Radio Guide

Radio Technology for Engineers and Managers

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NAB 2004 Radio Show Exhibitor Preview

September 2004

Volume 12 Issue 9

Injecting Excitement Back Into Radio!

Distinct 5.1 Surround Audio

Page 4 – We can actually inject life back into radio – make it fun and exciting again! We have a chance *now* to breathe new life into our medium. Finally, a killer app and a compelling reason for listeners to buy digital radio receivers – and a new reason to listen to radio again.

NAB 2004 Radio Show – October 6-8, San Diego

Pages 33-34 – On these pages, you will find a showcase of NAB Radio Show equipment exhibitors. From consoles to towers – and everything in between – equipment vendors are listed, along with their booth numbers, to make it easy for you to find what you need. **Radio Guide** will be at the show as well, roaming the floor checking out the latest gear. In the October issue of **Radio Guide** we will report on what we found.

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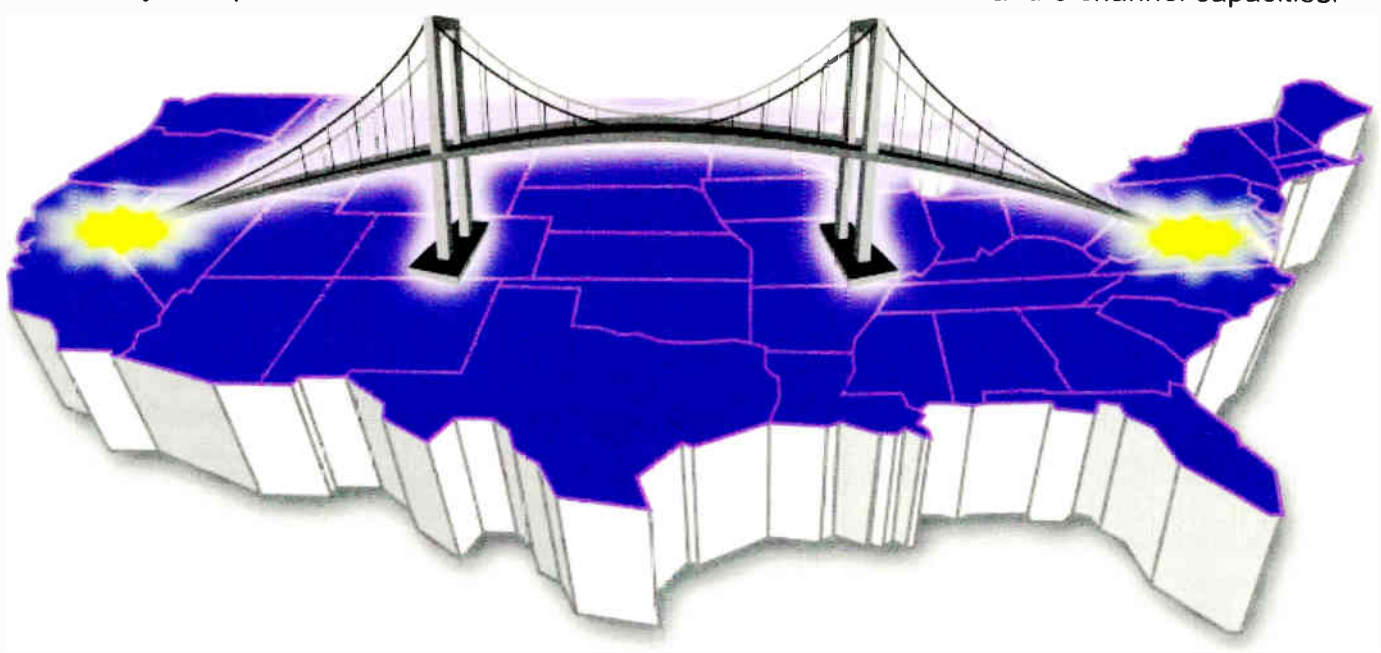

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Radio Guide

PO Box 20975, Sedona, AZ 86341
Phone: 928-284-3700 Fax: 866-728-5764

Ray Topp *(Publisher)*
Email: radio@broadcast.net

Barry Mishkind *(Editor)*
Email: editor@radio-guide.com

Cover Photo:
"Dr." Frank Foti and "nurse" Mary Ann Seidler resuscitate an ailing patient. (Courtesy Telos)

Radio Guide

Volume 12 Issue 9
September 2004

Reinvigorating Radio

Just as some pundits began to "write off" terrestrial radio as passé, several things have jumped out and given an emotional or financial boost to the industry. Love them or hate them, they have people talking, and more importantly, money flowing.

