

Radio Guide

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September-October 2017 – Vol. 25, No. 5

Delivering Solid HD Radio Coverage to All Your Listeners



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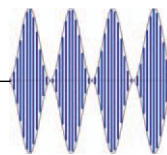


Radio Guide

Contents

September-October 2017

In This Issue



Critical Content for Radio

Cover Story	6
<i>Delivering Solid HD Radio Coverage To All Your Listeners</i>	
Studio Site	8
<i>"Milking" Your Skimmer</i>	
Chief Engineer	10
<i>Just When You Think You've Seen It All</i>	
Station Stories	12
<i>Saving a Tower</i>	
Transmitter Site	14
<i>New Transmitter Install</i>	
Radio Report	16
<i>Stories From the Field</i>	
Tower Topics	18
<i>Isolating Communications Services From Your AM Tower</i>	
Tips From the Field	20
<i>Keep Your Friends Close But Your Enemies Closer</i>	
Survival Guide	26
<i>Surviving a Natural Disaster</i>	
Engineering Perspective	30
<i>Artist</i>	
Maintenance Guide	34
<i>Air Conditioning Principles and Maintenance</i>	

Tech Management	38
<i>Don't Drive With The Parking Brakes On</i>	
Small Market Guide	42
<i>The Not So Jolly Green Giant Visits Small Marketville</i>	
Service Guide	44 & 45
<i>Radio Equipment, Products, and Services</i>	
Radio Classifieds	45
<i>Buy and Sell Used Equipment On-Line – FREE of CHARGE</i>	
Gear Guide	46
<i>New Product Releases and Information</i>	
Final Stage	47
<i>Convention, and Event Register – Advertiser Information</i>	

Radio Guide

Volume 25 – Issue 5

Radio Guide Website: www.radio-guide.com
Classified Ads: www.radio-classifieds.com

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Radio Guide, ISSN 1061-7027, is published bi-monthly, six times a year, by Media Magazines Inc., PO Box 20975, Sedona, AZ 86341. Radio Guide is copyright 2017, Media Magazines Inc., and may not be copied, reproduced, or stored in any format, without the written permission of the publisher.

Cover Story – by Elaine Jones (page 6)

Delivering Solid HD Radio Coverage to All Listeners: "Is it possible to provide fill-in coverage of HD Radio signals, meeting the FCC requirements, with an HD SFN? Nautel Research Engineer Philipp Schmid set out to answer that question with recent field tests of an HD SFN at KUSC in Los Angeles."

Chief Engineer – by Scott Schmeling (page 10)

Just When You Think You've Seen It All: "I have mentioned that I tend to save things – especially if I think they might have a potential use. Among the items I have in "storage," are a variety of inductors and RF capacitors removed from an old phasor. With this in mind, I was fairly confident I could find the needed components to build an ATU."

Tower Topics – by Michael W. Hayden (page 18)

Isolating Communications Services From Your AM Tower: "The challenge here becomes how to place these items across the base of the tower, while still presenting a high enough impedance to the AM transmitting equipment as to make these items seem invisible. In this article, we will discuss the ways colocation is accomplished today."

Survival Guide – by Tommy Gray (page 26)

Surviving a Natural Disaster: "Transmitter sites I have worked on for over 30 years were suddenly, and without warning, filled with several feet of murky, nasty water from the flooding that came with the hurricanes. Transmitters that were in excellent condition were rendered total losses."

Gear Guide – Equipment for Radio (page 46)

- CTP Systems – FWD 8000
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... edited by Barry Mishkind – the Eclectic Engineer

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- 1/2 - [The End is Coming for AMCS and 139 degrees](#)
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- 12/20 - [Cumulus in trouble again with NASDAQ](#)
- 12/19 - [FCC Seeks comments to reduce EEO recruitment requirements](#)
- 12/15 - [The Worst: Walking in to Find No Joy at All](#)
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Delivering Solid HD Radio Coverage To All Your Listeners

A Study in HD Single Frequency Networks

by Elaine Jones – President, Elaine Jones Associates

If your FM station is in mountainous terrain, you are all too aware of the challenge of reaching listeners who may be shielded from your primary signal due to natural features in the landscape. Your HD Radio™ coverage may equally be impacted, but the multipath robustness of the IBOC signal is ideally suited for on-frequency booster transmitters that can fill in gaps of coverage.

Typically, analog FM stations fill in coverage gaps through translators. In recent years, partially due to a shortage of available translator frequencies, broadcasters have been migrating to SFNs – Single Frequency Networks. An SFN is a fill-in translator, or booster, on the same frequency as the primary station. Having a booster on the same frequency is advantageous to the station because it makes it easier for listeners – there’s no need to change frequencies as they move from location to location within the listening area. This also enforces a station’s frequency branding. FCC regulations say that as long as the booster contour is confined to the same contour that is authorized for the primary station, it may be used to work around terrain issues in your coverage area. However, boosters may not cause interference within the community of license.

So, is it possible to provide fill-in coverage of HD Radio signals, meeting the FCC requirements, with an HD SFN?

Nautel Research Engineer Philipp Schmid set out to answer that question with recent field tests of an HD SFN at KUSC in Los Angeles. Working closely with KUSC engineer Ron Thompson, Santa Barbara contract engineer Tom King, and consulting engineer John Kean, Schmid demonstrated that it is possible to seamlessly hand off an HD signal from transmitter to transmitter, with essentially no interference.

It’s all in the timing. More on that below.

KUSC’s primary transmitter is located on Mt. Harvard, in the San Gabriel Mountains. The goal for the test was to bring HD Radio reception to nearby Santa Clarita Valley, which is shielded from the primary signal by other mountains. KUSC had been using an analog on-channel booster and directional antenna on Oat Mountain “for a long time, possibly 20 years,” said Thompson. It was time to refresh the technology. Thompson learned that Nautel was looking for a demonstration project for an HD SFN, and jumped at the chance to try something new. A Nautel VS300 transmitter was outfitted with a VS HD exciter and installed at the Oat Mountain site. The next step was to get it synced up to the Nautel NV15 on Mt. Harvard without generating undue interference.

In order to provide adequate FM and HD Radio coverage with minimal interference, the primary transmitter and booster transmitters must be precisely modulation and time-synchronized to one another, for both the composite FM audio signal and the IBOC signal. Since the IBOC signal originates from a single exporter and contains every bit to be modulated, all engine modulators for each transmitter in the system can guarantee modulation synchronization with the same IBOC signal.

Achieving modulation synchronization for the composite FM audio signal is far more challenging. Schmid says the FM modulation depth in any SFN system should be calibrated to within 1%, and must include all of the components (processed L/R audio, RDS, and SCAs). Nautel notes that analog STLs cannot be expected to handle this level of accuracy; a fully digital path is greatly preferred. Ideally, a composite MPX would be distributed from the studio to all the transmitter sites. Distributing the composite FM components separately requires synchronizing each component independently. Nautel excitors can synchronize the 19 kHz pilot to an external PPS source and thus ensure L/R synchronization when distributing stereo audio. However, the RDS and SCA modulators must also be synchronized independently, in this case, or allow for an amount of deterioration in modulation synchronization. This scenario has not been fully studied, but stations have deployed SFNs with independently modulated RDS.

KUSC distributed the L/R audio to the Oat mountain booster with separately modulated and unsynchronized RDS. Due to the high degree of terrain shielding this was deemed acceptable for this situation.

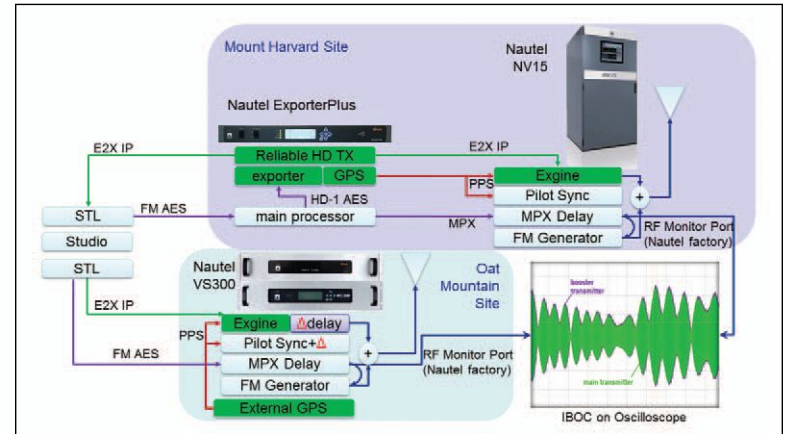
The composite FM audio signal is also challenging to synchronize in time. The overall system design must account for all signal latencies, from STL delays, exciter/transmitter delays and signal flight time to interference regions where a radio receiver will capture similar power levels from both transmitters within 15 dB. For good FM reception, signals must arrive within 10 μs of each other. Often the system design cannot address all interference regions and a station may have to evaluate trade-offs in coverage. It’s important to pay careful consideration to selecting good booster site locations, using terrain shielding to your advantage. The Oat mountain site is a good example as it is placed just on the other side of the mountain top with a directional antenna into Santa Clarita, minimizing back feed toward the main transmitter.

At KUSC, the IBOC signal originates from a single exporter and the equipment internally ensures fixed transmission delays. The exporter and all excitors are synchronized via a PPS signal that keeps all the gears in the system on the same beat. Schmid showed that multiple transmitters can consistently align their IBOC signal to within 2 μs of set point, guaranteeing IBOC synchronization under all conditions.

Time synchronizing the IBOC signal was an interesting challenge at KUSC. The system uses two T1 STL paths – the first from the Exporter (co-located with the NV15 transmitter on Mt. Harvard) back to the studio, then from the studio back out to the Oat Mountain booster site. Since the Exporter was adjacent to the primary transmitter, KUSC did not have to connect another GPS receiver; they were able to use the Exporter’s PPS and 10 MHz GPS

output. Schmid employed Nautel’s Reliable HD Transport protocol to ensure a reliable connection between the Exporter, studio Engine and the VS300 on Oat Mountain. A differential time delay was configured in the booster exciter to delay the IBOC signal by the flight time from main to booster and ensure the two signals met in the potential interference zones that were identified with the help of consulting engineer John Kean.

Once the IBOC signal was synchronized in modulation and time, the IBOC signal became the reference to the FM signal. An FM HD diversity delay monitor was employed at each transmitter site to help determine the appropriate delays for the FM signal and ensure correct audio phase on all transmitters.



IBOC SFN installation at KUSC with fixed audio delays on the HD1 path from the common exporter at the main transmission site to the two engine modulators. Both the NV15 and VS300 produce identical IBOC waveforms as captured at the Nautel factory, shown here without differential delay on the booster transmitter. The final installation delayed the booster IBOC waveform by 136 μs for optimal IBOC coverage.

Once the FM and IBOC signals were fully synchronized, the system was activated. With only 2 Watts of IBOC, the system provided solid HD coverage in the Santa Clarita valley. Even more surprising was the solid coverage along a nearby highway in canyon country, with HD locked even where FM was impaired.

Thompson says KUSC intends to keep the system in place. “HD SFNs will be very important in the near future,” says Thompson, “and learning about the system and how it works was invaluable to us. We plan to keep experimenting with it.”

Because a seamless handoff of HD can be achieved between transmitters, terrain shielding for an HD SFN isn’t as essential as it is for a standard FM SFN, and Nautel says that when digital-only broadcasting is adopted, this type of technology could prove invaluable for establishing content-rich coverage across wide areas.

Today Nautel is deploying HD Radio SFNs on a limited basis and expects full release in Q4 2017. To deploy an HD Radio SFN, a broadcaster requires a Nautel Exporter Plus with the Reliable HD transport option and a factory enabled and configured Nautel HD capable transmitter, such as Nautel’s VS and GV product lines. Contact Nautel to see if your transmitter can be used in an SFN installation.

Important: Nautel says they cannot stress strongly enough the need for you to obtain the services of a professional broadcast consulting engineer before you launch into an SFN project. Make sure the engineer has expertise in SFN installations. He or she will perform RF coverage simulations, evaluate booster locations and antenna patterns, identify interference zones and any required terrain shielding, determine optimal time offsets (they may be different for FM and IBOC), and handle legal matters for licensing etc. The consultant can also help you ensure that interference zones are placed where a minimum number of listeners would be located.

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“Milking” Your Skimmer

Are you getting the most from your logging device?

by George Zahn

Many stations have been using skimmer or logging recording devices and software for years. As more and more stations are being “collected,” under fewer ownership umbrellas, the economy of scale on paper can become daunting for an engineer or traffic director handling and processing information for a dozen or more stations – when the broadcast landscape of ten to fifteen years ago called for the same person to monitor and create affidavits for just one or two stations.

While some large networks such as Westwood One have a one stop web page to allow affiliates to access logs and affidavits for their stations and clients, many smaller stations (or groups of stations), may still be doing some of the work the old-fashioned way – generating reports by everything from home-grown databases to purchased basic traffic or skimming software. Web interfaces on many skimming software packages allow management to keep tabs on stations from multiple markets at one time, quite handy in this day of doing more work over entire regions with less people.

One Tool – Many Uses

The need to create audio records of your broadcast day can help a station in numerous ways. For instance, in Canada and some other countries, stations are required to audio log for the last thirty days of broadcast. Many stations use skimmers or recording devices for announcer critiques, audio proof of broadcast, time shifting or repetition of a program, and preserving show segments for later internet/podcast distribution.

