

# Radio Guide

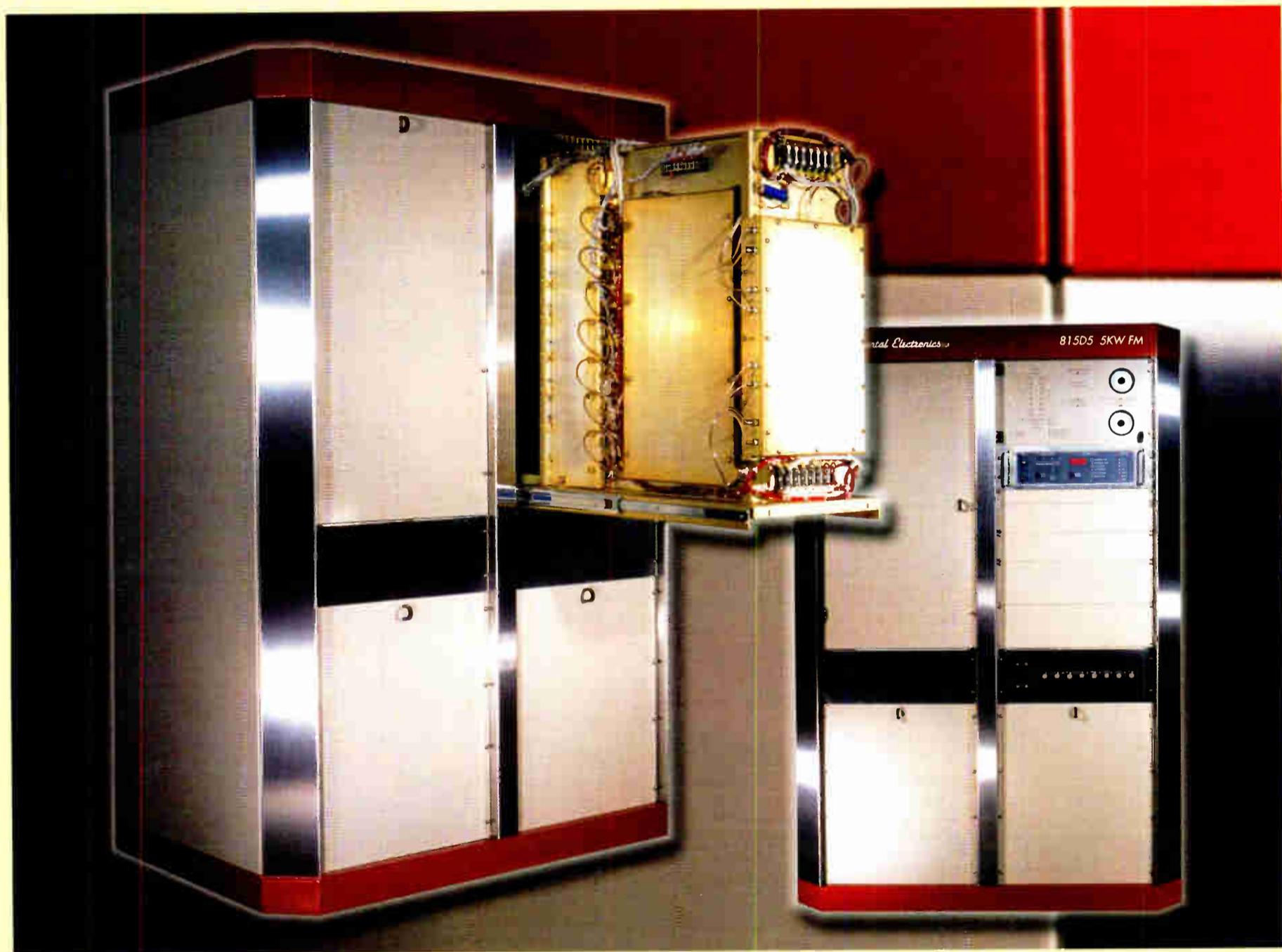
Radio Technology for Engineers and Managers

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April 2004

Volume 12 Issue 4

## Radio Puts on a New Look for NAB2004



### **A New Transmitter from an Old Friend**

Page 4 – The acquisition of Continental Electronics by DRS Technologies in late 2003 brought new vision, along with a strong R&D plan. With the push on towards digital radio, management saw the need to develop a solid-state transmitter product that is IBOC compatible, and would serve as the foundation for an entire new series of transmitters.

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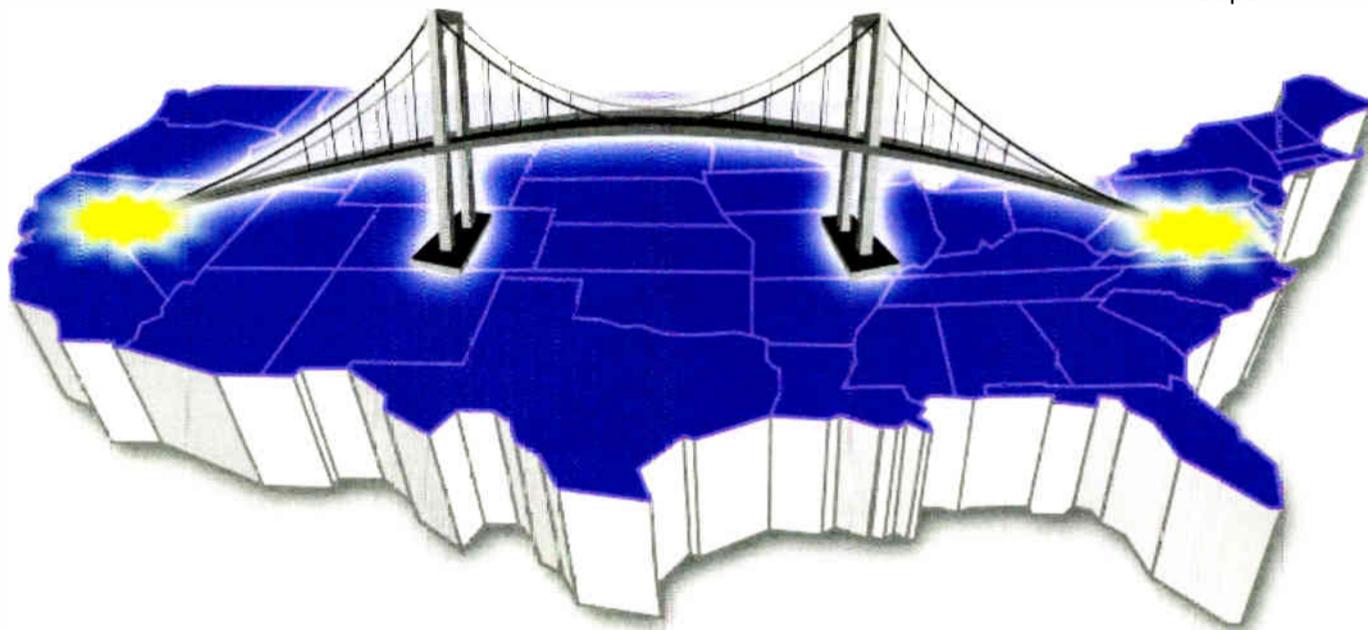
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### Radio Guide

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## Radio Guide

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April 2004

### The State of Radio Engineering

As we get ready for the 2004 NAB Convention, we are again reminded of the many hard working companies who are continuing the technological progress that has reshaped our industry. While the debates continue over which changes are good and which are bad, it is nevertheless true that many people are still passionate about the profession of broadcasting.

By that, we mean that aside from the “media frenzy” of debate over decency or how many stations a corporation may own are an army of people whose main motivation is to produce cleaner, more reliable broadcast signals to serve their community.

Certainly some have more responsibility and less “fun” under consolidation, leading to an erosion in the ranks of radio engineers as some retire or leave the industry. On the other hand, it is apparent manufacturers and suppliers continue to innovate, and thousands of engineers are actively meeting the challenge of building and maintaining high quality facilities.

From the increasing number of IBOC installations to the state-of-the-art automation systems, to the new transmitter products from companies like Broadcast Electronics, Nautel and DRS-Broadcast Technologies (it is difficult not to say “Continental Electronics!”), there is plenty of new technology for engineers to learn about and gain familiarity with in the field. Meanwhile, **Radio Guide**’s mission continues to be focused on helping you cope with all the various aspects of your jobs. so you are better equipped to handle them and can derive satisfaction from being in broadcast engineering.

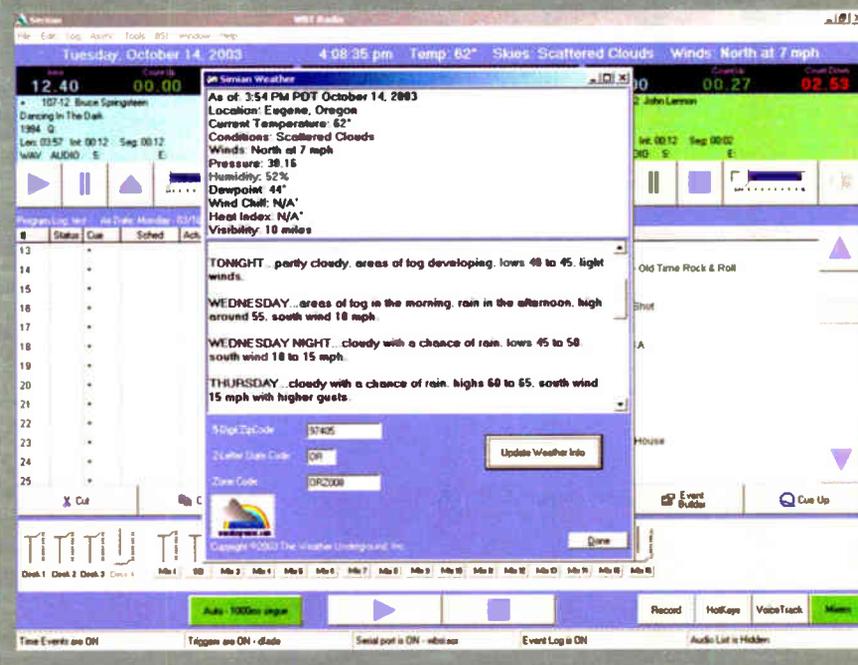
We hope to see you at NAB. Stop by our booth, #N1200 in the Radio Hall. Join us for lunch at Noon on Tuesday (20th). But, even if you cannot make it to Las Vegas, communicate with us – let us know what are your concerns and needs. Let us grow together!

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# A New Transmitter From an Old Friend

by Barry Mishkind

[TUCSON, Arizona - April 2004] Suppose one day you were asked if you would like to design a new FM transmitter, and had the opportunity to do it any way you wanted, within economic reason? Would you welcome the challenge? Over at Continental Electronics, now known as DRS Broadcast Technology, Inc., Bret Brewer found himself with this very interesting assignment.

Of course, pioneering new designs is nothing new for this company. For nearly 60 years, the company has been in the forefront of the broadcast industry with some of the best-known transmitters in history. Actually, the roots of innovation go back even further to James O. Weldon, and the Washington, DC, consulting firm of Weldon and Carr. Their work with high power transmitters led to the formation of Continental Electronics in 1946.

Weldon's company eventually took over the AM designs from Western Electric, and improved upon them to become the source for many large AM and Shortwave transmitters used around the world, including XERA and some of the other famous Mexican "Border Blasters." Products ranged up into the multi-megawatt range, and expanded to FM with the acquisition of the Collins line from Rockwell-Collins in 1980.

From the famous Model 317 series of 50 kW transmitters, to the 816R series of FM transmitters, to a wide range of shortwave transmitters, Continental Electronics was a leading supplier of transmitters for decades. Unfortunately for the company, a series of ownership changes disrupted the development of new models, especially in high power solid-state technology, and Continental slowly lost market share. Although still known for solid products and a high level of commitment to technical support, the product line was narrowing and generally aging.

## RENEWED R&D

The acquisition of Continental Electronics by DRS Technologies in late 2003 brought new vision, along with a strong R&D plan. With the push on towards digital radio, management saw the need to develop a solid-state transmitter product that is IBOC compatible, and would serve as the foundation for an entire new series of transmitters.

The decision was made to go for a 5 kW solid-state FM model, and Brewer, the Broadcast Marketing Manager, was placed in charge of the project. He immediately wanted to take advantage of the company's known technological strengths, but "we didn't want to just rely on our reputation. Rather we intended to find out what our customers wanted and respond appropriately." Brewer wanted to produce a design that would last for years – much like the 816R series, which is still popular after well over 30 years of production and some 2000 units.

## DESIGN PHILOSOPHY

So, where do you start? Clearly, the goal was not a transmitter that merely "looked good," although even if it was stuck out at a transmitter site, there was no reason not to give it a "classic look." Turning to the operational aspects, Brewer reviewed his interviews with customers and company designers. He found the key criteria mentioned over and over included "simple," "straightforward," "easy to maintain," and "rugged." That makes the project easy, right?

Using the concept of "Designed by our Customers, for our Customers," Brewer started with the specifications expected by the ultimate users. For example, the transmitter had to be able to handle both analog and digital modes, with simple swapping out of modules to make the changes. This was accomplished in such a way that, during the NAB, the plan is to run a transmitter on the floor in analog one day, and by swapping the exciter and modulator, digital the next.

Without question, the ability to run 24/7 and stay on the air – even with the occasional parts failure – is essential. Oh, and this has to happen in some terrible environments, perhaps places the designers could hardly imagine on their own. The system should include a complete spare module that is hot swappable.

Other key considerations mentioned by users included the use of components that are easy to find when replacements are needed (free from quick obsolescence), and still have good operational reserve. Although the semi-conductor industry does not exactly ask broadcasters before they obsolete a part, a transmitter is expected to have an anticipated lifespan measured in decades (compared to computers, which can be outdated in a year). Being able to access power devices easily at modest prices is very important. Ideally, all should be at least double-sourced.

Of course, users want something that looks expensive and feels good, yet actually is inexpensive – both to purchase and to operate.

In discussions with the DRS-BT marketing, engineering, shop and tech support departments, a number of other important issues were added to the list: sufficient headroom on all components, adequate cooling and air filtering, the optimal materials for construction, and even details like paints that can be acquired locally for touch up and other needs. (Paint matching the new color scheme, "RF Red and Solid-State Beige," is available at Sherwin-Williams.)

## FROM CONCEPT TO 815D5

All of this input has now been translated into the new Continental Electronics™ 815D5, 5 kW Transmitter, scheduled to be unveiled to the world at the 2004 Spring NAB.

Among the ways in which one can see the results of the design effort is the simple, straightforward layout of the transmitter, which makes operation easier and maintenance less of a gymnastic event. The transmitter not only looks good when closed, but it opens fully to allow the engineer to stand up for most routine maintenance activities, including the PA cabinet. The doors "feel" good.

Looking at the 815D5, the imperative to "keep it simple" is immediately evident. The control panel has a system flow chart, with high intensity LEDs to instantly show any "non-standard" operation. Even this has a unique implementation; the LEDs are green; if everything is OK, all the LEDs are lit. Even colorblind persons will have no trouble with identifying operating conditions. Power, interlocks, temperature, and combiner conditions are all monitored. As Brewer puts it "Green is good!"

Something else that you see right away: The meters are round ... and analog. This is not a money issue, as these are expensive, accurate meters. This is in response to the stated desires of the end users. With good resolution over a wide range, it is easy to see what the transmitter is doing.

There is another aspect of the LED indicators and analog meters that is worth comment: according to Dave Hultsman, Eastern US Regional Sales Manager, "we were amazed at how many folks were resistant to microprocessor control, unless you could operate the entire transmitter in some mode without it."