As you will read in our cover story, the advent of 5.1 transmission capabilities presents broadcasters with the potential to deliver startlingly vivid audio. Whether stations will simply modulate this with a dynamic range of 0.45 dB, or use the technology to "open up a sound" that will make people stop and listen remains to be seen.

At the same time, the recent commitment to IBOC by several of the larger groups, as well as grants to many non-com FM stations has manufacturers scrambling to build new transmitters, processors, STLs, and antennas and combiners to move IBOC onto the radio dial around the country. Whether consumer reaction is strong is yet to be seen, but the cash infusion in the radio manufacturers is indeed welcome.

Of course, all of this activity is putting additional stress on many already stretched engineering departments. This should be seen as an opportunity for industry leaders and professional engineering groups to spend a lot more time and effort towards educating station owners – and especially the local managers – on how to treat their engineering resources in a way that prevents burnout.

"There is no budget for that," just is not an acceptable answer when more manpower is needed to do a job on time *and safely*. We do not need more stories about engineers who die alone on a mountaintop.

For our part, **Radio Guide** will continue on its mission to provide you with the information you need to do your job well. As always, we solicit your thoughts.

Simian 1.6 is the result of input from numerous BSI users. Thanks to their input, Simian now includes an on-screen weather display that updates from the internet.

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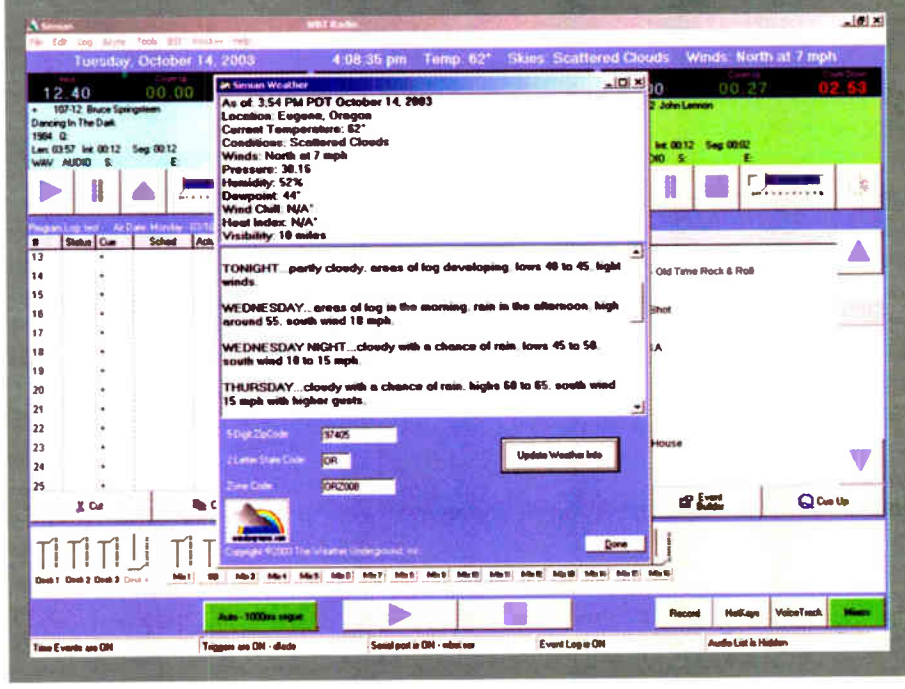

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Distinct 5.1 Surround Audio

A Life Saving Injection for FM Radio

by Frank Foti, Omnia Audio

[CLEVELAND, Ohio - September 2004] When was the last time you turned on the radio and heard something truly exciting? Think about it. Take a moment and *really* think about it. Hmmm, not easy is it? For me, it was probably during the last of the heydays of CHR, about 20 years ago, when Z-100 (WHTZ) made its run in New York City.

Radio today is losing market share to its many alternatives: mobile CD listening, iPod, XM/Sirius, and netcasting. While none of those entities alone are beating radio, combined they are eroding the listener base.

Recently at the *Radio & Records* Convention in Los Angeles, I had the following dialog with a well-known PD who did not want to admit his station was losing audience: His claim was: "Hey, even with XM and Sirius around I still have a 4.3 share in Los Angeles." My reply: "Yeah, you do still have a 4.3 share – *but the pie is smaller*. Why is that?" He had no rebuttal.