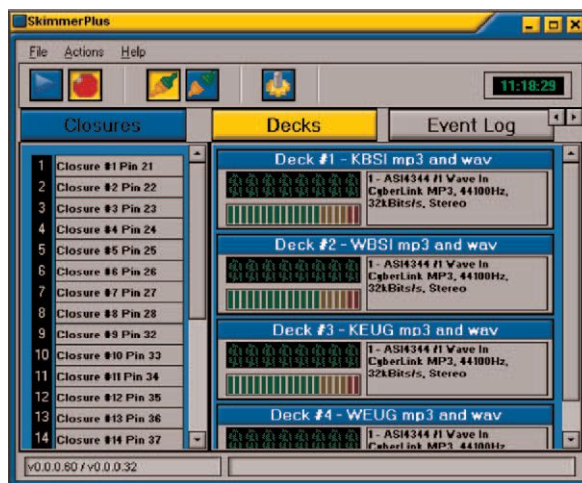
Having worked in news and talk radio in the 70s and 80s at a 50 kW AM, I remember the crude logging system with a 10.5 inch or 14 inch reel of audio tape, rolling at 1-7/8 inches per second, or even the snail-like 15/16 ips which would allow for hours of logging in very low quality on one reel. Stations recorded every hour of every day in order to be able to prove their product in the case of allegations of defamation or a client’s charge that their spot was run incorrectly – or not run at all.

Today with digital recording, we have better technology with far better signal-to-noise ratio. Digital loggers can chew up disc or cloud space with WAV recording, although many broadcasters will economize and use everything from the more compressed mp3 or even the open source Ogg Vorbis format. Obviously, dramatically compressing the size of any audio file will eventually start to compromise its audio quality. It’s a trade-off of storage space versus audio quality. Just as no station would use a recording of the old 15/16 ips logger tape for pristine re-broadcast use, it’s important to consider the eventual use of your archival recording before determining how degraded the recording should be.

Accessibility to the audio and data further augments today’s loggers and skimmers. Most modern loggers take a variety of audio inputs and can record multiple channels (stations) at the same time. A quick look at the various software packages show a range of a few hundred dollars to a few thousand dollars, depending on the

needs, the number of recorded streams to be recorded, and quantity of licenses required for your operation.

A number of the loggers also allow for the unit to issue automated alerts for loss of audio signal, with the ability to call pagers, send messages, or initiate serial commands for connected devices. Some, including Pristine Systems Logger, can use an AudioScience ASI tuner board to even monitor RF signal strength. No reel-to-reel recorder of yesteryear could give us these features, which allows for almost immediate notification to engineers that may be servicing multiple stations on a network. Station management can also be alerted and have a better system for make-goods and rectifying other technical or operator issues.



BSI Skimmer Plus

Professional skimming and audio logging software.
www.bsiusa.com/software/skimplus/overview.php

A “Log” Up On the Competition

Stations not only use skimmers to improve their own sound, but also to sample competitors by tuning in different frequencies. Instead of a constantly running tape, skimmers can be started and stopped at set intervals to telescope a broadcast day if complete day recording is not needed. Microphone activation can be used to start the logger for standard air checks and critiques. Some of the software packages also allow for a complete show to be recorded, with markers that show the program director when the microphone actually was open, making it easy to jump to the needed segment while still checking the overall board technique of the DJ. Visually seeing the audio file, also helps easily spot dead air.

How many times have we had to live with, or heard other stations in the market air, poorly produced or low fidelity filler “best of” programs for holidays or last minute emergencies. Another feature of some skimmer/loggers such as the Skimmer Plus from BSI allow for recording of highly compressed audio files for long-term logging, while also making a high quality recording for a “best of” show.

For station management not needing all day control or recording, most of even the most basic skimmers allow for timed record starts and stops for podcast

shows or for grabbing a show to excerpt for promos. Some more advanced software can work with servers to allow for remote access to the recorded audio from virtually anywhere. If your thoughts when you hear “logger” are simply for affidavit verification and/or legal protection, you may not be “milking” your skimmer for all it’s worth.

In short, today’s skimmer and logger software is actually a more thorough tool – yet one that some stations choose to ignore. As social media becomes more important, the sheer backup of being able to extract a show for a podcast, in case a manual recording is skipped or has a malfunction, is a great asset. Alert notifications, monitoring your competition, easier and quicker air checks, and the obvious feature of “proof of broadcast” make the skimmer a potential New Year’s resolution for 2018.

Are there creative ways you use a skimmer or logger in your station, group, or network? For those who may not currently own one, what are your top reasons why a station should consider one? Let me know and we may feature comments in a future article.

Good Listener Vibrations

Speaking of feedback (the good kind!), I want to thank Terry Cowan from KNLR and KNLX, La Luz Radio, in Bend and Prineville, Oregon. Last issue, we looked at some of the soundproofing that can help new, re-designed,

or upgraded studios. Terry responded, “I have found that a product called Tectum to be a great broadband attenuator. I was told it must have insulation behind it to perform properly.”

Cowan adds, “Our radio studios were new construction, so we attached “Z” bar to the studs, then sound board, then sheet-rock.

The sheet-rock was then stripped with 2x2s, insulation installed between the 2 x 2s, and then Tectum attached to the 2 x 2s. We also used drop-in panels in the ceiling grid – again, with insulation above the Tectum.”

Doing a quick check at tectum.com, the company manufactures and sells large “roof deck” panels, often used for ceiling and roof sound deadening and insulation in everything from gyms to performance areas. They also have a variety of interior sound panels for walls and ceiling and artistic designed blocks to assist with sound diffusion.

It’s always great to get comments on these articles. I hope you’ll feel free to share them so we all become better broadcasters!

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](mailto:g Zahn@mkcommunities.org)



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- John Herath, Director of Operations, Farm Journal Radio



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Chief Engineer

Just When You Think You've Seen It All!

by Scott Schmeling

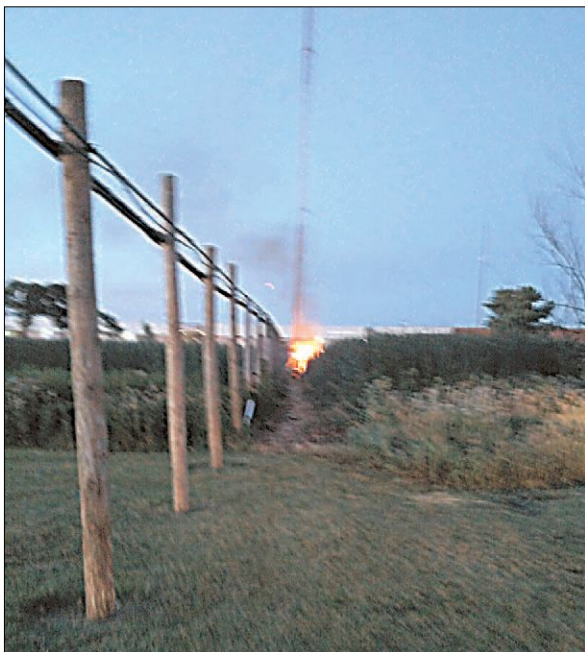
We were working on one of our AM towers recently. The station has been on the air for over 60 years. (Little-known fact, *the* Tom Brokaw of NBC Nightly News fame worked there as a very young announcer!) When the station was built, the tower was in a plowed farm field. *Now*, however, it is quite literally in a slough – cattails and all! This time, the water was a little under knee-deep. There have been times we've had to wear *chest waders* to go out there to work on things.

Part of our project was an “out with the old-in with the new.” We (and by “we,” I mean, the tower crew) removed an old 5-bay FM antenna and line that hadn't been used for 30 years. In addition, “we” were installing a new 2-bay antenna and line for a translator as well as mounting an STL antenna and line, plus isocouplers for both, which were mounted on the east wall of the fence surrounding the tower base.

The ATU panel for the AM was mounted on the wall of a small wooden shack inside the fence. Over time, the wood of that shack had started to rot and the whole shack was quite literally falling over. With that in mind, we also mounted an enclosure on the east wall of the fence with the plan to move the ATU into that enclosure “when things slowed down,” and tear the shack down and pull the pieces back up to dry land.

Up to this point everything we wanted to accomplish was done. The antennas were mounted, the translator was on the air and a good strong STL signal was being received. And it was only *Wednesday!*

Friday morning at 5:00 a.m., a police officer knocked on the door to inform the station staff that ... “*Your tower is on fire!*”



The Tower Base – A 5:00 a.m. Call

We're not exactly sure *what* happened, but a fire was definitely burning at the base of the tower. The fire department was there quickly and put out the flames.

To our amazement, damage was limited to the fence's west wall and the west ends of the north and south walls. Remember all that new stuff? The two isocouplers and the cabinet for the ATU? They were all mounted on the *east* wall of the fence. The only visible damage was slight melting of the outer jackets of some of the coax lines going up. Everything else looked as good as new!

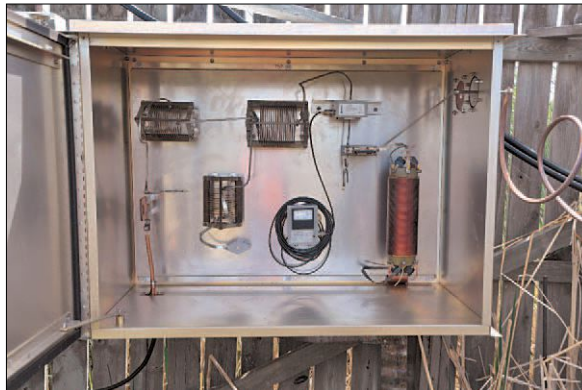


The Original ATU Was a Total Meltdown

And the “shack?” It was reduced to ashes. Needless to say, the ATU was a melted, mangled mess. And, yes, the AM was off the air. But if you look on the bright side, we no longer had to worry about tearing that shack down and dragging the pieces in. But – *the AM was off the air!*

We could get a new ATU manufactured and delivered in about 2 to 3 weeks. But we certainly couldn't be off for *that* long!

I have mentioned in past articles that I tend to save things – especially if I think they might have a potential use. Among the items I have in “storage,” are a variety of inductors and RF capacitors removed from an old phasor. With this in mind, I was fairly confident I could find the needed components to build an ATU ourselves.



A New ATU – You Can Do It Yourself

I called Doug Thompson, an independent engineer and friend, who came and measured the tower's base impedance. Those measurements were sent to legendary, semi-retired engineer and good friend, Mark Persons, who designed the ATU network. Then Operations Manager, Keith Wright (another friend), and I searched through the components I had brought, to find the values we needed.

Once found, we set up a little shop area in the front entrance of the building and started working on compo-

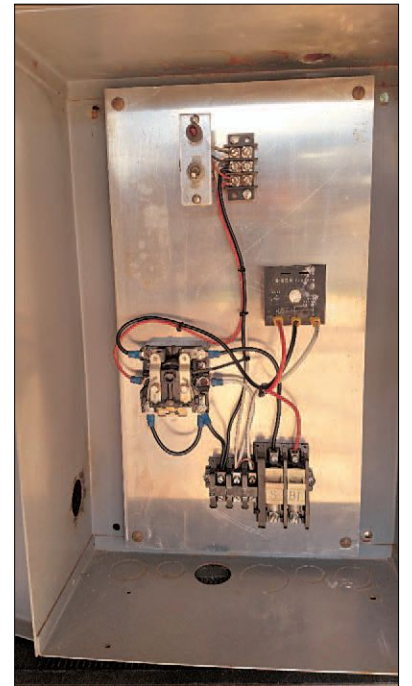
nent layout. We measured, marked, drilled and tapped holes, and mounted the coils and capacitors onto an aluminum panel that had been cut and bent to size to mount inside the cabinet on the fence.

The ATU panel construction went very well. After it was completed, we took the panel out to the waiting cabinet and mounted it. Then the three of us went to work tuning it up. Once tuned, we turned the transmitter on. The match was great and we were back on the air! The only item we had to purchase was a toroid RF base current meter. The one I had was the wrong scale.

By the way, having the parts on the shelf saved us a couple weeks and several thousand dollars!

While we were at it, we decided to put the tower light controller up in the studio building. It had been out in the shack and was a pain to work on (remember that it was in a slough!). With that in mind, a 3-winding lighting choke was included in the new ATU panel.

It just so happened we had recently updated the lights on a different tower to strobes. That also meant I had a controller that was no longer in use! The configuration of that controller wouldn't work for *this* tower, but I could use the cabinet, and at least some of the parts. So I got a new piece of 3/8" aluminum to fit the case, “salvaged” the contactor, the by-pass switch and photo cell terminal strip, AC input terminal strip, and the output fuse holders. I added a solid state flasher from SSAC and – voila – a brand new tower light controller!



Salvaged Parts Make Up a New Tower Light Controller

After the dust (or smoke) settled, all in all, even with a fire getting in the middle of things, the final results were good all the way around. The translator and STL are working great and with the help of friends working together, we were able to design and build a new ATU and tower light controller – and everything worked!

On a totally unrelated note: Autumn is here and winter is just around the corner. Take a look around your transmitter sites. Plug up any holes where rodents or snakes could come into your buildings. Check your air filters, especially if your site is in a high dust area. Take a close look around. Are there any things you need to restock? Now is the time.

I've been through floods, and I've experienced towers toppled because of ice and wind, but a *fire* at the tower base is something I *never* would have imagined. I *hope* now I've seen it all!

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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Saving a Tower

by Richard Wood

Many articles have highlighted the importance of regularly looking over the physical attributes of a station's tower sites. First, looking up the tower from all sides to see if anything has changed or is not secured properly is a good start. Then taking a close look at the base foundations and insulators, if this is an AM Radio tower. Be careful when inspecting the base insulators – the tower could be on line. Recently, a staff engineer in Wausau WI was inspecting the 500' self-supporting AM tower when he found that one of the four base insulators had cracked and was breaking apart.



After quickly exiting the fenced compound, he alerted management of the problem and then began making inquiries. This tower was built in 1949 as an AM radiator with an FM antenna on the top mast added in 1954. In the mid-1980's the station changed frequencies and moved to a different location. The tower continued being utilized as a backup FM site, pass through for an STL, rental property and for translator antennas. With the AM off line, the base insulators had been shorted out with large grounding cables.

