Radio Guide

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Digital Issue Now On-Line

July-August 2014 – Vol. 22, No. 4

Small is Beautiful – Innovating Over the Years

POWER & LOGIC CONTROL

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An interface for control of "On The Air" warning lights and utility switching from tally circuit of a broadcast console or switcher.

LOGICONVERTER
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DISTRIBUTION, ANALOG & DIGITAL

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MultiPort is a multi-format digital and analog interface panel that provides convenient access to studio inputs and outputs.

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TALENT POD
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The MultiPhones Distributed Headphones System provides headphone listening facilities for multiple users. Use with Guest Pod and MiniPod listening stations or with Talent Pods/ Sports Pods.

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A compact stereo headphone amplifier that can be used with MultiPhones II Master unit, or by itself as a "stand alone" headphone listening station.

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AutoSwitch is a silence sensor and automatic stereo switcher. It switches to Backup audio if Main audio fails or loses a channel.

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Critical Content for Radio

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Small is Beautiful: *To radio station customers who need the products and services offered by these companies, size truly does not matter! Radio Guide spoke with four small businesses who have been innovating for decades. All four got their start by addressing specific customer needs. In this issue, we talk with Joe Klinger of JK Audio (founded in 1992) and Rod Graham of Graham Studios (founded in 1980). In a future issue, we'll continue the discussion with Henry Engineering and Circuitwerkes."*

FCC Focus – *by Peter Gutmann (page 14)*

Radio Myths: *"Although some may have wished – and a few have tried – you can't run a radio station without a staff. That means you must rely upon others to keep you out of trouble with the FCC. Unfortunately, in their push for sales and ratings your staff may overlook some key FCC danger spots, so the time may be ripe for a reminder of how to avoid them."*

Chief Engineer – *by Scott Schmeling (page 26)*

Build a Universal Marti Antenna: *"I still like to build things. It's in my nature. I'm guessing many of you are the same way. One thing I've found to be extremely handy is a "build-your-own" Marti antenna mount. This project was initially born from the need to mount an antenna at sites where remotes are done frequently."*

Audio Guide – *by Mike Phillips (page 38)*

Audio Over Internet: *"The Internet has leveled the playing field ... there are some very simple solutions that are free, assuming you already have Internet access and computers, microphones, headphones, and mixers."*

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Cover Story

Small is Beautiful

Innovating over the Years

by Elaine Jones, owner, Elaine Jones Associates

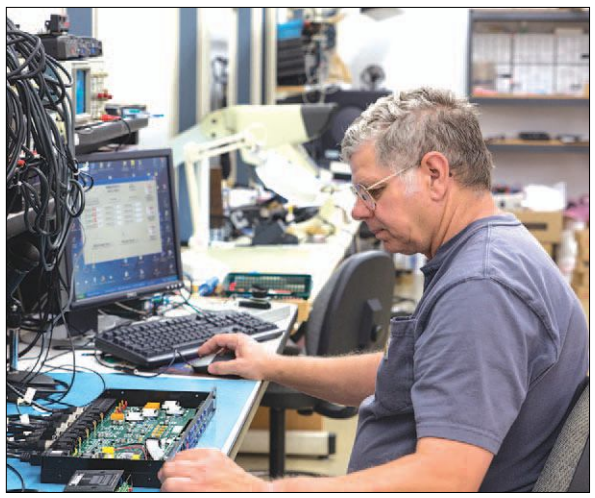
The U.S. Small Business Administration classifies manufacturing companies in our industry as "small businesses" if they have 750 or fewer employees. By this standard, virtually every manufacturer of radio equipment is a small business. Some, however, are truly small, ranging from sole proprietorships to businesses with fewer than 20 employees.

To radio station customers who need the products and services offered by these companies, size truly does not matter! Radio Guide spoke with four small businesses who have been innovating for decades. All four got their start by addressing specific customer needs. In this issue, we talk with Joe Klinger of JK Audio (founded in 1992) and Rod Graham of Graham Studios (founded in 1980). In a future issue, we'll continue the discussion with Henry Engineering and Circuitwerkes.

Graham Studios Radius Curve Setup

Radio Guide: What events led you to the creation of your company?

Joe Klinger, JK Audio (JK): I had just spent 7 years at AT&T Bell Labs designing telecom audio interface products for laboratory use in a Speech Processing lab. I soon realized that extracting high quality audio from a phone line was a unique skill, and quickly recognized the applications in the broadcast market.



Dean Tillman at a JK Audio Test Bench

I couldn't do it alone. My wife Linda handled bookkeeping, allowing be me to concentrate on product development. We slowly added a dedicated assembly and office staff, and eventually hired two former Bell Labs colleagues.

Rod Graham, Graham Studios (GS): We began in 1980 as a cabinet shop doing remodels and fixtures in Medford, Oregon, but didn't really become visible in the industry until NAB 1984. I was asked by Arrakis in 1983 to build side pieces for their consoles, which I did in my shop – then I was asked to build a set of furniture for their booth for NAB 1984. I sold that furniture off the show floor and sold another four sets in the next three days. I thought "Wow! This industry has some promise!"

My company continued to manufacture and sell furniture packages until 1988. Then the owner of Arrakis and I forged a deal where he bought the woodshop and I became VP & part owner. I made my furniture under Arrakis Systems for 19 years. In 2007, I bought the entire woodshop back and founded Graham Studios in Fort Collins, Colorado.

Radio Guide: What was your first product, and what did it do?

JK: Our first Radio Broadcast product was the model THAT-1 Telephone Handset Audio Tap, which allows a field reporter to capture clean phone recordings and play them back to the station over any phone handset. We sent out a mailing to 150 farm broadcasters and quickly sold 70 units. We knew that we were on to something. Model THAT-1 is still in production today.

GS: We've been focusing on high quality furniture since our founding, both custom designs and modular packages.

Radio Guide: What has been your biggest challenge as a small company?

JK: Financing! We started the company with our good friends Visa and Master Card. The banks wouldn't take us seriously until we hit $1M without a LOC. It wasn't easy, and there were some very lean years.

Second would be compliance testing. Our products must go through the same compliance and safety labs that are frequented by major corporations. We've been lucky so far, as our testing lab seems to have a soft spot for us.

GS: The simple answer is: keeping up with an ever changing industry. Quality products at all price levels as well as new and inventive product offerings are always at the forefront of our research.

Radio Guide: How do your current products/services differ from your original offerings?

JK: I think its safe to say that we are the world leader in interface products for mobile devices. Our selection of wired and Bluetooth interfaces cover any possible I/O application. We still offer a full line of POTS analog and digital hybrids in desktop and rack mount designs, and recently introduced a unique VoIP/AoIP hybrid/codec. We continue to evolve with technology, but some things remain the same. "Broadcast Quality" isn't limited to the audio signal. It's a way of building a product that will weather the storm. A design that pleases the engineer without intimidating the user.

GS: We still provide custom studio packages, but the majority of the work we do is based around the Modulux and Radius furniture lines. Modulux is our premium package and Radius is the economy version. Modulux now has hardwood face frames, 2" thick tabletop trim as well as hardwood plywood floors and toe kicks. We use CNC technology to create graceful, curved interview ledges. Radius XP now has more robust PVC trim, full cabinetry and easy wire integration and access.

Graham Studios Furniture Assembly

The cabinetry for both lines now have enhanced passive ventilation and can accommodate more guests and co-hosts. We've added AC and lighting packages as well as a line of LCD monitor arms. We now offer full service design and integration, including turn-key. "White glove" service is available on all furniture packages. Almost all of my furniture packages are designed and tweaked to meet custom needs, which we do at no extra charge. We're happy to work with the customers to get exactly the furniture they need.

Radio Guide: What has been your biggest surprise as a small business in the broadcast industry?

JK: I would have to say the longevity of some of our products. Some of our products are over 10 years old and sales continue to rise. While we enjoy the loyalty of our customers, maintaining production for this long becomes complicated by the steady increase in the number of obsolete parts.

GS: How many people think that smaller is better! People have come to me saying they want to do business with a smaller firm. One customer told me "I like to know that I'm important to you." They come to us for the quality of our product and individual service. We get business from all over the world.

Radio Guide: What's next for your company? What do you envision for the future?

JK: We intend to remain the leader in offering the widest variety of broadcast quality telecom audio interface products. Not an easy task to achieve as the world slowly migrates to wireless and IP audio – this while many markets still need our older products. We fully intend to continue building all JK Audio products right here in Sandwich IL, with sub-assemblies built and sourced from OEM domestic suppliers whenever possible.

GS: I want to continue helping broadcasters meet their goals. Beautiful, cost effective furniture packages are our roots. We will continue to work with designers, engineers, and integrators in order to become a more rounded provider of goods and services.

Elaine Jones also runs a small business, providing marketing and PR services to equipment manufacturers in the broadcast and AV industries. Her company was founded in 1997. She can be reached at elaine@ejonespr.com

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MPEG O' My Heart

Today's Digital Storage

by George Zahn

In today's "instant" society, we want things to happen now. We want faster downloads for our MP3 players or iPods. We want faster, more efficient, conversion for our station's hard disc delivery system when we generate a new spot or add music. We want it now and we want it correctly. How does this all happen, and as some music artists are inferring, are we creating a deficient product?

Let's look at our broadcast signal, taking FM as the higher common frequency response denominator. We know that FM yields a high frequency limit of 15 kHz. That will come into play as we look at the audio that many of us are encoding for broadcast playback. Most automation and hard drive delivery systems are using "lossy" or compressed formats from the Moving Pictures Expert Group (MPEG), the organization that puts the MPEG into MPEG-3, MPEG-2, etc.

I Love Lossy?

What does "lossy" mean? Before we explain, let's revisit our college days and the Equal Loudness Contours which actually date back to the 1930s. In effect, the contour measures what loudness level a frequency needs to achieve in order to be perceived as equal to any other from the bass to treble ends of the spectrum. The curves reveal that our hearing is keenest in roughly the 8th octave – approximately 2 kHz to 4 kHz. That is where most intelligibility of speech lies – our "S" and "T" sounds, for example.

There are ten octaves in the "average" human hearing range, starting at roughly 40 Hz. The next octave is a doubling of that frequency or basically 80 Hz, then 160 Hz, 320 Hz and so on, ranging from bass through midrange to treble. Upper midrange is basically the 8th octave and treble , or brightness and sound overtones. For instance, as a piano string that vibrates at 880 Hz comes to rest, its overtones are generally at octave intervals of 1.76 kHz, 2.64 kHz, 4.4 kHz, 5.28 kHz, 6.16 kHz, 7.04 kHz, 7.92 kHz and so on, until the octaves range beyond what our ears can detect. We perceive these overtones as part of the overall sound of that piano string.

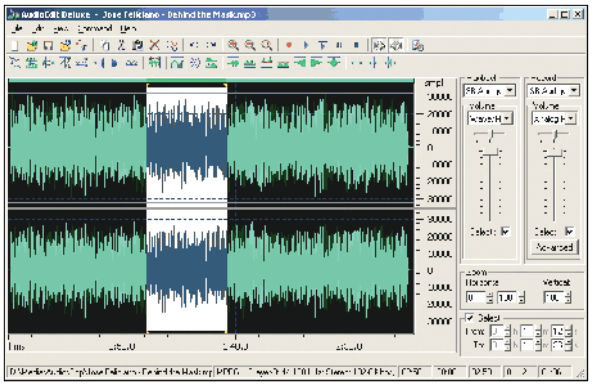
As we approach the 8th octave, sound does not have to be as loud to be perceived as equal loudness compared to bass frequencies (roughly octaves one through four), midrange (octaves five through seven) or the treble frequencies (octaves nine and ten). This aspect of our hearing opened up a possibility, because some frequencies are in effect masked by others.

We also need to understand sampling and bit rate. Digital audio conversion is an encoding based on thousands of "samples" of sound or audio every second. The samples are based on frequency and amplitude, and the number of samples per second (usually expressed as kHz, though not in a frequency sense) will determine the upper frequency and precision of the digital audio. An uncompressed wav sampling rate of 44.1 kHz is the CD standard and will yield lossless full fidelity to 20 kHz upper frequency response. That's 44,100 samples of sound taken for every second of audio! 32 kHz sampling will yield, roughly, a 15 kHz upper frequency limit.

Chomping at the "Bit"

The bit rate also determines the length of the sample to be encoded and stored. Higher bit rates are far more accurate and better fidelity, but chew up more hard drive space, especially when you're storing 32 to 44+ thousand samples every second. CD quality audio can chew up a lot of space on a storage device.

To better understand bit rate, a bit is the simplest iota of digital information. 1-bit is a single binary number (either a 0 or a 1) or just two options. Two bit information is 2 numbers of either 0 or 1, or four total options. Taking it to more usable rates for audio, 16-bit CD audio allows each sample to be assigned one of more than 65,000 sampling codes. If we use 24-bit, each sampling is 24 numbers long, providing more exact fidelity. Think of it as communicating by vocabulary – 2-bit audio gives you only two word options whereas 24-bit gives you a vocabulary, or digital flexibility of more than 16.7 million words.



By understanding the "magic" that some frequencies will mask others because of the Equal Loudness Contours, new technologies such as ATRAC on MiniDisc and MPEG were founded. There's more science behind this, but simply put, the ability to eliminate some "unheard" samples compressed the size of the audio file. Slightly less quality was traded for quicker access and downloads – and more storage space.

This consumer algorithm has been witnessed before. VHS offered more recording time on one video tape and easier time calculation (2-4-6 hours), and it trounced Beta which offered better video quality but recording times of 1.5 hours, 3 hours, and for most of its life, a max of 4.5 hours. When MiniDisc was introduced to recording producers in Nashville, a colleague of mine who has produced for U2 among others, refused to use the device because he felt the high frequency response was compromised and he didn't like the other frequency shading of the filtered-out samples.

Many of our broadcast hard drive systems are using MPEG-2 compression, which is far better than MPEG-3 (MP3), but results in larger files. The compression of file size drops some of the audio samples, resulting in a "lossy" format, meaning some information is lost. Please note that if a piece of music or other audio you're entering into your system was at one point an MPEG-3, that will become the prevailing quality baseline. Once those frequencies have been extracted, changing it to an MPEG-2 will not restore or improve quality.