SLICES OF PIZZA

Most people can eat half of an 8-cut pizza easily. If the pizza is 12 inches round, that is a fairly large amount of pizza. However, suppose the pizza is only 10 inches round – although it is smaller, four slices is still a 50% share of the pizza. Think of radio ratings shares the same way; the radio "pizza" is getting smaller folks! If we do not do something soon, that same PD who once had a 4.3 share of a huge LA audience – and now has a 4.3 of a smaller audience – will soon have a 4.3 of next to no audience!

Fortunately, pessimism has never been my strong suit. I have heard the future of FM Radio, and it is truly exciting. The amazing thing about this new enthusiasm is that it is not a new format, super-duper air talent, or an amazing station giveaway. Surprisingly, it is technical. Now, for the first time since FM went stereo in 1961, we have technology that will blow your socks off. The ability to transmit distinct 5.1 multi-channel audio!

THE KILLER APP

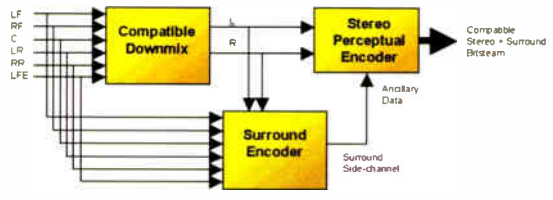
This multi-channel system invented by Fraunhofer Institute (FhG) and Agere Systems is superior in every way. It should be – it comes from people who know their stuff. The FhG folks created MP3 and MPEG AAC. They are also getting a lot attention for their new Iosono system that uses as many as 304 loudspeakers to create an amazingly enveloping soundspace for applications like high-end movie theaters. The Agere people are former Lucent and Bell Labs audio coding researchers.

FhG has been busy pushing the frontiers of audio perceptual research. The latest result is a powerful spatial audio coding system, taking advantage of the most up-to-date knowledge in aural perception. I will spare you most of the techno-babble, but this is the *only* surround system providing distinct multi-channel listening experience to the FM radio audience. It is accomplished using a technique called *coded-discrete* which prepares the audio for transmission over iBiquity's HD Radio® system.

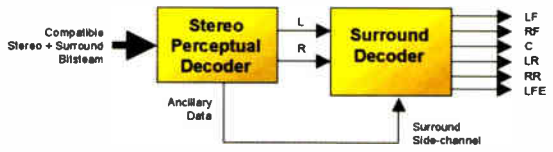
Psychoacoustics studies prove the *level difference, time difference, and coherence* between channels is what creates the perception of spatial image. The key to FhG's multi-channel system is representing these difference values with very compact coding, rather than transmitting all of the individual audio channels. The encoder estimates the values as a function of frequency (that is, within each sub-band) and transmits them to the decoder in an ancillary stream accompanying the main coded audio stream.

PUTTING THE PIECES TOGETHER

A few block diagrams illustrate how an encoder/decoder pair would work within a broadcast channel such as HD Radio. The first step is to create the compatible stereo downmix from the multi-channel material. The resulting stereo signal is coded using any perceptual codec. Since there are no changes to the basic codec, this signal can be received by stereo radios. The spatial encoder extracts the various spatial cue parameters from the multi-channel input, which are transmitted in an ancillary data channel. The decoder, if present in the receiver, recreates the original multi-channel audio.



The Encoding (transmitter) Side



Decoding (receiver) Side

You can see that we need to have a downmix function to create the compatible stereo channels from the multi-channel source. The most obvious way to do this is with simple linear combiner (where a and b are constant scale factors, with the values usually ranging from .5 to .7), as follows:

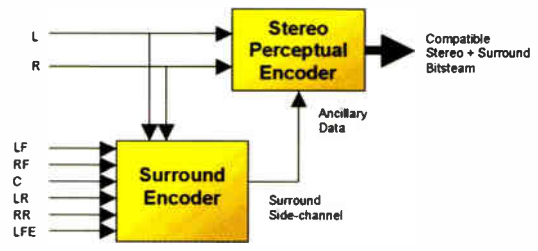
$$L = L_{front} + (a)L_{rear} + (b)Center$$
$$R = R_{front} + (a)R_{rear} + (b)Center$$

But this simple procedure is far from the best possible. When making an optimized downmix, a number of considerations come into play, from both psychoacoustic and production practices. Simply collapsing the front and back signals into a 2-channel representation may cause some confusion in the normal binaural cues and degrade traditional stereo listening. It almost certainly will sound different from what listeners are used to hearing.