The AM insulator appeared to have originally been supplied by Austin Insulators. There were numerous name and ownership changes (including being part of Decca Records at one point) and documentation was not available for the refit. DKD Engineering made a trip to the site to gather data from the tower and insulator, and produce replacement drawings. Dave Davies of DKD Engineering forwarded me the preliminary insulator replacement drawings and asked for a site visit to verify them. A mockup of the 4" jacking post and top plate were made up out of wood and PVC pipe for modeling the jacking system.

Upon arriving on the site, I took a close look at the broken insulator and decided to do the mockup work on a different leg. Using the mockup was a good plan. I could verify the jacking system fit up with the clearances required and an absolutely vertical alignment. Measurements on the initial documents were verified and returned to the engineering team.

Next, the contractors were chosen for providing and installing the replacement steel pedestals for the tower. Since AM operation was not required, solid steel pedestals would be put in place of all four insulators. The

winning bidders were Austin Insulators of Canada and ERI for the installation work, with Resonant Results on site as the owner's representative.

The Austin material arrived in early May 2017. Each steel pedestal weighed in at 1,500 lbs.

When the ERI crew arrived, the first order of business was to go over the Rigging Plan for this work. Under new standards, any work occurring on a tower that requires more than 200 lbs. in material or hoisting pressure, needs to have a plan. There are four categories depending on the scope of work. Levels I to III would be prepared by a "Qualified Person" or a "Competent Rigger" and cover loads of up to 2,000 lbs. Since this job required handling loads greater than 2,000 lbs., and structural members needed to be removed, this work fell under a Category IV Rigging Plan, as per ANSI 10-48 standards. This level of planning called for a "Qualified Person" or "Competent Rigger" to prepare a list of equipment to be utilized – rigging drawings and procedures that were then submitted to a Professional Engineer for review. This insulator change-out job had a rigging plan that was 26 pages long and included a 24 step procedure for the work.



Steel Pedestals Replace Insulators

After careful review of the plan, the work moved forward with a certified welder attaching the jacking plates to each to leg and the base plates. The steel legs needed to be preheated to 175° F before welding the plates in place to ensure good bonding of the weld material. Next, holes were drilled in the angle legs, above the jacking points, for installation of 3/4" guy wires to stabilize the tower square shape during the insulator removal.

The jacking system was set in place. The main jack shaft was a 4" solid rod with two, 20-ton Enerpac Rams for lifting the lower. The tower leg weight was estimated to be 22,000 lbs. With the base bolts loosened, the rams were engaged until the base shoe of the insulator began to lift. All we needed was 1/2" of lift and for the tower to be stable. At that point, all the attaching hardware was removed and the old insulator was lifted/pried out of place. To everyone's delight, the tower did not deflect in any direc-

tion while the insulator was being removed. The new pedestals came in three individual pieces, so they were assembled in position. The holes for the leg bolt up points on the top collar section were carefully marked. This was then placed on the ground and 38, 5/8" diameter holes had to be drilled in the 1-1/2" thick steel collar section. The crew brought coring bits, special cutting grease (that did not travel and obscure any hole markings) plus a mag drill for the job. The magnetic drill was a small drill press with an electro magnet for holding it in place. Each hole took about 5 minutes to drill, so three hours later the collar was ready to bolted up. During the drilling procedure, the jacking system was closely monitored for any issues. As the afternoon air heated up, the hydraulic fluid expanded and the lift pressure increased, but there where no discernable change in the leg elevation. With careful planning and good preparation by ERI and DKD Engineering, the project went smoothly. The weather cooperated by keeping the winds below 5 MPH for the substitution procedure, which was a requirement in the Rigging Plan. Total work days on site was 15 to get all four leg insulators changed out.

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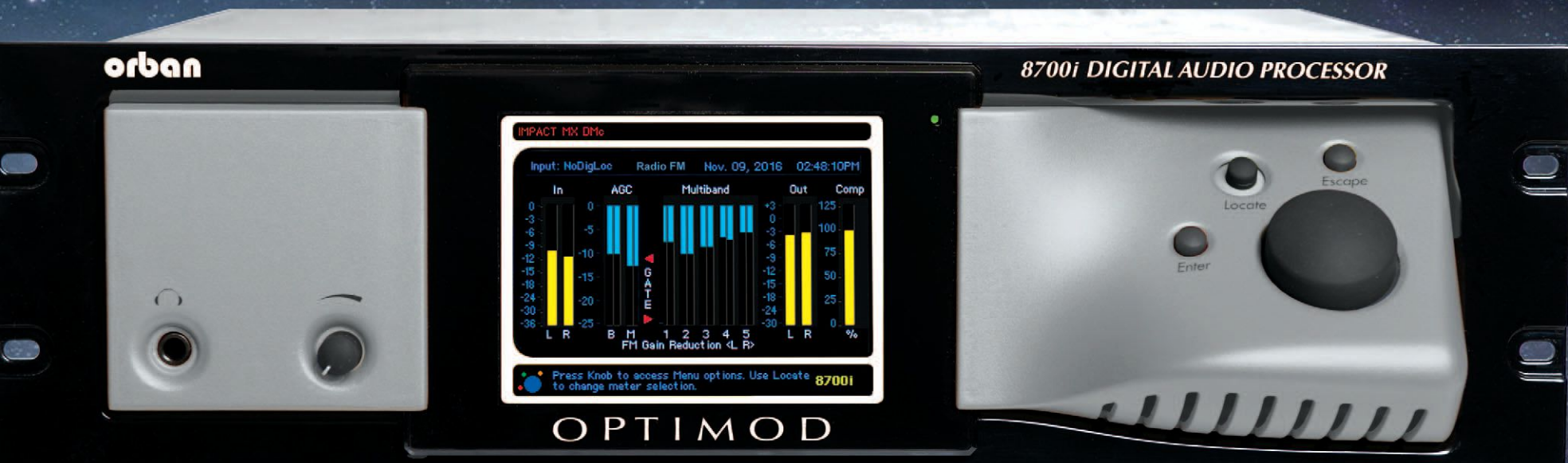
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Richard Wood is the owner of Resonant Results and provides Broadcast Engineering services throughout the U.S. – www.resonantresults.com



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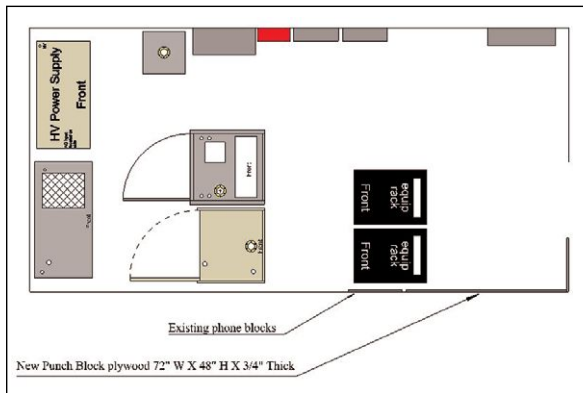
Transmitter Site

New Transmitter Install

by Mike Hendrickson

You received some good news! You can finally get the transmitter the stations needs. Now the detailed planning begins.

There are several things to consider. First of all you need to consider the space. Is there enough room? When I do the planning I make a scale drawing of the space. I include on the drawing all the existing items in the room. Include items like the work bench, equipment racks, file cabinets, and any other existing equipment that will not be removed. Be sure to show the location of the electrical equipment and transmission line equipment. Make a scale drawing of the new transmitter – since this is a drawing, you can move equipment around to determine the best location for the transmitter. If you have a CAD (computer aided drafting) program you can easily make changes in the drawing.



One basic floor plan of an existing transmitter building. Missing items may include the various transmission line components such as filters and the transfer switch.

If you don't have a CAD program you still should make a scale drawing of the space. Now, instead of drawing the transmitter, make a paper cutout to the scale of the transmitter. You can move the paper cutout around on the drawing until you find the best location.

One very important consideration is providing space so you can maintain the transmitter. Check the clearances around it so you are sure you will have access to everything that may need maintenance. Another consideration is the routing of the remote control, audio, electrical, and transmission lines. Be sure to take into account any ventilation duct work when you are routing these lines.

One very important item to consider is getting the transmitter into the space. Check the entrances for clearances. Be sure the doorway is both wide enough and high enough to permit the transmitter to pass through. Check the transmitter manufacturer's drawings of the transmitter to be sure about the clearances.

Next you need to consider the electrical connections to AC power. If this is an additional transmitter, the electrical service to the space needs to be sized to adequately supply power to all the transmitters and equipment at the same time. Unless otherwise specified by the manufacturer of the electrical equipment, you should not exceed 80% of the nameplate rating of the equipment on a continuous basis (NEC 210.19 (A) (1)).

Now, is there enough cooling for the space? If the space is not air conditioned, and you are installing a new transmitter, you may want to install air conditioning at the same time. You really should keep the temperature well under the maximum temperature specified by the manufacturer. A new transmitter is essentially a computer with a power amplifier. Computers

do not like high temperatures! Even moderately high temperatures will result in reduced life for the equipment.

If you install air conditioning you need to be careful not to install too large a unit. One of the functions of air conditioning is to remove the moisture from the air. If you install too large an air conditioner, the air will be cooled too quickly to permit the removal of the moisture. As an example, I installed an AC unit at a site in Florida's Panhandle and ran into an interesting problem. The AC air flow was across the equipment rack. The rack was cooled to below the dew point, and water condensed on the rack and dripped off. The solution was to add a smaller, second unit that was used as the primary unit. This kept the space cool and dry. The larger unit only ran when there were very high outside temperatures. Hire a professional air conditioning and ventilation expert if you are unsure about what is needed.

Another consideration on cooling and ventilation is sealing the space to prevent outside air from coming in. If the space is sealed there will be much less dirt that infiltrates. This will mean reduced cleaning and maintenance. My personal experience is that when this is done, the maintenance required just to keep things clean is greatly reduced.

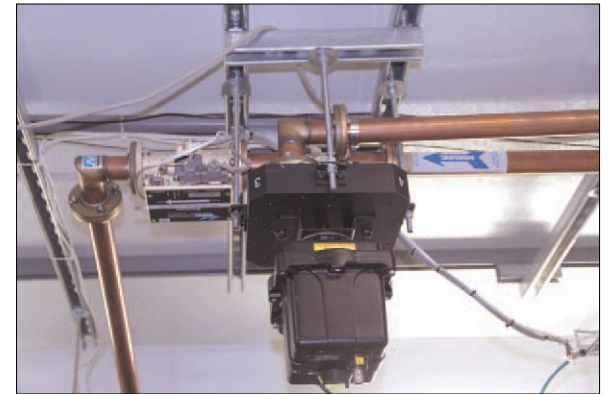
Another recommendation is to *never* directly connect the transmitter exhaust to an outside air duct. There should

always be an air gap of at least six inches between the exhaust of the transmitter and any exhaust hood. Why? Consider what happens if the exhaust system should be blocked. If there is an air gap, the transmitter can exhaust into the building and not overheat immediately. Also remember that the air safety interlock on many transmitters is based on air pressure. This means that, even if the exhaust of the transmitter is blocked, the air safety interlock will not open because there is still air pressure. The problem is that there is no air flow. The air gap I recommend will permit air flow even if there is a blockage in the exhaust system.

When you use outside air for ventilation and cooling where do you put the intake and exhaust of the system? Give some thought to this. I generally place the intake and exhaust high on the building's wall that faces north. The intake and exhaust are separated by as much distance as the wall permits. If the intake is placed high on the wall you will bring in less dust and dirt, and the north facing wall is generally cooler. The reason for placing the exhaust and intake on the same wall is that there will be less effect from wind. Since the wind is affecting both the intake and exhaust at the same time, the effect of the wind on the ventilation system will cancel out. If the intake and exhaust are on opposite walls the ventilation system will either be aided or hindered by the wind. If you do not have room on the same wall, place them on adjacent walls.

Will your existing remote control work with the new transmitter? Do you need a new remote control or does the new transmitter have remote control features built in? If you are adding a transmitter, does your remote control have enough channels? Be sure to check this out. You may be using your existing remote control for things other than just the control of the transmitter.

Are you keeping the old transmitter for use as a backup? If you are, please give serious thought as to how you will place it on the air. You will need some sort of transfer switch or coaxial patch panel. These devices come with interlock switches. You *absolutely* need to connect these interlock switches to the transmitters to prevent the transmitter from turning on, when the switch is either moving or in an open position. *Do not* rely on the interlock switches to turn off the transmitter. Instead, either have a step-by-step procedure written up and posted on how to switch the transmitters, or have some type of logic controller to do the switching for you. From my own sad experience, if you do not have a procedure or a controller, it is not a matter of if you burn up a switch, but *when* you will burn up a switch.



Coaxial transfer switch for 1-5/8" transmission line.

If you are purchasing a new physically large transmitter, it will be delivered to your location by a moving company. Be sure to specify to the manufacturer that you require a 24 hour notice before delivery. Also request that the specific street address of the site *not* be placed on the order. This will prevent the moving company from showing up without notice.

Remember, the moving company is responsible for the transmitter until you take possession of it. This is *not* when the truck arrives on site, but when it is in the building and in place. The moving company should provide the labor to move the transmitter from the truck to the proper location in the building. Once the transmitter is in your possession do an inspection of it to be sure it is not damaged. Do an inventory of any other packages. Once you are satisfied that everything is present, and in good condition, you can sign the various shipping documents. *Do not* let yourself be pressured into signing for something that is damaged or not present.

You finally have the new transmitter installed and ready to go on the air. Don't forget the final step! You are required by the FCC rules to make occupied bandwidth measurements and harmonic/spurious measurements. The results of these measurements must be kept on file at the station and be available to the FCC. (These *do not* belong in the Public File.) One other note on these measurements, they must be made whenever an item of transmission equipment is replaced. This includes the exciter, stereo generator, SCA generator, RBDS equipment, and antenna as well as the transmitter.

