's investigate Figure 3. This time let's start with a reference frequency, originally derived from a crystal controlled oscillator, as the input A to the phase comparator. And furthermore, let that reference frequency be that of your FM transmitter. Again, just like the other two circuits we've looked at, the error correction voltage goes through a LPF to the VCO. Now close the feedback loop and you have the VCO running in lockstep with the crystal reference. Stability achieved.

But our job is to frequency modulate the output signal. The simplest way is to introduce our modulation audio into the error correction signal at the input to the VCO. This can be done with a simple resistor mixer just before the VCO.

But wait – if you introduce an additional (audio) signal, won't that drive the VCO away from the desired reference frequency? Yes. And won't the phase detector attempt to make a correction to bring it back to the reference frequency? The answer is also yes. So how do we get this circuit to have both stability and modulation? The answer lies with the low pass filter.

As the audio modulates the VCO, the error correction voltage from the phase detector will contain a replica of the audio signal, but out of phase. At the same time, the phase detector is keeping track of the average frequency of the VCO which will be essentially a DC component in the error signal. If the design characteristics of the LPF are such that the audio component in the error signal can't get through, but the DC component can, then you've got a VCO that's still locked to the reference oscillator for stability, but which is also modulated.

Many transmitters and receivers in the last few decades are frequency agile, meaning that you don't have to change crystals when you need to change frequency. This is usually done with (you guessed it) a phase lock loop. In this application, the circuit becomes more complex because we're introducing a frequency divider. Here's one way to produce a field adjustable reference frequency such as the one used in Figure 3 on page 34.

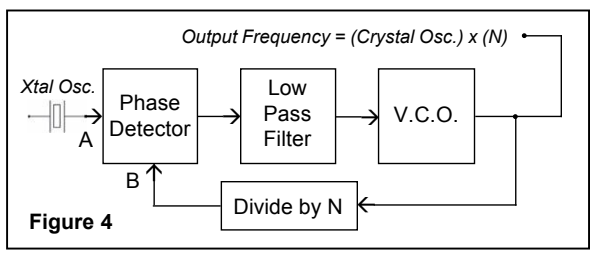


Figure 4

In Figure 4 we start with the same basic components we've seen in the previous examples, but were going to introduce a block in the feedback loop that's capable of dividing a frequency by some user defined number. We'll call this the "Divide by N" block

In this example, let's say we want an output frequency of 20 MHz, so let's set the free run frequency of the VCO to about 20 MHz. The reference frequency is 10 MHz When the 20 MHz signal from the VCO is fed back to the phase comparator, it's routed through the "Divide by N" block where N=2, so the output of the divider is near 10 MHz, exactly half of the VCO output frequency. Because the VCO is not yet oscillating at exactly 20 MHz, the approximate 10 MHz output from the divider block causes the phase detector to create an error signal which soon locks the VCO to exactly 20 MHz

Now let's look at a set of parameters that you might find in a piece of your equipment. Start with the same setup as given in the above example: 10 MHz reference, and the now familiar PLL with the divider block. The difference here is that we're looking for an output from the VCO that is at the station's output frequency.

But in order to get an output from the VCO on the station's frequency using 10 MHz as a reference, we need to do a bit of math. Just as in the above example when we divided by 2 to double the output frequency, here we're going to need a bigger number. Let's say you're at a station assigned 94.5 MHz as the operating frequency. If we divide 94.5 by the 10 MHz reference frequency to give the "divide by" number, we come up with 9.45. The chip in the Divide by N block will do that when set properly.

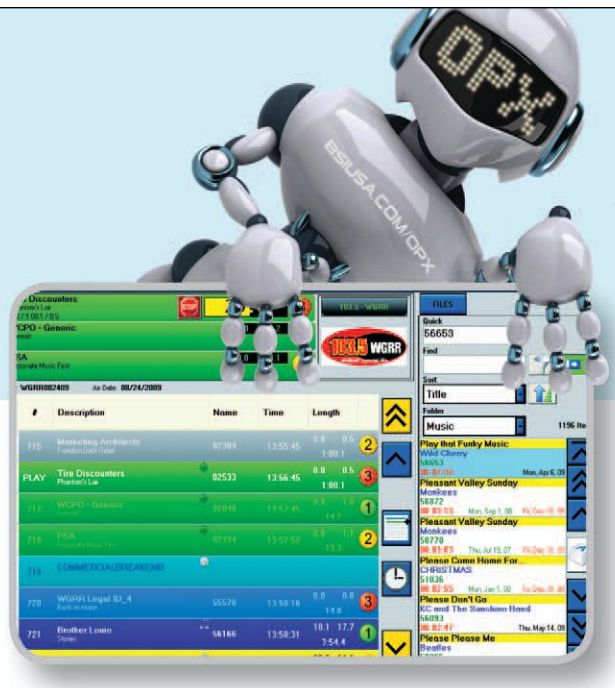
Now when the PLL is locked, the VCO output (94.5 MHz) sample into the Divide by N block yields 10 MHz, allowing the phase detector to compare it with the stable crystal controlled input. So now you have a stable, on-channel frequency that can be used as the reference input A to a second PLL (FM modulation) in the configuration described in Figure 3.