That is not to say that without microprocessors the transmitter cannot self-diagnose and "recover" from failures. In fact, there are many safeguards in place to keep the transmitter running and running. In addition to the relays, logic chips and op amps, the 815D5 is designed to "fall back" automatically, switchlessly, to compensate for modules that fail, or to handle other load variations.

Tuning the 815D5 is easy – you do not tune it. Right from the factory, the system is set up, broadbanded and matched for load. All the engineer has to do is set the power level and ensure the antenna is OK. In the case of trouble, the modules are hot swappable, and even after the spare module is used, the system can handle up to a five module imbalance without unduly upsetting the unique ceramic switching combiner designed by the DRS engineers.

## OPERATION AND MAINTENANCE

Brewer says a lot of thought was put into the operation and maintenance of the transmitter. Have you even been working on a transmitter, only to have the door swing around and create your head? Brewer apparently has, so he specified special friction hinges for the 815D5; the door will stay right where you put it. The other components are equally well thought out for selection: buttons and toggle switches are multi-hundred thousand operation units

In fact, Brewer likens the transmitter to a well-built car. When closing the door, for example, you expect a certain sound and feel.

Brewer thinks the Continental Electronics 815D5 has achieved the overall desired "look and feel" of quality.

This thinking is demonstrated even inside the box, where ICs are socket replaceable; and the PA cabinet is designed to pull out completely for servicing. The PA and IPA modules themselves are all interchangeable, the design having been field proven for years as the solid-state IPAs in the 816R series.

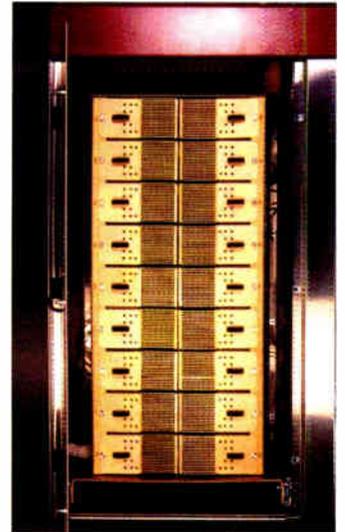
Linking the PA modules is an ingenious combiner/splitter, using space-age cellular technology. Instead of coaxial combining, it uses a stripline without any moving parts or switches, allowing for easy repair or replacement in case of disaster. Brewer says the combiner/splitters tested up to three times their power rating without failure.

## TECHNICAL SUPPORT

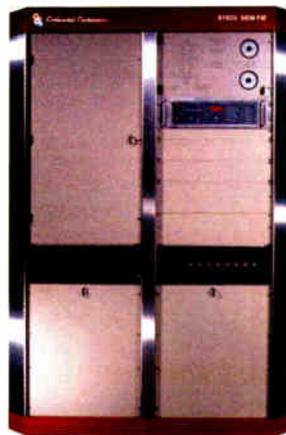
No transmitter will serve well without access to knowledgeable technical support. The company has long had the reputation of an expert support staff that patiently and quickly helps engineers solve problems in the field. Of course, the goal is to build them not to fail, but since most things can die at one time or another, it is comforting to know that Richard Garrett and J. Fred Riley, among others, are ready to help.



James O. Weldon  
1905-1993



Model 815D5  
Transmitter Modules



The 5kW Model 815D5



Richard Garrett, surrounded by some of the many manuals used in support of Continental products.

As one would expect, parts are stocked and ready for shipping to handle most any emergency situation aside from complete destruction from external forces.

The 815D5 is quite an accomplishment for a company some had predicted would abandon the broadcast industry. According to Hultsman, the 815D5 5 kW transmitter also is the foundation for future 10 kW and 20 kW editions. One can only think Jim Weldon would be pleased with his grandchild. – Radio Guide –

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# Audio Processing From the Ground Up

## Part 15 – Splitting the Audio Into Parts

by Cornelius Gould

[CLEVELAND, Ohio - March 2004] As we continue our guided tour of the audio path in a broadcast audio processor, we are ready to move on from the phase rotators and gates into the next section, where we find the crossover systems and multi-band AGCs. Both work together to accomplish an important function.

### CROSSOVERS

As we discussed early on in this series, crossovers are used to split the main audio signal into different frequency bands. The number can typically range from two bands (bass frequencies, and everything else) to four, five or more bands of frequencies. Some audio processors even allow you to set where the various band splits happen.

If you are lucky enough to have access to that part of the processor, the best advice on adjusting the crossovers is to play with the crossover points and see how things sound. The best frequencies for the band splits depend upon the format and the individual taste(s) of the programming staff. I can offer three hints to set the break points.

**Hint #1:** Adjusting the lowest (bass) frequency crossover band.

Any setting at or below 100 Hz will give a deep “gut shaking type” bass character to the processor’s low end sound; anywhere above 150 Hz will tend to cause the processor’s bass to sound “tubby.” One indication you may have set the bass band too low is this: If you have any program audio with ground loop hum, or fans or other motors in the studio that vibrate the microphone boom arm, you may be surprised to hear this sound boosted greatly on top of the DJ’s voice by the processor whenever the microphones are on.

Setting the crossover point higher will allow some of the bass frequencies in the announcer’s voice to keep the processor from bringing this machine hum up too much, but perhaps at the expense of losing some of that deep bass you may be craving on the music. Another consideration is to adjust the silence gate on the bass processor stage to compensate as well – but more on that later!

**Hint #2:** Adjusting the highest (treble) frequency crossover band.

The higher you set the high frequency crossover, the more “sparkly” the treble will sound. The down side is the possibility of enhancing any “hiss” that could be in older songs, or other material originally stored on analog tape. Setting the crossover lower can help, and re-adjusting the silence gate on the high frequency processor also can compensate for this.

**Hint #3:** Adjusting the middle frequency crossover bands.

There is a dizzying array of textures you can form on the mid bands. In music formats, the one I have found most interesting is this: you can enhance the “kick” of kick drums by finding the combination of adjustments across the midrange bands that bring out the higher frequency harmonics of the kick drums. If done right, you can sound like you have a ton of bass without the “muddy sound” heard on many receivers, as opposed to just “turning up the low end” on the

processor. You have to use your ears big time here, and take your time and listen carefully when adjusting.

### USING YOUR EARS CAREFULLY

Now that we are entering the realm of the multi-band processing adjustments (the meat of the audio processing world these days) keep in mind “listener fatigue.” But at this point in the game, consider not listener fatigue, but yours. *Do not sit in front of the speakers for long periods of time tweaking and listening.* The longer you listen, the more your ears (and brain) will tire from listening so hard to the audio.

Almost before you are aware of it, you may not only find yourself slowly raising the volume to ear splitting levels in a relatively short period of time, you may also find yourself adding more treble and bass to the audio to re-stimulate your ears (and brain) to make the audio “sound right.” Be careful! This is where most people seem to go wrong when adjusting processing!

I learned this the hard way after once spending *all* night adjusting and listening without breaks. I left thinking I had created the audio masterpiece of the century, only to be awakened early in the morning by the Program Director screaming bloody murder. Upset that he could not appreciate great audio, I got into the car, turned on the radio, and whoa! did it sound like absolute garbage! How did *that* happen?!

How? I let my hearing fatigue to the point that I no longer could tell the difference between good audio and bad! After a little rest, I was able to truly hear the audio for what it was: junk. These days, I do not work with processing for more than 15 or so minutes at one setting. I move on to something else; and I listen to something else. I find the best thing to do is to put a talk radio show on the radio, turn it down low so I am not bored, and give my ears a chance to recover for the next 30 minutes or so. I then go back, and see what kind of damage I may have done!

Keep the above rule in mind as it will be important to carefully listen to what is happening as you adjust the parameters that will be discussed in the remaining parts of this series of articles.

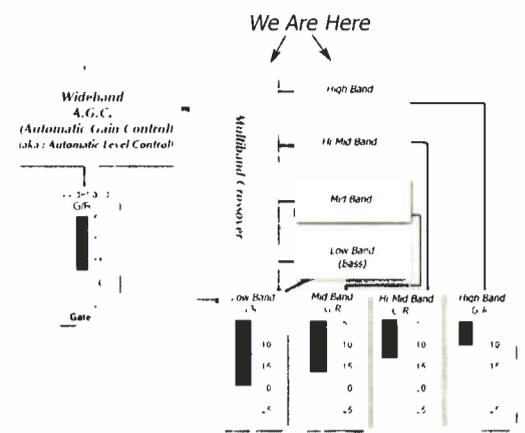
### THE MULTIBAND AGC

Now that we have gotten that out of the way, let us press on to AGC (automatic gain control). The adjustments you make with the crossovers generally go hand-in-hand with the adjustments made to the multi-band AGC and limiter stages.

The multi-band AGCs used in most processors typically are slightly different versions of the wideband AGCs. The controls will typically be the same as the wideband AGC, but the ranges will be “tweaked” for the particular band of frequencies in which that AGC stage operates. Further, the terms you hear used will be no different than the ones we used in the wideband AGC section; and some of the effects will be similar as well.

The multi-band AGC is typically used to automatically “re-equalize” the program content to try to match all program sources to some subjective EQ curve determined by the person (or persons) in charge of audio processing for the radio station.

This lends some consistency to the sound of the station, branding all programming elements with the “sound” of the radio station. The dynamic action of the multi-band AGCs (their attack, release, etc.) gives certain “textures” to the lows, mids, and highs, which further enhance the “signature sound” of the station.



For example, suppose we are running a soft music station, and we want the bass to be prominent, but not “thump” our listeners into a migraine headache. We are seeking a “smooth, round bass,” as opposed to a “thumping” bass.

### BASS TWEAKING

The first adjustment you would want to make is to run the attack time faster, to flatten out the bass pulses (the “thump”). As the attack increases, the bass thumps should transform from “THUMPS” to “BOOM” to “boom.”

You probably also will want to play around with the bass equalizer some to further shape the bass to your desire. (A similar procedure applies to the rest of the bands as well.)

By increasing the attack time, you can cause the percussion instruments in a song to move from the “foreground” to the “background.” Different adjustments can create anything from a subtle change to the objective sound of the percussion to a bizarre unnatural sound.

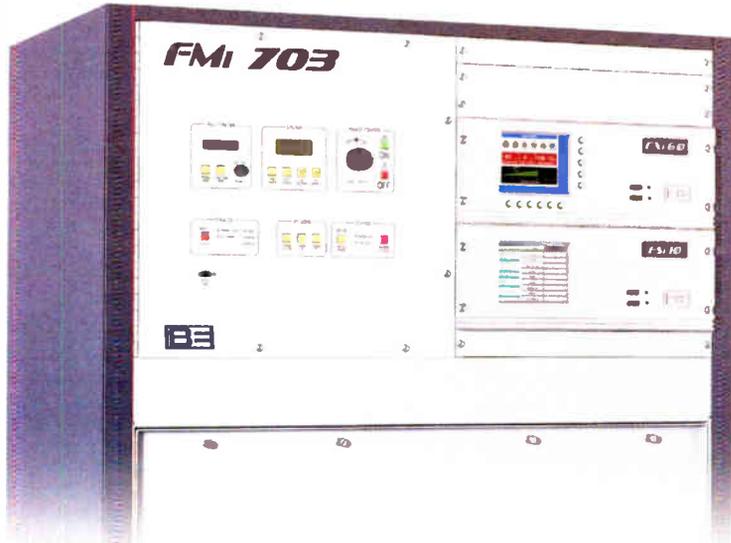
A “familiar” sound from days gone by is one where the attack times were set so fast on multi-band processing that drum kits were converted from sounding like drums to sounding more like a rhythmic “steam engine,” making pulsing noises in the background to the beat of the song.

In the above example, the attack times on the mid band were so fast on the AGCs, the snare drums changed from having “snap” when the drum stick hits to having a sort of “whooshh” sound. If reverb is mixed into the snare drum audio, the “whooshh” becomes even more pronounced as the trailing reverb sound would be increased as the midrange bands recover, or release, from “attacking” the initial snare drum “snap.” (Refer to the “attack” and “release” definitions described in previous installments.)

This is most noticeable when heavy-handed broadcast processing was used on radio stations in the 80’s. Phil Collins hit albums of the era are a good example to illustrate what I am talking about. The gated reverb and heavy compression Phil used on his drum kit recordings just sounded cool when heard on the original album (CD), but through a heavily processed radio station, the drums would sound outright bizarre!

Next up: we will take some time to discuss how the silence gates on multi-band audio processing stages can be put to good use in various processing schemes.

*Sometimes we think Corny is multi-banded himself, but he recombines quite well. Cornelius Gould is the technical advisor and weekend announcer for WAPS 91.3 FM, Akron, Ohio. You can reach him at: cg@radiocleveland.com*



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# The Transmitter Shack

## The Trade Show Scramble – An IBOC Odyssey

by Joe Sands

*Installing a new piece of major gear always carries a certain level of anxiety until it works correctly. Add in a new technology, several anxious manufacturers, a nervous PD, and some 130,000 conventioners. Are we having fun yet? Joe Sands has seen it all during demonstrations on his stations during NAB and CES. We get to look over his shoulder:*

[LAS VEGAS, Nevada - April 2004] "Hello, Joe? This is Doug Holland." The call came unexpectedly. "You will be receiving your Audio Vault equipment next week. And I'll be flying in after it arrives to help you install it."

What Audio Vault? I thought: OK, I'll bite. "Why are we installing an Audio Vault, Doug?"

"You'll need it for the iBiquity demonstration during CES (Consumer Electronics Show)."

Hmmm. Not only am I changing out my automation equipment, but now I am going digital too! OK.

I have been a radio engineer in Las Vegas, Nevada for some 20 years. With some of the largest electronic shows coming here each year, I have had more than one of these conversations. Over the years, I have learned it is sometimes necessary to stop and take a deep breath before panicking.

### PANIC TIME?

My mind began thinking of all the reasons that I was not ready to implement IBOC. As time progressed, we would discover that many of my fears were warranted, although some others were not.

The first issue was addressed early, how was I going to get digital audio to the site? As configured, Star 102.7 (KSTJ) was analog from stem to stern. My answer came two days later when two large boxes arrived from Moseley Associates; they contained the new digital STL, the 9003 SLQ.

Next on the list was audio processing. KSTJ was using analog "Light Shows" (my term for Texar Audio Prisms) and into a vintage 8100 Optimod. A few days later, an Omnia 6 Processor arrived. OK, two puzzle pieces down, 4,329.5 pieces to go.

Soon afterward, more boxes from Broadcast Electronics started showing up. At first, I thought BE had sent me a duplicate audio vault shipment. It turned out to be the first of a mountain of equipment including an IBOC transmitter, exciter, transmission line, an antenna from Shively, and a host of ancillary equipment.

The antenna was for IBOC only; because of the high transmitter power output of KSTJ (33 kW TPO), running a "high level" combiner was not an option because of the losses involved. We applied for and were granted an STA to operate on separate antennas.

### PUTTING THE PIECES TOGETHER

My mind was a blur. Where would you start an undertaking like this? A few days later, Pat Malley from iBiquity Digital arrived. Pat turned out to be the savior of this project. With many installations under his belt, Pat brought a wealth of knowledge to the project that was greatly needed.

My tower rigger hauled the shipping crates and boxes up the mountain to the transmitter site for KSTJ. First the STL was installed in the chain; then the audio processor was set up. This brought the digital audio to the site. Since the IBOC exciter requires a 44.1 kHz sample rate, the STL was configured this way from Moseley, precluding the need for a sample rate converter between the STL and the exciter.

The first problem Malley noticed was that the Omnia 6 was not the dual processor model designed to provide simultaneous processing for IBOC and Analog. I was puzzled about what was missing. The problem, Pat explained, was that the analog audio has to be delayed approximately seven seconds to match up with the delay in the IBOC exciter. (I immediately quipped, "Cool. We don't need a

delay anymore: If there is an obscenity, you can just dump the transmitter!" OK, I guess you had to be there.)