The Space Race

So how much do we gain by using MPEG-2 file compression for our audio? Quite a bit, actually, as an MPEG-2 file can store an audio file in roughly a 6:1 or 8:1 ratio. MPEG-3, with lesser quality, has a ratio of up to 12:1. Simply put, MPEG-2 translates to up to eight times the amount of storage on your system, with what many consider "acceptable" loss of quality, especially considering the FM 15 kHz upper frequency limit.

So as broadcasters are we diving down the vortex to audio doom by acquiescing to lower than CD quality? In the music recording industry, Neil Young and others have been decrying the "dumbing down" of audio quality on the consumer level. The proliferation of watered down MPEG-3 copies, Young and others claim, does not reveal the artistic fidelity of the creators' intent. Some folks are simply trying to squeeze as many songs onto their player as possible, so they rip a CD, and save the songs as an MPEG-3 with a low sampling rate and smaller bit rate – some even converting the song to mono, to get compression rates far beyond the 12:1 ratio.

There are legendary stories from classic radio conventions, in which an attendee claims to have every episode of a ten-year run of a radio show such as Fibber McGee and Molly on *one CD* (*not* a DVD). These are MPEG-3 files on a CD which only holds 700 MB of data. That means that to squeeze, let's say 300-350 thirty-minute episodes, onto the one CD, you'd have to create files so highly compressed that they couldn't even approach the frequency response quality of an AM signal or a phone line. It's one thing to "own" the shows on one CD and quite another to be able to listen to them with any enjoyment.

Young Ideas?

Neil Young and the music industry notwithstanding, I argue that the MPEG-2 format for most hard drive systems is very good for broadcast applications. For some remote interview, voice-only recording, you might be able to get away with a high end MPEG-3 recording. As FM fights streaming and downloads for its survival, we need to be keenly aware of where the quality of broadcast bar is and make sure we do not drop below it. While true digital can yield perfect copies, constantly jumping between lossy formats can create some form of copy "fade" similar to analog copy loss.

What's your opinion? Has the growth of lower quality MPEG-3 files lowered everyone's expectations? Are we to hold ourselves to a higher standard? Please share your thoughts!

One final note: Remember that sometimes the ends justify the means. Some stations record concerts and events for later broadcast or as they are aired live. If the intent could ever be to release this recording as a high quality audio file, or for the time being, even on CD, you will want to record in a lossless format such as wav. You can't really restore audio quality that has been filtered out before the recording. Keep in mind the long-term archival or distribution aspect of what you're recording and plan accordingly. When in doubt, record at the higher quality, and reduce file quality later as needed or desired.

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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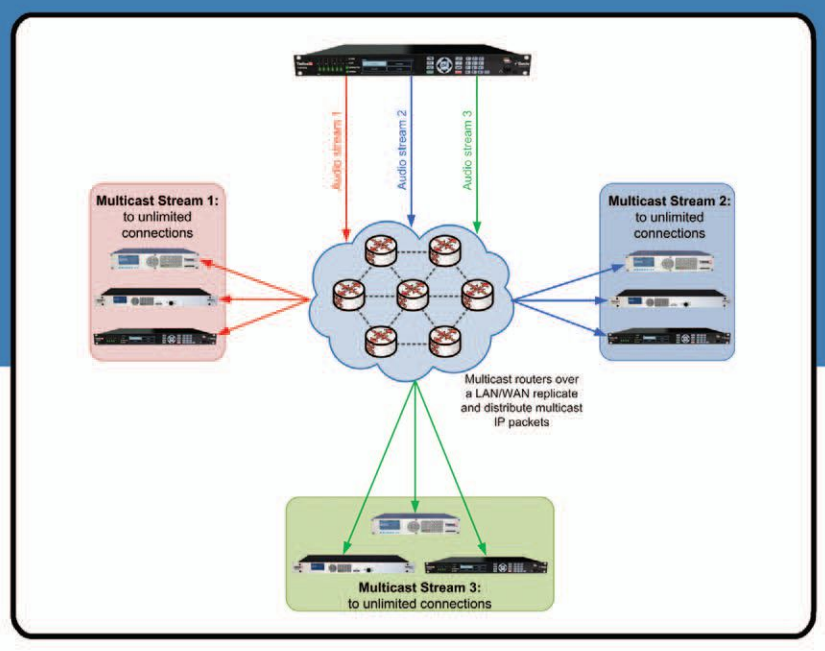

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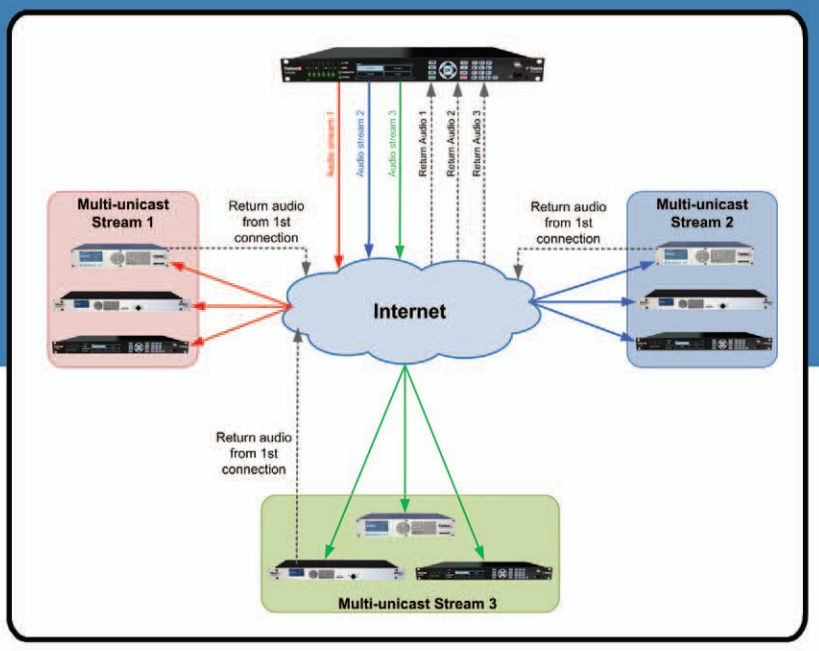

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Medium Wave True Digital Is About to Arrive

by Ted Schober. PE

First the Bad News (please skip down if you become depressed).

AM broadcasters have been in a blue funk. No one under 35 listens to AM (except to Radio Disney), amd RF noise levels are at an all time high. None of your AM neighbors have decent programming for anyone except angry old men, people who don't prefer English, and folks with a focus on religion.

The pressure is on all of terrestrial broadcasting to compete with other distribution modes that can reach much broader audiences. Competition for audience means that you need to develop new compelling content. Good content is expensive, and it is difficult to find the money to improve content in many AM stations.

FM translators will be a life vest for some stations, but unless you can locate the translator on a giant tower or mountain they often cover so little that they only serve a small fraction of the AM audience. On the other hand, if you're lucky enough to have a big FM translator, aren't you really just a little FM station? Doesn't that weaken the world for all the other AM stations who are not so fortunate?

AM hybrid HD has been a total disaster. If a station has any first or second adjacent channel neighbors, you help them to expire with the AM HD "buzzsaw." It covers well less than half the range of the analog signal. At the edge of your city grade signal, the HD signal keeps switching back and forth from a somewhat raspy HD codec sound to noisy analog. There is so much difference between the analog and digital signal that the switching upsets listeners concentration while driving – the most important radio listening venue. If your engineering staff is not vigilant and hasn't re-timed the audio since the last exciter reboot, oh, well half your programming comes out twice and the other half not at all for those folks in the range where mode switching happens.

Digital broadcasting is useful only if you have receivers. To date, digital radios have been power hungry, expensive and generally not available on store shelves. HD Radios are slowly becoming more available, but still represent only a blip on the horizon. At one point in 2013 it was speculated that there were no DRM(30) receivers being manufactured anywhere in the world.

What is an AM Broadcaster to Do?

Now, here is the good part: Finally, a bright light is at the end of the tunnel. Two chip makers have made all mode single chip radio ICs that will do AM, FM, Long Wave, maybe Short Wave, HD Radio, DAB+ (for England and a few European Countries), DRM(30) (Medium and Short Wave) and DRM+ (VHF) all in one chip! These chips are designed to run on batteries, and are cheap, unless you want HD Radio, where the license fees have to be paid.

NXP was first with their SAF356X family of multi-chip designs to implement all mode receivers way back in 2010. This multi chip solution opened the door for my call for multi standard receivers, but it was impossible to build a cheap radio because there were just too many parts. It was the first "give me any broadcast radio signal in the entire world and I will give you audio" solution, and remains a solid product for non battery powered higher end products.

All India Radio is converting to medium wave digital using the DRM(30) standard. I believe that this chip allowed them to make this decision. All India Radio's rollout has opened the giant radio market in India for full scale mass production of digital radio chips and radios. They have set a sunset date for analog broadcasting on medium wave.

Silicon Labs introduced their single chip Si468x family of low power chips that support multi standard operation with capabilities for AM, SW, LW, FM, HD Radio, DAB, DAB+, DRM(30) and DRM+. The problem for medium wave broadcasters is that the chip requires a separate tuner chip for AM, SW and LW, which was not good news, because using this chip requires additional expense to include the tuner for medium wave AM and DRM(30) or HD Radio. Medium wave works with the Si468x chips, but a separate tuner is needed.

The headline news comes from Frontier Silicon in London, England. They just introduced the Chorus 4 digital radio chip. Chorus 4 is a one chip, ultra low power, all systems compatible IC, making it the first silver bullet for digital radio receivers. It covers both medium wave and VHF in one chip! This crazy chip is made for car radios, tablets, mobile phones, bluetooth headsets, and will also work with WiFi radio chips to integrate web radio where WiFi is available.

Now that Frontier Silicon has thrown the gauntlet to make cheap multi-system digital chips that receive medium wave, and All India Radio has opened a 1.2 Billion person market for medium wave digital radio, this market is about to explode. We will find car manufacturers including this capability as a matter of course.

It is now time for Toshiba, Atmel, TI, SiPort and the other manufacturers to join the multi-standard bandwagon. There is a good reason for this: The same hardware decodes all the standards, it is just the IP (intellectual property) ie software which is different. A radio chip that permits upgrading and adding new codecs and capabilities in the field is guaranteed to avoid obsolescence.

The medium wave version of Digital Radio Mondiale, DRM(30) has recently been upgraded to use the amazing open source (free) Opus audio codec. Opus eliminates the sound quality issues that formerly crippled DRM(30). Low data rate voice encoding using Opus allows multi-channel medium wave broadcasting, For the first time DRM(30) offers full high fidelity, multi channel music performance on medium wave.

Another advantage that DRM(30) offers is the freedom from receiver IP and patent license fees. This means high volume production of single chip radios in India will finally lower digital radio prices to "giveaway" price levels. Unfortunately the cost of IP licenses for some systems may exclude those systems from truly inexpensive receivers. The presence of multi mode receivers worldwide will allow the "marketplace" to actually work, since the user interface to each system will appear transparent to the consumer.

It is time for the FCC and broadcasters to plan for action. The FCC has to open the medium wave and shortwave bands for multi-system digital experimentation. The Commission should also provide benefits for licensees who are early adopters of medium wave digital. Waiving regulatory and conversion application fees while experimenting would be a good start. A new optional call sign extension should be authorized for medium wave digital stations to conform simulcast pairs to the same base call sign. It must be established that analog-digital simulcast broadcasting in the same market is a single performance for copyright purposes.

Broadcasters should plan to convert their weakest medium wave signal in a cluster to all digital, and simulcast their AM most popular signal. AM broadcasters with strong FM translators should convert their AM signal to true digital, maintaining their audience with the FM signal while building digital audience.

All new and rebuilt broadcast transmission plants should be constructed to accommodate both HD Radio digital only modes and DRM(30) modes. This will not cost nearly as much as is needed for HD Radio MA-1 hybrid mode because the performance bandwidth needed for true digital is only a fraction of that required for MA-1.

Finally, the technology and the world is defining a clear path for Medium Wave Broadcasting here in the USA. We have a future that is as bright as anywhere in terrestrial broadcasting! We need to bring worthwhile content to the band so that listeners will find Medium Wave an enticing listening destination. The technology will follow.

The stars are aligning to make medium wave digital broadcasting viable. Good, cheap battery powered multi mode receiver chips, medium wave digital receivers manufactured in large volume in India, FM translators to hold present customers, underused AM signals in market clusters, an FCC that is willing to make changes to recognize that the "senior band" cannot continue as it is – these are all factors coming together to make this the decade not of reinvigorated AM, but instead an entirely new world of crystal clear medium wave broadcasting.

Ted Schober, PE, is a consulting engineer, and the owner of Radiotechniques Engineering, LLC. He may be reached at: ted@radiotechniques.com

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Transmission Topics

How's Your Switch?

by Steve Callahan

It seems like there is a component in your FM transmission system that gets treated like Rodney Dangerfield. Your RF coaxial switch just doesn't get any respect! Most folks think the real stars of their transmission chain are the transmitter on one end and the antenna all the way up there on the tower at the other end. However, if you have a backup antenna or a backup transmitter, an RF coax switch makes it possible for you to get them on-line fast and efficiently when they are needed.

I know stations that use manual coax patch panels to change transmitters, antenna or transmission lines in the event of a fault. I actually like patch panels, but only when they are used in conjunction with coax switches. A patch panel is invaluable in case you need a little-used configuration, or a test point access that you can't achieve with a coax switch. The investment in a reliable coax switch will save you time (and money) by allowing you to remotely switch transmitters quickly and safely.

Years ago, I worked in New Hampshire radio and had to visit the Manchester Airport frequently. I remembered a building at the airport with "Micro Communications, Inc" on it, and I was always curious as to what they manufactured. I later found out that they manufactured coax switches for broadcast stations – I filed that information away for future use.

Fast forward to a rebuild of a small station in Rhode Island. This long-suffering station was in need of a total makeover. It was due to get two new transmitters, a new transmission line and a new dummy load. Of course, a new coax switch was needed to remotely switch everything.

This rebuild was a pleasant way for me to spend a few summer weeks at the Rhode Island shore, but I was also pleasantly surprised to find that the switch I was going to install was a 7/8-inch EIA coaxial switch from MCI – Micro Communications Inc – the same company I had wondered about when I lived in New Hampshire.