Divide by N – User Set

In some ways, the Divide by N circuitry is the most unfamiliar, but the semi-conductor industry has created many chips that perform this function easily. The neat thing about these Divide by N blocks is that they can be user set to just about any divide by N desired by the use of external switching. For instance, at KLCC, we have several Broadcast Electronics exciters that use this technique to set the output frequency using a series of tiny DIP switches. Other designs allow a microprocessor to tell the divide by N block what is needed.

PLLs are very useful circuits. They're used in many more applications than we've had space to explore. As is the trend with everything in electronics, more designs that perform these operations are becoming digital. If you're still curious, go on line and search for "phase locked loop" and you may be surprised at the results.

You may email John at: jarthurbredesen@gmail.com



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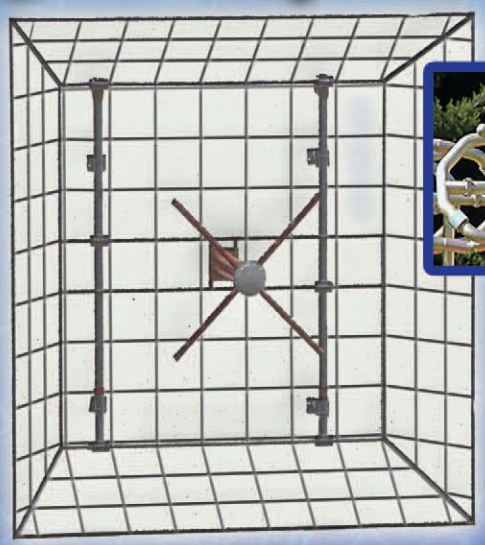

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LPFM Guide

What's Up With LPFM Radio These Days?

by Leo Ashcraft

Many have asked what's up with LPFM radio. Here is a bit of a recap on what's transpired this year for the LPFM service. Many new positive rule changes are on the books now and we have a confirmed two week filing window for later this year.

Second Adjacent Waivers Creates More Availabilities – Maybe

One major change in the rules is the use of second adjacent waivers. These are available to those areas that don't have any fully spaced channels. Keeping in mind that though a second adjacent might be available, they must be backed up by solid engineering studies that prove the calculated interference zone will not affect *any* listeners to the affected existing second adjacent facility. Some are fairly simple, once you have calculated the interference zone. If inside that zone, there are no buildings or four lane highways, it would likely be a grantable waiver. However, usually where a second adjacent waiver is needed would be in highly populated areas. So that kills most attempts at siting these stations using this method.

Second Adjacent Second Chance

If the basic second adjacent waiver process just won't work, the second option would be to utilize a directional antenna and height, to pull up the radiation center towards the horizon, off the ground, and away from potential listeners inside the interference zone and near the proposed tower. This can get a bit tricky however. This is a time consuming process and is much more complicated than even a full-powered application. An applicant for a second adjacent frequency will need specialized software and experience handling these kinds of studies. This is not something they will be putting together utilizing Google maps as the Commission suggested a few months ago. I must note here that directional antennas are only allowed for second adjacent waivers, and *only* where needed to clear the interference zone.

Bye Bye Third Adjacent

Protection for existing stations on the third adjacent frequency is no longer considered. No waiver is required for a station application located three channels away from the proposed application frequency.

LPFM Far Far Away

Other changes include the maximum distance that board members may be from the proposed transmitter site. Previously that was ten miles. Now that can be as much as twenty miles if the application is located outside of the top fifty markets. Many times a rural LPFM will have board members living more than ten miles from the site, this new rule change will be very helpful to rural applicants.

New LPFM construction permits will be good for up to eighteen months initially. If the CP holder is unable to build within eighteen months, an extension is now available for an additional eighteen months. Extensions should be requested no less than three months from the expiration date to allow sufficient time for the Commission to process the request.

Once the station is built and on the air, the station cannot be transferred to another entity for three years. The Commission put this restriction in place to discourage speculators from snatching up LPFM frequencies from serious applicants.