A fellow engineer in town offered his Orban 8200 as a second processor. Unfortunately, it was an older model, and although it had the digital output card, it was only capable of a 32 kHz sample rate. Luckily, iBiquity brought a spare 8200 with the 44.1 kHz card in it.



IBOC Gear from Broadcast Electronics

Malley methodically interconnected the equipment running audio to the exciter, the bypass switch (which arrived pre-broken) and to the analog transmitter. The wiring was completed and testing began. Well, almost: what about the subcarrier?

### MINOR DETOURS

It was around this time that I remembered Microsoft had installed an SCA at the studio for their SPOT watch; the sub-carrier generator needs to talk back to the studio. I called Ed Miller at Microsoft. My worst fears were confirmed. Yes, there had to be a bi-directional path for the subcarrier generator to talk back to Microsoft. Luckily, the folks at Microsoft were more than happy to move to one of Beasley's other FMs. I cannot express my gratitude enough for their cooperation.

The system design called for a circulator to be installed on the output of the IBOC transmitter, to keep the RF from the analog antenna from entering the IBOC transmitter. But it had not arrived, apparently lost "somewhere in the system." We were starting to run out of time to get this whole deal going.

A few days later a call came from Airborne: The circulator, made by Advanced Ferrite Technologies in Germany, was found and being delivered to Las Vegas. I knew from experience that ferrite devices are heavy. When it arrived, I asked the clerk at Airborne, "How much does it weigh?" She quickly answered "176." OK, it might require some help, but I can get that into my truck.

When I got to Airborne, I took off the top of the shipping crate, and pulled on one of the lift rings; it did not budge at all. I looked at one of the dockworkers and asked, "Did you bolt this to the floor? There's no way this weighs 176 pounds." He shrugged his shoulders and said "Let me give it a try, bud." He obviously thought I was a weakling as he grabbed hold of the lift rings. He grunted and groaned and yelled out, "Carlos! There's no freaking way this thing

weighs 176 pounds!" I looked at the bill of lading and saw the answer: No, it was not 176 pounds – it was 176 kilograms! (To the metrically challenged, that is 387 pounds.)

### NOW, UNLOAD IT

It took three of us to lift the circulator into my truck. When I got up to the site, Pat Malley was the only one there. There was *no* way the two of us could lift this device.

Thinking perhaps it was pulled from a black hole, we questioned whether the device really was ferrite ... maybe it was depleted Uranium. A whole story could be written on the elaborate procedure used to get the circulator into the building. Suffice it to say, it involved, 2x4s, gravity, grunting, groaning and conduit cut into sections to act as rollers. The words, "This is how they built the pyramids, Pat," were uttered more than a few times.



IBOC Circulator – Portable With Three Men

Obviously, heavy equipment was going to be needed to install the circulator. So testing commenced without it. We set it aside, confident it would not walk away.

### HOUSTON: WE HAVE ANOTHER PROBLEM

Whenever we turned the IBOC transmitter on, it obliterated the STL. We tried various power levels and finally concluded the IBOC antenna was too close to the STL dish and a mix was occurring in the final of the IBOC transmitter.

The ultimate solution – at least for CES – was to use a Scala 5-element yagi as the IBOC antenna. This worked; and KSTJ was on IBOC – just one day before the start of the show! (Because of all the problems, KSTJ was not able to demo Artist and Title displays as hoped; available manpower had to be diverted from Audio Vault installation to IBOC installation.)

Overall, I have a favorable impression of the iBiquity System. I had two previous exposures to digital broadcasting. The first was the NAB demo of the Eureka 147 system. I was not impressed with the signal dropouts and artifacts in that system. Then there was the first iBiquity system, using the PAC algorithm. I thought the artifacts in the audio were terrible. Later, when I heard iBiquity had arranged with Fraunhofer, I was excited. (Fraunhofer was the developer of the MP3 algorithm.)

### ON THE AIR!

How does it sound? Actually, it is very good; for a 96 kbps stream, the quality is excellent. If you put raw audio into the IBOC exciter, you do notice some coloration. This is easily overcome by using some processing. Personally, I see no reason to squeeze and scrunch up IBOC audio; the whole purpose of IBOC is to improve audio. While the dual processor system seems reasonable at first look, it would only work correctly if the processing system could have different degrees of processing for each output.

Coverage of the system is good, especially when you consider the IBOC signal is over 20 dB down from the main carrier. When the receiver unlocks, the system reverts to analog. The "blending" is transparent, with very few noticeable glitches. I drove around Las Vegas with the 6.8 Second delay on the analog signal turned off. In this way, I could easily tell when the system blended.

Obviously, my installation was done with the help of many quality people. It should be obvious that a great deal of planning is required to implement this new technology with a minimum of problems.

*Joe Sands is Chief Engineer for the Beasley stations in Las Vegas, and very tall for his age. He can be reached at [joesands@joesands.com](mailto:joesands@joesands.com)*

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# Digital Radio Installation Checklist

by Frank Foti – Omnia Audio

[CLEVELAND, Ohio - April 2004] Whenever a new technology or paradigm presents itself, there is usually no benchmark with which to reference or compare, so early adopters often endure the brunt of the rollout process. The following checklist was assembled to assist broadcasters with the rollout and installation of Digital Radio.

## ✓ MOVING TO DIGITAL RADIO

IBOC digital transmission has been approved by the FCC for use in the USA since October 2002 primarily using the iBiquity system (sometimes called HD Radio). Although commercial radios are just now appearing in stores, broadcasters need to begin transmission in order for the consumer market to develop.

HD Radio setups for FM and AM are basically straightforward, but there are some items that need attention and consideration in order for a seamless installation to proceed. It is strongly recommended that you investigate what is required *before* embarking. For example, you may need to add another transmitter, and it is critical that your conventional transmitter has the required headroom in the power amplifier if you are going to implement high-level combining. Additionally, you need to make sure that there is enough source power to handle another rig.

## ✓ COLLECTING INFORMATION

Start by opening a dialog with transmitter manufacturers and related equipment vendors to ensure your installation will operate as desired. Aside from the transmitter folks, it is a good idea to review your plans for STL, audio routing, audio processing, remote control, transmission line, dummy/reject load, and antenna. Block diagrams that detail equipment placement are available from each of the transmitter manufacturers.

The system approach can prevent situations like the major-market FM station that was dumped off-the-air due to an audio failure of the HD Radio exciter. Because the conventional audio path was routed through the HD exciter, it took the conventional transmitter down with it. This occurred not because anyone was negligent, but because they were dealing with a *new beast*, and the conventional path got lost in the planning process.

Thus, it is a good idea to ask as many questions as possible before embarking on this effort. As with any new tech, field experience will provide additional information to guide all of us. Since HD Radio is still in its first stages of evolution, please consider this checklist as a "starting point."

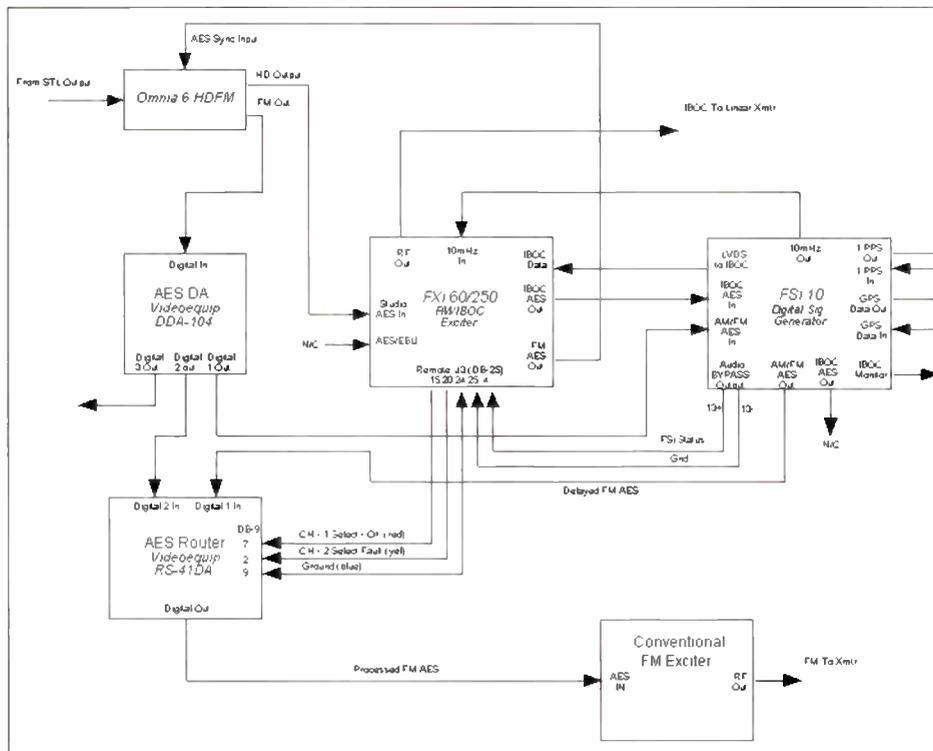
## ✓ STL ISSUES

The STL system does not have to be digital. As long as there is a conversion method at the transmitter site, the input audio can arrive via the STL in either analog or digital format. For example, if the STL system is analog, and is connected to a digital audio processor at the transmitter site, then the processor will provide the A/D conversion (more will be discussed regarding audio processing later). The assumption here will be that a digital STL is going to be employed.

The key issue here regarding the STL system is the combination of sampling rate and desired HD Radio audio bandwidth. The HDC FM System is capable of 20 kHz response, while the HDC AM System provides 15 kHz response. If you desire to offer 20 kHz audio

response for HDC FM, then the STL system *must* employ a sampling rate of 44.1 kHz or higher in order to pass the upper spectra.

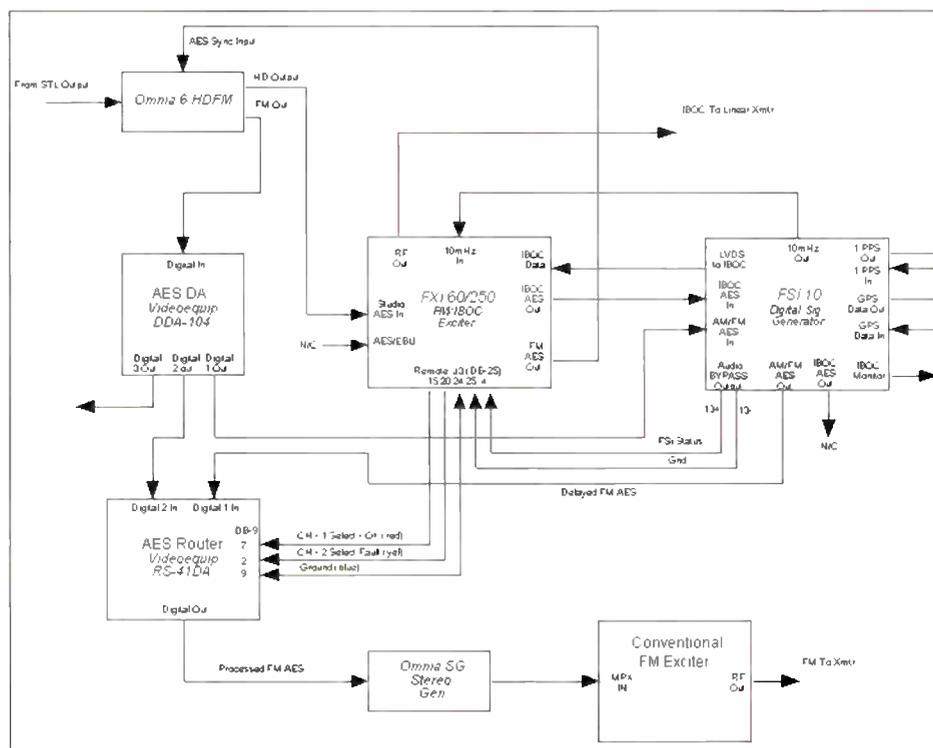
Since the HDC system requires a 44.1 kHz master clock, there is a subtle advantage to using a digital STL system that operates at 44.1 kHz too, as it will eliminate one more sample-rate-converter (SRC). But this is only an advantage; not a requirement, as STL systems employing either 32 kHz or 48 kHz sampling will work just fine.



HD Radio AES BYPASS Configuration For Broadcast Electronics  
Single Audio Processor

## ✓ AUDIO ROUTING

This area of your HD Radio installation is quite possibly the one that will cause the most confusion. It is vitally important to fully understand the audio routing layout of your proposed installation. The HDC system employs a master clock to sync everything to a 44.1 kHz sampling rate, but each of the transmitter manufacturers provide



HD Radio AES BYPASS Configuration For Broadcast Electronics  
Single Audio Processor and External Stereo Generator

their own method for audio routing and sync capabilities. Make sure to study and understand this aspect or problems will develop. Ensuring that your processing is operating in-sync with the HDC system and set to the correct sam-

pling rate will have a positive effect on on-air audio quality.

Also, it is important to have a *bypass* plan should the HDC exciter fail. The reason is that the diversity delay for the conventional (analog) channel is usually added in the HDC exciter. Thus, if the HDC exciter fails for any reason, it takes the conventional path with it, and then *both* channels are off-the-air. (Sorry to say – it has already happened to some folks.)

Below are sample block diagrams for systems providing automatic bypass switching should the HDC exciter fail. As of this writing, this layout works with the BE system; as other bypass plans are designed, they will be added to the information found on our website ([www.omniaaudio.com](http://www.omniaaudio.com)). We are not product-specific with regards to system use, but do wish to offer ideas that will help for specific product configurations. (It is best, of course, to verify these or any plans with your respective manufacturer.)

Note that in the block diagram, the processor block can be any device of your choice, as long as it contains the required I/O to work within the system. It is quite possible this same layout can be used with other transmission equipment than Broadcast Electronics, but again, it is best to confirm with your vendor.

## ✓ AUDIO PROCESSING

This section is not about how to adjust processing for HD Radio – it is in regards to how processing is implemented within the system. Processing can be used in two configurations: two separate units (one for HDC and one for conventional broadcast), or a single dual output *combo* processor that provides dedicated processed audio for both channels. Either method will work; the choice is basically determined by user preference.

As stated earlier, it is vitally important to make sure the sync method is set up properly and the correct output sampling rate of 44.1 kHz is used. Some HDC exciter require an external master clock that may be provided via the processor – but if the processor is being synchronized from the HDC exciter, then a paradoxical situations exists when the units power up, as a free-running condition can occur and no audio will pass through. Methods are being developed to insure this does not happen. If you choose to use the two-processor system, make certain that both processors are configured correctly with regards to sync and sample rate.

There is also the issue of how to implement composite clipping/processing on the conventional channel. The diversity delay that is added to the conventional channel renders the processor's internal composite clipper/stereo generator useless – unless you choose to not use the diversity delay.

But all is not lost! A separate external stereo generator that accepts an AES input will work. Refer to the diagram at the left for an example of how an external stereo generator can be inserted; in this example, the external generator contains a composite clipper/processor, so the ability to add composite clipping is once again available.

Even though the modern digital exciter for the conventional channel provide an AES input, field experience has proven that processor system-provided stereo generators provide better peak control and cleaner limiting/clipping functions. This is another user preference, and it needs to be stated that the AES inputs on the conventional exciter will also *electrically* work, but the subjective issue regarding how it will sound (when compared to the previously described method) must be given consideration.