MCI EIA Coaxial Switch Line

The first thing I noticed was that the MCI switch was going to be easy to install because of its design. It was much lighter than other switches that I previously had to manhandle into position upside down. Four mounting tabs were provided so it could easily be mounted. Another appreciated feature was the switch's radial design which eliminated the cost and need for extra coax elbows. The coax runs could go straight into the switch input and output ports without the direction-changing elbows.

I was curious so I took the time to take the cover off of the switch and take a peek "under the hood." What I found was a well-made piece of equipment which displayed a high degree of quality machining and a simple, trouble-free design. It was logically laid out and well labeled. I had it up and mounted in no time at all.

I recently had the opportunity to visit Micro Communications in New Hampshire. They had moved from that building at the Manchester Airport back in 2006, and are now located in a spacious facility in Merrimack, NH. Frank Malanga, their sales and marketing manager, took time out to give me a tour of the factory and to explain the history of MCI.

Micro Communications was started back at the airport in 1966 by Tom Vaughn, an RF entrepreneur, and was bought 15 years ago by the present CEO, Dr. Paul Smith It is now a RYMSA company, a Spanish corporation which manufacturers antennas. Today, MCI is more than just a coax switch manufacturer. They have been a big provider of filters, power combiners and diplexers for LPTV and HDTV stations. MCI also provides wave guide and other components to research facilities that utilize particle accelerators. However, they take great pride in their line of coax switches which range from a smaller model with Type N or 7/16 DIN connectors, all the way up to a 6-1/8 EIA model.

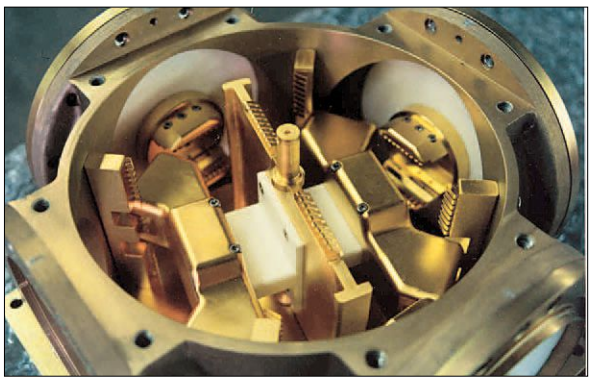
7/16 DIN Switches

Because of their relationship with RYMSA, a large part of their production goes to international markets and they hope to broaden their exposure in Asia, South America and Mexico.

Marc Lacerte, a long-time technician at MCI, told me that he's been to Mexico, Japan, and Canada, as part of his job to install and tune their products in the field. I was also quite impressed with the full machine shop and their ability to engineer and fabricate some very complex filter combiners, including some with military applications.

However, back to the switch installation. After locating the new main and auxiliary transmitters in the building, it was a breeze to mount the coax switch above and between then. The switch's radial design made it easy to bring the lines up to the inputs with a minimum of RF plumbing. Since it was a double-pole, double throw switch, both outputs were going to be used. One went to the new transmission line and the other to the new dummy load.

Interfacing the switch was a breeze, with a 25-pin connector for the switch commands, (24 VDC, but could be built for 5 or 12 VDC), and also for the switch status circuits leading back to the remote control. A handy manual operation knob and a clear, visual indication on the outside of the switch showed what position the switch in. A quick connection to 115 VAC (or optionally 230 VAC), and we were almost ready to test the switch.



Interior of an MCI Coaxial Switch

However, one connection that must be included on all coax switches is the interlock connectors to your transmitters. Raise your hand if you have ever installed a coax switch and thought that you would definitely get around to connecting the interlocks ... someday? Well, I know of one such station whose engineer knew that the interlocks were not connected to the switch, but the part-time, weekend board operator didn't know. When the operator couldn't hear the air signal in his off air monitor, he jumped to the remote control and reflexively changed the coax switch to the auxiliary transmitter, and promptly destroyed one perfectly good switch. The lesson to be learned here is take the time to connect the interlocks!

Marc Lacerte, MCI Master Technician

Here's where a matrix of patch panel and coax switch would have come in handy. In the event of a coax switch failure, it's quick and relatively simple to use a patch panel to bypass it, so it can be removed for evaluation and repair. At the Rhode Island station, I didn't have the luxury of a patch panel, but I did take the time to get the necessary RF connectors to bypass the switch and, to make sure they didn't get misplaced, I mounted them right up next to the switch.

I left the MCI factory with the impression that they were making a well engineered, carefully designed and fabricated switch, that was made right here in the USA and had been doing so since 1966. They also seemed quite up to the task of custom filters and diplexers and combiners.

Take a minute next time you are off-the-air doing scheduled maintenance, to make sure that the coax switch at your station is operational and is truly interlocked to your transmitters. A quick check now could save you time and money at a time when you really don't want to be off the air for an extended period of time.

Steve Callahan, CBRE, AMD, is the owner of WVBF, Middleboro, Mass.

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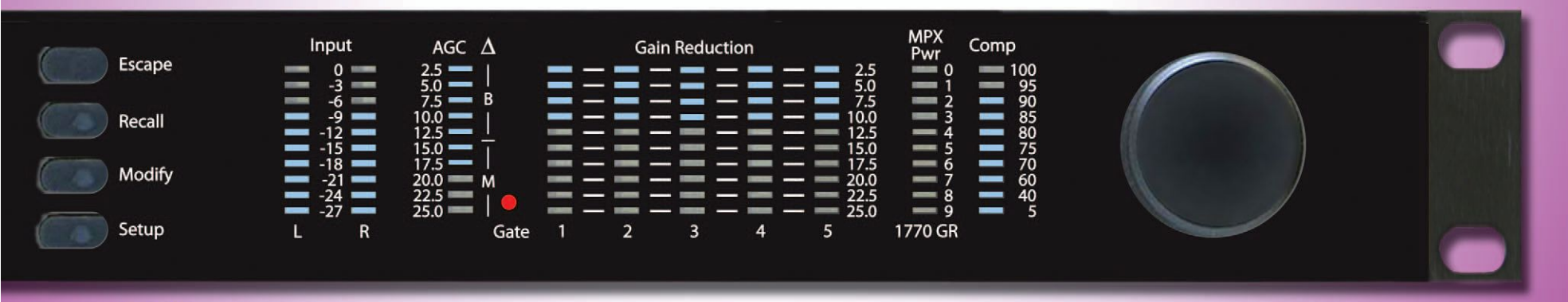

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FCC Focus

Radio Myths

by Peter Gutmann

Although some may have wished – and a few have tried – you can't run a radio station without a staff. That means you must rely upon others to keep you out of trouble with the FCC. Unfortunately, in their push for sales and ratings your staff may overlook some key FCC danger spots, so the time may be ripe for a reminder of how to avoid them.

Here are some myths that (hopefully) seem as incredible as they really are:

My personal website is my business, and I can say anything I want on it.

Not if it could possibly be read to have anything at all to do with your job. It's a time-honored legal principle that an employer is liable for just about anything done within the scope of a job. So unless you're entirely behind the scenes and not at all identified with your station, it's reasonable for a reader to associate personal posts with your station. Even beyond legal responsibility, several recent incidents have shown that management can deem personal tweets and even a tee-shirt to be offensive, inappropriate to a station's image, and grounds for firing.

A local club recognized me and comped me a few drinks the other night, so I want to say "thanks" to them on the air.

Payola, anyone? It's OK to give favorable mention to a business if your only motivation is your honest personal opinion. But if you receive any consideration at all, even if not in a direct exchange for the plug, then you have to treat it as a paid ad and make an appropriate sponsorship announcement. Announcing that the reason for your mention is that you got a free drink might comply with FCC rules, but it won't do much for your credibility.

Anyone called by a radio station should expect that their call may be broadcast, so there is no need to get their consent.

No! FCC rules explicitly require consent *before* any part of a call is broadcast live or even recorded for broadcast. That even includes just answering with a "hello." The only exception is "where the other party originates the call and it is obvious that it is in connection with a program in which the station customarily broadcasts telephone conversations." Admittedly, that's a somewhat gray area. But it's clear that you cannot call someone and when they answer announce "You're on the air!" Nor can you record a call and only later ask if it's OK to air it. Even a ten-second delay in asking for consent is a violation. True, this ruins spontaneity, but it does avoid a heavy fine.

We post extensive contest rules on our website, so we don't have to announce them.

While the FCC is considering moving into the 21st century in this area, it hasn't yet. For now, you can supplement your on-air rules with website postings, but the basics all have to be broadcast. This generally includes how to enter, eligibility restrictions, deadlines, prizes, the selection of winners and tie-breaking procedures. You don't have to announce all this every time the contest is conducted or promoted, but the FCC requires a "reasonable number of announcements" including when the contest is first publicized. The key should be common sense – would a typical listener understand all that is involved in deciding whether to participate?

A contest is getting boring, so we need to bail out of it.

Once a contest is in place, you need to see it through to the bitter end. Only if that becomes truly impossible (for example, if the grand prize is no longer available from any source at any price) can a reasonable substitute or adjustment be made. Even then you need to quickly and fully disclose the change to discourage contestants from expecting the original prize and becoming frustrated.

The First Amendment guarantee of freedom of speech insulates us from slander and libel.

If only it were so. Political "uses" by legally-qualified candidates, no matter how outrageous, cannot be censored. Otherwise, any false statement that harms someone can run afoul of defamation law, even if it only concerns their character, and even if a station only rebroadcasts it. There is some latitude for comments about public figures. There's also an exception for pure opinions, but nearly every opinion invokes at least an implicit fact – "I think Joe's crazy" may be intended to sound like an opinion but it could suggest that Joe might in fact be mentally ill.

A hoax is harmless if no one is likely to take it seriously.

Don't over-estimate your listeners! (Or, to put it more positively, don't you – and your sponsors – want your listeners to trust what you tell them?) While the FCC won't act unless you know that a broadcast is false and it actually causes substantial public harm, you can still be liable for all sorts of damage, ranging from property and health to mere reputation. Disclaimers may provide some protection, but they must be sufficient, both in content and frequency, to alert all likely listeners. Even then, you have to watch out for the one listener who managed to miss the disclaimer.

Oops – I dropped one "f-bomb." It won't happen again – I promise!

The courts are still wrestling with the "fleeting" exception to the FCC's indecency policy, but for now any broadcast of the dreaded "f-word," "s-word," or any of their variants may run afoul of the FCC's indecency policy. Until the matter is finally determined by the courts, the FCC is not penalizing stations for alleged isolated instances of indecent broadcasts. Yet that means that a pending complaint will suffice to hold up action on renewals and station sales unless the parties agree to remain responsible under any adverse outcome.

Our audio-delay system failed, but we should get credit for trying.

That's unfortunate, but the FCC and courts have taken the position that each station is responsible for everything that goes out on its air and must bear the risk that its technology (or the folks operating it) is not reliable.

The FCC doesn't care if an ad we broadcast is false.

Actually, that's pretty much true for the FCC (unless the station actively participated in creating the misimpression). But the FTC (Federal Trade Commission) just might. The FTC recently released a set of "gut check" guidelines to warn media about bogus weight-loss and dieting ad claims. So far, the FTC has not taken action against such broadcasts or the stations that air them, but it has the power to do so and is holding hearings. Even so, your listeners (and other sponsors) expect credibility.

I don't want to show our public file to two scruffy guys who just showed up, so they'll need to come back when our GM is here.

Anyone – *anyone!* – is entitled to see the public file during regular business hours without an appointment. Letting the public scrutinize station performance is the very modest price you pay for not having to file a huge stack of paper every three years for FCC staff to review in order to get your license renewed. (If you don't know what we're talking about here, ask someone who's been in the business 30+ years, or read my column in the September/October 2011 *Radio Guide*.) Motive is irrelevant. The most you can do is to have someone from your staff supervise them to be sure they don't harm the file or become disruptive. Only then can they be ejected or refused.

FCC inspectors just showed up. I told them to wait while I call our manager.

Not a great idea. Some inspectors may indulge you, but they have the right to inspect a station's studios and tower site without being put off. You may need to call your engineer or manager to provide specialized information they seek, but the FCC's agents are entitled to observe your transmitter control, public file, EAS and other parts of station operation without delay.

We only rent space on a broadcast tower, so we're not responsible for fencing, painting and lighting problems.

The FCC generally looks to the registered owner for maintenance, but in the event of a problem that the owner doesn't address it can hold all tenants responsible for compliance, even if your lease clearly imposes the duty on the landlord. Your lease may require the owner to indemnify you against FCC fines for tower problems, but that's not a matter for FCC concern.

We need to hire an experienced technician. Do we really have to notify the local high school of our job opening?

If the high school asked to be notified of all job openings, yes you do (assuming that your employment unit has five or more full-time employees and thus is subject to the FCC's formal EEO requirements). Otherwise, you can select from among your list of recruitment sources those that are likely to refer appropriate candidates. In all cases, you should detail the qualifications for the position in order to avoid wasting your and your applicants' time. And even if the high school is unlikely to produce a student with the necessary experience, a student's relative might be looking for a broadcast job and would be a great hire.

I already know whom we want to hire for our sales opening. Why go through a useless exercise of soliciting applicants?

All the FCC requires is that you give potential applicants a fair opportunity. For that, you need to spread the word through the usual channels. Who knows? You may find an even brighter gem than the one you had in mind, or you may find someone to keep in mind for the next opening. At worst, the lack of other viable candidates may increase your confidence in your initial inclination.

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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Science of Sound

Acoustics and Radio – *Part 5*

"Source of Our Signal"

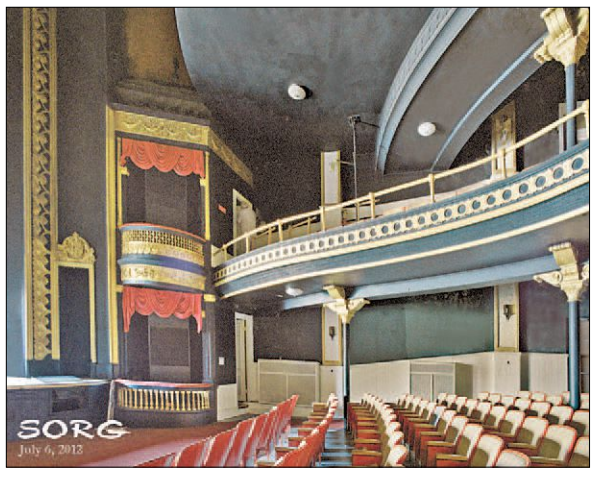
by Jeff Johnson, CPBE

As radio broadcasters, our sound is all we have. For music stations, how that sound is sourced – performed and recorded – is of utmost importance. Not all of our music is synthesized, harmonized, auto tuned and normalized. There exists still, the ancient art of "high fidelity." Lest it is forgotten, that means fidelity to an original source.