Hasta La Vista LP10

The Commission abandoned the LP10 – 10 Watt version of LPFM. A filing window was never opened for this service. It died on the vine so to speak. There are still some rumblings from an attorney who has been pressing the FCC to allow stations in the 10-50 Watt range. So far it appears to be landing on deaf ears. And rightly so, as the current service allows licensing as low as 50 Watts already. The noise floor of the FM band is such that anything less than 50 Watts is really useless anyway, especially in metro areas where they claim this wattage is necessary to squeeze in more stations. The reality is that lowering from 50 Watts to say 10 Watts doesn't really create many more availabilities in metro areas. And many metro LPFM stations are already complaining about the noise floor even with 100 Watts.

More Power to LPFM

There is a proposal coming to increase the maximum power of an LPFM station to 250 Watts. The FCC has taken that possibility seriously and positive comments from the Commission have been noted.

(Continued on Page 40)

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What's Up With LPFM Radio These Days?

– Continued from Page 38 –

That change will likely occur in 2014 where existing LPFM licensees may have the opportunity to upgrade to 250 Watts. Of course an engineering study would be needed to prove the upgrade would not interfere with existing stations. However, with the buffer zone on these existing LPFM stations, there is a good possibility many will qualify.

Even More Power to LPFM

One exciting change for LPFM licensees is the ability to own up to two 250 Watt translators to extend their coverage. Previously an LPFM licensee could not own any other licensed broadcast properties, so this is a major thing for the LPFM service. An LPFM could be rebroadcast on a translator; they just couldn't own that translator. So with a couple of translators at 250 Watts and 328 feet max, that's a major power increase and coverage for an LPFM station!

But don't get too excited – there are restrictions on how far the translator can be from the LPFM station. Additionally, the Commission will not accept translator applications during the upcoming LPFM filing window. That translator window will likely be in 2015. LPFM stations can purchase existing licensed or construction permits for translators. We've been getting a lot of calls from both sides of this recently.

Ready Set Go!

First things first though. We need to get through the next LPFM filing window first. And yes, finally the Commission has announced the official filing window. This window will be open on October 15th through the 29th. Yes, that's a two week national window for all states. The previous window nearly thirteen years ago was only five days and divided the United States into several regions. This was a bit of a mess; we're elated the Commission has decided to handle this through a single national filing window.

LPFM Shock

With so many delays of this window – starting back from 2010 – many would-be applicants are a bit shell shocked and in a bit of disbelief that this really is happening in October, after thirteen years and three years of recent delays. Trust me – this window is happening and will likely be the very last LPFM filing window. Now is not the time for procrastination for an LPFM applicant.

Several steps need to be taken in preparation for the window. Non-profit formation can sometimes take up to two months, and locating a workable tower site and securing reasonable assurance of availability, for instance. September and definitely *not* October is not the time to start thinking about getting started.

What's a Vongel?

As you know, I am in the final steps of retirement. I am hanging in there to help people through the LPFM filing window this October. I have assembled a tremendous staff to help those applying, after-the-window support, build outs and even purchasing existing stations, translators, etc. As many of you know, I tinker with various Internet websites and services. Back in 2004, I started a website called RadioDaddy. This was an extremely popular service to find and receive quality voiceover services for a low fee, or even free!

Initially, I got the idea because I was running a small one man operation Non-Com FM station. There weren't many voices on my radio station other than mine; I wanted some variety so that it didn't sound completely like "Leo Radio." I asked some friends in the business that also had small stations if they would cut some spots, liners etc. for me. In return, I would do the same for them. This worked well, so I put together a website and soon had 300 members trading services together.

Within two months it was a thousand, and when I sold it in 2008 we had over 20,000 members. I had my reasons for selling at the time – but have missed it ever since. So now, that I have more time to devote to this, and my non-compete clause has run out, I am doing it again! Soon my new voiceover exchange service will be live at Vongel.com. This expands greatly on the old service and will not only allow free requests for services, but methods for paid services for professional voiceover artists as well.

This will be a great training ground for those wishing to get into the voiceover business as well. They will be able to graduate through the levels from providing free services to later services for a fee – all with payment collection and product delivery built into the system. We're currently nearing beta release of the service and would love to have you on board as a beta tester and founding member. So check out the site and request your invitation today at www.Vongel.com

Leo Ashcraft is CEO of Nexus Broadcast "Broadcast Outside The Box!" Leo may be reached at email: Leo@NexusBroadcast.com, and at phone number: 888-672-4234

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Small Market Guide

Really Small Market Radio at It's Best

by Roger Paskvan

I was fortunate enough to take a trip to our 50th state, Alaska this past year. Naturally, I wanted to check out "home town" radio through my travels. It was a pleasant remembrance of what radio used to be.