(Continued on Page 12)



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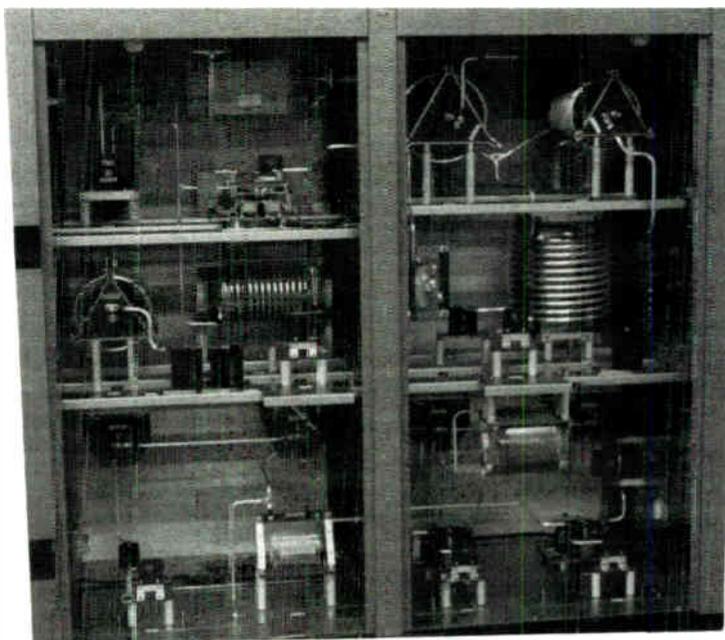
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# Digital Radio Installation Checklist

Continued From Page 10

## ✓ THE TRANSMITTER

Just as with processing, there are two methods available for HD transmission: Low-Level and High-Level. These terms refer to the method of combining the two RF signals.

Low-Level is a low power method that diphxes the output of the HDC and conventional exciter and then that signal is passed onto a common RF amplifier. The critically important factor here is that the RF amplifier must provide enough system linearity in order to pass the multiplexed signals without degradation. If you want or need to continue using your existing transmitter, contact the manufacturer to see if your rig will qualify to operate in this manner.

The High-Level method is the diphxing of two separate transmitters into a common feedline. The important criteria for this method is to make sure that the transmitter for the conventional signal has enough headroom to overcome the insertion loss of the combiner, so that the same RF power is delivered to the antenna.

This is important to note if the existing conventional transmitter is going to be used, because if the transmitter is already operating at or near its maximum rated output level, the insertion loss will reduce operating power to below the proper level. Remember, RF power level equates to coverage area!

Speaking of power: When implementing the High-Level method it is imperative that AC service is properly augmented to insure that there is enough juice to keep the plant running smoothly. This can easily be determined by observing the power demands of the added transmitter and associated ancillary equipment.

## ✓ DUMMY/REJECT LOAD

Most transmitter suppliers specify a reject load for the diphxing system, for either High-Level or Low-Level combiners. Care must be used when working with combiners and reject loads, as severe damage may result if proper operation is not observed.

Do not take any chances when specifying the reject load, as it must bleed off varying levels of RF energy as determined by the power requirements of your facility. Consider this: If an under-rated reject load is used and a problem develops within the system wherein the load cannot handle the RF power, severe damage will occur to your RF amplifier sections.

## ✓ TRANSMISSION LINE

While it might not seem significant, it is also important to make sure that all combined power levels fit comfortably within the specifications of the transmission line. And make sure all RF connections are tight and there are no pressure leaks within the system.

## ✓ RF SWITCHING/ANTENNAS

It is worthwhile to take the time to plan out the RF switching to account for the various RF configurations. For example, it would be prudent to have a well-thought-out scheme to bypass or switch out either transmitter for maintenance or troubleshooting purposes. Additionally, if an auxiliary or backup transmitter is part of the plant, you will need to determine how it will continue to function in the new HD configuration. Also think about how your dummy loads will be accessed for testing purposes.

Double-check to confirm that your antenna can handle the new level of RF power. This would also be a good time to make sure that it is optimally tuned to match your frequency. Remember, there will now be added RF spectra on the outskirts of your channel passing through your system; tuning and linearity of the transmitter and antenna are essential to successful operation.

## ✓ MONITORING FUNCTIONS

After conversion to HD, the conventional channel will still need all of the same power level and modulation monitoring functions that were required previously. The antenna/directional specs must be maintained for AM; the HDC transmitter needs a power level monitor. It is a good idea to have access to an indication of reject load level, too.

Modulation monitoring becomes a thing of the past in the HDC world, as there is a maximum ceiling of 0dBfs that can be used. It is not possible to overmodulate the HDC system.

## ✓ REMOTE CONTROL

Good engineering practice necessitates that any added transmission equipment have the capability of being controlled remotely. It would be a good idea to ascertain that the existing remote control system and interface can accept not only the added transmitter, but also any ancillary switching mechanisms. Tally and control of these functions will be an important aid when the need arises for switching or troubleshooting of the RF plant.

## SUMMARY

While some of the items mentioned here might seem like topics for a broadcasting primer, we have already encountered quite a few issues that were due to a simple item being overlooked. The HDC Radio system has the potential to provide an exciting experience for your listeners. We hope this guide helps you make the transition successfully.

*Frank Foti is the man behind the Omnia audio processors, and has spent a lot of time dealing with the issues digital radio presents to broadcasters. Foti can be reached at padrimo@telos-systems.com*

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# Things You Need to Know

by Barry Mishkind

*This is a recurring column intended to bring to your attention issues that may have an impact on your station's operation and planning.*

If you are contemplating a new tower or ground system in the near future, you may wish to move now to "lock in" the price with your tower contractors.

According to Ron Nott, of Nott, Ltd., in Farmington, NM, activity on the scrap iron market has resulted in sharply rising prices for steel. And with recent increases in copper prices, both copper and brass are more expensive, as well.

In turn, Nott has advised his customers: "Suppliers have notified many tower companies to expect "substantial increases" in the costs of steel and copper. This might have some effect on your plans for the months ahead, and you may wish to seek to 'lock in' prices."

## IRON HEADED EASTWARD, PRICES UPWARD

The reports related by Nott suggest that companies in China appear to be buying as much scrap iron as they can find, with the current price of \$100 or more per ton reflecting a tripling or quadrupling of the normal selling prices.

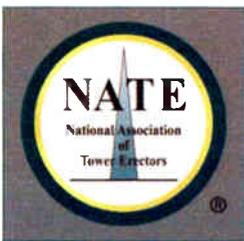
As this ripples through the manufacturing process, various advisories foresee steel and brass prices going up from 20% to 50% in the coming months. Other commodities may also be affected by what Chinese industries will need and purchase.

Clearly, even single tower installations could find themselves significantly overrunning their construction budget if these price increases catch stations by surprise. And, those who have installed multiple towers and larger ground systems can only groan over the thought of having to explain such potentially huge jumps in the costs. Even a scheduled ground system refurbishment could become a nightmare project.

## RAW COSTS MOVING UP

Industry trades show several copper mines reopening, something they do when the price of copper is expected to rise and stay higher than normal. Nott pointed to at least one mine that hired several hundred workers, a large number in these days of highly automated mineral production. "in order to take advantage of the higher prices on the markets." Brass, which is produced with copper, is already bearing a 25% "surcharge" for some deliveries.

The 1200 tower companies and riggers meeting together in late February for the National Association of Tower Erectors Convention in Nashville, Tennessee, received and digested some of this information. Those NATE members will now be better equipped to provide guidance to stations trying to understand the dynamics of planning for a tower or ground system installation.



## MORE CHANGES

Another announcement at NATE was the aftermath of the ROHN bankruptcy. According to Nott, "At least four suppliers will be making ROHN clones or something similar. They are Nello, Central Tower, Sabre and Radian/ROHN."

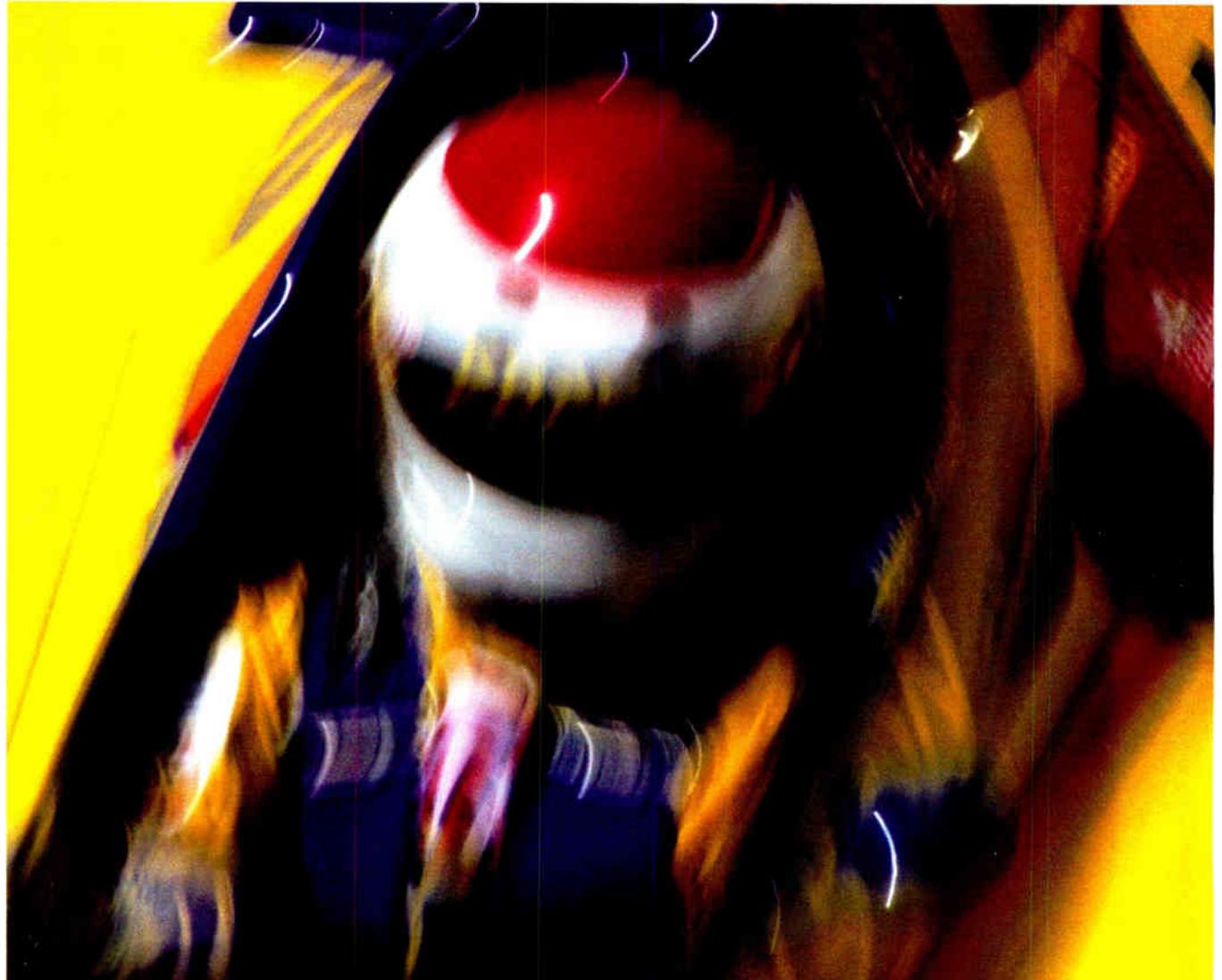
Radian Communications Services Corporation [see *Industry Update on page 30*] has purchased the remaining assets of the ROHN Industries. A Canadian company, Radian is a leading designer and manufacturer of towers, masts and antenna mounts for broadcasters.

wireless telecommunications, lighting, wind power and utility transmission/distribution sectors since 1948. In addition to the product lines, David Brinker, P.E., the head of ROHN's highly regarded engineering group, has been hired by Radian.



Nott says it was said that "Radian will close the Frankfort, IN facility and move back to the old plant in Peoria and build towers under the ROHN name. Their larger towers will be built in Canada."

This should provide continuity of parts and technical information on the ROHN line to the many users (there may be as many as 100,000 ROHN towers around the continent). Meanwhile, Sabre will make a similar tower to the ROHN 25G except they will use flanges instead of slip-in connections.



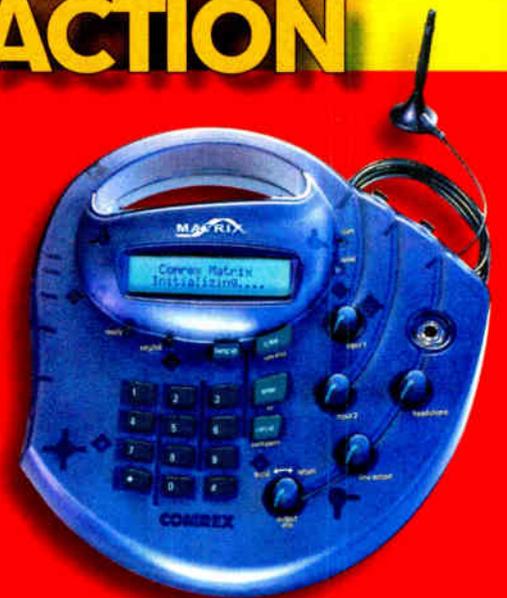
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# Prophet Systems Programs Innovations

by Donna L. Halper

This article is part of a series looking at different broadcast automation systems. Since they all use computers and sound cards, they all schedule the hits, spots, and record programs from satellite feeds, the key question is "What makes 'XX' different?" Donna Halper shares some of the reasons why many stations choose Prophet Systems programs.

[QUINCY, Massachusetts - April 2004] Automation is a fact of life these days. Station owners have many choices when seeking the right system for voice tracking, transferring audio files, and keeping multiple stations with multiple formats operating smoothly. Over 1600 radio stations worldwide use digital automation equipment from Prophet Systems Innovations (PSI). While the company has only been around for about 15 years, it has made a dramatic impact on broadcasting.

Many of these users are part of Clear Channel Communications, the large radio group that owns Prophet. Some users have been on board since the early 90s, when Prophet was getting started, as well as others who have chosen the product recently.

## GETTING STARTED

The story of Prophet Systems innovations began with veteran Nebraska broadcaster Ray Lockhart. Ray had worked as General Manager of KOGA Radio in Ogallala (about three hours from Denver) from 1967 till 1974, when he bought the station. He soon added KOGA-FM, as well as several stations in Colorado and Arizona. But in the late 1980s, when it was time to replace some of his old analog equipment, he could not find automation equipment that met the needs of his stations.

Lockhart and son Kevin decided to develop a system of their own. Kevin Lockhart had grown up with radio, working in just about every capacity. But it was his technical expertise that helped him handle the challenge of designing a system that could store audio directly on a computer hard drive. The first version was known as the AudioProphet, and in 1989, Prophet Systems was born.



Then in 1993, along came the AudioWizard. Users recall the early DOS-based incarnations. And while the new versions had more useful features, they also had some typical new product problems. Kelli Cluqué, today Program Director of KCXX (X 103.9) in San Bernardino, CA, remembers her experience with AudioWizard in the mid 90s. "I was using it at KNCN in Corpus Christi, TX," she says, "and it crashed a lot. And back then, there was a real problem getting support for it – the company only offered tech support during normal business hours."

Such problems, stemming from growing pains have been overcome. Support is excellent these days, says Cluqué. "Prophet is the best. I can get help from them any time, 24 hours a day. They are very quick to respond." She uses Prophet's NexGen at her current station. NexGen was developed in the late 1990s; the name referred to its being the next generation of digital automation. Cluqué could not be happier with it. "NexGen is so user-friendly that I don't have many problems at all."

## FAMILY VALUES

And that is the way everyone at Prophet wants it to be. Prophet is still a family-operated company. Ray Lockhart has retired, but Kevin is the President, and his sister Jackie is the Vice President of Marketing. The company's home office has remained in Ogallala, where it employs nearly a hundred people. Says Jackie Lockhart, "We are all radio people. We love radio, and we try to keep up with what our customers might need. We are always trying to make improvements."