Acoustic live performance, be it a symphony orchestra or a solo narrator on a bare stage, remains the benchmark of excellence. It must be faithfully recorded. The environment is nearly as important as the performance. The recording engineer must properly choose microphones and their placement. Sound reinforcement, if necessary, must complement the performance and the recording.

For this, a professional's knowledge and skills are necessary.

"What does a good concert hall sound like? Often times, the answer is that it depends upon what you are used to. If you spend a lot of time listening to music in the same locale, you may be conditioned to the sound of that particular hall, and anything else – no matter how good or bad or indifferent it may be by objective standards – will seem off, or in some way, unnatural." – *Richard S. Ginell*



Sorg's Opera House

"Most orchestras find a hall that is a "shoebox" shape and about 2,000 seats or so, the friendliest for orchestral music. There are a number of reasons (I recommend Leo Beranek's book *Concert and Opera Halls and How they Sound*), but in general, you want a rich, warm sound and in the audience, you want to "feel" the presence." – *Janelle Gelfand, cincinnati.com*

"Warmth" is dependent on the relation between the reverberation times at the low and at the middle frequencies; that "liveness" is determined by the reverberation time above 250 Hz, etc." – *Willi Furrer, past president, International Commission on Acoustics*

Architect Frank Gehry describes acoustics as, "mystical magic straight out of Alice in Wonderland." Regardless of the exterior architecture, performance spaces have remained essentially unchanged – after all, the physics of sound perception have never changed. Is acoustics an ephemeral art or a predictable science? Does music serve the space, or the space the music?

"To this day, music halls that represent perfection were built in the late 19th century. There were no electronics in those days, so halls had to "work" naturally. Examples cited are Musikverein in Vienna (1870) and Concertgebouw in Amsterdam (1886). Each has reverberation times of approximately two seconds at mid-frequencies when occupied. This is considered ideal for Romantic works, but not for Baroque or modern works. The Musikverein is narrow, creating an intimate feeling due to early reflections from the sidewalls, and the Concertgebouw, as it is wider, is more spacious and less enveloping." – *Victoria Newhouse*

Historically, music was written for a particular space, probably the home or palace of the patron. Later, public performance spaces were constructed for varied entertainments. Each became less well suited for all of the variety of works presented – too large and reverberant for intimate Baroque or too small and dry for Mahler.

In the 1960s and earlier, according to Newhouse, halls were forced to rent to entertainment forms requiring electronic amplification and "electronic architecture" (discussed below). Electronic guitars and synthesizers, B3s and drum machines confuse the acoustical requirements. Requirements for recording and reinforcement demand feeds from both the electronics directly and the reverberant environment secondarily.

Leo Beranek has been cited as a consummate scientist of acoustics. Wallace Sabine, an earlier researcher, developed a formula for determining the RT60 of a performance space. RT60 is the time it takes reflections to become inaudible.

"In this wide, acoustical world there is now one special subject on which Leo L. Beranek has set his heart and inquisitive mind: auditorium acoustics. This is much more than a pure coincidence. In the first place, since the time of Wallace C. Sabine, Cambridge has been the genus loci for concert hall acoustics. But perhaps the factor that most determined Dr. Beranek's interest, is that art and science join in this subject. Here, the acoustician must not only know the laws of sound waves but must deal with all the manifold and complex psychological problems involved in listening to music. This task is fascinating and rewarding, but it is also difficult and requires capabilities extending far beyond simple physical and technical knowledge and thinking." – *Willi Furrer*

The author of this article utilized the dimensions of Sorg's Opera House, Middletown, Ohio, of which he is familiar, to test the Sabine formula. An interactive version is available here:

http://www.sae.edu/reference_material/pages/Reverberation%20Time%20Calculator.htm

The wall surfaces are all plaster on metal lath, excepting the floor and seats, which are carpet and fabric. The space has a 60' x 60' floor plan and is 43.6' high. It seats approximately 1,000 including the gallery.

The specifications are shown in Figure 1. The results are: 125 Hz - 4.11 seconds, 250 Hz - 5.07 seconds, 500 HZ - 5.87 seconds, 1000 HZ - 3.77 seconds, 2000 Hz - 2.78 seconds, and 4000 Hz - 2.69 seconds.

These numbers seem rather long, as they do not take into account absorption by patrons, a closed stage curtain or the seats. The space is close to a cube with a curvilinear balcony and gallery. Beranek states that solid plaster on metal or wood lath is desirable for walls and ceilings. Thin flexible wood is bass-absorbing as we have seen in an earlier article and is to be avoided in a concert hall. It will be very interesting to do a study with varied frequency sound bursts, directional microphones and a storage 'scope at the Sorg.

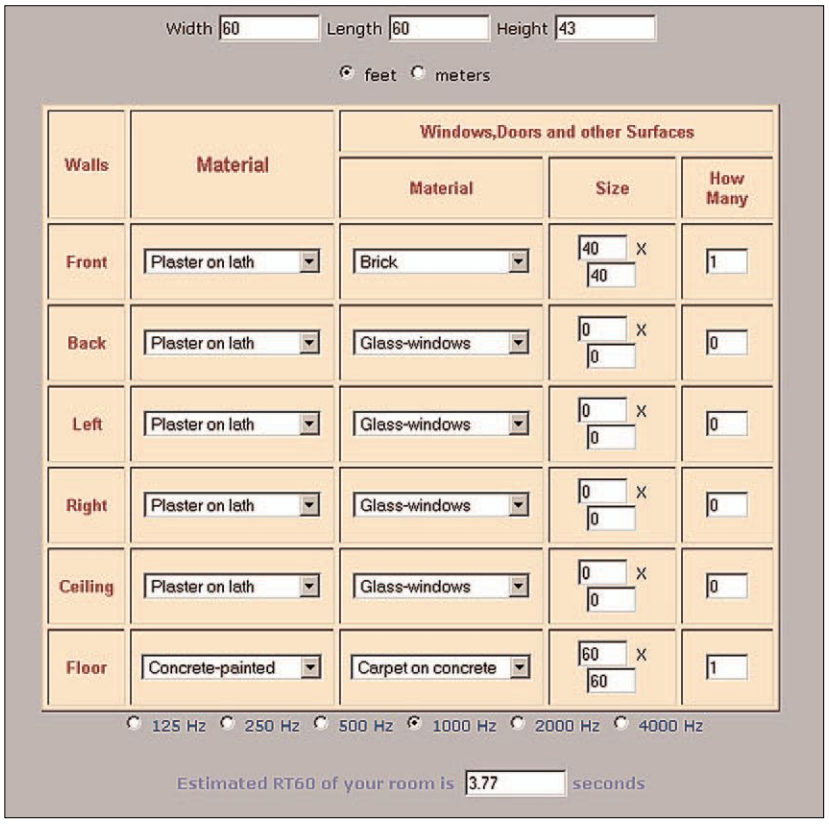


Figure 1: Sabine Formula Applied to Sorg's Opera House

A technology surprising to many is "electronic architecture" or Electronic Reflective Energy Systems[3]. Another term is "acoustic enhancement." Sitting in a concert hall we are surrounded by direct sound, reflections and re-reflections or reverberations. Well, why can't those be created with delay and reverberant electronic processors and fed to speaker arrays surrounding an outdoor audience? Why rely on walls at all?

This has been done at the Jay Pritzker Pavilion in Chicago and the New World Center in Miami Beach. The Metropolitan Orchestra utilizes this technology for its videocasts to movie theaters.[3] The sound technicians attempt to recreate the acoustic experience of the Lincoln Center house in quite a different space.

This writer recalls a very effective outdoor reinforcement or "acoustic enhancement" system at the Riverbend Pavilion near Cincinnati as far back as 1984. Harry Olson of RCA and others developed "electronic architecture" as early as the 1930s. Radio broadcasters utilizing 5.1 surround sound technology are doing just this today.

"There exist different types of acoustic enhancement systems: In-line and feedback systems with or without electronic reverberators. In-line systems are also called non-regenerative (i.e. no feedback). Feedback systems are also called regenerative." from Wikipedia

References: ***1:*** *http://asa.aip.org/encomia/sabine/beranek.html* ***2:*** *'How They Sound: Concert and Opera Halls' by Leo L. Beranek 1996;* ***3:*** *'Site and Sound', by Victoria Newhouse 2012*

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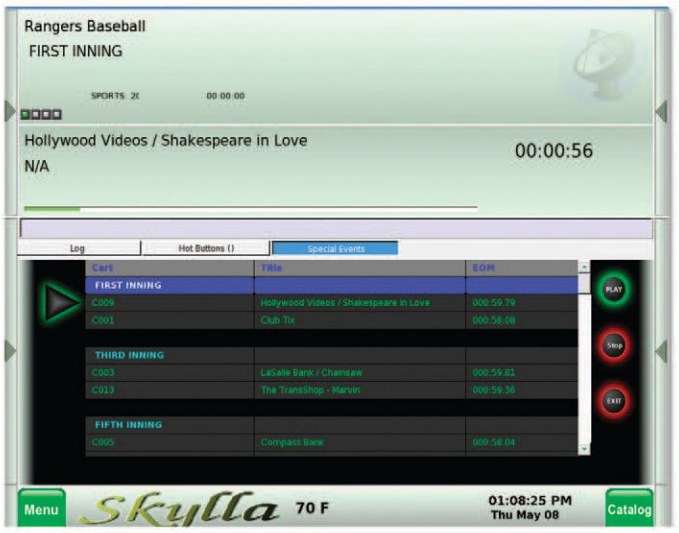

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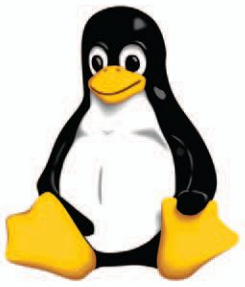

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Tower Topics

The Truth of Towers

Part 5 – Concrete, Steel, and Wire Rope

by Leonard Weenou, P.E.

In past months, we have discussed how the process of tower design is based on working backward from the projected loads and the location. We have also noted how that process is interactive and not linear.

This situation also affects this column. No sooner do we address one element of the design, fabrication or construction process than we find that we need to address adjacent components to fully illuminate the very points we have just made.

In the last installment of The Truth of Towers, we addressed some of the physics and math of how a steel tower is kept vertical. In a guyed tower like our fantasy structure for WQRM-FM, that need for verticality is provided by guy lines. Guy lines are normally made of wire rope (see sidebar) and those guy lines are attached to the earth with an anchor that is predominantly concrete.

So in this column we will deal in steel *and* concrete.

Large Load, Small Footprint

When you think about it, a guyed tower, like the WQRM-FM fantasy mast, only touches the ground at the base and at the anchors. At these loci, a guyed tower has the minimal footprint foundations needed for the purpose, a great financial and construction advantage. But – these foundations have to be sufficient.

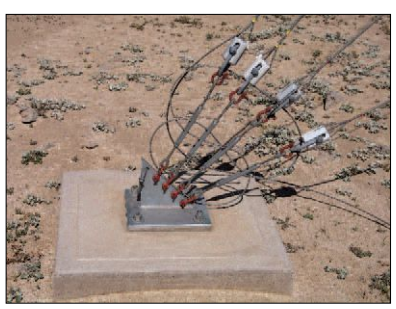
Let us first consider the tower anchors. We should mention that they come in multiple design styles selected as a function of the site layout and the soils (or lack of soil) encountered. In general these can be divided into three separate design groups.

The most ordinary is the "drag anchor," made up normally of a concrete underground structure below the frost line embracing a steel, typically galvanized rod or beam that travels above ground to be connected with the guy lines.

A typical drag anchor.

The "block anchor" is a concrete structure that starts below the frost line, but that continues above grade. The only metal part visible is the connection plate or point for the guy lines.

A third type, the "rock anchor," is where a suitable steel connector is either screwed or grouted into a crevasse or drilled hole in solid rock.



A typical block anchor

Hopefully the WQRM-FM tower will be able to use drag anchors since these are the least expensive to install. If the soil is firm enough and there is little or no ground water seepage, one can carefully dig down with a backhoe to the design depth proscribing the "form" of the anchor in the ground. In construction vernacular this is called an "earth form."

The reinforcement steel (rebar) can then be carefully placed in this form along with that anchor rod mentioned above. The concrete is then poured in like filling a cake pan and – voila! – your anchor is made.

Properly designed anchors resist the uplift tension on the guy lines caused by the physical weight of the tower (overturn moment) and the wind on it by providing "drag resistance."

This is an accumulation of four contrary forces: the weight of the concrete and steel; the wedge resistance from the leading edge bottom phalanx of the concrete anchor wanting to drive itself into the ground; the weight of the overburden or cover; and finally, the vector resultant of the horizontal drag through and over the earth surrounding the anchor assembly.

Anchor Elevation Issues

Probably the least thought about item in the anchor design is "sinking settlement." This is the tendency of the mass of the anchor to sink or settle into the ground, analogous to the design study to confirm that the tower base has enough displacement to keep the tower from sinking.

Why would this sinking be a consideration? Are not the guy lines pulling up on the anchor all the time? Not necessarily so.

Guyed towers are seldom ever really balanced exactly or, so to say, standing perfectly straight up. Resultant tension on an anchor can be much less than the calculated static tension when perfectly plumb. Early designers knew this by instinct (or discovered this phenomena by painful experience), and anchors in questionable soil tended to be broader and flatter than high. This is still the norm today, but we have a better handle on the numbers.

Because of this broad and long format, the design of the anchor, and especially the rebar internal structure, is important. The anchor must move (if it moves at all) as one unit. Even an inch of sinking can precipitate a major change in static tension when tension returns on that anchor as the tower "leans away."