SOLVING THE DOWNMIX PROBLEM

The FhG system allows a producer to make a manual downmix, thus preserving maximum artistic freedom and allowing maximum flexibility to adapt to different kinds of audio material. Since almost all music released in surround format also has a stereo version on the same disk that could be used as input to the encoder, this stereo version is what would be heard by listeners with non-surround radios – with no modification or compromise of any kind.

Advanced automated downmixing is also an option when manual mixes are not available. A processor could dynamically modify the scaling values and relative phase during mixdown. Such a processor would use advanced algorithms that can take into consideration absolute source positioning, panning laws, the way sources were mixed into the multi-channel signals, and original inter-channel phase relationships, so it would have the potential to achieve a quality comparable to manual downmixes.



Encoder using external downmix process.

All well and good, I hear you asking, but will this work with HD Radio? The astonishing answer is: Yes. The FhG spatial encoding system is fully compatible with HD Radio's current codec for the stereo channels. (The side-channel for spatial information is less than 20 kbps, a rate possible in HD Radio's ancillary data channel.)

The ISO/MPEG audio group has noted these recent advances (and their market potential) and has started a new work item with the working title *Spatial Audio Coding*. FhG will submit their spatial approach to MPEG for consideration and testing, and chances are good it, or some variation, will eventually be approved as an international standard. Thus there will be the usual advantages of MPEG: an independent confirmation of performance, and assurance of fair and equal access to licensing.

NOT YOUR DAD'S SURROUND

Again this coded-discrete system is the *only* system offering distinct surround sound. All of the other designed systems are matrix based and contain dual drawbacks that compromise and degrade the 5.1 multi-channel audio, as well as the existing stereo mix.

Consider the FM-Stereo system in place today. It offers discrete 2-channel audio with separation theoretically approaching 70 dB. I do not believe our industry would have accepted a broadcast system that passed off synthesized, fake 2-channel duophonic sound as FM-Stereo. Maybe you remember the quadraphonic systems from the 70's. They had the critical drawback that only fixed-scale downmixes are possible, so stereo compatibility suffers.

This is what the matrix proponents do: they fake the 5.1 audio channels by manipulating the original stereo mix to create the surround effect. In doing so, this technique also alters the original stereo mix so both the stereo and surround signals are in effect spatially distorted. Basically these other systems have yanked those old quad concepts from the 1970's out of the closet, and repackaged them as digital. This type of backwater tech is not the solution to boost radio listening.

For surround on radio to be respected and to successfully compete with other media, Radio needs the real thing: state-of-the-art performance – not synthesized, not matrixed, not compromised. The FhG method is innovative, totally preserving spatiality of *both* the stereo and 5.1 audio mixes.

THE TROUBLE WITH MATRIX

The critical flaw in matrix systems is the spatial distortion of the audio. (Note: distortion is being used in a different context than we normally associate with audio.) The area of concern is the loss of separation in the spatial-axial patterns between the Left-Front/Right-Rear and the Right-Front/Left-Rear channels.

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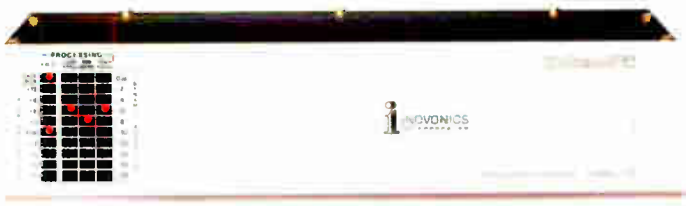
World Radio History

Indecency Processor



No, this product doesn't remove naughty words, but if you do run a profanity delay or simply have a buildup of digital latency, talent can't listen to the processed air signal. Instead, their feed is probably direct from the console. Compared to the air sound, this can seem weak, dull and lifeless.