In 1998, Prophet was sold to Capstar, and is now part of Clear Channel. However, Lockhart stresses that Prophet is an independent division. "Clear Channel is our largest customer – about 2/3 of the stations using Prophet. But we also have 1/3 of our customers who are not part of Clear

Channel." And she points out, some of her customers are small operations.

For example, KUOZ is a student-run college station at the University of the Ozarks in Clarksville, Arkansas. Professor Susan Edens decided she wanted the best balance of features without an onerous learning curve. And with Prophet in use in so many markets, it made sense to train her students "with something that they would likely encounter on their first job."

Edens said she had looked at several systems, and "having a professional background in both Talk and Music radio, I know the importance of software that is so reliable it is almost taken for granted. I've used other automation/management systems that constantly have to be re-configured and babysat whereas ... Prophet Systems stood head and shoulders above the rest."



KUOZ Copywriter and DJ Kristen Cousar

A system at Sun Sounds, a radio reading service for the blind, demonstrates the ability of NexGen to handle a wide range of applications. What is unique about this installation is that the company was able to modify NexGen to integrate itself with a voice synthesizer in order to provide directions to the blind or visually impaired announcers and board ops who use the system.

## IMPROVING THE PRODUCT LINE

Prophet continues to improve and up-grade its products. NexGen is now up to version 2.4. "We learn from each up-grade," says Jackie Lockhart, "and we try to make each one easier to install." Not every up-grade has gone smoothly, however. Several engineers and program directors who did not want their names used told me Prophet sometimes rolls out up-grades too quickly, without having adequately tested them.

Lockhart admits there have been occasions where the bugs were not entirely worked out, but says the company is known for being very responsive when there are problems. And to be fair, the people who told me they had had problems all agreed Prophet made a sincere effort to resolve them.



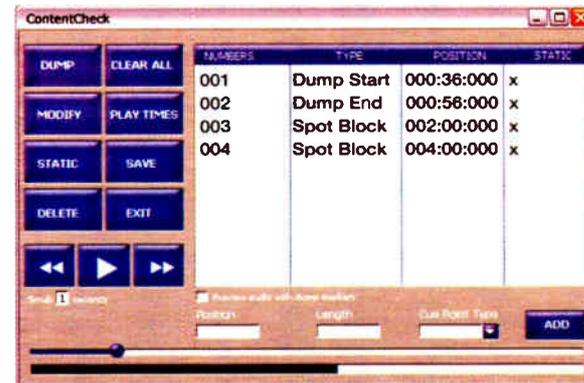
PocketGen on a PDA

Prophet is also known for developing new products solve problems for their customers. One of the newest offerings is PocketGen, software for the PDA. PocketGen allows the transfer of digital files from a remote location back to the station. It is especially useful to news reporters, since it permits information to be recorded and sent quickly.

According to the Prophet website, "PocketGen will run on handheld devices which are running the PocketPC 2000, 2002, 2003, Windows CE, and .NET versions 4.1 and above. An HP iPaq h5555 model offers a combination of features that are well-suited for use with the PocketGen

software, including 128 MB RAM and 802.11b wireless connectivity built-in." The basic package including the hardware and the software is currently available for less than \$1000.

Another recent product came about as a result of the controversy over indecency on the airwaves. Jackie Lockhart explains that stations were demanding a way to keep profanity or questionable comments from getting broadcast, and the typical 7-second delay was not flexible enough.



Prophet's ContentCheck software permits the PD to set a delay of any length up to 60 minutes, as well as being able to monitor and even edit entire segments of a show in a way the listeners will not even notice.

## SMOOTH OPERATING

As for NexGen2, it has earned a reputation for flexibility, since stations can purchase the modules that meet their specific needs. PDs say NexGen's features simplify their workday. "What I really like about NexGen," says X 103.9 PD Kelli Cluqué, "is that I don't have to go back to the traffic department if I need to make changes. And I can modify or add in something right in the studio."

Cooper Fox, formerly the Operations Manager at Clear Channel's WVOM in Bangor, ME, agrees. "On the News Talk side, the autofill options really cut back on time spent editing logs. And on the music station side, the voicetracker system is phenomenal! The ability to alter the way two songs segue is especially useful on CHR and Urban stations where you want a good mix."

George Nicholas is DE for NewRadio Group LLC, a 27 station chain of AM's and FM's in Wisconsin and Illinois. He says, "One of my first challenges was to develop a digital playback standard for the critical first-year capital expense rollout. [We chose] NexGen, currently running in four of seven markets, with the other three converting this year."

"What I really like about Prophet Systems is the stability in their company. Our decision to choose NexGen is partly because of our management team's previous ties with Capstar. We've been working with the same crew for quite some time. I have been impressed with their development of new products and enhancements to the NexGen software. And Prophet's pricing became very competitive, which allowed us to configure the systems to improve programming as well," said Nicholas.

## ECONOMICAL CHOICES

Jackie Lockhart is pleased with comments like these. "Some people think we are probably not affordable, but it's just not true. Depending on what you need, you can get started for as little as \$4000. We are proud of our prices. We put them right on our website so that anyone can see them."

A basic system like the Studio 11 – aimed at the stand-alone stations and enables them to do voice tracking and music scheduling – is advertised at \$4500. More complex systems such as the Studio 44 ("the most powerful of the NexGen 2 Audio Workstations") come with an audio card containing 4 stereo inputs and 4 stereo outputs, and two 8x2 audio switchers to switch both the outgoing on-air signal and incoming audio to be recorded by the Digital Reel-to-Reel. Studio 44 costs \$9700.

Finally, a product with the most reasonable price of all – free. Prophet is currently allowing free downloads of its music scheduling software, MusicGen. "We hope that once people try MusicGen, they will want to try some of our other products too," says Lockhart.

More details about Prophet Systems many products and services can be found at: <http://www.prophetsys.com/>

Donna Halper is a radio veteran, programming consultant, historian, author and lecturer at Emerson College in Boston, MA. You can email her at [dhl@donnahalper.com](mailto:dhl@donnahalper.com)



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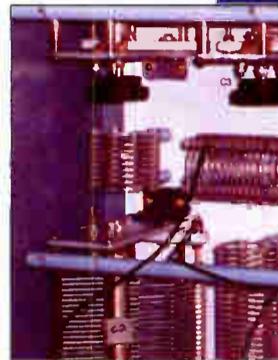
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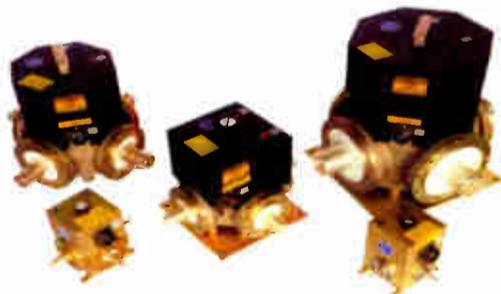
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# It's Zephyr's 10<sup>th</sup> Birthday

## What clients are saying about Zephyr Xport and Zephyr Xstream:

"We do a lot of remotes... we use Zephyr Xports for about half of our remote broadcasts. My remote tech tells me 'It doesn't retrain or drop. The connection is very stable.'"

*Vic Jester, Market DoE, Radio One, Atlanta*

"We sent stereo music and two presenter microphones into the Zephyr Xstream and applied basic limiting using the built-in processor — the mixer is very flexible and easily configurable, making it simple to set up in the field."

*Alex Lakey, Chief Engineer, Virgin Radio*

"Xport's audio quality is outstanding. The *aacPlus* algorithm provides great fidelity... Every hit, the metal sticks hitting each other, conversations from the field, all were reproduced with great clarity over the POTS line."

*Michael Black, GM, WEOS, Geneva, New York*

"I was wary of using a compressed link, but the Zephyr Xstream's AAC algorithm is incredible. The on-air audio is the best we've ever had."

*James Turvaille, Chief Engineer, WAY-FM Media Group*

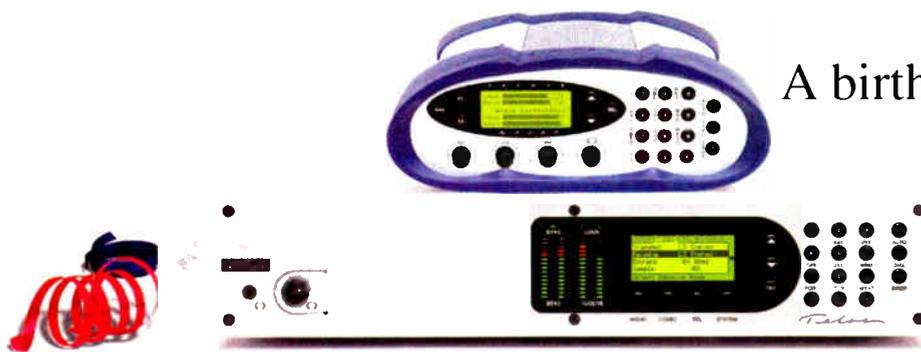
"We were out in the mud [at the Bonnaroo Music Festival] and the phone line had been run over by a thousand cars. But the Zephyr Xport worked great!"

*Jake Glanz, Engineer, Sirius Satellite Radio*

"Zephyr Xstream is in a class of its own, the only codec really worth having for main broadcast ISDN."

*Graham McHutchon, Senior Sound Supervisor, BBC News*

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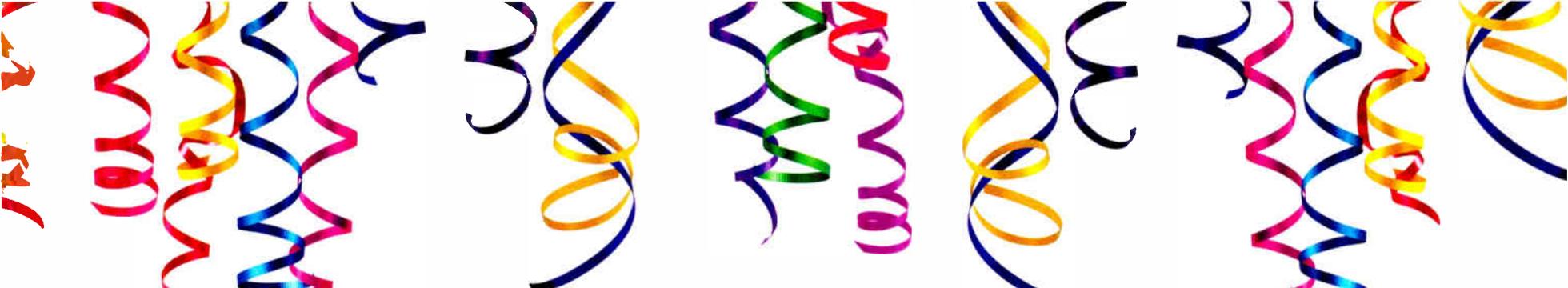
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but you get the present).

with ISDN in 1993, we had no idea that their offspring would grow up to be a codec ever. But it has, and its popularity keeps growing – there are now codecs in radio stations and production studios around the globe.

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# Technical Support Forum

## Doing Tech Support and Loving It

by Kevin Clayborn

[TEMPE, Arizona - April 2004] I love my job.

Now that is a strong statement to make in today's American workplace, is it not? Yet, it is quite true. I do love the work I do. Why? Because I like finding solutions to problems. And I like people. Especially you people: the readers of this magazine. Engineers and others in the radio business are a very interesting lot. Indeed – you fascinate me.

I have worked for Circuit Research Labs for 11 years now. Seven of those years were as the Customer Service Manager for CRL. The past 4 years have been in a variety of roles, including, but by no means limited to, Sales, Product Manager, and now Orban Customer Service. Many of these roles I have filled concurrently.

### ATTRACTED TO RADIO

Like most of you, as a kid I enjoyed staying up late at night and listening to the nine transistor radio. It was fun trying to listen to KOMA at 2:00 in the morning. When I joined the military years later, a job as an Avionic Communications Systems Specialist (Air-craft Radio Technician) seemed like just the ticket. Talk about pulling in distant stations! How about a contact at Hickam Field in Hawaii from McGuire Air Force Base in New Jersey?

When it came time to leave the service, I sought a job in broadcasting, naively thinking that since radio towers do not move, the stations do not move either! I worked for a small AM/FM combo in Tucson, AZ as Chief Engineer before joining CRL. What an experience: there are not enough pages in this magazine to cover all the stories I have from the short time I worked there!

In the years that I have worked for CRL, I have indeed "met" some very interesting people on the phone. So much so that I keep a map on the wall in my office and use stick pins to locate where some of you are.

### UNUSUAL LOCATIONS

The map helps me remember you – and your stories. Like the small AM in the mountains of Virginia where the mortuary answers the phone. (This particular station is located in a small town, about 20 miles from where my dad was raised as a kid.) Then there is the station in Nebraska with an STL hop over 100 miles long! It is a regional network, and that is how they service one of their affiliates.

Other interesting locations include the station in Hawaii where the tower is built on lava rocks (I would like to see that one some day). And there is a station in rural Alaska where they drive on the rivers in winter to get to town (I do not ever want to see that one!).

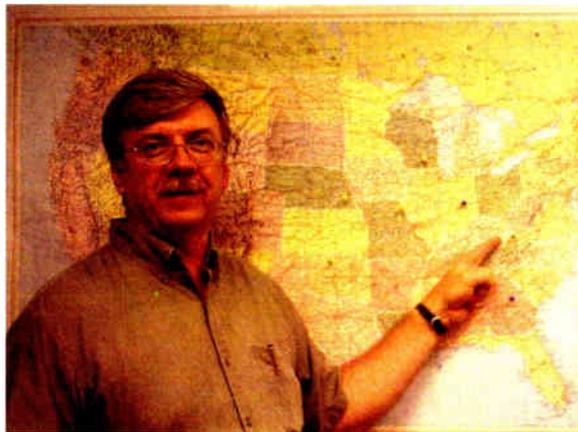
It seems like the most interesting calls from you folks always happen around 8:00 AM. When I arrive to find a call on the answering machine, or the phone rings at 8:02, it can mean only one thing: someone else got up at "Oh Dark Thirty" for a problem at the transmitter building.

### UNUSUAL PROBLEMS

One guy in Oklahoma called me every morning for about a week asking why his unit would be noisy in the morning, but get clearer during the day. After about a week of troubleshooting, we found that the problem was really the STL receive dish frosting over during

the night, then melting off slowly as the morning wore on. The condensation at the connector would partially short out the signal until it dried.

Another 8:02 AM call came from a guy who had been up all night installing equipment at the transmitter building so he could go on the air the next day. Everything worked like a charm, except the audio processors – all three units. And, all had the exact same problem: no power. Needless to say, this fellow was wondering if any one at CRL had parents that were married.



Kevin Clayborn reflecting on his unexpected call to the Mortuary.

The troubleshooting call went something like this: "Are all of the units on the same circuit?" "No." "Are they on the same power strip?" "No." He had changed them. Perhaps, and this was a long shot. "Were the fuses of all three of the units blown?" He would check. The phone was laid on the table and then a variety of expletives were heard and a very upset gentleman wanted to know just where were the power cords? They were not in the box. They all were plugged into the wall sockets. Unfortunately, the other ends of the cords were not plugged into the units! Don't you just love all nighters?

### MORE POWER HASSLES

Speaking of power, why do you folks trust the power company so much? A few years back an engineer in the deep, deep woods of Minnesota called to say that his unit would not stay on. It would simply turn itself off and then back on. About half the time, it would blow the fuse. He knew what the problem was: He was at the end of a 20-mile long run on the power grid. He was lucky if the power company could keep 100 volts AC, much less the normal 120 V.