Keep an Eye On Tower Alignment

This is a good moment to mention that any new tower should *always* be checked for plumb, tension, tightness and distortion six months after its erection. From the above discussion of soil settlement and compaction, and since the greatest changes occur in that first six months, you can see why even exact settings on a new tower will need to be touched up.

As with any construction project, creation of a meaningful artwork or any great fabrication, the project is always divided into two parts: The selection of ideal materials, and the execution of the work. Putting up a perfect tower is no exception to that premise. Coming up will be some more information on what goes into tower bases and guy anchors.

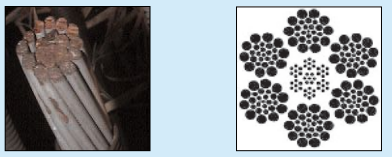
Select your steel and concrete well and strive for a perfect installation. *– Radio Guide –*

Wire Rope

Many have claimed invention of wire rope; as with any such success there is always a multitude of progenitors. However, the purveyor who undoubtedly brought wire rope design and manufacture to its 19th century zenith was John Augustus Roebling, who, among many triumphs, was also the designer of the Brooklyn Bridge.

All Twisted Up

Wire rope is made up of multiple strands of steel wire evenly twisted together to achieve the final, desired diameter and strength. In larger sizes, wire rope is made up of multiple small wire ropes once again twisted together. IWRC is a particular type of wire rope that has a single 'racer' strand running straight through the middle.



Guy wires are made up of many smaller wires.

As mentioned, normally the smaller strands are twisted together. This slight tensioning into a bundle provides us several advantages. The first and most desirable is that the wire rope is very flexible for its diameter, which allows it to be rolled on a drum for transportation and ease of deployment and use.

The second is that the multiple strands produce distributed and equalized strain on the line enhancing its strength under duress. For many reasons, when strain is introduced into a solid, it is never evenly felt across the cross section of the object.

Strength in Numbers

A solid object, such as a solid cylinder, could be viewed under stress conditions as having a "strain line" running through it. Each of the wires in a wire rope have a strain line running through them but their capability is times each wire's capability, times the number of wires at equalization.

The fundamental difference between the limited strain line in a solid of comparable cross section and the multiplication of strength from multiple strain lines in a cluster of wires is the secret of strength in wire rope.

Details of Extra Heavy Strength (EHS) galvanized wire rope typically used in tower construction. (For a more extensive table go to: http://www.wrca.com/galvanized_strand.html)

Size In. Dia.	Strand Count	Wire Size Dia. in	Ultimate Strength	Initial Tension	Turnbuckle Size (typical)
1/4 EHS	7	.080	6,650 lbs.	700 lbs.	1/2"
5/16 EHS	7	.104	11,200 lbs.	1200 lbs.	5/8"
3/8 EHS	7	.120	15,400 lbs.	1600 lbs.	5/8"

Those engineers who design in steel primarily look to the AISC (American Institute of Steel Construction) Manual of Steel Construction for the strength of the steel material they will use.

Interesting enough, there is no data on wire rope in this manual so in this instance we have to follow code limitations, our own instincts and calculations based on the data supplied by the manufacturer.

Although already taken into account by the manufacturers, it is interesting to note that galvanizing normally reduces the strength of the steel used in the wire rope by 10%.

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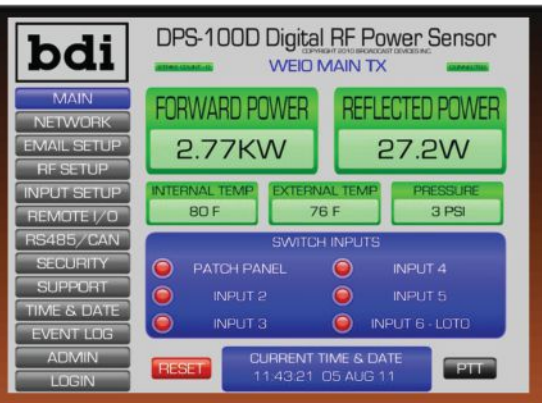

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Transmitter Site

Remote Troubleshooting

by Chris Tarr

As always, it started with a phone call.

"I'm calling from the transmitter site. I press 'raise' from the remote control, the transmitter turns on, then it shuts off right away. What do I do?"

Doing contract work often means that I get calls like that – someone depending on you to remotely help them solve a problem. With the right preparation, you can manage this sort of thing safely and easily!

The thing that I have to stress right out of the gate: This is *NOT* for major transmitter problems. Remember that the person on the other end of the phone is relying on you to keep them safe. This means that you should *NEVER* instruct them to open up any HV cabinets or turn anything on if you aren't 100% sure that it is safe to do so. This is intended to cover those "99%" cases where we're looking for simple things to reset, or gathering enough information to understand what the next step should be.

First things first. As I've mentioned in this space many times before, take pictures of all of the gear you support, and make sure you have copies of the manuals handy. I go as far as to document everything in each rack by taking pictures, then making sure I have the PDF version of the manuals with me all the time.

Now, when you get that phone call, it helps to know who you're dealing with. Their skill and comfort level will dictate how much troubleshooting you have to do. You need to know if this person has basic "screwdriver" skills, or is this someone who is just a button pusher. You can then gauge whether or not it's even advisable to proceed. It's much easier if you have someone technically inclined on the other end of the phone. If you don't, it may just be easier to ask a few simple questions, and plan on heading out the door.

Always check the breakers!

Once you know who you're talking to, it's time to get down to business. Open up a copy of the manual and a picture of the device. This person will be your eyes, ears, and nose on site!

Start with the nose. Are their any odd smells? Does it smell like burnt electronics? Can you pinpoint the source of any smell?

Check lights. Are their any fault lights on the device? Any tripped breakers? Are there any obvious scorch marks anywhere? You want them to look for the same sorts of things you'd look for when you walk into a room.

If none of these things turn up an obvious problem, then it's time for a bit more troubleshooting.

I always (politely) explain to the person on the other end of the phone that it's important to do only what I ask them to do, and only report back what I ask for, unless there's something obviously wrong. Explain that you need them to listen as carefully as possible, and if there's any question about a task that they should feel free to ask for clarification as many times as it takes to understand. Also explain that it is OK to stop at any time if they are concerned.

With that out of the way, start asking questions and taking notes. Using the manual and pictures for reference, be very clear about what you want them to do. Remember that the person on the other end probably has no idea what a "Plate Current Meter" is. So ask questions like "What does the third meter from the left read?" You know the scale is Amps, so all you need to hear is something like "3" and you'll know what's up.

Generic questions also help. "Do you see any lights on?" is better than "Is the VSWR alarm lit?" If they can't read what the alarm says, having them say "The second light on the top right is on" can be helpful – refer to the picture or manual to know what they're talking about.

Be sure along the way to ask if they hear anything or smell anything odd. These can all provide clues.

Really, what you want to do is walk through resetting breakers or alarms and see if that clears things up. Be sure to warn them if you think a breaker may trip. For example, if a circuit breaker is tripped, and you think it may trip again, let them know. For obvious reasons, I'd rarely let someone reset a tripped breaker on a transmitter without physically being there – safety is always the primary key here.

(Continued on Page 22)

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Remote Troubleshooting

– Continued from Page 20 –

After asking some questions and getting some answers, you should be able to determine whether there is something they can easily reset or turn back on to get things going again, or whether or not you have to make a trip. At least you'll have a little info before you hit the door which should help you prepare.

In my case above, a little sleuthing helped fix the issue. We were dealing with a Gates One AM transmitter. The person at the site could turn the transmitter on, there were no alarms or smells or sounds, but the minute they took their finger off of the power button the transmitter shut off. In this case, my first concern was VSWR overload. So I had them step back and watch the transmitter as I turned it on via remote. Transmitter came on, transmitter shut off. So next I had them (at low power) hold the button in only as long as needed to check VSWR, forward power, and the alarms. It turned out everything looked good.

It was becoming clear to me that the transmitter was probably being commanded "off" by something. From that point, it's just working through the chain. First thing I had the operator at the site do is put the transmitter in "local" and turn it on low power. Voila! Transmitter came on and stayed on. No problems. I then had them slowly ramp up the power to full. The transmitter was happy and they were on at full power.

It was pretty clear that either the remote control or something on the transmitter controller was bad. That's something that I can investigate later – for now, they were back on the air and everyone was safe.

That kind of troubleshooting is about as far as I'd go with remotely. You definitely need to draw the line with opening up equipment or resetting HV breakers. Those are the sorts of things that are dangerous, and have risks that need to be understood by competent workers. Remember again: Reset, check for lights and smells, and report. You aren't looking for these people to fix anything (unless it's someone you know to be competent at basic repairs), they're simply there to observe and report.

There is a lot of lively discussion in the industry about safety and using "civilians" in the transmitter room. I would love it if we never had the need to have them in there at all. However, the real world dictates that sometimes it becomes necessary, especially with smaller stations with smaller staffs. Let's face it – they'd probably venture in there whether or not you're willing to help. In my mind, if you can at least control the situation, you can insure the safety of whomever is there, and potentially solve a problem quickly and easily.

It's important for you to remember that that person's safety is in your hands. You *ALWAYS* need to err on the side of caution, even if they're willing to "go the extra mile" or the station management is putting the pressure on you. You need to be willing to shut the entire "operation" down if you, or the person on the other end, become concerned about anything.

The upside is with the newer generation of transmitters, it really is hard to do a lot of damage. Between "soft-start" circuits and computer control, it's pretty hard to get a new transmitter to fail catastrophically by resetting a fault. In fact, it's pretty easy to tell whether or not a transmitter is good to restart based on the transmitter's logs.

New Generation Transmiters Make Life Easier

I had a transmitter call one time where the person on the other end checked the transmitter log and it was determined that someone (we never did figure out who) switched the transmitter to "local" and shut it down. The log told all! They would have been off for at least an hour if I had to drive there. They had it back on in a matter of minutes thanks to my remote help.

As I've mentioned before, radio stations are often doing more with less. Even contract engineers are having to take on more stations, simply because in some areas, there is simply nobody else available to help. This often means operating as efficiently as possible.

As great as it would be to be able to head to the transmitter site for every single event, sometimes it just makes more sense to have someone do "triage" to see if it's simply an overload that needs to be reset, or if there might be something much bigger going on. By preparing in advance, and by taking safety seriously, you can better manage your time and efficiently use your time to get things done.

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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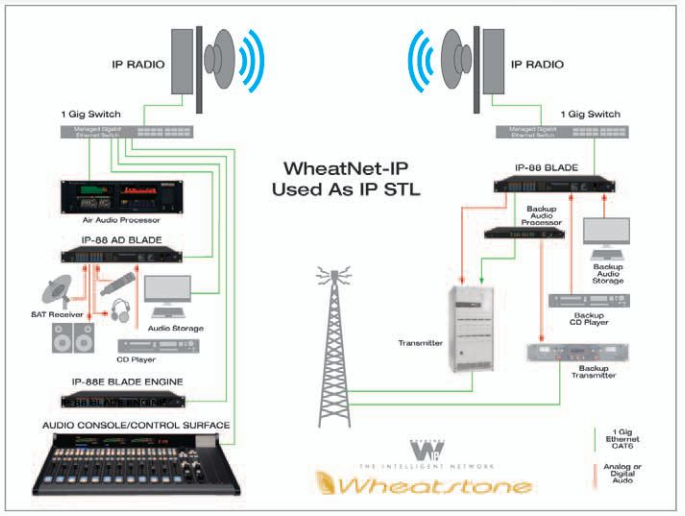

Multimedia Madness

Rethinking radio because of multimedia? We're putting more shared resources on the WheatNet-IP audio network and discovering some interesting uses for logic, including video following audio.

If you wanted to mess with cameras all day you wouldn't have gone into radio, right? It's not just YouTube, either. Or the station website that needs a continual stream of video and audio, or the photo bombs that are going off all day, every day. Or even that the morning guys are running all over town with a microphone and a camera.

Multimedia is requiring all of us to rethink radio.

We're putting more shared resources on the WheatNet-IP audio network in order to clear the studio of old gear and other camera eyesores, and we're putting audio processing at every access point in the network for the disparate sounds coming off the Internet, for example. We're finding a lot of new uses for logic control, too — like, triggering the studio camera to take a picture for Instagram or record video for YouTube whenever talent talks into the mic. For more ideas on how to deal with multimedia madness, go to...

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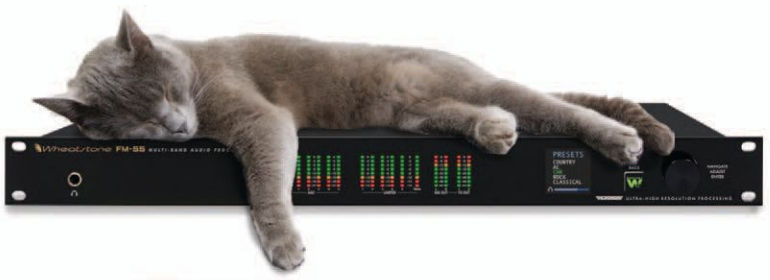

Something New is in (on) the Air

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INN13.wheatstone.com

Chief Engineer

Build a Universal "Marti" Antenna

by Scott Schmeling

I still like to build things. It's in my nature. I'm guessing many of you are the same way. One thing I've found to be extremely handy is a "build-your-own" Marti antenna mount. This project was initially born from the need to mount an antenna at sites where remotes are done frequently.

If I may digress for a minute, I remember years ago – make that *decades* – reading in the Electronic Industries newsletter, in a "Memo from Mertz" column, how to build your own yagi antenna. Back then, as a young engineerling, I found it intriguing that you could build an antenna like that. And, as I recall, it didn't look very hard to do. But we're not going to build anything quite that involved right now

Usually, setting up for a Marti broadcast is pretty easy. You go in with the Marti, a microphone or two, and the antenna. Your path back to the receiver would dictate your choice of antenna. Sometimes a whip antenna from inside the store will work just fine, other times you need something with a little more directionality and gain. You might need a yagi antenna, and you might have to get it higher up. That's when your setup becomes more complicated.

We have stations with clients who frequently buy remote packages. Some weekends it was not uncommon to be doing remotes from two or three locations on the same day. We wanted to find a way to make the setup (and take down) for these remotes faster and easier. In some of these locations we probably needed a yagi on the ground, but a whip up in the air would get us back with no problem.