Until next time, enjoy thinking about a new transmitter and happy engineering!

Hendrickson, CPBE, CBNT is the retired Chief Engineer of American Public Media Group. He has been involved in Broadcast Engineering since 1969. Over this time period he has been involved with all aspects of broadcast engineering from the technical to the budgeting. He may be reached at: mikelakeville@gmail.com

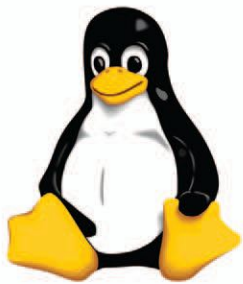
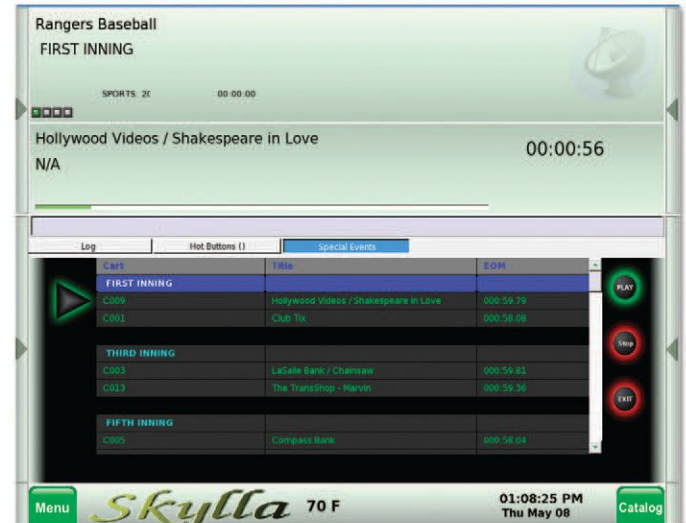
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- Roger Utnehmer, Nicolet Broadcasting, Sturgeon Bay, WI



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Stories From the Field

by Steve Callahan

First, let me say that I do really enjoy visiting radio stations. I have visited most of the small market stations in New England and I have been known to pull off the interstate when I see an interesting AM directional array in another part of the country – and I have knocked on more than one front door of a local radio station when I've been on the road away from home.

A couple of years ago, I had the pleasure of meeting now FCC chair Ajit Pai in his office at the FCC in Washington. He also likes to visit local radio stations when he's on vacation or traveling from one place to another. What impressed me is that when he visits Mom and Pop's radio station in Smalltown, USA, he takes the time to listen to them and then take what's he's learned back to Washington. Yes, you can learn a lot about the state of the local radio business by listening to someone who is on the "front lines" everyday.

I've had the opportunity to visit a couple of radio stations that were memorable, but not in a good way. One station was a poor little two tower directional which was built back in the mid 70's and hadn't had any real maintenance or facility upgrades since then.

The heat and air conditioning in the studio building was non-existent. The water had been turned off and there was just one tiny window air conditioning unit doing it's best to keep up with the heat in the transmitter room. Most months the electric bill just barely got paid and some months it didn't get paid on time. When I went into the on-air studio, that still had cart machines and reel to reels, I could see blue sky up through the ceiling of the studio, which explained why there were so many plastic pails positioned carefully around the building. The building's foundation sill was thoroughly rotted and it was just a matter of time until the building would be condemned – or fall down. The station's satellite dish, which was the primary source of programming, was intermittent because the trees blocking the dish's view hadn't been regularly trimmed and now were so tall that they were obscuring the view of the satellite they needed. There was no such thing as automation there, and their talk shows were done via a speaker phone with a microphone pointed to the phone's speaker.

I soon learned that their licensed 1000 Watt transmitter output was something they hadn't seen in many years and the station was running somewhere around 400 Watts non-directionally. A quick look inside the one working antenna tuning unit explained why they had been operating at low power. Field mice had taken it over and it was a mess. Factor in a cut transmission line and crushed sample line, and you had a radio station that was barely on the air but, in its own tortured way, was still serving its community of license. The one and only employee, who ran the station for an out-of-town absentee owner seven days a week – 365 days a year with no time off – was doing everything he could to keep the place together, despite the fact that the station was on "Red Light" status because the owner hadn't paid his financial obligations to the FCC for many years. I left the

station feeling that this one, very dedicated employee was doing all he could – but it was a losing battle.

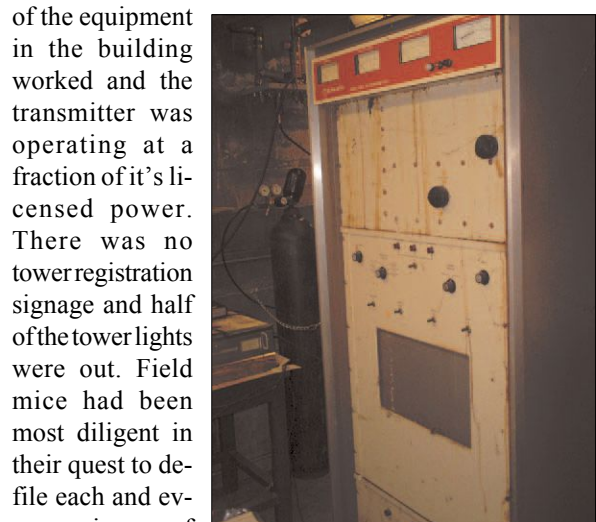
I later learned that the lone employee had died, the absentee owner had then taken the station off the air for over a year, and the FCC dismissed the license and call letters. The decrepit building was condemned and had to be razed. However, don't feel too bad for the neglectful owner because he got to sell the towers to a cell company – he profited while the local community lost it's only radio voice. Sad but true.



When the mice take over!

I very much enjoy performing "due diligence" reports for radio station buyers. I try to give the prospective owner an idea of what the station was, is now, and could be.

It still amazes me that some folks will buy a radio station sight unseen and then are totally surprised when they have to dump copious amounts of money into it just to make it legal. One day I was called to a small FM station that I had visited more than 20 years before. The outside of the transmitter building hadn't changed much in those two decades but the inside was rough. Very little of the equipment in the building worked and the transmitter was operating at a fraction of it's licensed power. There was no tower registration signage and half of the tower lights were out. Field mice had been most diligent in their quest to de-file each and every piece of

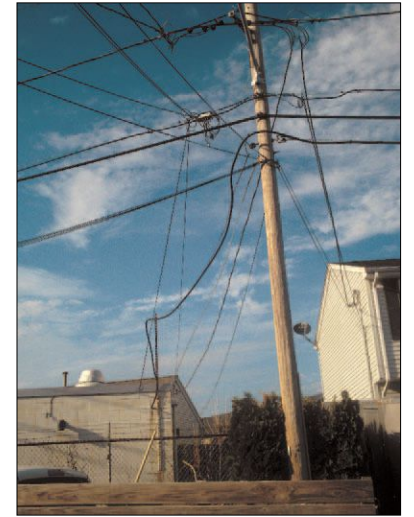


That is *not* rust ...

There were three transmitters in the building and none of them were capable of full power operation. Again, sad but true.

Being a station owner myself, for more years than I want to admit, I know that the owner should be the last person each month to get paid. In some cases, the owner gets what he or she can out of the crumbling station and then defers maintenance and repairs for still another month – and those months turn into years. Now some radio stations are indeed a labor of love and a break-even business at best and, unfortunately, no longer the money machine they once were. However, that is not an excuse to allow a radio station to literally rot away.

I visited a small AM station recently that really surprised me. The antenna tuning unit was actually a small plywood structure that completely surrounded the single tower. At first glance, I wondered how small the transmitter would have to be to fit into that most unusual arrangement. I then noticed where the buried transmission line came out of the ground at the nearest power pole and was strung from pole to pole to a neighbor's house where the transmitter obviously was. Yes, they used the existing telephone poles on the street! You can't make stories like this up.



1KW of RF in 7/8 coax strung along three public utility poles!

A wise multi-station owner once old me that if a station owner can't pay the bills, then he should sell it to someone who can. Don't let the station you take care of end up this way.

I thought I'd toss out a mystery problem from a station that I recently visited. It's a directional AM station with different day and night ATU's at each tower. The station uses a classic "Jeep Coil" phasor. The problem is that, very intermittently, the antenna current in one of the towers, during night mode only, drops to zero and the common point impedance goes from normal to abnormal.

The transmission lines have been checked, along with all connections in the ATU and phasor. There are no signs of damaged contactors. The cap in the shunt leg of the affected tower's night ATU checked out OK. Like I said, it's an intermittent problem which seemed to occur more often when there was rain. If you have any guesses as to what I found was the cause of the problem, e-mail me and I'll reveal the answer in the next edition of *Radio Guide*.

Steve Callahan, CBRE, AMD, is the owner of WVBF, Middleboro, Mass. Email at: wvbf1530@yahoo.com



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Isolating Other Communications Services From Your AM Tower

by Michael W. Hayden NCE, CPBE, CBNT, AMD – V.P Site Services, LBA Group, Inc.

With the continued growth of cellular and Wi-Fi networks, not to mention the flood of new translator installations and the TV repack, it is becoming increasingly difficult to find suitable tower or roof-top space for antenna placements. Local zoning regulations and environmental compliance often is problematic. An existing AM radio tower may be the best or only solution, and that can be gold in the station till!

“But that is not possible,” you say. “AM towers are hot and are not usable.” I hear this frequently but, in actuality, we have been colocating other services on AM towers since the introduction of FM radio in the late 1950’s. It is true that the AM antenna is the tower itself and 95% of today’s AM towers are series-fed “base insulated” or, in other words, sits on a porcelain insulator. Placing anything across this insulator, such as conduit or transmission line, will short the tower and may cause severe damage to the AM transmitter and/or tuning equipment. So, the challenge here becomes how to place these items across the base of the tower, while still presenting a high enough impedance to the AM transmitting equipment as to make these items seem invisible. In this article, we will discuss the four most common ways collocation is accomplished today.

Quarter Wave Isolation

This is the first method, devised in the early days of FM radio and “hard line” coaxial cable, but is little used today. This technique is based on the transmission line theory stating that a 1/4 wave transmission line shorted at one end presents a high impedance. The tower being used must be at least a 1/4 wave or 90° electrical length at the AM frequency. The transmission line is grounded at the base of the tower and mounted to the tower on insulators to the 90° point. At this point, the transmission line is electrically bonded to the tower, and at intervals until it reaches the antenna.

If the antenna location is below the 90° point, the transmission line is doubled back and run down the tower to the antenna location. This has been referred to as a “trombone.” In practice, the insulated section can be as short as 75° as the distributed capacitance of the line and the hangers tend to increase the electrical length of the shorter line. Shorter lengths can be resonated at the base with an appropriate capacitor.

Isocoupler Devices

The most common method in use today is the “isocoupler.” These come in several varieties and are based on the “tuned resonant circuit” design. A coil and a capacitor are placed in parallel. The coil is made from coaxial cable selected for the power requirement. This L/C combination is selected to be resonant at the AM station frequency. The result is a high impedance presented at the tower base. The translator, or any other service, is fed through the coaxial coil with the only insertion loss being that of the cable.

The advantages of using this type of device are:

- Due to its high Q, an extremely high impedance is presented at the AM tower base.
- Since the throughput is a section of coaxial cable, it has a low insertion loss.
- The VSWR is that of the coax itself.
- Will pass DC for operating RRHs, tilting mechanisms, or antenna pre-amps.
- A lightning failure will affect only the AM, not the auxiliary service.
- By stacking units of differing AM frequencies, duplex and triplex AM towers can be used.

- Multiplexed auxiliary services of different frequencies can be accommodated.

- No retuning needed for changed auxiliary frequencies, as in TV repack.

Disadvantages are:

- Multiple units needed for multiplexed AM’s.
- More susceptible to lightning than the ¼ wave stub.

Isocouplers come in various sizes and styles, depending upon the manufacturer. **Figure 1** shows an LBA Technology ColoCoil® installed with an AM tower in Hawaii, isolating 12 coaxial antenna feeds simultaneously for a cellular carrier base station. **Figure 2** shows a multiple isocoupler AM installation in Illinois. FM and translator signals are being isolated by an LBA Technology CAMI®500 along with two Kintronic Labs FMC isocouplers.



LBA ColoCoil® AM tower collocation in Hawaii, with 12 coaxial cellular antenna feeds.



Multiple FM and TV translators in Illinois collocated by an LBA CAMI®500 and two KTL FMC isocouplers.

Inductive Loop (Transformer) Isocouplers

Those of us who have been in the business for many years remember the old STL isocouplers manufactured by Moseley. These, as well as larger models from Kintronic Labs and other manufacturers, operate with two tightly coupled inductors tuned to resonate at the pass through frequency. As there is no physical connection between the input and output, a high impedance is presented at the AM frequency.

The advantages with this method are as follows:

- The unit is not typically AM frequency dependent.
- The air gap between inductors provides a high impedance at the AM frequency.
- Cost is relatively low.

Disadvantages are:

- They do not pass DC.
- Capacitive reactance varies with AM frequency. Several used on the same tower will reduce the shunt impedance which can be a serious issue on high impedance towers.
- Can experience internal flash over when used on towers with high base voltages.
- They have a narrow passband which may induce signal ripple as well as having a high insertion loss
- Lightning failure can affect both the AM and the auxiliary service.