Since the unit would sometimes pop the fuse on power up, he doubled the rating of the fuse from a quarter amp to a half amp. (Seriously – why do you people do this?) But while the fuse held, the bridge rectifier did not fare so well. After fixing his unit here at the plant, we ran some current load measurements on it. We wanted to see how much amperage it would draw, before smoking. The answer? A whopping 0.4 amp. We gave him special permission (so as not to void his warranty) to install a one-third amp fuse. Happily, it has stayed on the air since.

Not more than two months later, I got another call, with similar symptoms. This engineer was in a remote area of New Mexico. (Why do you folks build radio stations in such remote areas?) He had purchased the unit new, six months earlier at the beginning of the

year and it was working well until just that very week. It would blow a fuse, everyday between 3:30 PM and 4:30 PM. Ah ha, I thought! "Are you at the end of the power grid?" "Yes."

I figured this would be an easy fix: "What is the line voltage?" "120 VAC." I quickly gave up on the concept of it being an easy fix. So why did it blow fuses? It would only happen when the air conditioner turned on. Strangest thing he had ever seen. Each new fuse would work until the next day when the A/C cycled back on again. We finally determined the Run-Start motor on the A/C would draw just enough current to blow the fuse on the Amigo FM, and by the time he replaced the fuse, the current draw had settled down.

Sadly installing a one-third amp fuse was not a viable solution for him. However, his solution was to put the A/C on a generator. An ingenious fellow; he rigged the thermostat to start the generator, which would then start the A/C unit.

### REPLACEMENT PARTS

Our colleagues around the world are experts at doing much with little as well. Think how you have to improvise at times when the right part is not available. Now, think how difficult it would be if there were no Radio Shacks at all! Or, if the only way to receive parts was by a courier service.

I once sent four diodes to a gentleman in Lagos, Nigeria, only to have him call five weeks later asking where the parts were. When I explained they were sent via the mail, he said if that was the case, he would never see them, so would I please re-send them via courier. I did and he received the diodes a week later. He was right by the way. He never did get the diodes I sent by the mail. They were returned to me as undeliverable – 11 months after I had sent them!

Some of the best calls I get though are from "Wanna-bees." Luckily I do not get many of them. But when I do, the questions are real doozies. The most frequent question from a Wanna-bee is "How much does it cost to start a radio station?" A long time ago, I settled on a "Number," what it would cost to put a station on the air – just for the equipment alone – \$104,624. It included everything from a pair of microphones to an antenna, and everything in between. The "Number" seems low now; I guess I should update it. But the funny thing is that I never get any call backs asking to buy the equipment after I tell them the "Number."

After hearing stories like these at the dinner table, is it any wonder that none of my children want to follow me in the business?

### CHANGED EMPHASIS

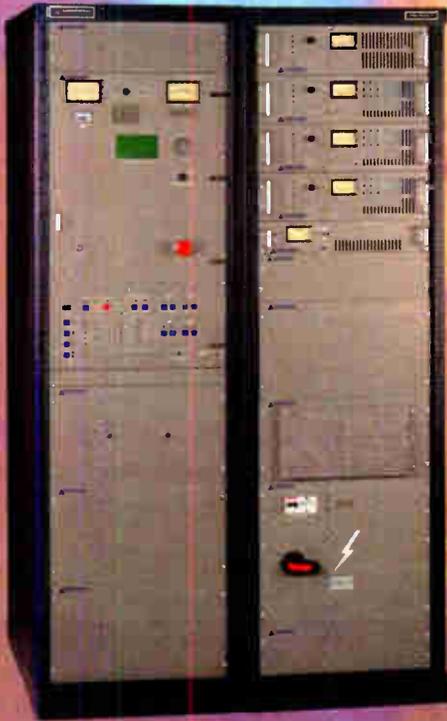
Calls today are different than they were ten, eight, or even just five years ago. Then, calls were about resistor changes, modifying filter curves, frequency responses and inter-connectivity of the units. Today I receive calls regarding the plethora of Windows operating systems and their interconnectivity to our equipment. Terms like High Q, steep roll off, and flat response, have been replaced with null modem, RS232 and ComPort. There are days when I think I should send Microsoft or IBM a bill for my time.

Nevertheless, the excitement I felt 11 years ago is still there. I look forward to each day. I may work indoors in a nice climate controlled office, but it is never the same old grind day after day. You folks provide me with unique challenges. I truly thank you for that.

I love my job.

*Kevin Clayborn is the voice of Orban Customer Service and CRL Product Manager. He usually can be found somewhere in the southwest corner of the map, where he is ready to help solve your problems. Call him sometime at 602-483-0888 and let him know how your day is going.*

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# An EAS Case History

## Part 2 – The Postmortem

by Clay Freinwald

*Virtually everyone in the system did exactly what they were supposed to do. Yet, there it was - a crawl on the local TV stations, scrolling over and over with the announcement that "... the Civil Authorities have issued an Immediate Evacuation Notice for Snohomish County, Washington." This month, Clay reports on an "event autopsy" held at a local meeting of stations and officials, and results that followed from it.*

[SEATTLE, Washington - April 2004] Somewhere between the scene of a gas main leak, and the crawl on local television screens, a problem occurred. Even as many radio stations identified the exact area of concern, and officials were thankful for the alert to the public, it was clear that one part of the system could cause widespread panic. That was the lack of detailed information in the scroll after the initial alert.

It did not take long after the event for the "fall out" and "post-mortems" to begin. Along with the successful evacuation of the area to protect residents came the questions: "Why did the television stations fail to transcribe the voice message from their EAS receivers?" "What about those people, including the deaf, who got only the crawl?" "How can we protect and not cause panic?"

### INITIAL REACTIONS

We have a continuous "virtual meeting" on the Washington State EAS Remailer. After the alert, the volume of postings quickly shot upward and enabled a lot of steam to be vented. The primary complaints were from TV stations that were very displeased with what took place. They were calling for major changes that would eliminate what they viewed as misleading information being distributed. As it turned out, this was the perfect "lead-in" to our regularly scheduled SECC meeting.

Prompted by comments on the Remailer, a lot of new faces were present at the table, including representatives from all the major TV stations in the area, representatives from the government entity that had initiated the EVI message, and many other interested parties. I knew that this was going to be a most interesting meeting. Indeed, the stage was set for a lot of finger pointing.

The TV stations felt that - at minimum - the Evacuation Notice was misleading; the actual area affected was a few blocks in size and did not involve the 600,000 or so other citizens of the county. The TV stations wanted them to stop using EAS until the matter could be resolved. The government agency that initiated the EVI said they just used the tools given to them, and defended the use of the EVI stating that this was about saving lives and they were going on the side of caution.

### SEARCHING FOR SOLUTIONS

My role, as moderator of these sessions, is to try and find common ground and help develop solutions. This was clearly a situation where a compromise was required, and where one would be acceptable provided defined steps were taken to insure the matter was not just be placed on the back burner and forgotten. In general, here is what we came up with:

1. TV stations really need to understand the necessity of getting the information contained in the Voice Portion of the message into their crawls. With current technology, this requires procedures and labor at the TV stations, something not well received by most stations.

2. The duration of the crawl needs to be examined. Initiators of messages, and stations, need to do their part to make sure that crawls do not run on and on, without the specifics in the Voice Portion to back them up.

3. Cable TV systems need to examine how they handle these situations. It was noted that there is a new effort to

reverse the way cable and TV Stations handle EAS events. TV stations presently are very displeased with the fact that cable systems can take them "off the air" during events like this - even if the TV station is providing greater coverage.

4. The Event Location Code (FIPS) may need some adjustment to better use the Location Code scheme, permitting greater resolution as to the locations of events.

5. The possibility of transmitting the information contained in the Voice Message in the form of data was deemed worthy of exploration.

By the end of that meeting, all parties came away with a better understanding of what EAS can and cannot do, and what can be done to make it more effective. The good news is we all agreed that working together on these issues is the best way to find and implement solutions. More good news was that some of the mechanisms put in place back in 1997 when our plan was first implemented are serving us well in the present.

### IMPROVING THE LOCAL SYSTEM

Several of the key points of discussion from the Washington State SECC meeting can be applied to help improve EAS operations (and enhance cooperation among the many users) in your area. Let us take a few moments and examine the above points in some detail:

1. **The crawl versus the Voice Portion.** Radio can learn from TV's problems in dealing with the information in the Voice Portion of the EAS message. Station(s) need to know ahead of time how they are going to deal with EAS in general. While this process often is left to the Engineer, I submit programming and perhaps management need to be involved.

Different events often require different actions and live operations should have specific procedures for dealing with each. It is critical that all parties understand a total EAS message needs to reach the listener, and how to do that. Unattended stations are pretty much stuck with the transmission of one-time messages (unless management makes an effort to enhance these alerts).

2. **Crawl length.** The time the crawl continues needs to be revisited in detail. Everyone agreed there is no need to continue a crawl on cable systems for extended periods without the additional information contained in the Voice Portion of the EAS message.

3. **Cable systems.** Cable operations need to be fully integrated into the EAS. Perhaps existing EAS committees should consider an "outreach." While EAS is an outgrowth of the EBS (which we have been dealing with for years), EAS is something relatively new for cable.

4. **Location codes.** A greater understanding of the use of the Location or FIPS codes is essential. Snohomish County encoded their message as 053061 (ALL of Snohomish County), although only a portion of the County was involved in the evacuation notice. Currently, a county can be divided into up to nine different segments; had the code been 253061, all would have known that the EVI was applicable to only northern portion of the county, potentially an area 1/9th the size of the whole county.

Using this technique, the TV stations would have been running a crawl clearly showing the evacuation was not meant for the whole county. Radio stations would have seen the county sub-division on their EAS printer tape as well as seeing it displayed on their Display Sign.

If counties in your area are not ready for sub-divisions, your SECC or LECC has some work to do! It is vital to be able to specifically identify the location of an emergency, and get all parties on board with this process. With recent changes in Part 11 naming conventions, counties can be more easily sub-divided along conventional or historic lines - sub-divisions recognized by the residents who live

there - so when EAS messages are targeted to that portion of the county, they know it is meant for them.

Once the local government entities are on-board with the sub-divisions, the process can move forward to implementation.

a. Governments can release maps showing these sub-divisions for the benefit of the citizens (and the Media) via print media, hand-outs etc

b. All Broadcasters (and other EAS sources) will need specific instructions as to how to deal with this new level of information.

c. Perhaps existing EAS plans will require changes or updates.

All of this work should be coordinated by the SECC and/or applicable LECC.

### MUCH GREATER DETAIL

5. **Adding data to the alert.** Getting additional information into EAS messages in "data-form" is a goal for all to work toward. The SBE and others called for this in the last round of Part 11 Rule changes, but no one had a method and/or system ready to go. The FCC did leave the door open to consideration of this; apparently they want to see something proven first.

The idea is to permit the information contained in the Voice Portion of the EAS message to be delivered to recipients in data or text form. In the case of the Snohomish County incident, this would have enabled the initiator to convey all the information in the Voice Portion to the TV stations who could, in turn, add it to their existing crawl thereby enabling TV to carry the entire message as well as repeat it for a longer period of time.

This would require EAS message initiators have additional equipment enabling a text version of the voice message to be added. At TV stations, hardware changes would add this information to the stations text crawl coming from the Header Codes. Extending this concept to radio would be natural. I can imagine a text reader (think NWR) that would enable repeating messages etc.

During the debate in response to the last EAS NPRM there were a couple of suggestions for dealing with the issue. One was to insert a data version of the voice message within the present Voice Window. However, with most EAS boxes limited to 60 seconds of voice, this would effectively reduce the amount of time that a voice message could run.

Another suggestion was to insert such data after the existing message. This concept would only work where there are "background channels" to handle the distribution chores. Certainly one could not expect a Broadcast Station to run data after the transmission of an EOM. So, either way, to make such a system work might require considerable equipment modifications.

Whatever approach eventually is taken, it appears there is certainly a need for expansion of the text delivery system for public warnings via EAS. Not only would this benefit the Television industry, but this addition to EAS would enable many other systems to become more fully integrated. Existing communications systems, like pagers, cellphones, wireless PDAs, etc. could then receive the information, as well as RBDS systems and highway signs.

The ability to send text specific to the emergency appears to me to be a vital and next step for EAS. The only thing at this point lacking is someone to step forward with an integrated and fully tested solution. As soon as this is done I look for many to quickly jump on board, including the FCC.

### IN CONCLUSION

The incident involving the EVI in Snohomish County was not recorded as one of those "%&#EAS blunders," but rather was viewed by most of the Washington SECC as a call to action. EAS should not be viewed as a static system, but rather as a dynamic and evolving one. For the 99.9% of EAS that is voluntary and not regulated by the FCC, we are free to invent, create and improve. I encourage you to also "think outside the box." I would love to hear your suggestions.

*Clay Freinwald, Senior Facilities Engineer for Entercom in Seattle, is Chairman of the SBE's EAS Committee as well as chair of the Washington State SECC. He welcomes your comments and suggestions at k7cr@wolfenet.com*

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# FCC Focus

## EEO Cited for Gross Complexification

By Ken Benner, NCE

[TUCSON, Arizona - April 2004] A few weeks ago the SDFPRGCFP&JS (Society for the Development, Furtherance & Perpetuation of Really Gross Complexification for Fun, Profit and Job Security) awarded its "Most Ignominious Award" to the creators of the current version of the FCC's EEO and its related Public File compliance requirements.

Society spokesperson, Herkimer Schmalz\* explained, "The NAB booklet of 36 pages detailing '10 Steps to EEO Compliance' along with the FCC's numerous required forms quite likely renders this item the most gross of any item ever nominated for this ignoble distinction."

Many folks regard the EEO Public File folder primarily as a defense against substantial fines and/or loss of license in the event of a petition to the FCC to deny a broadcaster's license resulting from some allegation of employment discrimination (in addition to providing substantial retirement income for the Washington legal lobbyists).

All this has prompted requests from several **Radio Guide** readers for a good faith effort to demystify FCC EEO requirements, including one from Steve Tuzeneu, OM of WVNE-AM, Leicester, MA. Well Steve, we will try, but do remember I am not a lawyer, and the following is not to be construed as professional legal advice, but rather a good faith effort on behalf of our colleagues in Broadcasting.

### EEO THRESHOLD

If your station has five or more full-time (30 hours or more per week) employees, you are required to jump through the FCC EEO compliance loops. I suggest you obtain a copy of the booklet "EEO Regulations for Broadcasters - A Primer on Current FCC Requirements" (available free at

www.wcsr.com), or the NAB's booklet mentioned above (at a nominal cost).

Through all of this, remember your primary goal is to inoculate your station(s) from a successful effort resulting from a petition to deny your license, generally at license renewal time, which is just around the corner for most of us.

### THE THREE PRONGS

Compliance with EEO is really not all that difficult. We accomplish this primarily by documenting with what the FCC calls "Prongs" - three of them in fact:

**Prong 1:** Involves disseminating widely info regarding every full time (30 hrs/wk or more) job opening.

**Prong 2:** Notifying recruitment organizations, i.e. State Broadcaster Associations, schools teaching broadcasting, the NAB, the Internet, etc.

**Prong 3:** Develop other non-specific initiatives, for example: job fairs, public appearances of talent, intern programs, etc.

What we have established here is that we want job candidates to apply regardless of race, color or creed and employment for our operation is without regard for discrimination to any extent. Our profession is quite unlike almost any other area of employment. These kilohertz and megahertz upon which we operate are public domain and they belong to everyone equally and no one has the right to discriminate with regard to who has the right to make a living off of the broadcast spectrum.

Be sure to carefully document all of your "Prong" efforts.