We decided to mount whip antennas outside, and up high on the buildings – then run the coax down through a conduit and mount a female connector (SO-239) on an electrical box cover plate.

For the antenna mounting I adapted a product already available from Marti Electronics. I'm sure many of you have seen their "Mic Stand Antenna." It's really pretty ingenious. They mounted a Larsen "Kul-rod" whip antenna on a piece of aluminum (approximately 8-inches square as I recall) with an aluminum "yoke" on the bottom side, that had a flange mounted on the underside, which was threaded to screw on to a microphone stand (desk or floor).

My adaptation is really quite simple. I start with a fairly thick – 1/8-inch or so – piece of aluminum measuring 12 inches by 15 inches. There is a 90-degree bend three inches from the end on the 15-inch side. That gives you a 12-inch by 12-inch piece with a three-inch lip on one side.

In the center, I punch a 5/8-inch hole and insert a UHF Bulkhead connector (Amphenol 083-1F). That connector is essentially a "barrel connector" which will accept a PL-259 on each end. Mount it on the upper side of the aluminum so the antenna base will almost bottom out, but not quite. The connector comes with two nuts. Be sure to tighten them so the connector won't turn when inserting either the antenna on the top or the cable on the bottom.

(Continued on Page 28)

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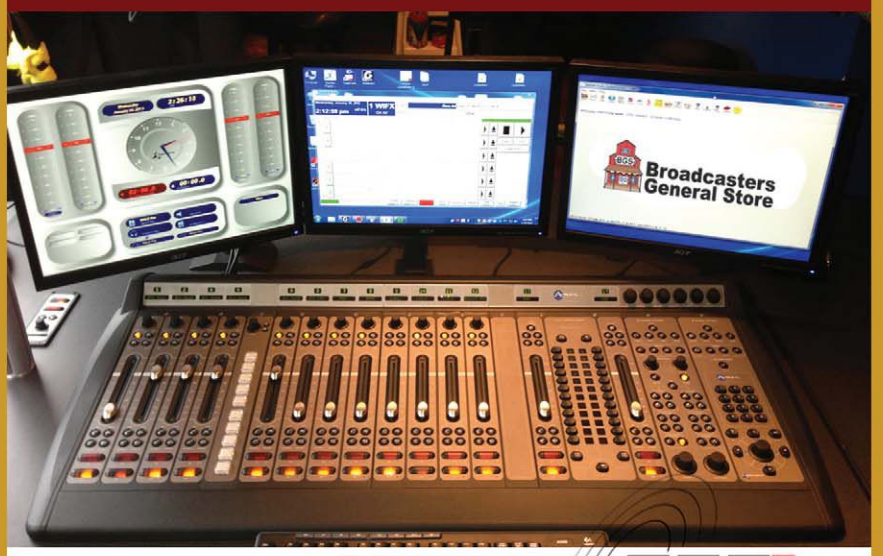

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Chief Engineer

Build a Universal "Marti" Antenna

– Continued from Page 26 –

By the way, I was putting so many of these in that I had a bunch of the pieces made by a local HVAC contractor. They're nice to have available when you need one. And you can build one of these up in under a half-hour (about 15 minutes after you've done a few!).

The antenna I use is a Larsen PO-450 for the 450 band and PO-150 for the 161 band. They terminate in a male PL-259 UHF connector, which fits just like it should in that 083-1F bulkhead connector. I have heard that Larsen has discontinued this antenna, but they have agreed to continue making them for Marti. Unless you find one on E-Bay, your only purchase option will probably be from Marti Electronics, now part of Broadcast Electronics.

Since the 083-1F is essentially an SO-239 at each end, the cable you use will also terminate in a PL-259 at the antenna end. And since the RF output connector on a Marti transmitter is also an SO-239, if you are using this for a transmitter, you'll have a PL-259 on *each* end. 161 receivers' antenna connectors are also SO-239, but the 450 receivers use an N-Type connector. Just be sure you're using the appropriate connector for your device (nasty things happen when you –I mean *someone* – plugs a PL-259 into an N-Type female connector!).

That 3-inch lip on one side of the aluminum piece is for mounting. The building or structure will determine your mounting options. The lip is large enough for screwing to a wall using the appropriate screws, or drilling holes for U-bolts for mounting on a pipe or tower leg. Another option I have used is to mount a dual-duplex weatherproof electrical box on the bottom side of the panel – directly below the bulkhead connector – then fastening it to a conduit using the proper hardware. I used this configuration on a brick church building. There was no good place up high to mount the antenna, but we could anchor a conduit near a window. The cable came out of the window frame (weatherproofed, of course) and up inside the conduit to the antenna – worked like a charm!

I have antennas like this mounted at several locations, including schools, businesses, churches, and studios. In fact, just today (as I write this) I had a base receive antenna fail. I took one of these mounts and a whip over and replaced the failed antenna. Right now, it's a "temporary" installation. If I can't find the problem with the original antenna, I'll make a shorter pigtail and consider it permanent!

I would be remiss if I ended this article without thanking George W. Marti on behalf of radio stations everywhere. He built KCLE in Cleburne, Texas in 1947. He thought about a portable VHF transmitter that could send high quality audio from a remote site back to the station. In 1960, Marti Electronics was formally established to build RPU's (Remote Pickup Units). I would venture a guess that *more* radio people know what a "Marti Unit" is than know what an RPU is. Marti is as synonymous with remote broadcasting as Kleenex is with facial tissue!

With advances in technology, we now have audio codec's (and codec smartphone aps) that allow us to broadcast from literally anywhere in the world. But it was George Marti who started it all. Thanks to George W. Marti and his wonderful RPU's for helping radio come out of the studio!

Until next time ... 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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- Outputs & Inputs for telephone handset, cellular phone or balanced line level at up to +10dBm.
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- The DR-10 is a Dial-Up remote control with balanced, telephone audio input & output that can control many automation systems or your audio console for unattended remote broadcasts.
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- Can be used as a phone tap or a passive manual telephone coupler.
- Send or receive telephone audio.
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State of the Station

Document It!

by Tommy Gray

Having been in broadcast for a "few" years, I have seen a lot of different operations, but one thing I have found that is all too commonplace at many of them, is a lack of proper documentation. I have seen everything from highly detailed Autocad™ (www.autodesk.com) drawings, to block diagrams scribbled on restaurant napkins (I admit it worked!). My first Chief Engineer job was replacing an engineer who had just retired. I was pleased to find that this engineer was very "Old School" and had documented repairs to everything he ever touched at the station, since the day it went on the air.

There were file cabinets with folders for each piece of equipment there. In those folders were detailed maintenance logs of each item. His logs contained detailed descriptions of the symptom of the problem, the parts that had failed, and everything he did to bring the equipment back to fully functional status. When something had an issue, all I had to do was to go to the folder, look at the logs, and know what the problem was if it had ever happened before. I quickly learned the value of good documentation, and tried to follow suit by continuing that system of record keeping while I was there.

I cannot tell you how valuable those records have been for me and everyone else. If you are around a facility for several years it is easy to forget things. When you have them written down, you go back, pull up the records, and find what you need. *One note here: When I left one group after being there for many years, housekeeping came in to clean out the office. They threw away all the documents not realizing their value. Make someone else at your place aware of how important they are.*

How To Do It

In the past you may have used a typewriter, a pen and paper, or other means to keep records. Today, we can do up some really nice documents with ordinary office software and a PC. I am going to show you a few common methods of documenting stations these days. Some are expensive, and some are totally free. All of these, however, do a satisfactory job at broadcast station record keeping.

Familiar to most of us, are lists and spreadsheets made up with Microsoft EXCEL™ or other similar spreadsheet programs. EXCEL is a powerful program that allows you to embed formulas, etc., into the sheet, as well as hyperlinks, etc. Here at our facility, we use it for some of those endless IP Address tables, etc., that we have to maintain to be able to manage our networks, and digital audio systems.

Below, you can see an example of a section of one of our sheets. This particular sheet contains some configuration documentation for some of our studio setups. This particular one is just a part of a much larger document, and is an Excel worksheet.

This document is under construction and not yet totally complete, though the list is already useful. You may notice some of the underlined names on the right. These are "hyperlinks" that take you to bookmarked locations elsewhere within the multiple tabs of the worksheet. Each of these takes you to an entire section of documentation relating to that particular item. Spreadsheets are a good way to keep track of a large amount of data in a manageable fashion. The really great thing about them is that you can open them on a cell phone, tablet, etc., and have them available anywhere you happen to be when you need them.

Studio Equipment locations & IP Addresses

B1.CTRL1	IP Address	Host Name	Serial #	Tx Channels
Cisco	10.17.20.100			
Mic node	10.17.20.120			
Analog node	10.17.20.122			
AES node	10.17.20.121			
Vset (future)	10.17.20.119			
OnAir1	10.17.20.101			
Control1	10.17.20.102			
Element CPU	10.17.20.110			
Mix Engine	10.17.20.111			
VoxPro1	10.17.20.130			
VoxPro2	10.17.20.131			
VSet12	10.17.20.132			
AirTools Processor	10.16.20.13			

B1.CTRL2	IP Address	Host Name	Serial #	Tx Channels
Cisco	10.17.20.200			
Mic node	10.17.20.220			
Analog node	10.17.20.222			
AES node	10.17.20.221			

ENGINEERING	IP Address	Host Name
Ethernet Sw 1	10.17.1.3	Audio Core (3650)
Ethernet Sw 2	10.17.1.5	Audio Edge(2960)
Ethernet Sw 3	10.17.10.5	WebStream
Ethernet Sw 4	10.17.10.6	WebStream
Ethernet Sw 5	10.17.19.201	CNTRL1 CLIPS
Analog node 1	10.17.20.10	B.1.MDF.ANA1
Analog node 2		
Analog node 3		
Omnia 1	10.17.20.20	B.1.MDF.OMNIA1
Omnia 2	10.17.20.21	B.1.MDF.OMNIA2
AES Node 3	10.17.20.3	LvAES
AES Node 5	10.17.20.5	Arbitron-IF
AES Node 7	10.17.20.7	B1MDFSATMON
AES Node 8	10.17.20.8	B.1.MDF.AES2
AES Node 9	10.17.20.9	B.1.MDF.AES3
AES Node 18	10.17.20.18	B.1.MDF.AES4
Router Sel 1	10.17.20.250	
VX1	10.17.20.30	
VX2	10.17.20.31	

(Continued on Page 32)

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MR-PRO

The MR-PRO is a versatile reference grade analog audio source generating both standard and user-stored signals at extremely low distortion. It also includes some remarkable additional features including readout of the impedance and phantom voltage of connected devices, as well as a cable test/signal balance function.

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- User stored signals and signals for polarity and delay testing
- +18 dBu output at -96 dB distortion

MR-PRO

XL2 (with M4260 microphone)

XL2

A high performance audio analyzer and acoustics analyzer together in one efficient battery-powered package. Designed to close the gap between handheld and benchtop instruments in performance and features, it functions as an audio/distortion analyzer, with frequency counter; octave and 1/3 octave real time analyzer, sound level meter, FFT spectrum analyzer, RT60 reverberation analyzer, polarity tester, delay time analyzer and optionally, as an STI-PA speech intelligibility analyzer.

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- Broadcast and Studios
- Environmental and Community Noise Measurements

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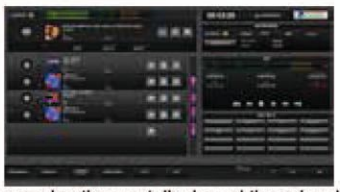

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OXYGEN 3 - up-to 20 channels

OXYGEN 3 is a compact audio console for "on-air" and production in the broadcast radio field.
It is very simple to use and provides maximum operating flexibility.
The OXYGEN 3 console is a complete and self contained piece of hardware, requiring no additional equipment to operate.
All relevant functions are built-in, such as 2 telephone hybrids with conferencing capabilities. On Air lamp control, Monitor loudspeaker cut-off and Talk-Over facility.
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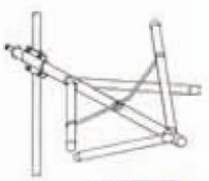

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State of the Station

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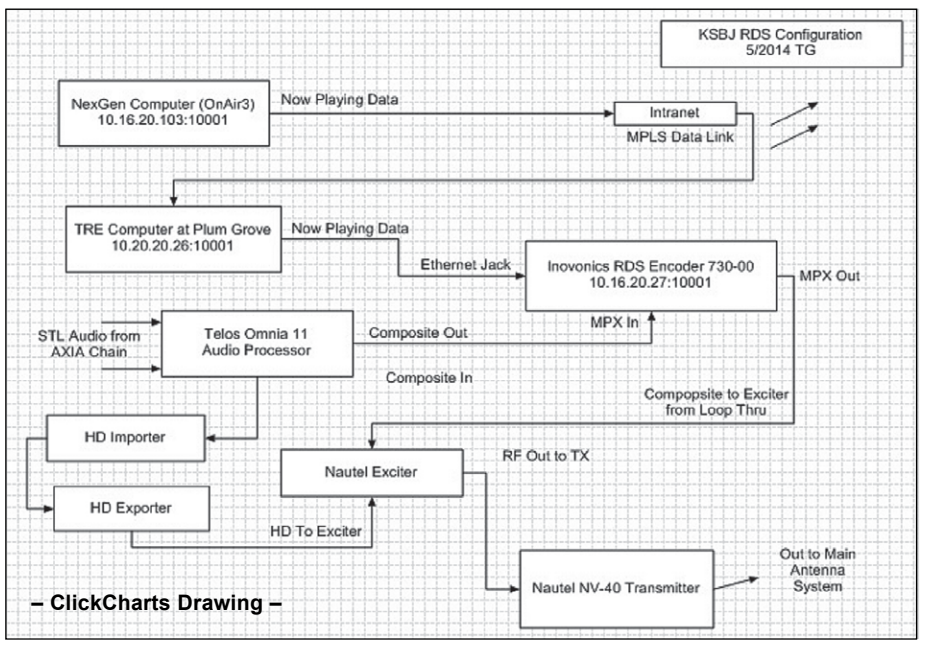
Putting these important documents into something like a Dropbox™ (www.dropbox.com) or cloud account, allows you to not only access them wherever you are, but allows you an easy way to share the documents with your colleagues or even contractors. If you like products such as Evernote™ (www.evernote.com), you can get a PC version and phone or tablet App for free, for a limited account. For more involved needs, you can purchase modestly priced annual subscriptions. Drop the document into your account from your office PC and have it almost instantly available when you are out in the field on your phone or tablet, etc.