Folded UniPole Feed Systems

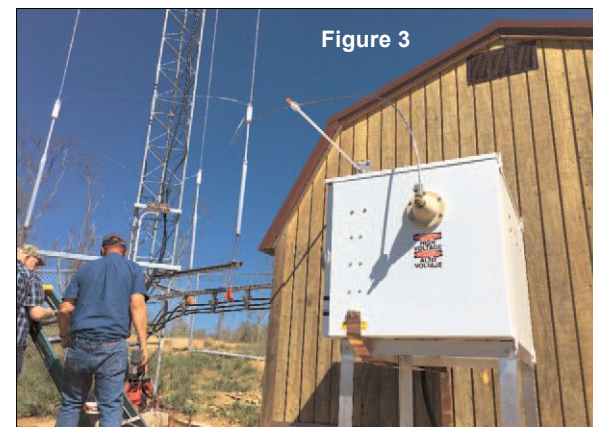
The fourth method is to ground the tower base and install a “folded unipole” feed system. This “modified” shunt feed method requires installing skirt wires from the tower base to 60° - 90° up the tower. Shorting stubs are then placed between the skirts and the tower at a pre-determined level to adjust the impedance. **Figure 3** shows the base of a newly installed LBA TuniPole® folded unipole in West Virginia. Using a folded unipole is the more complex method. Converting an existing series-fed tower requires tower rigger services, a new ATU, and an FCC Form 302 filing. However, the costs of installing a folded unipole system on a new tower can be very cost effective when looking to rental opportunities or multiple uses.

The following advantages are realized:

- The tower is grounded providing protection from lightning strikes.
- Any number of coaxial cables or electrical wiring may be installed across the tower base without any isocoupling devices, enhancing potential rental income.
- Tower lighting can be installed without the use of Austin Rings or lighting chokes.
- The AM tower is often broadbanded.

Disadvantages are:

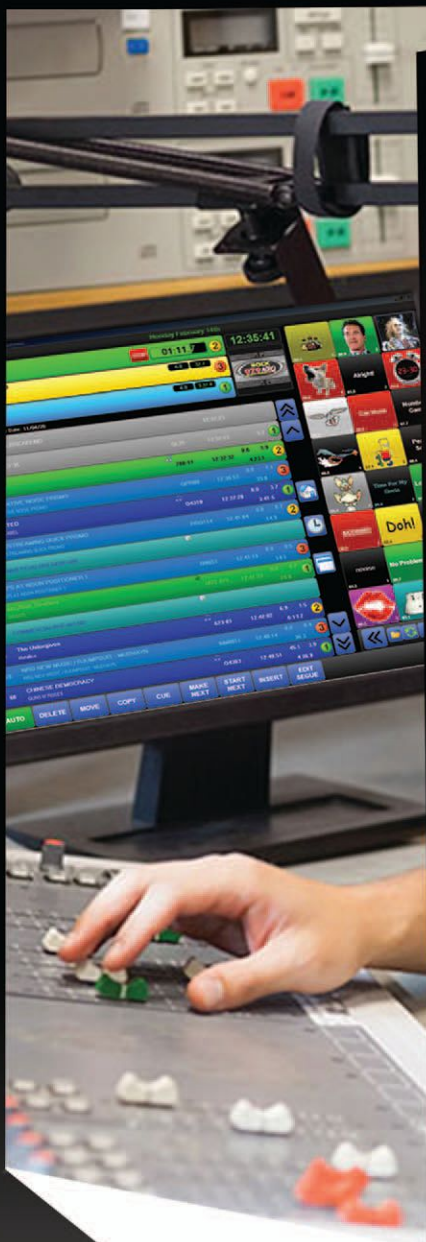
- Acquisition and installation costs may be higher than other methods.
- Not convenient for use with all AM tower types.
- Often not feasible to retrofit directional array towers.
- Rigging may limit installation of auxiliary antenna systems.



LBA TuniPole® folded unipole in West Virginia with STL and collocated translator cables.

There is one last, but extremely important point. AM towers may have high voltages present at different locations on the tower. Further, improperly bonding cables and appurtenances to the tower can also cause impedance instability issues, particularly critical in directional arrays. Because of this, we need to make sure that all coaxial cables, electrical conduits, tower light wiring, etc., that are mounted directly to the tower, are well bonded to the tower, and to ground where appropriate, to insure that all of these items are at the same electrical potential. There are also RF hazard issues to consider. It is beyond the scope of this article to detail such installation issues, but anytime you are making changes around an AM tower, you should use a qualified consultant to assist in planning and executing the installation. LBA has also drawn upon its years of experience in AM collocation to offer a wide ranging white paper on the subject at: <https://www.lbagroup.com/blog/hot-am-tower-collocation/>

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Tips From the Field

Keep Your Friends Close But Your Enemies Closer

by Jim Turvaville

You fans of *The Godfather Part 2* probably picked up at once on that line, which is the first published record of it being used in modern day, in spite of the principle of it being used for millennia in literature. I'm not a fan of the movie, so that phrase has an underlying lesson which goes far beyond the mob or criminal behavior when I hear it.

In this life, and particularly in our line of work, most every "thing" has a relatively easy definition of "good versus bad," and how it either contributes or hinders our productivity. I have my own mental list of "friend" and "enemy" when I am in just about any given situation. The "friends" are things that help my situation and are desired to have close by; while "enemies" are things which are undesired to have present – but one keeps close to mind for safety and productivity sake.

For example, if I'm operating a hand grinder and the sparks set the grass on fire, that list might look like this:

Friends: fire extinguisher, good shoes, leather gloves.

Enemies: high wind, gas can nearby, flammable material on the body or nearby – you get the idea.

So what I present to you is by no means an exhaustive list; I only intend to spur your own thoughts to what are your friends and enemies as you work day to day.

My Friend List

My Tool Bag: That may be obvious, but a well-organized and properly stocked tool bag is my closest friend at all times. My go-to bag has what I need most, and not much more – small hand tools, simple test items and a few often-needed spare parts. I'm not afraid to re-organize it as I acquire new things, or my work priorities change. The one I have now has been in use for nearly 10 years. It is a Husky brand and seems to be my lifetime favorite – it only weighs 30 pounds fully stocked. This has the added advantage of being TSA check-baggage suitable, since it zips neatly with a comfortable carry handle and a steel-cable aluminum engraved name tag.

I have a second bag, which is not TSA-approved, and has some of the bigger items, which is used on a less frequent basis. Things like larger adjustable wrenches, soldering gun (the pen is in the small bag) and even the propane torch are in it – along with several containers of assorted hardware, components, connectors and adaptors which are needed. It is also here that I keep an added stock of things like electrical tape (remember, I carry it in all 10 colors) sealant, heat shrink and heat gun, extra gloves and some micro-fiber towels.

My Travel Log Book: As a contractor, that log book is *The Gospel* when it comes tax time, and I am equally religious about keeping it updated on a daily or hourly basis. It is a 6 x 10 inch model with a zip side, keeping my pens, business cards, receipts, and all other miscellaneous items secure inside its covers. This one is well over 10 years old, and I replaced the pages with personally designed forms that I print and hole-punch to mate. A habit I started many years ago, it has served me very well for tracking mileage for work, expenses along the way, and notes of jobs done. As an added bonus, it contains the important phone numbers, contact info, site access codes, etc., that will suddenly be invaluable if my smart phone dies without warning. Without it, I would not even know my wife's cell phone number and that alone makes it a necessity.

My Smart Phone: This may also go without saying, but how you equip your mobile device can make it an even more valuable friend in your daily work. As just noted, those critical phone numbers, contact info and site access codes are all in it and may be accessed multiple dozens of times a day. If you know me, then you know what my next statement will be: "Jesus saves, and so should you – and in multiple places." All of that data is of little value if it has not been backed up by you in a purposeful manner. I do not mean saving it in "the cloud" somewhere, by that automatic feature on your device – we all know that "the cloud" is really just someone else's computer, and it can fail like yours can – albeit just less of a likelihood is all. I can't speak for the i-people, but my Android phone has a pretty simple method to "Back up Contacts to SD Card," so I can have an external copy of that part of my mobile brain.

(Continued on Page 22)

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Tips From the Field

Keep Your Friends Close But Your Enemies Closer

– Continued from Page 20 –

I also move all of my pictures, documents and downloaded items to that SD card on a regular basis, and off of the internal storage. If you're not using an SD card in your mobile device, please consider beginning that habit and keep either the original, or at least a copy of the device's saved contents, on that SD card. When your phone drowns in the water, that SD card will likely have no harm and can be read on any other device or your desktop computer.

I also have some great apps, which come in handy on my mobile device, and you should at least know which ones you have, should you need to re-install on a new device. I cheated my memory by taking a series of screen shots of my mobile desktop, so I can at least see all of the short cuts to my apps and have a reminder of which ones I use most often. And yes, those screen shots are saved on the SD card as well.

My Enemies List

The items on your enemies list will vary greatly depending on your day-to-day work or responsibilities. Since my hands-on Engineering is more limited these days, my list has been refined through the recent years to reflect my specific circumstances.

Excessive Heat: Hitting #1 on my list, since in West Texas we have more hot than cool days in our year –

especially compared to the 10 years I lived in Colorado. That heat is not only an issue for our bodies, requiring us to always be conscious of too much sun without a proper hat (*not* a baseball cap), or traveling without drinking water at all times – it also is a huge enemy of our equipment in this climate. Loss of cooling or proper air flow at a tower site is not a mere inconvenience. Temperatures can and do hit 140 plus degrees in a matter of minutes in a time of failure. I rarely travel without an exhaust fan to plug in as may be needed, and have kept more than one transmitter running with it in a pinch. Mine is a high velocity kind which looks like a small-scale version of the big ones used to dry carpeting – the best \$40 investment I've made in being prepared to fight heat.

Varmints: That may mean different things to different people in different climates, but in my world it means snakes and wasps – both of which have taken me off the air more than once in a variety of manners. Mice are often an irritation, but they tend to be less of a threat to my person than the snakes and wasps – and I've found that if you got snakes you got no mice! I won't go as far as keeping a non-poisonous snake around to control the mice, but I'm aware of at least a couple of my radio friends who do just that at their tower sites.

It's an equitable trade for the irritating damage mice can do to the wiring in your transmitter. Just remember and give Mr. Snake his clearance when you go there to work. I carry a pellet gun to ward off the creepy crawling ones, and a real pistol for the poisonous ones. A couple good cans of long-shooting wasp and hornet spray are never too far away in my large tool bag for those flying creatures.

Distance: That may seem odd to have on the enemies list, but there's nothing like the sick feeling of traveling an hour to a difficult tower site, just to get there and not

have the key or the right part. If you are traveling a long distance to get to a work site, don't make that distance become an enemy when you get there. Carefully plan and go over all of the possible scenarios you may see when you get there and what may be needed to accomplish your task. Try to find out if you will be driving out of primary signal coverage of your phone provider. While not as common as it used to be, there are still places I go where cell coverage is spotty at best and limited to voice-only with no data. Download the map data or have written notes of directions if you are not familiar with the path to your destination.

Distance can also become an enemy to your transportation source if it is not properly prepared or conditioned for the duty at hand. It is a 23 mile drive from my house to the office, and having a mechanical problem on that well-worn path is of much smaller consequence than being 200 miles away from home at a rural tower site. Keep your transportation in a travel-ready condition for your longest likely possible destination – in my case that is 300 miles and is equal to a full tank of gas. I know where all of the gas stations and convenience stores are located on my treks, and which ones will be open or available at odd hours of the night.

We don't have to be gangsters to be wise about what things are our friends and which things are our enemies, and we can keep them both close for our own safety.

Jim "Turbo" Turvaville is semi-retired from 39 years in full-time Radio Engineering and lives in Rural Wheeler County Texas in a "tiny house" where he maintains a small clientele of stations under his Turbo Technical Services (www.jimturbo.net) operation providing FCC application preparation and field work.

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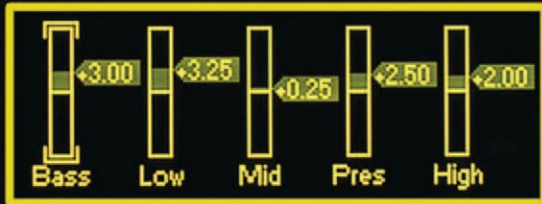


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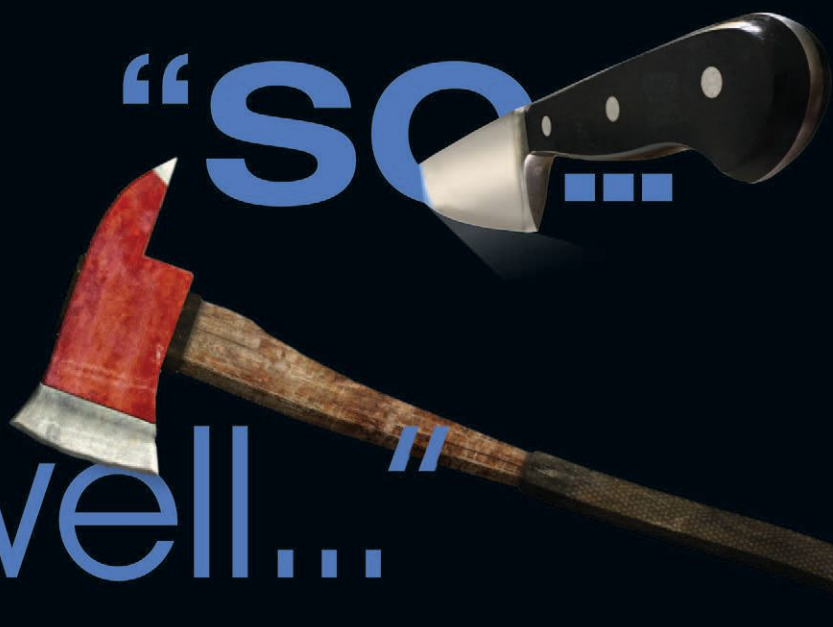
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Survival Guide

Surviving a Natural Disaster

Getting a signal back on the air when you have been hit hard!

by Tommy Gray – CPBE CBNE

Since our last issue, a lot of things have happened in our country. The Gulf South has experienced at least two major hurricanes that have totally wiped out, not only homes and businesses, but a great many radio stations. Several I know of in south Texas had water deep enough in the buildings to almost cover the tops of the transmitters. As a result, most are a total loss. Then, just a few days later, when folks were still reeling from the loss and devastation from the first one, two more hurricanes of major magnitude hit shortly thereafter all across the Gulf South and as far away as Puerto Rico, and the islands.