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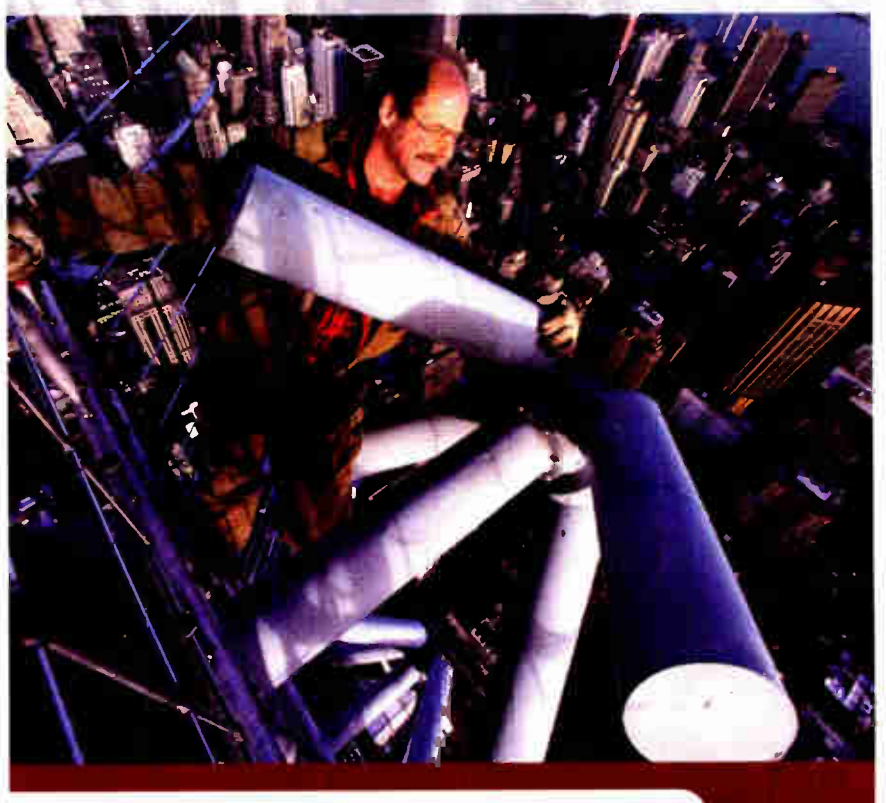

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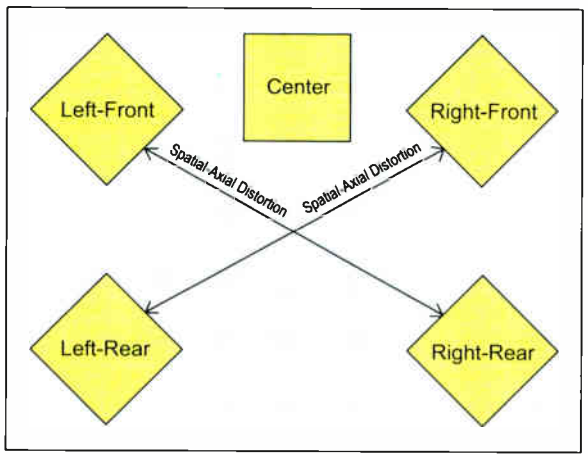
Distinct 5.1 Surround Audio

A Life Saving Injection for FM Radio

Continued From Page 4

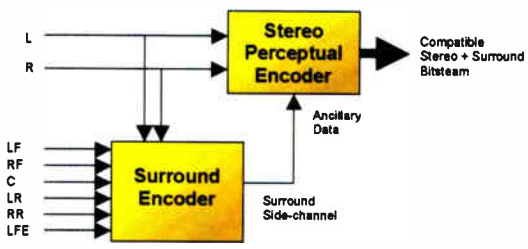
Audio signals along these two axes will tend to bleed into one another. This diagram illustrates:



The arrows correlate to the paths of perceived multi-channel artifacts. They are heard as false spatial cues and lost separation.

The alternative surround methods employing watermarking will not offer much additional benefit than matrix systems. The reason is a watermark function can not contain the needed data payload to properly manage all of the audio channels over the entire spectrum. There will be aural compromises, especially in separation and placement, sort of like lipstick being applied to the withered old lips of the failed 70's vinyl quad schemes.

This is one reason the 70's era matrix systems did not catch-on – they had a weird soft and indistinct quality in stereo. Clearly this is an important issue for broadcasters. With most people listening in stereo, we cannot afford to compromise our fundamental service. And that is why the FhG approach is so well suited to radio broadcast: the system does not depend upon any specific downmix procedure to work. Indeed, the downmixing process can be thought-of as a component outside of the basic spatial coding system.



Ask dad about this backwater tech!