Moving Right Along

Address tables and lists are just one way of documenting a facility. One thing that I always like to see at a new place or station, when I am asked to assist with a project, is a block diagram. Block diagrams are an important tool to help you to quickly get acquainted with the layout of a station. They help you to get a handle on how things are connected at a glance. You could literally spend hours tracing wires, trying to ascertain where thing are routed. A block diagram gives you an instant "snapshot" of the facility and is very valuable. Block diagrams are especially useful when training new people on your team.

There are many ways to create block diagrams. A sheet of paper and a pencil will work in a pinch and organizing them in a notebook has saved many an engineer a lot of hours. Today, most of us have access to a PC and can use some kind of useful software. A lot of great tools are out there that can run the gamut of very expensive to totally free. We are implementing VISIO drawings a lot these days. VISIO is another powerful tool like Autocad and other CAD and drawing programs. It can do some fantastic documentation, but there is a good sized learning curve to master it. I suggest starting out simple and expanding as you go.

Other programs work well for small projects and don't cost you a lot. I mentioned free earlier. ClickCharts™ (http://www.nchsoftware.com/chart/) is a good tool for quick and easy charts – and it's easy to learn. It has an "Export to PDF" function which is handy to pass along your diagrams to others, or to send them to your phone to tablet through your cloud accounts. As an alternative, you could email them to yourself if you don't happen to have a cloud account.



– ClickCharts Drawing –

I have included for you above, a sample of a ClickCharts drawing I did a few days ago in planning for a new RDS install at one of our stations. The install team can use it when they go out to the site to do the actual installation, and know exactly how things are supposed to be connected. Obviously, it is very basic, but gets the job done nicely. It took me about 5 minutes and was done for free. I did it faster than I could have opened up VISIO and put together a drawing. Later on, we will add this info to a VISIO master, but for now, it is good enough to be used even for permanent documentation should we need to.

You can do up a simple ClickChart diagram or you can get as elaborate as you want – use whatever you like. There are a lot of useful tools out there to build your document library. They all will allow you many options for good record keeping.

Trust me, friend. At three in the morning when you get called in to correct a major issue, your brain is not going to be as alert as it might be at three in the afternoon. You could sit there and stare at the back of the rack until your brain wakes up, or you could open up a good drawing and find the problem quickly.

The option you choose will largely depend on how much you prepared for it with good records. Think about how you would enjoy getting back into that nice warm bed, and continuing what remains of your night of sleep! I promise you, good documentation will "save your bacon" over and over again!

Whatever method you may use or have at your disposal, please, for the sake of the next guy, (or even yourself at three a.m.), "Document it!"

Tommy Gray is the Director of Broadcast Engineering/Technology/Facilities at KSBJ/NGEN Radio Networks. He may be reached at: tgray@ksbj.org

Operations Guide

Is That Data Safe?

by Jim Turvaville

The world of Radio Broadcasting has evolved what seems like light years in the five decades that have existed in my radio journey. Back in the 70's, we never wondered if our music library or listener correspondence could somehow go missing – after all, the music was all on vinyl records or tape and those letters were all on paper in a file cabinet. As the 80's introduced the PC to our offices, it began to take over in the 90's; and by the new Millennium the radio engineering department became intrinsically entwined with the newly-created IT Department. While it was once a joke that, "one day we'll have a network connection to our transmitters," that reality actually happened years ago.

What we are now experiencing is an all-digital-based radio environment, from offices to studios to transmitter sites. Along with that comes facing the inevitable situation when some computer reaches its end of life – in either a voluntary or involuntary mode. And when that happens, the first question is always, "Is there a backup?" In cases like that, I'm constantly reminded of the old poem about job responsibility:

It's not my job to drive the train, the whistle I can't blow.
It's not my job to say how far the train's allowed to go.
It's not my job to blow the horn, nor even clang the bell.
But let the train jump the track and see who catches hell.

While humorous, the truth of that saying hits everyone at one time or another. Before your name is the one that gets called, making some plans and taking a few relatively simple and affordable steps of action, can take a situation from crisis to controlled chaos – maybe even making you a hero of the day.

Office Environment

Not every station location utilizes Outlook Exchange for email or has a centralized file server for document storage. If you do, then you already have a system in place that makes backing up data relatively smooth and efficient. In the case of Microsoft Server OS machines and Outlook Exchange servers, there are built-in tools to facilitate a backup of mailbox and other data on a regular schedule to an alternate location.

That location can be just another computer in the network, an external drive connected to the server, or a stand-alone storage solution. After all, the typical primary intent of the data backup is to replace that specific machine's data upon a failure of that specific machine – not necessarily for a cataclysmic failure of the entire network (hurricane, fire, etc). While a complete failure is always possible, it is fractionally as likely as a single machine failure where data recovery will be needed. If you have not set up a backup system because you are not prepared for a catastrophic failure, then at least set one up for a typical machine failure.

In the locations where I manage data networks, we utilize a multiple storage architecture model which covers the single machine failure scenario and provides usable catastrophic protection ability. Having spent 27 years in the Christian Radio environment, I often tell my co workers *"If Jesus saves, then so should you – and in multiple places."* The Engineering and IT department shares the bulk of the responsibility for the security of the data, but at least some of it is also shared with the end user.

Specifically, our 11 office environments each have a local file server. It is a Windows Server 2010 machine with usually 1 or 2 TB of storage capability on RAID-1 (mirror) drives. The RAID-1 setup was chosen mainly for economy, since the classes of server machines that support this are more affordable on our non-profit budget; and for efficiency, as most all new motherboards support a RAID-1 hard drive setup without the need of outboard controller cards which can be the source of many failures.

Apart from providing local DNS and AD management, there are no applications on this server; it is almost exclusively a local file repository. In a couple of our very small office environments, a workstation class machine is even used for this purpose, just to have a centralized file storage location. Each user in the local office has a unique directory on that server where personal files are stored, and off-line synchronization provided in the Windows operating system that is set up on each user's workstation.

To compliment the server in each office location, we have a Network Attached Storage (NAS) device which duplicates the storage capacity of the file server by a factor of two. In locations where the file server has 1TB of drive space, my NAS box has 2 TB – just for some headroom in being able to manage backups of the data. After some shopping, we also did not break the bank in setting up the

(Continued on Page 36)

Is That Data Safe?

– Continued from Page 34 –

NAS system – ours happens to be a Synology DiskStation DS213 which comes with two open disk bays for under $250. We then add the size drives desired for each location, and configure them in RAID-1, like the file server, for a typical onetime cost of under $500. There are several other brands that are just as competitively priced. Like all NAS devices, they come with necessary applications for automating a backup process of data from various sources on your schedule. These boxes are compact enough that, if placed in an easily accessible location, can be unplugged and carried out the door in case of a pending disaster (hurricanes in Florida and wildfires in Colorado have caused this at our facilities in the recent past).

In this setup, we have a total of five copies of all office data. The original on the user's workstation ("My Documents"), the off-line synchronized copy on the file server and its mirror on the RAID-1 drive, and the NAS copy made each night at midnight and its mirror on that RAID-1 drive. The likelihood of losing all five of those sources at the same time is small enough that I can sleep at night knowing my CEO will not worry about losing any of his important business documents. We also strongly encourage all our end users to utilize local backup (usually USB drives) of their data not found in those off-line synchronized folders; which includes the "Archive" files in Outlook which are stored exclusively on the local workstation.

Even if you do not have a centralized server configuration in your office, the NAS box can serve as a file repository and the NAS-provided utility can run on individual workstations, or the Windows off-line synchronization can work with it just the same. For a few hundred dollars, your office can have a reliable and usable data backup system in place.

Studio Environment

The Studios bring a different dynamic to data storage, since it most often involves more than just audio files. In our operations, the iMediaTouch automation systems have companion data files that have to be backed up to synchronize the audio file usage; just having the audio files is only half of the necessary data to restore in case of a failure.

Like the office environment, we also have a file server just for the purpose of storing audio that is used in the various studios. It also tends to be a Windows Server 2010 machine with usually 2 or 4 TB of storage capability on a RAID-1 drives, or at least a high quality workstation class machine with those capabilities. Again, there are no applications which run on the audio server, it is a file repository. A second NAS box, or at least a good quality USB external hard drive, is then paired with that audio repository and similar backup scheduling is enacted. Often backing up on-air and production machines is more complex than personal folders on an office server, so more complex management may be needed. I have had great success with *Second Copy* for making custom definitions of file backup needs, including various synchronization schemes to minimize data duplication on the backup copy. At $30 per license, it's hard to beat the performance, and there are several products which will do the same for an equitable price.

Again, even if you do not have a centralized audio server in your studios, the NAS box can serve as a file repository and the NAS-provided utility can run on individual workstations or other file synchronization can work with it just the same. For a few hundred dollars, your studios can have a reliable and usable data backup system in place. In a smaller operation, the same NAS box can manage both office and studio needs; just size the storage in the NAS box to exceed current and future file size estimates.

Tower Environment

With many of the new transmitters, remote controls and half a dozen other items at our tower sites all being IP based, broadband at the tower is more common than ever. While it is very convenient, the truth is that for most stations that Internet pipe at the tower is mostly underutilized. If you are considering a catastrophic data recovery plan, then don't overlook your IP connected tower site. Get a duplicate NAS box and make a current backup of your office and/or studio data on it. Then take that NAS box to the tower site and plug it in to your broadband connection. Set that location for incremental updates from the unit at the studio, and set it for 2:00 a.m every Sunday (or some other extremely idle network time). By starting with a full backup on the unit, then requesting only incremental updates, the data demand will be minimal – and you'll still have a true offsite data backup in case of a real catastrophic occurrence at your studio location.

While we would all love to have a complete data backup system for all types of emergency situations, everyone can start small and work toward that goal. If yours is the "name called" when the inevitable computer failure happens, a little preparation and some affordable resources now, just might make you the star of the day.

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.

Audio Guide

Audio Over Internet

Using Skype, SIP, and WebRTC

by Mike Phillips

Remotes are great ways to get involved with the community and increase revenues. Whether you're doing a remote from a local car dealership or from the high school football stadium, you always want the highest audio quality you can get. Back in the good old days, many stations used Marti transmitters and receivers for mobile remote-to-studio links. They worked well so long as your remote was within a reasonable distance of your RPU antenna. They were not so useful when the football game was in another state.

The Internet has leveled the playing field. There are some excellent hardware and software solutions for wideband audio remote broadcasts made by companies such as Comrex, Tieline, Telos, Barix, and others, but there are some very simple solutions that are free, assuming you already have Internet access and computers, microphones, headphones, and mixers.

Skype

Skype revolutionized wideband audio communications, enabling you to create a high quality audio call between two locations using just two computers and a microphone. Because so many people use horrible headsets or even the microphones built into their laptop computers, you may not be aware how good Skype really is.

Since Skype uses the Internet for connectivity, it has to deal with the complexities of that medium. Skype does an impressive job of making itself a universal communications tool. Add someone as a Skype contact, make a free call, and you're communicating in wideband.

As wonderful as Skype is, it has issues that probably prevent it from being the remote broadcast tool of choice. Skype requires an excellent and reliable Internet connection. If the connection has high latency, packet loss, or low bandwidth, Skype will attempt to negotiate a lower bandwidth connection. Even if it's able to negotiate a lower one, the audio quality suffers. (To be fair, all IP communications tools suffer from similar problems, but Skype's auto-negotiation can be really bad.)

The most problematic issue may be Skype's Broadcast Terms of service, located at **http://www.skype.com/en/legal/broadcast/**. It's likely that most radio stations that use Skype for remotes violate Skype's Broadcast Terms of Service. If a Skype-based remote is 15 minutes or less, you must "transmit an identification announcement" at the beginning and at the end of the broadcast that complies with their "Branding guidelines for broadcast." If the remote is over 15 minutes, you must make the announcement at "no less than 15 minute intervals" for the duration of the remote. Have you ever heard a station make those announcements?

SIP Clients

There's another world of audio and video connectivity out there called SIP, or Session Initiation Protocol. Check Wikipedia for a technical explanation that is beyond this scope of this article. The protocol is widely used in business telecommunications systems. In its simplest implementation, SIP allows you to create a peer-to-peer, two-way audio channel between two computers, each with a SIP client. Each side may be connected to a SIP server. One side then calls the other by "dialing" a SIP address that often resembles an email address. Press "call," and a two-way, full duplex session starts.

One of the greatest benefits of SIP is that it's free. There are no monthly, connection, or per-minute costs. Most SIP clients allow you to choose the codec you want to use for the call. While most people will choose the Opus codec for highest audio quality, it's possible to choose one that uses less bandwidth if you're trying to do a remote from a location that has less-than-stellar Internet service.

There are three reasons that SIP connections for audio transports have not been widely adopted. First, many broadcasters have never heard of SIP. Second, since SIP has historically been used for telephone communications, the codecs used are narrow band and do not have the fidelity needed for radio. Third, installing and setting up a SIP client can be a challenge – there are many parameters that are foreign to broadcast engineers.

If you have not used SIP, go to **http://icanblink.com** download Blink, and install it on your computer. When you start Blink, even if you have a SIP account elsewhere, let Blink automatically create an account for you. Click on Blink | Accounts | Add account. In the screen that pops up, select "Create a free SIP account," and fill in a name.

(Continued on Page 40)

Audio Over Internet

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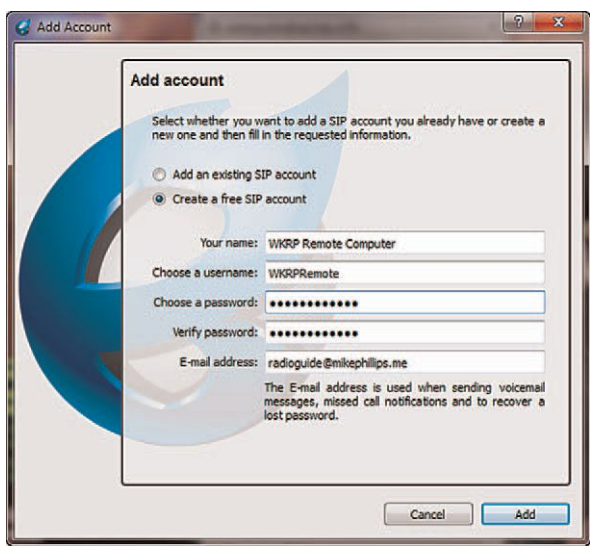
Choose a meaningful username, such as wkrpremote, for the "Choose a username" field. Pick a password. Finally, enter your email address. Then click "Add."