### EEO PUBLIC FILE ITEMS

What goes into the Public File Folder for EEO? It is not really all that involved (Official FCC 396, 397, 396-A forms to cover all of this can be obtained at [www.fcc.gov/formpage.html](http://www.fcc.gov/formpage.html)):

1. A list of all full-time jobs (30 hrs/wk or more) filled by the station, identified by job title.
2. A list of recruitment sources, newspaper ads, State Broadcasters' Associations, job fairs, etc., used to seek candidates for the job(s).
3. A list of recruitment sources, newspaper ads, etc., that resulted in hiring of the successful candidate.

4. A data list reflecting the number of persons interviewed for all full-time vacancies during the preceding year.

5. The total number of candidates provided by each source for all vacancies.

6. The total number of candidates provided by each source that the station interviewed for all vacancies.

7. A description of any non-job specific outreach activities completed during the year (i.e., job fairs, talent visits to broadcast schools, seminars on the joys, big money and glories of broadcast employment, etc.).

### RENEWAL TIME

Two EEO Public File Reports for the two-year period that precedes your filing of a renewal application must be submitted with your application as an attachment to Form 396 (FCC form "Broadcast Equal Employment Opportunity Program Report"). Stations with more than 10 full time employees must file two prior EEO Public File Reports with the FCC as part of their mid-term license review.

Carefully using the FCC or NAB booklets will provide all the info needed to be fully confident of compliance with FCC EEO (Also check with your State Broadcast Association website for any late-breaking recomplexifications for EEO.) Even if you miss an item or two you will be able to certify under oath that you did all you could and in good faith complied to the best of your ability. In my 45 years of broadcasting I have never known anyone fined by the FCC for doing their best in good faith.

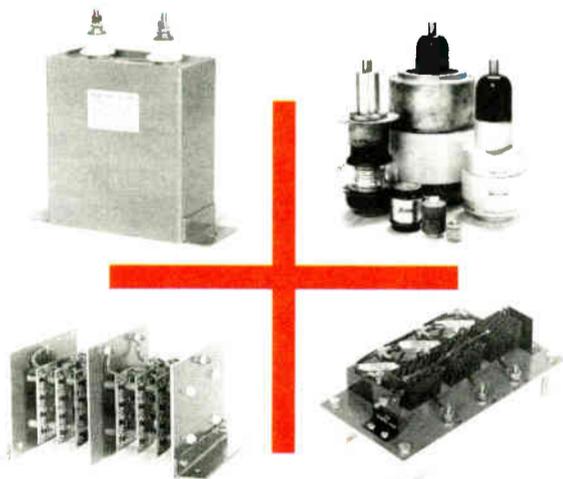
The FCC Enforcement Bureau are all good people doing a good job and they fully understand the complexification syndrome under which we are all encumbered. Do your best; never try to bluff. Document everything, answer their questions, explain everything to the best of your ability and you will find common sense and good faith will always outweigh even the most preposterous efforts to complexify.

*\*Note: Schmalz is in reality the Chairman, Executive Director, Membership coordinator, fund-raiser, sole member of the SDFPRGCFP&JS and author of this column.*

*Ken Benner - who never has a strong opinion on anything - is an active AIP inspector. Ken can be reached at [bennerassociates@aol.com](mailto:bennerassociates@aol.com).*



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	3.5 kW	1992	Harris HT3.5
	5 kW	1983	Harris FM5K
	10 kW	1980	Harris FM 10K
	10 kW	2000	Harris ZD10CD
	20 kW	1978	Collins 831G2
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20 kW	2000	Harris Z20CD	
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30 kW	1986	BE FM-30A	
50 kW	1982	Harris Combiner(w/auto exciter-transmitter switcher)	

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# Radio Guide Book Shelf

by Ray Topp

## Marty on the Mountain

38 Years on Mt. Washington

Author: Marty Engstrom

This is not a book *about* technology. As you read, it becomes clear its focus is not the nuts and bolts of broadcasting – you will not find a circuit diagram or tech tip. I was surprised at first not to find at least a block diagram of the systems he faced. But other than a few black and white photos, it became clear that few visuals *were* needed – it was all in the telling. This is a story of a man's life *with* technology.

Fresh out of the Air Force, with a fresh First Class FCC License, Engstrom found employment at WMTW-TV8 – on Mt. Washington in New Hampshire – for 38 years. Most of us probably cannot comprehend that length of service – at the same location no less. I had to laugh when Engstrom first described himself as a Mountain Man. But after reading this book, I learned it is a serious and well-earned title.

### UP AND AWAY

During winter months, you do not jump into your car for the trip to the summit of Mt. Washington. The transmitter crew shift change would board a Sno-Cat with their winter gear and perishables – then head up. Above the tree line – past survival shelters and fuel storage tanks – the TV buildings would soon become Engstrom's home every other week – for many years.

The 36-foot x 70-foot TV building had it all: living room, bathroom, bedrooms, kitchen – with enough food and staples to last a two man crew for a year.

As important as the transmitters were, it was the engine room with its three Caterpillar engine/generators that were the life of the installation. There were no power lines to the site, so all electricity had to be generated locally – and continuously.

### THE WEATHER SHOW

I have never been surprised at what stations will try to extract from their engineers. But a live weather show from *that* transmitter site? The nearby Weather Observatory had been doing the weather shows for some time, but then they asked for more money. You can guess the rest.

Armed with an old monochrome vidicon camera on a shaky wooden tripod, and six 300W floods, these engineers managed to do a regular show. After the video signal was passed through the "master switcher" (with parts from old WWII gear), viewer's TV receivers regularly lost sync.

There is an entire chapter devoted to Pushka – their resident cat. In a technical environment, with open racks and such, you would think a cat would be as welcome as a bad connection. But any cat that could hold its own against weasels – and win – was probably a good thing to have around.

### PARKER'S WAY

Engstrom's description of Chief Engineer Vincent Parker is simple: "It did not matter what the station owners or managers wanted, it did not matter what local, state, or federal laws, or FCC Rules required. It did not matter what the laws of physics dictated, things would be done Parker's way – that was it – no room for arguments or discussion."

Parker was a man who could get things done, and in his position as CE of this vital and remote site, that was a quality more important than most. I am not sure how well the two got along, it does not say – but maybe it did not matter.

### WHY HERE?

Engstrom asks a question that I had been asking myself as I read: "Why do we go to all this trouble to operate a TV transmitter on the mountain that is famous for 'the world's worst officially recorded weather?'" This is where he went into the details of propagation, and we were reminded why a 50 foot tower was all that was needed.

At this site, 30 foot visibility, 100+ MPH winds, below zero temperatures, and 10-20 foot snow drifts can combine to create some very nasty conditions.

He describes dealing the various forms of rime and blue ice and their effects on the transmissions. With hundred pound chunks of falling ice, it could be a hostile work area.

### THE ENGINE ROOM

At this point, you might believe that routine was the order of the day. I learned how serious things could become in a very short time when Engstrom discovered a tripped transmitter and loud noises coming from a generator in the engine room.

No sooner had they switched to the alternate generator, than the noisy unit blew off its side panels and dumped gallons of hot oil and 60 gallons of anti-freeze on the floor – and they *still* had to remain in the room to try to shut it down!

### THE NEW TRANSMITTER

While working on the main transmitter, the standby quit. Hasty repairs were made to the old main, but too many bypasses and unavailable parts soon resulted in a "conversion" of management. Results: a new Harris HT-20-HS.

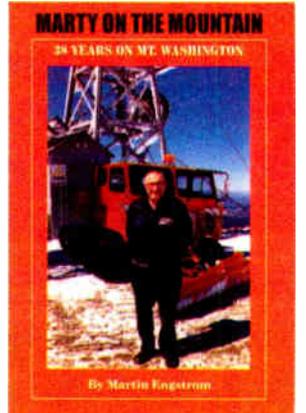
The removal of their old RCA (what else) TT-10/25BH is a story in itself, which will have many of you thinking back to those de-installs with nicked dikes from cutting through still-live circuits. The installation of the new solid state transmitter would have more effect on the future of those station engineers than they could have imagined at that moment.

His most telling words are: "The job which I had studied for, trained for – and worked for all my life – no longer existed."

Many of us have had the pleasure of employment in the broadcasting business. We have all seen changes, and most of us have learned to accept why they were needed. Still, the "Good Old Days" can be looked upon with pleasure, and this book will help.

Engstrom's personal philosophy? "I have always taken the attitude that anything that needed to be done, and anything that I was asked to do or told to do, I could and would do it – and do a good job of it."

This book may be ordered for \$16.95 on-line at: <http://www.mountwashington.org/catalog/books/stories/>



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**Rack 1**  
0 90.9 WHYYY  
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63.9  
MODULATION

**Rack 2**  
2 98.1 WOGL  
SET FREQ CALL  
102.7  
MODULATION

**Rack 3**  
6 101.1 WBEB  
SET FREQ CALL  
107.4  
MODULATION  
109  
LEFT CHANNEL  
105  
RIGHT CHANNEL  
RDS INJ 4.3 %

**Rack 1 FMMA-1 TOTAL**  
FMMA-1 TOTAL Bar Graph  
PEAK 107.4%  
AVE 94.2%  
MIN 51.0%

**Rack 2 FMMA-1 TOTAL**  
FMMA-1 TOTAL Bar Graph  
PEAK 107.4%  
AVE 94.2%  
MIN 51.0%

**Rack 3 FMMA-1 TOTAL**  
FMMA-1 TOTAL Bar Graph  
PEAK 107.4%  
AVE 94.2%  
MIN 51.0%

**Rack 1 FMMA-1 TOTAL vs Time**  
PEAK: 63.9% AVE: 48.1% MIN: 33.1%  
Percent vs Seconds  
3/24/2004 4:56:56 PM

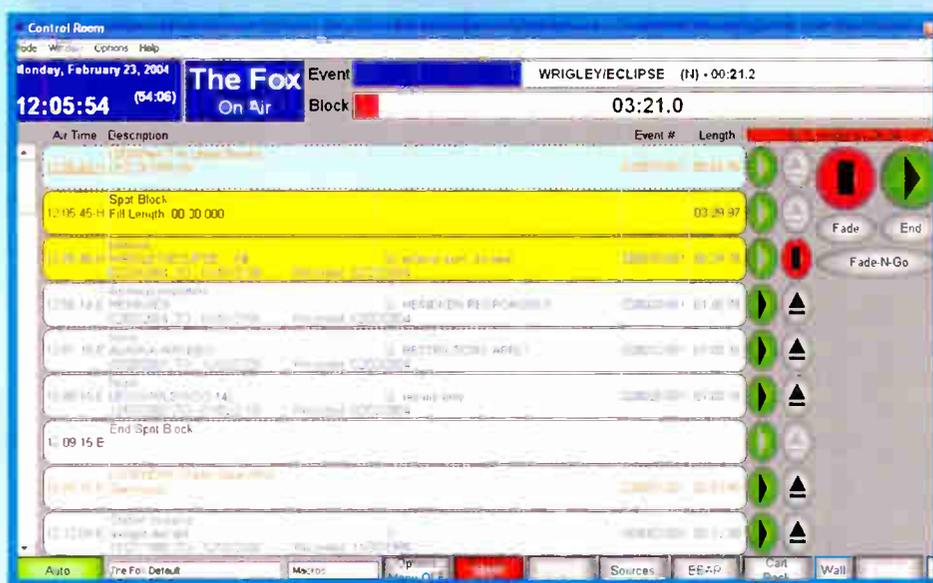
## If you haven't looked at us lately.



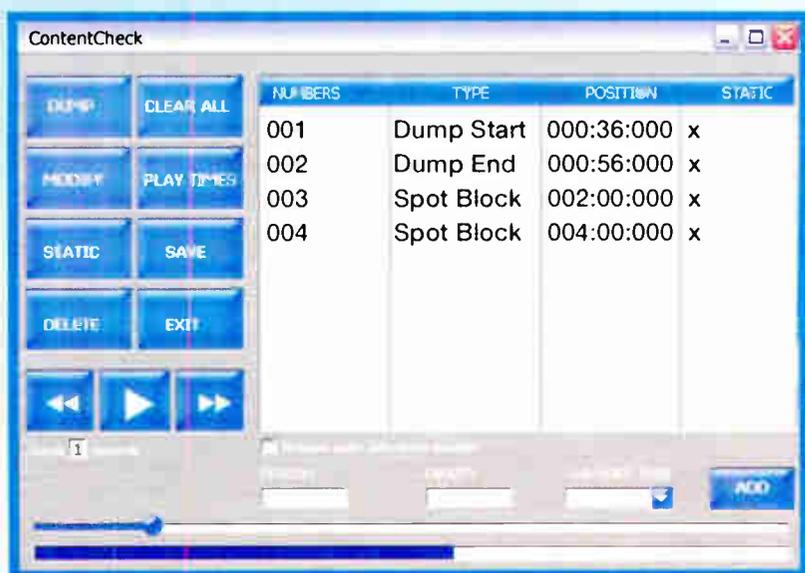
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## Decade

The **FM-850** is a professional grade mono/stereo, 1.8 Watt FM transmitter operating in the commercial FM broadcast band (87.9-107.9 MHz).



Both models (FM-800 & FM-850) can be used as a stand alone FM transmitter or as an FM exciter for greater RF power (RF power amplifier required). The FM-800 series are currently the best affordable, stable and trouble free FM transmitters available on the market today; thanks to its new auto-compensation circuitry that will assure optimum RF linearity on a temperature range of -50°C to +50°C (-58°F to +122°F). The stereo generator of the FM-850 model features a full digital circuitry that allows a stereo separation greater than 45dB. Both models feature an incredible carrier frequency tolerance equal to, or greater than .0008%.

### Decade Transmitters Inc.

Toll free: 1-888-428-4323  
Website: [www.decade.ca](http://www.decade.ca)

## Energy-Onix

The **ECO-25**, 25KW FM Broadcast transmitter is one of the most popular high power FM transmitters produced in the United States. It is normally used with 6 bay CP antennas to produce 50kW ERP stations or with 10 or 12 bay antennas to produce 100kW ERP. It contains the field proven 3CX15.000A7, zero-bias, triode in its final stage.



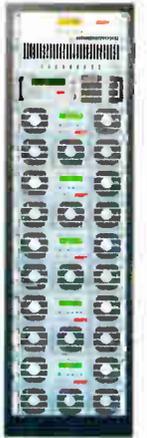
This tube is operated in a grounded grid configuration and does not require any neutralization. It is available in single and 3 phase. It contains a broadband 2KW solid state IPA with (41 hot pluggable) 500 watt modules as well as a frequency agile, 100W Stealth exciter. Normal delivery is 30 days.

### Energy-Onix Broadcast Equip.

Phone: 518-758-1690  
Website: [www.energy-onix.com](http://www.energy-onix.com)

## BEXT

Bext Corporation introduces the **FD10000** Solid State Transmitter at NAB 2004. The FD Solid State Transmitter/Amplifier Series from Bext starts out with the FD2000, a 6 rack spaces high 2 kW stand-alone unit, also used as building blocks for higher power units.



The FD10000 is a 10 kW complete transmitter with 5 FD2000s, a combiner and an exciter, in a single 19" rack cabinet. Each FD2000 section is a self-contained, independent 2kW amplifier.

It is possible to pull out one (or more) of the FD2000 sections, place it in your car, and go use that section as a stand-alone 2000W somewhere else, all the while keeping the FD10000 on the air at reduced power.

### BEXT Corporation

Phone: 888-239-8462  
Website: [www.bext.com](http://www.bext.com)

## Nautel

The **Maestro M50** is Nautel's new Direct-to-Channel exciter for FM and HD Radio. It employs advanced Digital Signal Processing technology enabling direct conversion of the audio source to the low level FM signal. The exciter accepts data from Nautel's NE IBOC generator to produce a hybrid or all-digital HD Radio signal.