Alaska is probably the most remote place on the planet, or for sure in these United States. Geographically, there are many engineering coverage problems caused by mountain ranges, and just the distance between towns. The state is made up of many small villages in remote areas. Some of these towns have no roads and are only accessible by air or water. There are still places that have no cellphone service and dial up Internet service. In reality, this is the perfect setting for small market radio stations. Many of the villages have one radio station that does it all. These are your typical small market, Ma & Pa owned radio stations with the same two employees doing everything from sales to announcing – and their own engineering.

My first stop was flying into an isolated, small fishing village called Cordova. This beautiful town is located in a valley with mountain ranges on three sides. Great for looking, but a real coverage problem for radio. They had a 1 kW AM and a small FM located down on the sea shore – KLAM and KCDV. The signal did very well throughout the area but didn't go very far out of town. Since there are no roads leading to or from Cordova, it didn't matter. KCDV was your local lost and found source, music source, and news source, along with tidal information and fishing weather dominating everyone's interest around town. There were fishing catch reports as part of the news because this was what the home town people wanted to hear. A popular program is "Tradio," a buy/sell auction, and a Friday night call-in show hosted by local high school students.

The town is so small that the local hardware store carries everything from food to big fishing tackle. Radio survives here because it is part of the community. The local people rely on radio to get their only source for information. This is grass roots radio at its finest. The town goes to sleep early and that includes the radio stations signing off.

My next stop was Valdez, a nice fishing nest on the sea with snow capped mountains on each side. There were only two stations in Valdez – one 1 kW FM and an AM. Yes, like Cordova, fishing information and tide levels dominated the air waves. This was a serious fishing village and the fishing season is only three months long. In the short time I was in Valdez, I even heard a live broadcast from the school principal. KVAK covers local sports and devotes programming time to kids' programs – small market radio in action, serving the local needs of the licensed community. The big hype this year was bragging about Valdez's 354 inches of snowfall, that's *29.5 feet deep* from last winter! (see photo)

29.5 Feet of Snow in Valdez!

Our last stop was a nice quite village on the far western part of Alaska, Nome. The dominant station in that small market is KICY, owned by Artic Broadcasting. Disregarding the play on words, KICY is a 50,000 Watt AM and a 1 kW FM station located on the sea coast. This is a serious radio ministry operation with a very popular morning show live from 7 to 9 every weekday, called the "Coffee Crew."

The station has a unique programming mission unlike any other radio station in the USA. KICY is the only commercial radio station in the United States licensed by the FCC to broadcast into another country in their native language. When the people of Western Alaska are sleeping from 11:00 p.m. to 4:00 a.m. it's evening in Chukotka, our nearest neighboring Russian region. At that time, KICY's AM is aiming a directional 200,000 Watts ERP westward into this often cold and dark part of Russia, spreading Christian doctrine to our neighbors.

The station also sends solar powered radios to its listeners in Russia. Another unique factor is that the power for this radio station comes from an 18-turbine wind farm just outside of Nome. A unique and specific application of small market radio at its finest hour.

An overview into the past days of small market radio? No, just real radio in very small markets, and how they have adapted to the needs and wants of their respective communities. The remoteness of Alaska provides the culture and setting for local small market radio to flourish.

Roger Paskvan is an Associate Professor of Mass Communications at Bemidji State University, Bemidji, MN. You may contact him at: rpaskvan@bemidjistate.edu

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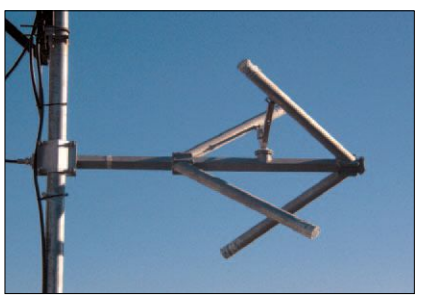

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He started by developing the Carribbean out of Aquadilla, Puerto Rico, back in the late 70's, then moving to El Toro, in the south of California, where he made contacts in Mexico, Central and South America. Rob spent many years in the Dallas area expanding contacts and sales world wide. Rob then moved to South Central Florida where he worked with station owners and top engineers.

For the last eight years, Rob has been operating from the Metroplex of North Texas. Rob has developed a close relationship with the top broadcasters across Canada, and has been instrumental it helping them move from AM to the much more desirable, interference free, FM band.

His skills have been primarily devoted to the pre-owned AM and FM transmitter business. The all new Besco Internacional will not only keep a complete inventory of clean used transmitters, but Rob will represent a number of the major manufacturers of the latest technology, providing towers, antennas, coax, and supplying all of your audio needs.

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www.radioshowweb.com

SBE 22 Broadcast and Technology Expo
September 25, 2013
Tuning Stone Resort and Casino, Verona, New York
www.sbe22expo.org

WBA Broadcasters Clinic
October 8-10, 2013
Middleton, Wisconsin
www.wi-broadcasters.org

135th AES Convention
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