Blink then creates a SIP account for you at **sip2sip.info**, an excellent SIP provider. The SIP address in this example is **wkrpremote@sip2sip.info**. Repeat the process at the other end, using, say, WKRPStudio. The remote computer can then call the studio computer by entering **wkrpstudio@sip2sip.info** in the "Enter Address" field and clicking "Call." The beauty of Blink is that by allowing the program to create the new SIP address, Blink is automatically configured. If your test setup doesn't work immediately, you'll have to do a little troubleshooting. The key is to allow Blink to create the sip2sip.info account for you.

While I have no connection with AG Projects, the creators of Blink, I'm a big fan of the program, and I've had some excellent interaction with the developer, Adrian Georgescu. Adrian is an audio guy who is making SIP a reliable wideband audio (and video) tool. He appreciates the need for true wideband SIP audio. Blink is available for Windows, Mac, and Linux.

WebRTC

There's a new breed of connectivity called WebRTC. It's a communications protocol that's integrated with web browsers. It allows you to send and receive high-quality, wideband audio (and video) in real time. You can learn more about WebRTC at **http://www.webrtc.org** or Wikipedia.

One excellent service is Source-Connect Now from Source Elements. It provides "free high-quality bi-directional streaming in your Chrome web browser." Only one person needs an account. He can then send a guest invite via the built-in email invitation. When the guest and the host log in, the call is automatically established. It's even capable of conferencing multiple guests into the same call. It even has a built in recorder so that each member of the call can easily record themselves for editing at a later date.

Using Source-Connect Now, it's possible to connect two computers at 128K in stereo, using the Opus codec. Yes, *stereo*. The tests we did provided stellar results. Source-Connect Now offers premium options that are shown on their website at **https://now.source-elements.com/#!/** With a paid account, calls can now go as high as 512K stereo and 256K mono using Opus. The quality is excellent.

One problem that some people may experience with WebRTC is the inability to select a computer sound card output other than the operating system default. It's not uncommon to have a computer with multiple sound cards, particularly when you use a mixer, and need a mix-minus. Since Google Hangouts now use WebRTC and allow for sound card selection, others will hopefully follow suit.

Conclusion

There are many other providers that have released products, or have products in beta that will provide audio quality over the Internet, that have never before been available. Codecs will come and go, but the end product will continue to get better.

You might benefit from an article about intefacing computers with mixers that I wrote and posted on the International Association of Internet Broadcasters website at **http://www.ibroadcastnetwork.org/blog/interfacing-skype-with-a-mixer**. The article refers to Skype, but the techniques are the same for SIP and WebRTC clients.

If you want further information, you're welcome to contact me at radioguide@mikephillips.me. Maybe we can do a test call and verify that you have your Skype, SIP, or WebRTC setup working properly.

Mike Phillips started in the radio business in 1962 at his family's radio station in Laurinburg, NC. Over the years, he has been engineer, on-air, sales, and management. He is presently an attorney in Cary, NC and provides audio help for broadcasters and podcasters. You can reach him at radioguide@mikephillips.me

Small Market Guide

An Opinion on AM Radio

The Good, the Bad, and the Ugly!

by Roger Paskvan

In small market, AM radio has been the community voice for fifty years but that menu is changing! The history of AM radio dates back to the beginning, the 1920's. AM was the first format to be broadcast and to this day, a staple in radio history that weathered the test of time. AM stands for amplitude modulation and was one of the first methods to broadcast information to the general public. Changing the height of the carrier at an audio rate is what is happening. This modulation process was easy to detect with diode tubes or solid state today. AM broadcasting was a huge step and was considered an evolution at the time.

The original AM dial was assigned 540 to 1600 kHz and latter the FCC allowed the excursion to 1700 kHz. AM radio took off in the golden age of broadcasting, the mid 1930-40's. The process of mass production borrowed from Henry Ford's idea made radio sets economical. David Sarnoff, a mail clerk at RCA worked his way to CEO and led the charge in the production of AM radios. Radio, first brought to the public as a novelty, now became a household item because of demand and increased production. Mr. Sarnoff wanted a radio in every living room, and just about succeeded.

AM was originally the only form of modulation that could be found on a radio. This all changed when a new way to listen to radio was discovered. FM (Frequency Modulation) was introduced by Armstrong and was immediately considered a major threat to AM radio. When first introduced, many different claims were made against FM. RCA fought the new concept with its power and influence. The FM founder, Edwin Armstrong, a one time friend of Sarnoff and a former employee of RCA took-on the big company. FM made AM sound like poor fidelity music, but the big boys did all they could to keep FM from getting into the public hands.

In a last effort to kill FM, RCA with its power and money petitioned the FCC to move the FM dial from its original frequency band 42-50 MHz to 88-108 MHz. It was a cleaver ploy because in the 1940s' reaching 88 MHz with existing technology was not easily possible. RCA won, and FM listenership became similar to AM radio listenership today. AM was king and no one but a select few spent the money or time to dial up what few FM stations there were on the new FM dial. Even in the late 50's FM stations programmed what today is called "elevator music." There was talk that FM radio would die before it had a chance to be heard by the public.

It took stations owners like Todd Storz to introduce top 40 music to the FM format and let people hear the major difference in sound. Once people started to hear more and more FM, its "quality" and sound started to draw sizeable audiences. Soon many listeners began moving away from AM and more towards FM radio. In 1961, the FCC allowed stereo broadcasting, giving FM a major niche over its big brother, AM. By the end of the 60's, FM had taken over and the preferred choice for music was Frequency Modulation.

After FM engulfed the airwaves, AM listenership began to dwindle leaving a small audience – but still an audience, all the same. The remaining audience tuned in for specific shows that stayed with AM. With their AM stations losing listenership, the larger broadcasting companies began preparing for this loss. Given FM's shocking blow to AM, things only got worse when television replaced radio. Television became a household novelty in the mid seventies and radio in general was put on the back burner. Radio's glory days were short lived, a mere 25 years. FM became a background medium to TV and it was expected that AM would no longer be around in the coming years.

Though the number of AM listeners fell drastically, programming changed to adapt to the narrow audio frequency response of AM. Talk and Sports shows found a home on AM radio. They maintained a narrow audience of aging population. As the baby boomers grew up, the next generation of listeners were raised on FM radio. Internet, Satellite Radio, cell phone access and iPods all stood up and placed their crashing blow to AM listenership. With the same shows now in high fidelity on these alternative forms of reception, the attack was always against AM radio. A lot of formerly AM syndicated shows have either moved to the FM side, satellite, or completely disappeared from radio all together.

(Continued on Page 46)

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Service Guide

Radio Equipment Products and Services

Service Guide

Radio Equipment Products and Services

An Opinion on AM Radio

The Good, the Bad, and the Ugly!

– Continued from Page 42 –

This resultant dim future of the AM band has become a major concern for many existing broadcasters, as consumers migrate more and more to their cell phones, tablets and crowded dashboards for crystal clear sound. Broadcasters by content, are moving away from the static sound of the AM band, simultcasting their news and sports games to the FM dial where it's become fact they can pick up younger listeners and the sound quality is outstanding. Many new car radios have substituted satellite radio for the AM tuner.

AM stations are primarily local stations, and here lies their greatest asset. Local stations serve local needs. If one listens to FM radio it is obvious most programming is not local, with much of the programming brought in through satellite. Because the band characteristics of the AM radio spectrum making it less desirable than the FM portions, commercial AM radio is more likely to keep losing listeners just because of the technical superiority of FM broadcast. AM radio could redefine itself by capitalizing on its greatest strength – local listeners. Some smaller stations have done this already by becoming much like the community newspaper, with stories of local interest and strong connections to the community. Other stations will likely transform into special interest stations, meaning they will serve specific needs in a given community.

The AM radio signal is also subject to atmospheric noise and static crashes, causing more difficulties for listeners, particularly with music stations. FM radio and the regular cell phones/music players have led people to expect at least reliable clarity (audio fidelity is another issue altogether!). What may be even worse is the interference caused by the myriad of electrical devices flooding our lives—AM radio signals are quite susceptible to electronic interference from Plasma TVs, power supplies, fluorescent lighting and overhead power lines. One very important function that AM radio can do better than almost any other broadcast medium is to provide the listener easy access to emergency information with a minimum of equipment needed. Local coverage by AM signals is actually better than FM, and this can be a real plus in a time of crisis.

The question that is constantly asked is, "Will the AM dial become obsolete in the coming years?" For this answer it could be stated that the current broadcasting world is very focused on quality of the sound coming from whatever the source. Sound quality is improved on all devices outside of the AM dial. So will AM radio die? With all the blows that have been dealt, this could be the end of AM radio. May broadcasters ask this question daily, keeping their AM's on only because the FCC says you must meet the 18 hour broadcast day rule.

There has been talk that AM radio could be used for the public's benefits such as the use of state weather channels or even another way of communication for the delivery population that involves truckers and their haulers. The AM stations could be transferred over to the FM side and their AM frequencies made available for park information channels, state law broadcasts, weather in the area, and even information about areas entered.

Currently there is not much incentive to listen to AM since most programming can also be found on other high quality sources readily accessible to today's audience. Even sports is slowly transferring to the FM dial.

In some markets AM stations have moved to re-broadcasting on FM translators. An FM translator re-transmits the signal of an AM or FM radio station (with FCC licensing approval, of course) without significantly altering characteristics of the original station. While this has had a pseudo effect of increasing listeners for certain markets, some people believe it further underscores the irrelevancy of current AM radio. Although the FCC has made it possible to allow AM's to translate their programming to FM, why not just originate on that FM channel and just shut off their AM station?

So, what is the future of AM Radio? Many people and broadcast owners have been discussing this topic in detail including the folks at the FCC. While AM radio has been an icon fixture of the airwaves from the beginning of radio days, the future of this band is questionable – at least to some longtime broadcasters.

With the decline in audience and also the moving decline in programming, many stations are dealing with resulting declining profits or just plain negative cash flow. AM radio came in with a storm but it is quietly leaving in many marketplaces. What is going to become of 4,700 AM stations? It is this broadcast author's opinion that AM radio will not be able to survive for any length of time without some major technology innovation or FCC legislation to improve its competitive effectiveness. With the given new technologies, it may be time to replace Ancient Modulation.

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

Final Stage

RADIO ROUNDUP

The Radio Guide Event Register

Email your dates and info to: ***radio@rconnect.com***

Texas Association of Broadcasters (TAB)
August 6-7, 2014
Renaissance Austin Hotel
www.tab.org/convention-and-trade-show

2014 NAB Radio Show
September 10-12, 2014
Indianapolis, Indiana
www.radioshowweb.com

SBE 22 Broadcast and Technology Expo
October 8, 2014
Tuning Stone Resort and Casino, Verona, New York
www.sbe22expo.org

137th AES Convention
October 9-12, 2014
Los Angeles Convention Center
http://www.aes.org/events/137/

WBA Broadcasters Clinic
October 21-23, 2014
Madison Marriott West, Middleton, Wisconsin
www.wi-broadcasters.org/events/broadcasters-clinic/

Ohio Association of Broadcasters (OAB)
October 29-30, 2014
Columbus, Ohio
www.oab.org

Radio Guide Advertiser Info – July/August 2014

Advertiser - Page	Website
Aldena - 38	www.aldena.it
Altronic - 37	www.altronic.com
AM Ground Systems - 4	www.amgroundsystems.com
Arrakis - 21	www.arrakis-systems.com
Bay Country - 43	www.baycountry.com
BEXT - 41	www.bext.com
Broadcasters General Store - 27	www.bgs.cc
Broadcast Devices - 19	www.broadcast-devices.com
Broadcast Software Intl. - 35	www.bsiusa.com
BW Broadcast - 11	www.bwbroadcast.com
Classified Ads - 39	www.radio-classifieds.com
CircuitWerkes - 29	www.circuitwerkes.com
Coaxial Dynamics - 36	www.coaxial.com
Comrex - 5	www.comrex.com
Davicom - 42	www.davicom.com
Delta Meccanica - 43	www.deltameccanica.com
Deva - 32	www.devabroadcast.com
DM Engineering - 47	www.dmengineering.com
Econco Tubes - 43	www.econco.com
ESE - 46	www.ese-web.com
Graham Studios - 46	www.graham-studios.com
Henry Engineering - 2	www.henryeng.com
Inovonics - 1, 23	www.inovon.com
Jampro - 39	www.jampro.com
Kay Indistries - 47	www.kayind.com
Kintronic Labs - 43	www.kintronic.com
LBA - 22	www.lbagroup.com
Lightner Electronics - 20	www.lightnerelectronics.com
Logitek - 34	www.logitekaudio.com
Michael Patton - 47	www.michaelpatton.com
Micro Communications - 41	www.mcibroadcast.com
Mooretronix - 45	www.mooretronix.com
Myat - 26	www.myat.com
Nautel - 7	www.nautel.com
Nexus - 41	www.nexusbroadcast.com
NTI - 31	www.minstruments.com
Orban - 28	www.orban.com
Phasetek - 47	www.phasetekinc.com
ProAudio.com - 37	www.proaudio.com
PSI (Propagation Systems) - 35	www.psibroadcast.com
Radio Systems - 33	www.radiosystems.com
RF Software - 45	www.rfsoftware.com
Samco Antennas - 46	www.samcoantennas.net
SAS (Sierra Automated Sys) - 15	www.sasaudio.com
SCMS - 13	www.scmsinc.com
Shively - 33	www.shively.com
Smarts Broadcast Systems - 17	www.smartsbroadcast.com
Sparta Broadcast - 40	www.ebsradio.com
Stackley Devices - 46	www.stackleydevices.com
Studio Items - 30	www.studioitems.com
Superior - 31	www.sbp-tv.com
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