The hurricanes brought widespread disaster, leaving thousands without electricity, food, water, and one more important commodity – communications! I am sure that I am not alone when I say that I cannot recall a time in my life when there have been so many problems of this nature, this close together, and this bad.

Transmitter sites I have worked on for over 30 years were suddenly, and without warning, filled with several feet of murky, nasty water from the flooding that came along with the hurricanes. Transmitters that were in excellent condition were rendered total losses, and left as nothing but scrap. As a result, stations that were major sources of information and assistance were no longer even on the air to carry vital survival assistance to the folks in

great need. We all saw the pictures of people being rescued in boats, from helicopters, and in large vehicles, etc. Thousands were left homeless and not knowing what to do or how to do it. Many only had the clothes on their backs, and nothing else. Disaster relief agencies poured in from all across the nation and still are doing so at the time of this writing – giving food and assistance of all kinds, to folks who lost everything.

Somehow, through all this, a few stations managed to keep a signal on the air, and disseminate important survival information to those in need. Never a time in our nation's history, at least in my lifetime, have so many been in dire need at once. Again, people turned to radio to help them know where resources were and how to get them. One network of stations I have personal dealings with, lost their primary stations to many feet of water. Numerous transmitters were lost and the stations spent days waiting on the waters to recede so they could even get back in to assess the damage, and attempt to get a signal back on.

I managed to assist most of the stations who contacted me for help, in getting a signal back on the air quickly, even though it was not at full power. Some signal is better than no signal, right? Here is what we did for those of you who might face something like this, in some form in the future.

Several stations had followed my advice and installed small FM antennas on their STL towers at their stations. These stations had FM exciters that were frequency agile, and could be used on different frequencies. Numerous others also had FM amplifiers that could also be used to amplify the exciter power to a much higher level, of from a few hundred to about 1000 Watts. This may not seem like a lot to a station usually running 100 kW ERP, but listen to what we found.

A couple of stations in Louisiana, in an area that was only slightly hilly, had 250 Watt exciters that were still working even though the transmitters were destroyed. We connected the 250 Watt exciters into a single bay, broadband FM antenna installed at 100 feet AGL, at the studios (transmitter sites were inaccessible at the time). Field tests found that these stations put out a signal from 17-20 miles, easily picked up in our cars. Now keep in mind that this was covering their city of license pretty well, though building penetration was not necessarily that great.

Another station in South Texas had a 1 kW amp and was able to get to their transmitter site a couple of days after the hurricane had gone through. This station lost both the main and aux transmitters to flood waters. The processor and STL were saved, due to their fairly high location in the rack. The rack was cleaned out, all the wiring dried out, and then the 1 kW amp was connected directly into a 12 bay antenna up at 935 feet AGL. This station easily covered 30 miles in every direction with a decent signal, and the station only lost two days of broadcasting. Others also did the same thing, connecting exciters or low power amplifiers into their main antennas. They came back at a great time, as recovery efforts were just getting into full swing, and they were able to provide a much needed service to their audience.

(Continued on Page 28)



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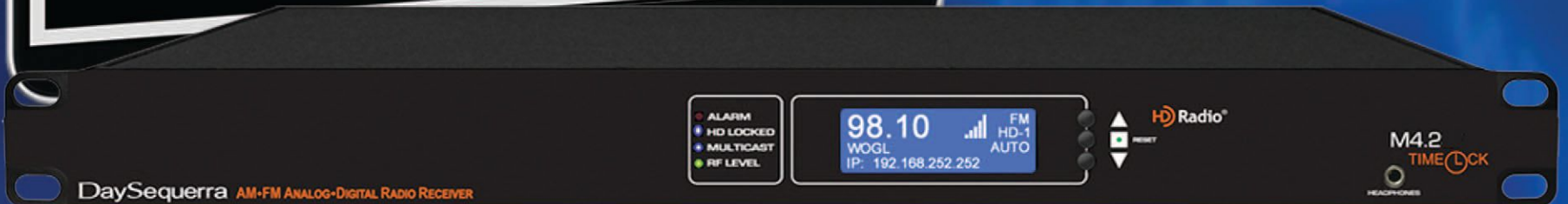
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– Continued from Page 26 –

These are just a few stories, of many, that were played out and are still being played out across the globe after the hurricanes and other disasters.

Bottom Line:

You are never totally down if you use your head. There are three things to keep in mind, in my “Engineering Recovery Philosophy.”

These are:

1. Start where you are.
2. Use what you have.
3. Do what you can!

They work every time!

Getting Back to Normal:

You may never be back to exactly where you were before the disaster, but you can get back with a good facility that will serve you well, and maybe even better than before. One thing worth mentioning here is that, in the midst of all the problems you are facing, don't forget to let the FCC know that you are off the air or operating at very low or reduced power. You are required to file an STA, if you are down for 10 days, requesting permission to either be completely off or to operate at a power level below your legal power tolerance. I know that the last thing you think you have time for is paperwork, but you can take a few minutes to either file it yourself, or get your Washington attorney to do it for you. Just do it! You will be glad you did. Now I am guessing that the commission may allow a little tolerance due to the incredibly large number of

stations affected, but do yourself a favor and stay legal. It will pay off in the long run.

Now the water has gone down, and the winds are at a safe level to allow travel to your site, where do you start? If you got water in your transmitter building, before you try to clean everything up and fire up that water soaked transmitter, there are a few things you should know. First, transformers and chokes, both small and large (especially plate transformers and chokes), rarely survive water even in small amounts. Being submerged, it is a given that they are gone, and you should not even attempt to try to apply voltage to them unless you enjoy large indoor fireworks displays. Even after they dry out, which can take a month or more in a dry environment, the insulation inside is damaged and when you apply voltage, they will usually severely arc and burn – many times causing a fire or even more damage. You need to replace both the transformer and choke(s) if they got wet.

If you were fortunate to only get a few inches in the bottom of your transmitter, you can feasibly clean it out – and after replacing anything that got wet, salvage what is left. Otherwise, replacing the transformers and chokes is pretty much a given. This is where you might have to consider replacement of the transmitter, as the transformers and chokes could easily cost more than the transmitter is worth. There are other things to consider, such as relays, contactors, circuit boards, etc. – all of which are usually intolerant to water, especially the contaminated water that comes from flooding.

If you are fortunate enough to have only gotten water into the transformers, etc., and your control relays, contactors, and other things were saved, replacing the transformers may get you back on the air. I have had a few down through the years, where just doing these replacements returned things to normal. One important thing you need to remember here is that the water that accompanies a flood is highly contami-

nated with everything you can think of (chemicals and waste products – both human and otherwise), and will no doubt bring along with it continued corrosion and a scad of intermittents that you will have to deal with for a long time to come. My advice to you is, if you are able to put things together and you feel comfortable with your repairs, just bring it up slowly, and keep a close eye on everything.

Hopefully your transmission line and switches, patch panels, etc., all managed to avoid the flood waters and are safe to use. If not, then you have to totally disassemble them and clean them as well. Get some denatured alcohol, a ton of good towels, brushes, and all kinds of cleaning supplies, and go at it. I would also suggest a large stock of contact cleaner with which you clean everything in the box that is tolerant of it. Turn off the AC in the building, run just the fan, pull out some extra fans to direct where needed, and dry everything out

Finally, depending upon what kind of insurance coverage you might have (and if it covers flooding, which many don't), you might be able to replace the transmitter with a new one, or at the very least a good refurbished unit. So ... if you got flooded, clean the place up but only after letting your insurance adjuster look at the loss. If they are uncooperative you may have to hire an insurance advocate to make them ante up.

Space prevents me from getting into this as much as I would like to but let me say, that our best wishes go out to all of you who lost your stations and transmitter sites or other facilities in the Hurricane aftermath!

More next time!

Tommy Gray is a retired veteran broadcast engineer currently staying busy doing engineering in the gulf south, through “Broadcast Engineering & Technology LLC”, a Louisiana based Consulting and Contract Engineering Firm, serving the US. www.BEandT.com

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Artist

by Sam Wallington

When is one considered an artist? The first painting done by a famous painter was probably ordinary – or downright bad. Was it their 30th attempt that made them an artist? Or maybe their 3000th?

My daughter, who will turn 14 this month, is (in my possibly biased opinion) an artist. She's always liked to draw, color and paint and so on. Whether it was finger painting (more like hand-and-arm-and-half-the-kitchen painting), chalk drawings on the driveway, drawing on a computer tablet, or sketching in a sketch book, pictures have just seemed to flow out of her. She first became serious around cats. For a long time, most (if not all) of her drawings were of cats. At first, you could mostly tell they were cats. Then the cat(s) became obvious. And finally, the cats became beautiful.

But when did she become an artist? Her earlier drawings certainly don't show as much skill as later ones, but they aren't "bad" (like she now thinks). My wife and I just see them as steps along the way. She now is drawing exceptionally: Portraits of people accurate enough to readily recognize the person, and, more importantly, convey mood and heart and feeling. Her still life drawings have depth and meaning, and yes, she still draws beautiful cats.

Which brings me back to my question: Is she an artist yet? When did (or will) she become an artist?

One thing that frustrates her is when people say, "I wish I could draw like that!" Those observers usually add something about how "talented" she is or how "lucky" she is to have the ability to draw well. But she recognizes that, though there may be something called talent, it really is the thousands of hours of practice she has put in that makes her able to "draw like that." Perhaps, we've wondered, "talent" is simply an interest that keeps someone working at something until they become good at it. Rarely, however, does someone who wishes they "could draw like that" put in the time necessary to learn and grow, and eventually be able to "draw like that."

What does this have to do with radio? I believe art is possible in every field and every endeavor. A mathematician is someone who loves ("has a talent for") math, and who practices math until it becomes a natural expression – and they become an artist in math. A dancer dances so much and so often that their dance becomes art (or, in the lyrics of Michael Sembello's *Manic*, "the dancer becomes the dance"). Every part of radio could be art – that is, if we're willing to put in the time and effort.

After college, I had an opportunity to travel in Europe for several months. As is typical for tourists, there were a number of great cathedrals on the agenda. Almost invariably, as I would walk into a cathedral with a few dozen

other tourists, the casual talking and noises would quickly stop as we surrendered to the echoing silence and majesty of the building. For some, quiet was a statement of reverence, others felt awe at the beauty and majesty of the soaring rooflines and gold-encrusted artifacts. Regardless of our individual feelings and motivations, the outcome was the same: We recognized it as art. Centuries of effort, in most cases, had produced an awe-inspiring work of art, which moved us to silence or whispered awe.

During a later trip to South America, I was appalled that a cathedral I visited had dozens of homeless, broken people sitting and laying on the sidewalk outside the building. I wasn't offended they were there, I was offended that this abject poverty existed just inches outside a building that contained large amounts of gold and precious gems, not to mention an expensive and elaborate pipe organ. My thoughts were that all this money should have instead been spent on the deeply poor people just outside.

Then I spent the night in the attached monastery. Cold showers, sparse rooms with nothing but a cot and mosquito netting – coffee and an egg for breakfast. Realization began to dawn that no one was wasting money here. Later, I talked with a very wise and well-travelled friend, and he helped me understand that the lavish and beautiful cathedral was not an offense to those broken people. Instead it was a beacon of hope – and likely the only truly beautiful thing in their life. Most importantly, those people felt a sense of ownership in this art: "This is *my* cathedral. Even though my life is very difficult, it does have art in it."

The term art, as it relates to radio, might generate ideas of the great radio dramas, or the beauty of watching a great on-air talent back-cue a record, while editing a phoner and, when they open the mic three seconds later,

(Continued on Page 32)



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Artist

– Continued from Page 30 –

perfectly chosen words are expressed with amazing vocal quality, such that a listener is completely enraptured.

But art in radio goes far beyond the on-air product. What about a beautifully designed studio? From an aesthetic viewpoint, the room is beautiful with coordinated colors, clean surfaces, and lovely lines. That's the obvious part. But as you look more carefully, you realize that the room was carefully designed to enhance the flow of creative work. Equipment is positioned just so. The console is at just the right height. Acoustics are spot-on. Monitors are easy to see and adjust. Speakers are placed so that they look great and sound better.

Looking even deeper, perhaps inside a perfectly matched door, you would find wiring that was color-coded, labeled, and routed with graceful bends and consistent lengths, all properly grounded and shielded. Even deeper, the wiring would also be easy to service, using wire management to enhance serviceability rather than require cutting dozens of cable ties to add or remove a cable. And at the deepest level, we'd find logic in the actual and virtual circuits, IP addresses, and standards used.

Art may be found at every level in a studio.

What about at the transmitter site? The happy transmitter is so clean you could eat off any part of it. Its remote-control wiring, though carefully hidden, is beau-

tifully laid out. The meters have been calibrated (and indicate 100%). The tuning parameters and transmitter readings have been carefully documented over months, and the transmitter is carefully optimized to operate most efficiently. The filters have been cleaned or replaced regularly for years, and proofs of performance are a routine part of the calendar. The building is painted and swept, all the light fixtures work, the HVAC and site grounding are regularly inspected and maintained, transmit coax is properly routed and secured, and the racks contain equipment that is logically laid out and equally pampered.

Thus, art is found at the transmitter site, too.

The realities of radio today mean that creating art in the studio and transmitter site is not easy. It's rare that multiple thousands of dollars will be allocated just to make the studio and (especially) the transmitter site look amazing and function perfectly. At the same time, my daughter can take a scrap of paper and a burnt piece of wood and create an artistic charcoal drawing. Perhaps we can learn from that.