An adaptive pre-equalization process compensates for system non-linearities to ensure the HD Radio signal is transmitted within spectral limits, avoiding the need for supplementary filtering.

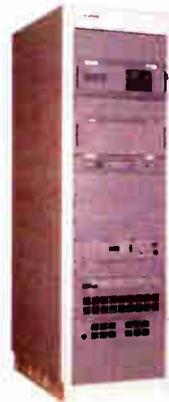
The M50 is frequency agile and suitable for N+1 applications. Advanced control and monitoring including an LCD graphic display and status flow diagram.

### Nautel Transmitters

Phone: 902-823-2233  
Website: [www.nautel.com](http://www.nautel.com)

## Harris

The **Mini-HD™** transmitter series are ideally suited for applications that require a low-power digital signal, including space combining with interleaved or separate antennas, dual port antennas, FM combiner port injection, or high-level combining with a two-transmitter coupler.



The new Harris Mini-HD™ FM digital transmitter line features four models that will offer from 10 to 600 watts of digital-only power.

Mini-HD is the only low-power FM HD Radio transmitter line with Harris' exclusive IP2D linearity maximization circuitry that eliminates a costly external filter and meets FCC mask requirements.

### Harris

Phone: 800-622-0022  
Website: [www.broadcast.harris.com](http://www.broadcast.harris.com)

## Armstrong

Armstrong Transmitter proudly introduces the **X1000B** 1KW, HD Radio Ready, AM Transmitter.

Built with dual hot-swappable 600 Watt RF modules capable of 150% modulation, X-1000B can bring that major market sound to your radio station. Engineered with the latest technological innovations, the X-1000B offers high reliability, built-in redundancy and it is HD Radio™ ready.



Best of all, our customers tell us that the money they save running the X-1000B pays for itself with savings in electricity and maintenance costs over an older transmitter ... and as a bonus they get exceptional reliability and that major market sound for free.

### Armstrong Transmitter

Phone: 315-673-1269  
Website: [www.armstrongtx.com](http://www.armstrongtx.com)

## Broadcast Electronics

Broadcast Electronics is the only broadcast manufacturer making HD Radio-compatible, low-powered FM transmitters with outputs below 3.5kW for separate antenna configurations.

Broadcast Electronics low-powered **FMi-73** broadband transmitter, shown, is capable of outputting 280 watts HD Radio only (or 700 watts combined FM analog and HD Radio).

Using the FMi-73 in a separate antenna configuration eliminates injector loss and the associated cost of a high-powered transmitter to handle the loss.

BE's FMi-73 is just one in a complete line of FM transmitters for HD Radio, which step up in power to 14kW combined FM analog and HD Radio output.

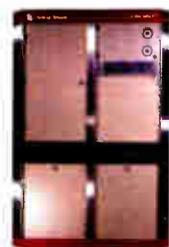


### Broadcast Electronics

Phone: 217-224-9600  
Website: [www.bdcast.com](http://www.bdcast.com)

## DRS Technologies - Continental

DRS Broadcast Technology will be introducing the new Continental Electromes™ 815D5 and 815HD line of Solid State FM Transmitters at NAB2004 Show, booth #N2402. This transmitter line wields a unique combiner system option that insures that the most RF possible gets to the output in the event of single or multiple amplifier module failure.



All of the Continental Electromes™ FM transmitters use our "Soft Start™" power control to gently apply primary voltage to the transmitter. The control and diagnostic system is of a rugged and simple design so that rapid repairs are made possible.

This is just the beginning of a long plan of new innovations to come from our plant in Dallas, TX.

### DRS Technologies - Continental

Phone: 800-733-5011  
Website: [www.contelec.com](http://www.contelec.com)

## OMB America

The **Model EM 1000** is an FM transmitter using solid-state power amplifier Mosfet technology. An LCD meter displays forward reflected power, frequency selection, power consumption, modulation level, modules voltage and current levels, etc.

There are protection and alarms system for situations of SWR, temperature, overload, over drive, and output power control for adverse conditions. The cooling system allows the transmitter to work at altitudes up to 12,000 ft AMSL. A Wilkinson coupling system between power modules gives the advantage to work without interruption with 4, 3, 2, or 1 power module, each one easy to replace in very short time. Low pass filter and telemetry outlet as standard features. It is supplied with 19" rack.



### OMB America

Phone: 305-477-0973  
Website: [www.omb.com](http://www.omb.com)



# Meet Nautel's Newest Performers

**V10** VIRTUOSO  
10 kW FM HD Radio

**J1000** JAZZ  
1 kW AM

**M50** MAESTRO  
Digital FM Exciter



## VIRTUOSO 10

New compact 10 kW FM transmitter designed specifically for HD Radio all digital or hybrid transmission. Frequency agile and ideal for N+1 configurations in conjunction with the Maestro 50 digital exciter. Hot-plug RF and power supply modules with maximum duplication and redundancy features. Sophisticated graphic user interface plus diagnostic LED flow diagram.



## JAZZ 1000

1 kW AM transmitter in compact 19" rack mount value package available for overnight delivery. Dual redundant RF amplifiers and universal switch mode power supplies. Sophisticated graphic user interface plus diagnostic LED flow diagram. Built-in power pre-set scheduler is ideal for day timers. Fully compatible for HD Radio or DRM transmission.



## MAESTRO 50

Direct-to-channel digital FM exciter for FM and HD Radio. Sophisticated graphic user interface plus diagnostic LED flow diagram. Programmable for N+1 channel and audio source pre-sets. Universal switch mode power supply operates from 90 V to 264 V AC supply.



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Photo Courtesy: Gary Zocolo

Send your information for publication to: [radio@broadcast.net](mailto:radio@broadcast.net)

## Letters From Our Readers

### Dear Radio Guide:

It was with some skepticism that I opened my first issue of **Radio Guide**. My first thoughts before tearing off the plastic wrapper were "Oh, not another advertisement-heavy, radio trade magazine, full of boring articles, aimed at programming and sales".

I was rather pleased with the premier edition here in Canada. Finally a publication directly for radio engineers and technical staff in radio! How often do we hear a particular department at a radio station touting itself as indispensable?

Radio broadcasting originated out of engineering and could probably be run entirely by engineers, if need be, albeit probably sacrificing somewhat in the area of sales, programming, management, etc. Could the same be said of all other departments?

Again, kudos on an excellent publication, keep up the good work!

**Dave Funk**  
Golden West Radio,  
Swift Current, Saskatchewan, Canada

## Radio Guide Ads: Apr-2004

Advertiser - Page	Website
AM Ground Systems - 21	<a href="http://www.amgroundsystems.com">www.amgroundsystems.com</a>
Armstrong Transmitters - 19	<a href="http://www.armstrongtx.com">www.armstrongtx.com</a>
Audion - 23	<a href="http://www.audionlabs.com">www.audionlabs.com</a>
Balsys - 21	<a href="http://www.balsys.com">www.balsys.com</a>
Belar - 24	<a href="http://www.belar.com">www.belar.com</a>
BEXT - 9	<a href="http://www.bext.com">www.bext.com</a>
Broadcast Devices - 12	<a href="http://www.broadcast-devices.com">www.broadcast-devices.com</a>
Broadcast Electronics - 7	<a href="http://www.bdcast.com">www.bdcast.com</a>
Broadcast Software Intl. - 3	<a href="http://www.bsiusa.com">www.bsiusa.com</a>
Broadcast Tools - 19	<a href="http://www.broadcasttools.com">www.broadcasttools.com</a>
Broadcast Warehouse - 11	<a href="http://www.broadcastwarehouse.com">www.broadcastwarehouse.com</a>
Conex Electro Systems - 23	<a href="http://www.conex-electro.com">www.conex-electro.com</a>
Comrex - 13	<a href="http://www.comrex.com">www.comrex.com</a>
D&H Antennas - 23	<a href="http://www.dhsatellite.com">www.dhsatellite.com</a>
Decade Transmitters - 21	<a href="http://www.decade.ca">www.decade.ca</a>
Econco Tubes - 9 & 28	<a href="http://www.econco.com">www.econco.com</a>
CKE - 12	<a href="http://www.rectifiers.com">www.rectifiers.com</a>
Energy Onix - 2	<a href="http://www.energy-onix.com">www.energy-onix.com</a>
ERI - 5	<a href="http://www.eriinc.com">www.eriinc.com</a>
Harris - 32	<a href="http://www.broadcast.harris.com">www.broadcast.harris.com</a>
Henry Engineering - 2	<a href="http://www.henryeng.com">www.henryeng.com</a>
Inovonics - 5	<a href="http://www.inovon.com">www.inovon.com</a>
JK Audio - 7	<a href="http://www.jkaudio.com">www.jkaudio.com</a>
Kahn Communications - 19	none
Lightner Electronics - 7	<a href="http://www.lightnerelectronics.com">www.lightnerelectronics.com</a>
Micro Communications - 15	<a href="http://www.mcibroadcast.com">www.mcibroadcast.com</a>
NAB - 31	<a href="http://www.nab.org/conventions">www.nab.org/conventions</a>
Nautel - 27	<a href="http://www.nautel.com">www.nautel.com</a>
Nott Ltd. - 15	<a href="http://www.nottltd.com">www.nottltd.com</a>
OMB America - 19	<a href="http://www.omb.com">www.omb.com</a>
Orban - 32	<a href="http://www.orban.com">www.orban.com</a>
Peter Dahl - 22	<a href="http://www.pwdahl.com">www.pwdahl.com</a>
Phasetek - 11	<a href="http://www.phasetekinc.com">www.phasetekinc.com</a>
Prophet Systems - 25	<a href="http://www.prophetsys.com">www.prophetsys.com</a>
Ramsey - 15	<a href="http://www.ramseyelectronics.com">www.ramseyelectronics.com</a>
RF Specialties - 9	<a href="http://www.rfspec.com">www.rfspec.com</a>
SCMS Inc. - 21	<a href="http://www.scmsinc.com">www.scmsinc.com</a>
Sine Systems - 15	<a href="http://www.sinesystems.com">www.sinesystems.com</a>
Telos - 16 & 17	<a href="http://www.telos-systems.com">www.telos-systems.com</a>
TFT - 22	<a href="http://www.tftinc.com">www.tftinc.com</a>
Tieline - 5	<a href="http://www.tieline.com">www.tieline.com</a>
Transcom - 23	<a href="http://www.fmamtv.com">www.fmamtv.com</a>

## Industry Updates

### Radian Communications Services Acquires Assets of ROHN Industries



Radian Communication Services Corporation ( Radian ), a subsidiary of Onex Corpora-

tion, announced that it will acquire all of the assets related to the tower and tower accessory manufacturing operations of ROHN Industries, Inc.

ROHN has been a leading designer and manufacturer of towers, poles, masts and antenna mounts for the wireless telecommunications, lighting, wind power and utility transmission/distribution sectors since 1948.

ROHN's product offerings, which include hollow leg towers, tapered monopoles, light towers, and tower accessories, complement Radian's extensive line of broadcast towers, solid round and angle leg towers, flange monopoles, and tower accessories. In addition, this acquisition will allow Radian to provide its full range of maintenance and installation services to owners of ROHN's products.

Together, the combined engineering leadership of Radian and ROHN has designed over 100,000 towers worldwide. The value provided by the group's collective experience will be available to all current and future Radian and ROHN customers.

ROHN's products are well established and include a broad range of quality towers and tower accessories. Radian will continue to produce, market and support all of these products, enabling us to offer a full range of telecommunications infrastructure solutions to North American and international wireless carriers, broadcasters and governments.

#### Radian Communications

Phone: 866-472-3426

Website: [www.radiancorp.com](http://www.radiancorp.com)

## Date Book

### Radio Conference Guide

List your Convention or Gathering Here  
Email: [radio@broadcast.net](mailto:radio@broadcast.net)

**NAB Spring 2004** – April 17-22 – Las Vegas, NV  
[www.nab.org/conventions](http://www.nab.org/conventions)

**Nebraska Broadcasters & SBE Chapter 74**  
August 11-13 – Lincoln, NE – [www.sbe74.org](http://www.sbe74.org)

**32nd Annual SBE22 Broadcast & Tech Expo**  
September 23 – Verona, NY – [www.sbe22.org](http://www.sbe22.org)

**Electronic Equipment Expo**  
September 28-29 – Seattle, WA – [www.emexpo.org](http://www.emexpo.org)

**Pittsburgh Chapt. 20 Regional SBE Convention**  
October 6 – Monroeville, PA  
[www.broadcast.net/~sbe20](http://www.broadcast.net/~sbe20)

**NAB Radio Show** – October 6-8 – San Diego, CA  
[www.nab.org/conventions](http://www.nab.org/conventions)

**2004 Broadcaster's Clinic** – October 12-14  
Marriot-Madison West Hotel, Madison, WI  
[www.wi-broadcasters.org](http://www.wi-broadcasters.org)

**Southwest Communications Expo**  
October 19 – Phoenix, AZ – [www.sbe9.org](http://www.sbe9.org)

**Broadcast Engineering Expo**  
October 22-23 – Grapevine, TX  
Contact: Sandy Sandberg at 214-343-3555

**Bos-Con Boston SBE Regional Convention**  
October 26-27 – Boston, MA – [www.sbe11.org](http://www.sbe11.org)

## Announcement

### Broadcast Warehouse Gold Plated Audio Processor to be Given Away at NAB2004

Broadcast Warehouse (BW) will be giving away a gold plated version of its DSPX broadcast audio processor at the NAB show in Las Vegas. Visitors who stop by booth N1710 will be able to fill out a card and a winner will be picked out in the booth on Wednesday afternoon. No gimmicks or promises, the winner will be able to take the gold plated audio processor away with them then and there.

At NAB2004, BW will be demonstrating the DSPX, a low-cost fully-featured FM, digital radio and Internet streaming broadcast processor. BW will also be demonstrating the Microgen TS9000 FM broadcast analyzer, a low-cost USB-powered FM test set.

BW will also have on show their popular range of low-power transmitters and dynamic RDS encoders.

#### Broadcast Warehouse

Phone: 888-866-1672 (6AM-3PM EST)

Website: [www.broadcastwarehouse.com](http://www.broadcastwarehouse.com)

### Nautel's User Group (NUG) Goes to Las Vegas

Nautel will, once again, host a Nautel User's Group (NUG) session in Las Vegas on April 18, 2004 from 9:00 AM until 12:00 PM at the Riviera Hotel and Casino.

NUG @ NAB2004 will feature sessions with Nautel: Customer service staff on their tips & tricks for AM and FM transmitters. Sales and marketing staff for a "sneak peek" of new Nautel transmitters. Design engineers and other Nautel users in a round table discussion about transmitter issues and solutions.

There will also be a complimentary lunch and prize draw following the NUG @ NAB2004 seminar.

We are expanding the concept of the Nautel User's Group to include: two annual NUG seminars, one at the NAB Show in Las Vegas (NUG @ NAB) and one at a Nautel facility (NUG @ Nautel); a quarterly electronic newsletter that outlines transmitter tips and tricks; and online access to Nautel's troubleshooting knowledge database.

If you would like to become a NUG member, and/or would like to attend this year's NUG @ NAB2004, please take a moment and send an e-mail to [nug@nautel.com](mailto:nug@nautel.com), indicating your name, preferred email address, telephone number. Call sign, and Nautel equipment you presently own/operate.

#### Nautel Transmitters

Phone: 902-823-2233

Website: [www.nautel.com](http://www.nautel.com)

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Visit [www.nabshow.com](http://www.nabshow.com) for a complete list.

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**Monday, April 19**

**Oprah Winfrey To Receive NAB Distinguished Service Award**

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## "Music and the Spoken Word" featuring The Mormon Tabernacle Choir

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