What if, next time at the transmitter site, practicing cleanliness becomes a goal? Sweep the floor, wipe the dust off the transmitter and equipment, and shake the dirt out of the filters. Basic, yes. But even if paid for the work, it's nearly free. Then, on the next trip to the site, perhaps the remote control is re-wired to neaten it up. During a late-night trip, the same happens to some of the audio cabling. Some other time, \$25 worth of paint can make the building look better. Even without the luxury of a large budget or lots of time, with some practice, we can eventually create a beautiful transmitter site.

In the studio, we can do the same thing. Pick a circuit or two and re-wire, cleaning up the wire routing

in the process. Take the mic boom apart and clean the gunk out of it, or spend a few bucks and replace the broken springs, finally getting rid of the rubber bands. If there is some budget, what would make the biggest difference in workflow or product quality? Honestly, I'd rather have a happy on-air person before fixing that tiny bit of distortion, so replace that burnt-out light bulb and noisy headphone volume control – and unleash more of the talent's potential on a grateful audience.

Perhaps it's obvious, but my point is to not settle. Don't settle into the job and stop making things better. Don't settle for being good enough – or allowing good enough to sit around your station. Instead, start looking for ways to be an artist. An artist of sound, an artist with wiring, an artist who creates happy transmitters, an artist in calculating and optimizing coverage, an artist in setting up the firewall, an artist in negotiating a great price, an artist who, quite simply, fills a need and makes something beautiful.

Honestly, I don't know when someone becomes an artist. Maybe when the art inside a person starts to come out, they become an artist. Maybe someone else noticing the art creates an artist. In any case, being careful, caring, trying, and practicing – all eventually create art. In turn, that art inspires someone else to be careful, care, try, and practice. And radio, again, becomes full of amazing, enduring art. Art in which the audience takes pride and ownership: "That's my station!"

Are you an artist?

Sam Wallington is VP of Engineering for Educational Media Foundation, and has 34 years of experience in broadcast engineering. He can be reached at swallington@kloveair1.com

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Maintenance Guide

Air Conditioning Principles and Maintenance

by Wiely Boswell

Be it in the studio or at a remote transmitter site, air conditioning is an essential part of broadcasting. You perhaps have been to an old site and it vents the stack out the roof and only has a window exhaust fan. Older transmitters could take the heat but those days are about over. New equipment is not happy long under hot conditions.

You need some background to even talk to HVAC techs nowadays. I would surmise all of you have your go-to tech for HVAC issues. The problem is, when it gets hot they are in serious demand and may not be able to respond as quickly as you would expect. Having some redundancy, and being able to resolve some issues on your own, is the best way to reduce heat stress on you and your equipment.

When a transmitter building is "sealed" and the AC goes down, the exciter gets overheated, the transmitter shuts down, cools back off – then comes back on/off over and over. Going into a building at 120 degrees or more can knock you down as you walk in – you will be looking for a good fan to cool off the building with the door open. One or more fans on hand are first in the line of things you need to have. You can also have a shuttered exhaust fan that comes on at a set high temperature.

Hopefully your alarm system gives you enough notice to get there before an outage.

Let's start looking at systems in detail.

Standard maintenance discussion would include filters and air handling. Using good pleated filters are worth the money, even if you have to change them more often. A lot of systems will let you upgrade from 1" to 2" thick filters by simply removing the 1" tracks. They have more surface area and provide a better flow longer. A clean environment, be it a studio or a transmitter site, puts less requirement on the equipment filters to perform. A lot of equipment only has coarse filters anyway and you can get that nasty fine black dust I feel sure you have seen.

If a filter is allowed to get really dirty, the system will pull air and dirt around any crack it can find. It can even bend or warp the filter by the strong suction and then there is little or no filtration. The dust can then travel to ducts, squirrel cage fan blades, and clog coils. It is very hard to reverse the situation after the fact. A frequent filter change of course is easier said than done – like changing UPS batteries every two or three years. You can have a routine AC filter change-out schedule by your service company in the studio but it is not as easy at a transmitter site, unless you plan to do that yourself.

Office buildings fight dust contaminants by incorporating positive building pressure. A small amount of intake air is brought in by a controlled vent from the outside. When an exterior door is opened, air will flow out of

building keeping dust and contaminants out. This intake makeup air needs to be filtered by a pre-system filter because it can be faced with much more dust than the main system filter. Bottom line, filtering is important, so go to your local parts place and buy filters by the case.

The same idea applies to a transmitter building – especially if a transmitter stack is forcing air out of a building there will need to be replacement air plus some from the outside. If you open the door air should not blow in – the HVAC system has to help pressurize room. This is a tough assignment, having positive pressure in this case.

Moving on, Freon is a gas compound that makes the system work. To be efficient, Freon must be in the system at a proper quantity that is determined by pressure readings. It is measured as a liquid in pounds. A scale is used to weigh the jug as it is dispensed, to determine how much has been used. Gauges are used on high and low side ports when testing or adding Freon. The current R410A Freon requires new gauges because pressures are higher than the old gauges can read accurately.

I remember a small compressor system for a cooler that had a permanent pressure gauge installed on the low side. That was really nice feature. Of interest here is a mini split system I have, that only has a low side port. (The ports also have changed in size.) You have to add gas to an evacuated system by prescribed weight, in a mini split – more on mini splits later. In general, when you have a small leak, the system will slowly become inefficient and may shut down. One symptom of low Freon is the inside coils freezing up.

There are several types of Freon. Automobiles used R12, then went to R134a, and now the newest use R1234yf. In the early years ammonia was used in refrigerators. Some refrigerators even had a gas flame to heat

(Continued on Page 36)

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Air Conditioning Principles

– Continued from Page 34 –

the ammonia, which gained pressure and was released as a gas (evaporator) to cool the inside. Then in 1930 they came up with something “safer” – Freon – and it started in cars with R12.

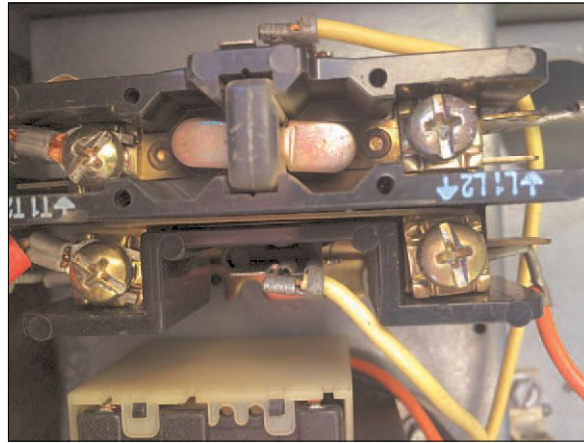
R22 was prominent in typical ducted HVAC system. R22 has been given notice of end-of-life, prices have gone way up, and so now HVAC folks are pushing new systems. If it is an old system with a leak, and they can not find it, then it may be new system time. It is a tough call to just replace the indoor “A” frame evaporator coil on a relatively new system, but the cost of R22 will help the tech scare you into a new system.

The new standard is now R410a which is a mixture of two gasses. What is note worthy about this, is that a small leak will tend to leak the lighter gas first which changes the ratio of two gasses and impairs operation. The system has to be completely drawn down (evacuated) and a new R410a refill is required.

This type of work will limit most of us trying to find a leak, pull a vacuum, and refill. But there are other parts of the system more in our line of expertise.

The main outside compressor contactors have been, over time, supplied with lighter duty contacts and the points will burn with electrical arcing. Some have gotten so economical that the contactor may only break one side of the 220 VAC. Contactors are great spare parts to have on hand and they typically have a 24 VAC coil. A contactor out of an old transmitter can outlast the AC

unit if you can get it to fit in the space available. A 24 VAC transformer with sufficient VA (volt/amp) rating provides power to pull in the contactor – either directly from a thermostat closure or uses an intermediate smaller relay.



Newer AC contactors are using only one contact.

The photo above shows a contactor relay with coil connections and the edge of the 24 VAC transformer. It has the single metal bar with contact points on the reverse side. The black burning, which is around the points, is hard to see. A power failure return-to-operation delay should also be incorporated into this circuit.

Here is a warning on three-phase scroll compressors. Like a tube cavity blower motor, if a phase gets reversed, it will run backwards. Nothing bad happens quickly like in the case of a tube cavity, but there will be no compression. You could have phase rotation shutdown detectors installed, just in case the power company gets confused on phases.

AC techs have a good ear for sounds like bad/slow fan motors and compressors, a good feel for temperatures on lines, and a good smell for burnt Freon. That is what experience teaches. There also is some math in calculating heat load, which uses coils temps and air temperature when testing pressures in a system.



AC Condenser Units Can Become Easily Clogged

The outside unit, has huge air flow volume and sucks in all kind of debris from floating seeds out of trees to grass slung up by weed eaters. Some times you may have to take the unit apart to clean it out. The above photo shows the “blanket” over one of my units that it gets every year. I had to pull sides off carefully to get to the coil. As you see, I got behind on this one. You have to be able to get heat out of that coil. I’ll have much more on this important subject to come in the next issue.

Wiely Boswell is Chief Engineer of Faith Broadcasting, Montgomery, AL; CBRE, CBNE, and SBE 118 Chairman. He may be contacted at: Wiely@faithradio.org

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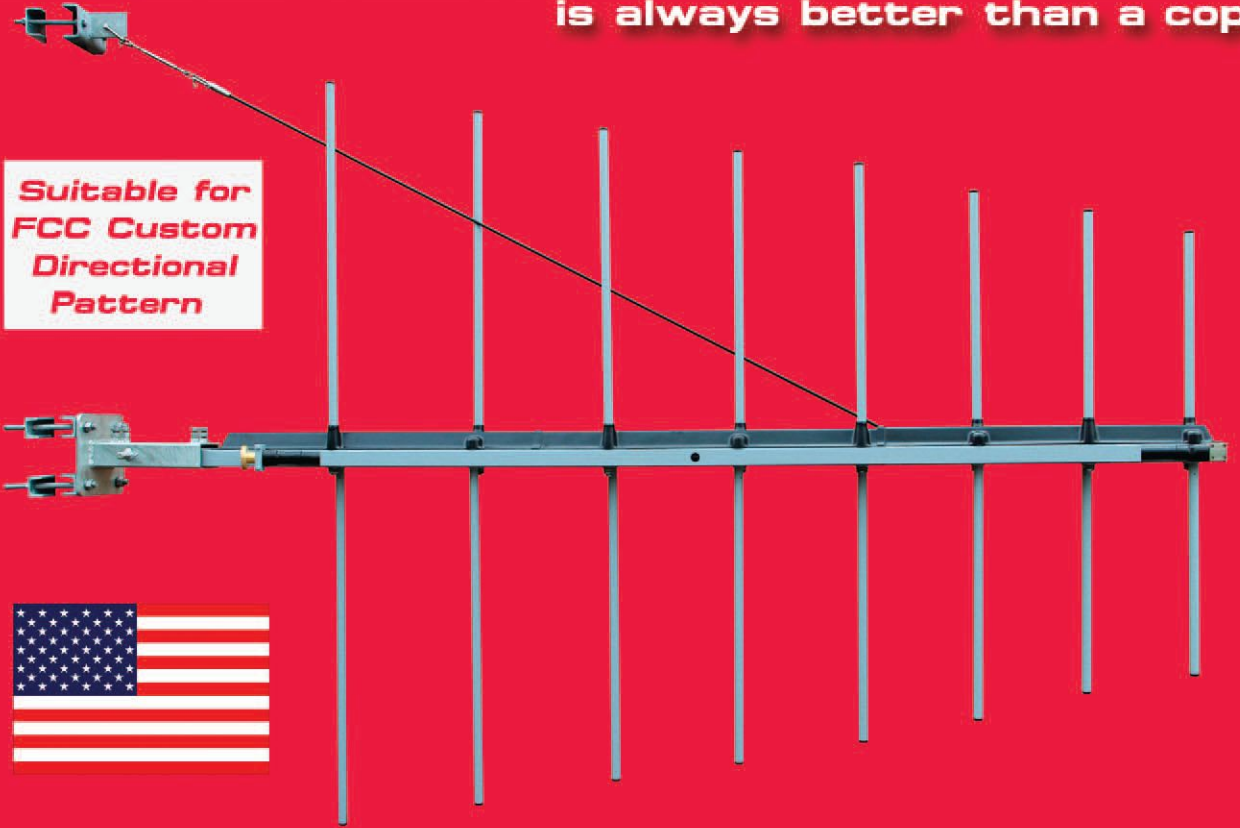
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Don't Drive With The Parking Brakes On

by Rolin Lintag

The engine is roaring. The gas pedal is floored. But the vehicle is not moving like you expected it to. Before you suspect there is something wrong with the engine, check the parking brakes first. If the brakes are engaged, you'd either burn the pads or smoke the engine—or both! You'd say, "That's not gonna happen to me!" But Murphy will agree with me that it is the obvious things that can escape us in this complex world.

Have you experienced putting in your best efforts but, in spite of all the revving, you don't seem to be going anywhere? Your parking brakes may be working against you so check it out!

Resistance to Change

Perhaps I don't need to prove here that people are creatures of habit. Steven Covey said that if you do a task a certain way for at least 21 days then it becomes your habit. This is why it is important to develop the right habits in order to be successful, according to Covey.

I remember an old-timer telling me, "we've done this like this before so why change it?" I can relate to that because I am now an old timer, too. But the problem with that paradigm is it may be a habit that needs to change.

I usually say that, for a task to be meaningful, there should be a valid rationale behind doing it. I've been with organizations that do too little preventive maintenance and also where there are just too many things to do. Doing too little preventive maintenance is not bad in itself, if we are talking about hard drives, but doing too much can be harmful since unnecessary human intervention on working systems can actually cause more problems than good.

There was this Chief Engineer who thought his staff needed to be busy to earn their paycheck—even if the tasks were not necessary. The problem with that mode of operation is you rob yourself of time you need to spend on the priority tasks which usually are the more important non-urgent tasks. If one is operating only in fire-fighting mode all the time, then you cannot get ahead of the problem to prevent the fire from happening in the first place.

Just how do we deal with people's resistance to change? Participative style of management.

People need to understand why tasks need to be done and what benefits can be reaped by doing things differently. Not just for the sake of doing things differently,

but to improve the status quo. If a certain task will not improve the status quo, then there is no sense in doing it.

People need to own the task, convinced that it is the right way to go. Now if you can turn that into a habit for people to do, you have turned off the parking brake.

Communicate the right things, to the right people, at the right time.

Sun Tzu said, "If instructions are not clear and commands are not explicit, then it is the fault of the general." If your communications are not clear, the people who work with you get the wrong ideas—and waste their time and effort in delivering results other than what you wanted.

There was another Chief Engineer who wanted to repurpose some 10-foot, high performance microwave dishes from one tower to another. The source tower and the destination tower were about 50 miles away from each other. The source tower had at least four dishes on it that were not being used. A tower crew needed to know which ones should be dismantled, lowered down and transported carefully to the destination tower.

It should have been a straightforward rigging work, if not for the CE failing to mention that he wanted only two dishes done and which ones. He relied on his Purchase Order but it was not even specific that two dishes need to be moved. It just said "move dishes" but no other specifics. It could have been clarified with a verbal conversation but the CE failed in that, too. When the tower crew got to the destination tower, they found out about the "miscommunication." There's more to the story but that is all I can share here.

(Continued on Page 40)

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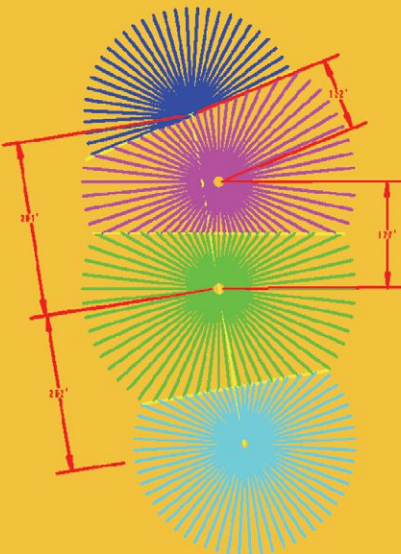
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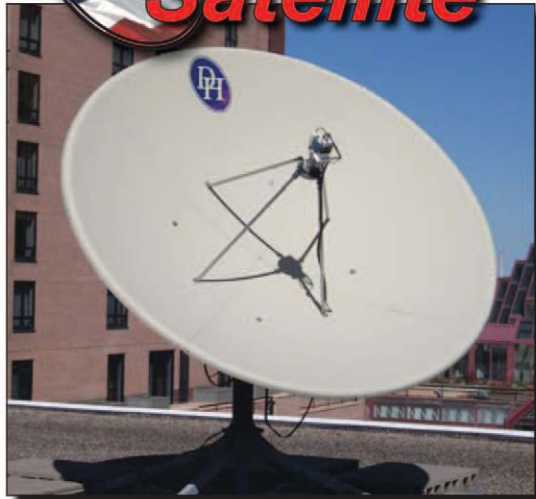


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Don't Drive With The Parking Brakes On

– Continued from Page 38 –

It is true that written instructions are a must to establish a paper trail and accountability but if that is not followed through with a verbal agreement and understanding, then it can cause miscommunications. I find it helpful to secure an understanding, first verbally, preferably in person, before following through with an email to establish a paper trail. Or if there are just too many details, send an email first but make sure to follow through and secure a verbal agreement. The more communication channels you use, the better is the chance to get the message across. Yes there can be mixed messages, which is why you need to address that too, like we do with FEC (forward error correction).

Now if your communications are effective, you have turned off another parking brake to move you forward.

Training is useless if the attitude is wrong and aptitude is not there.

“Hire for attitude and train for skills” is an adage that hiring managers should be familiar with. However, most job ads we see are focused on skills, as if shopping for an Android phone based on its features alone. Even a cell phone needs to be dependable, reliable and easy to work with. All the capabilities and features that the latest technology can give us are useless if the phone is just a pain to work with or just won't stay working.

Interviews should be geared to find out if the right attitude is present. A “can do” attitude can go farther than a “been there done that” attitude, in this fast paced technology we are in. If one is not keen in learning new things or open to take on more responsibility, then his time with your organization is similar to that of buying a PC with Windows Vista just before Windows 7 is announced. You just bought a product that is already obsolete before the warranty starts.

Aptitude is a measure of learning ability. Educational attainment and professional certifications can be indicators of one's aptitude. If one is in the habit of reading, studying, working on different projects – and can understand concepts and apply them at work – then that person has the aptitude to be effective after a training program.

Anything is expensive if perception of value is low.

This has been the bane of our Engineering existence when dealing with laymen.

Consider this scenario: You are so excited in presenting what you believe will launch the station to the next level in technology but the other non-engineering personnel may be thinking, “Here it comes, wait for it ... wait for it ... that dollar figure ... wait for that expense I have to add to my sales quota ... wait for that big spender finale....” OK, you got it.

Somehow you feel like you are the only one cognizant of the need to buy that gear that will improve News automation or can add to the archiving capability of your servers and so on. You may be right – until people see the value of the investment. Ideas are formed between the

ears and if the perception of value is low, everything is expensive.

I hope there is an easy way to overcome this. But when you are dealing with perception, subjective that is, there are just too many moving gears in everyone's head to pin down how you will deal with it. I don't propose a sure fix here. I'll just identify the parking brake for you and it is up to you to turn it off.

The difference between a stepping stone and a stumbling block is how you see it.

A glass of water can be half full or half empty. If you have been an engineer long enough, you will agree with me that problems help you to be more optimistic than pessimistic. Problems don't stymie us, but rather step up our adrenalin level and get those thinking gears working. I would even dare to say that problems not only keep us awake but keep us alive. We get bored when things are so peaceful and quiet. (Some of you are already thinking – speak for yourself!). All I'm saying here is if all the stones you come across look like stumbling blocks to you, then it is going to be a challenge to get across. But if you look at them as stepping stones, you can ride on them and get yourself moving.

I remember one adage from the U.S. Marines, “Pain is weakness leaving the body.”

Turn off the parking brake and rev on!

Romualdo “Rolin” Lintag is Asst. Chief Engineer for KRON 4 in San Francisco, CA. Although driving through the streets of San Francisco is like driving with the brakes on, I'll respond to your email in a zit if you send it to rlintag@kron4.com.

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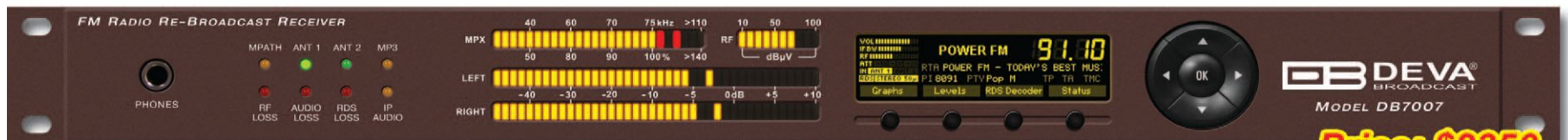
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Small Market Guide

The Not So Jolly Green Giant Visits Small Marketville

by Roger Paskvan

It was fall and one of my clients was busy installing a directional system for a second AM license they had acquired in a small northern Minnesota town. The main idea was to piggy back on the existing AM towers with diplexers, allowing two AM signals to share the same towers.

The phasor and antenna tuning units (ATU) for both towers were purchased from a reputable manufacturer, built to order. Both ATU's were built into two, four foot square weather proof metal enclosures with a front door. They were to be attached to the outside of the existing tower buildings, which meant they would be exposed to the elements all year. The construction went along as planned and everything tuned up perfect with a network analyzer. The station signed on a few weeks later.

About three months went by and I received a call from the station owner. He said the transmitter was still on the air but he received a few emails from listeners, complaining about raspy sound that comes and goes on certain days. He asked me if I could look into this audio problem and get it fixed.

Later that week, I ran tests through the compressor and audio chain – all looked great. The transmitter checked out and all sounded real clean. I couldn't find any audio problems but told him to keep a log of the occurrences. Another month went by and he called again. This time, he said that he himself heard the sound go from clean, to music with a jagged edge. Returning, I installed a substitute audio processor. Possibly there was a bad IC that was clipping in his Optimod audio compressor. Well that seemed to do the trick, and for the rest

of the winter there were no problems with audio. The Optimod was shipped to Orban for repair. In April the snow was beginning to melt, humidity went up and the problem returned. I had not put the original Optimod in yet, so it wasn't that box. When I arrived, the transmitter meter readings were lower than normal. Shutting off the carrier and bringing it back cured the audio problem. The next few days were spent looking for arcing evidence in the transmitter. I checked the entire unit and found little evidence of any damage. The next morning, I came in real early and was able to see the meters drop and the audio get noisy. I spent the second day going through the transmitter output stages but came up empty. The problem had to be at the tower or antenna tuning units.

Since the snow was almost gone and it was possible to make it to the towers without shoveling, I opened the new ATU box on the first tower and everything looked nice and shiny. I had the PD turn on the transmitter and watched. No arc problems and no evidence of past problems. So, on to tower two, the second outdoor ATU. I opened the door, I couldn't believe my eyes. All those silver plated coils everywhere were coated with bright green corrosion. The entire ATU looked like it had been in rough service for 30 years. Every piece of metallic hardware was coated with either rust or green copper corrosion. In the upper corner, where the signal goes to the antenna, all the paint was pitted from a steady corona. This ATU was arcing all along. The green giant had left his mark!

With the extensive corrosion, it was not possible to clean each coil and the silver straps between. I finally concluded that we just order new inductors and replace all the corroded parts. The vendor provided some mods to coil placement to stop the arcing from reoccurring.



What happened here could happen to any AM station with sealed ATU boxes that sit outside. Dew forms on the components in the morning and encourages arcing on some high voltage points. The high frequency arc converts the available oxygen to ozone. We now have an environment of confined ozone (super oxygen) and moisture coated copper parts. Since there was no ventilation, the ozone just stayed in the water tight enclosure and ate away at the copper and steel. What a great chemistry experiment.

The immediate solution was to put screened louvers on each end of the box, after replacing the corroded parts. The long term solution is to remove the box sides and put the ATU in a dry wooden building that allows for ventilation.

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

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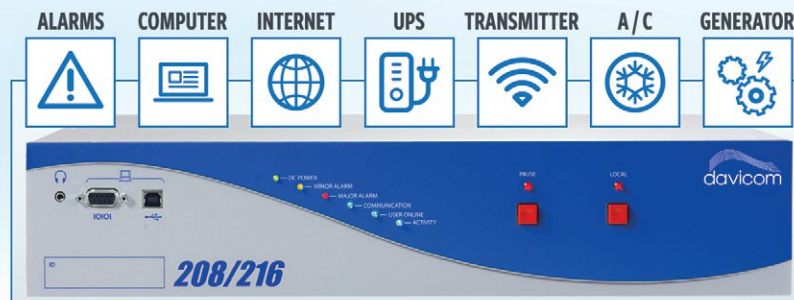
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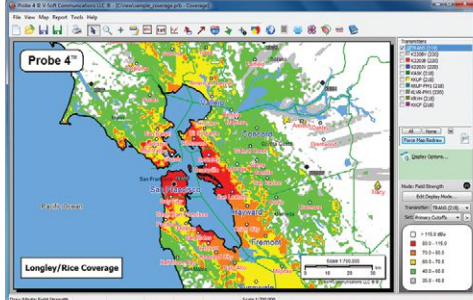
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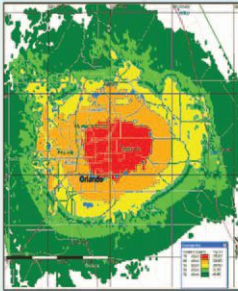
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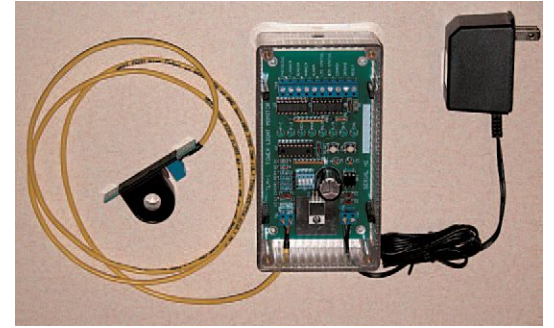
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Each channel has a cut switch, a ifb monitor button plus a vox incoming audio present indicator.

Press the talk keys down for momentary operation and up to latch. The latch operation can be defeated if required. Units can be supplied with a headphone jack or a 5 pin XLR headset connector.

There is an “all talk” key which can be set to talk to any or all of the four wire outputs. There is also a microphone cut button. When a talk key is pressed, incoming audio to the loudspeaker is normally dimmed to prevent feedback, the level may be adjusted or defeated as required.

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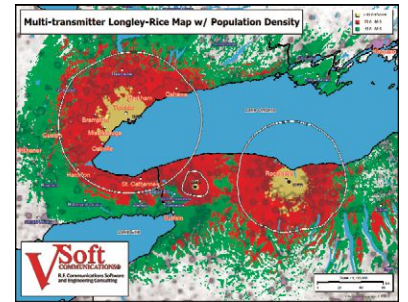
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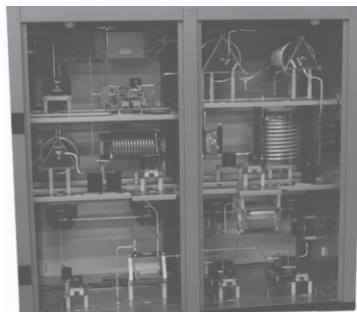
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