Another problem with matrix schemes is poor surround separation. Matrix systems must mingle everything into a 2-channel signal, which is a crippling constraint on performance. They can have only a few dB separation between some of the channel pairs; even which channels get the separation is a design compromise. Because FhG's spatial encoding uses an independent digital side-channel and a modern perceptual approach to spatial cue encoding, it can always offer very high separation.

By the way, watch out for matrix demonstrations using material in one or two channels at a time. These are deceptive because a steering circuit detects this very directional condition and steers the strongest signal into the target channel, while reducing gain or providing some kind of cancellation in the other channels. (This approach is also a leftover from the 70's, having first been used in the Tate and Vario-Matrix "logic" schemes.) In today's digital world, there is no reason we should bind ourselves to such limited approaches.

EXCITING AND COMPELLING

Multi-channel 5.1 surround creates an impressive *theater of the mind* – something you must hear to truly appreciate. Imagine turning your Production Director loose with the power of additional audio channels on station liners, sweeps, and promos – even your commercials will sound exciting! Using surround channels offers endless creative possibilities that will stimulate live on-the-air bits, and morning show routines!

The 5.1 surround audio that accompanies DVD movies and videos has conditioned early adopters to a multi-channel world, and this is rapidly spreading to the mass audience. A common crawl on TV shows and movies is now: "This program is broadcast in 5.1 Surround Sound."

Are you aware it virtually is impossible to buy a 2-channel stereo receiver anymore? Audio stores tell me that 90% of their customers ask for multi-channel sound equipment by name. Most video and computer games now offer surround sound as well; remember we have a whole generation of young people who now consider multi-channel audio *standard*, just as this 1956 model-year writer considered stereo as a standard for so very long!

How about music? Have you heard any recent DVD-Audio or SACD discs? They will take your breath away. The re-release of many classic albums has brought new light, appreciation, and enjoyment by hearing them presented in an environment that actually draws you into the sonic experience. Getting this music on the air will make exciting radio.

Steely Dan's Gaucho, Elton John's Goodbye Yellow Brick Road, The Who's Tommy, REM's Automatic For The People, Roxy Music's Avalon, and Fleetwood Mac's Rumours are a small sampling of discs that will leave you not only wanting for more, but making a trip to the local audio store to outfit your living room in 5.1. (Even the latest Britney Spears DVD-A/SACD is incredible in surround.)

ROLLING ALONG AND ROCKIN'

Acura, Cadillac, Volvo, Mercedes, and Lincoln have already announced 5.1 surround with DVD-Audio/SACD players in their up-scale 2005 models. As happened with FM Stereo, soon this will work its way down to all models; the auto industry is moving this way because consumers want it.

Thus, radio broadcasters *must* migrate into the surround world, or they will get left behind. Remember: AM became a stepchild once FM stereo was universally accepted; all of terrestrial radio is now at risk due to the advancement of surround technology because the consumer has more exciting alternatives for their listening, and many involve surround sound.

Of course, to remain interesting to consumers program content needs to be compelling as well – that is a given. But now we have got a technical reason to get excited about radio again, and it will inspire new and compelling programming – just as FM stereo did when it was a fresh technology. This is what it will take to motivate the average consumer towards HD Radio, their vehicle to hearing exciting radio once again.

As an industry, we need to adopt the following mindset: Create enough of a "***WOW!***" factor in the mind of the consumer that it compels them to purchase a digital radio. The HDAM system offers that "wow" when comparing the HDAM signal to conventional AM audio; distinct 5.1 audio puts the "wow" factor into the HDFM system, creating the opportunity to win back lost listeners.

WHAT'S NEXT?

If you are now convinced, you are probably wondering, "OK Foti, so what's next? When can I crank out this cool excitement you have pondered about?" For this to happen, only a few key people need to hear and act on this: the record labels, radio executives, iBiquity Digital Corporation, and the receiver manufacturers. Like I said, a few key people.

We need the record labels to provide the 5.1 content. This should not be hard; a lot of surround is already available, and with the incentive of radio's promotion capabilities, all new releases should be in surround format, as well as stereo. Just think about those vaults filled with multi-track master tapes of classic recordings that can be remixed into 5.1 and re-released again. The artists and record labels stand to make millions on the re-issues alone!

The record labels win, as they have a new revenue source from material they already have, similar to the introduction of CDs. This creates a general excitement involving a new music format drawing people back to record stores. DVD Audio and SACD multi-channel are ready for consumers now, but record labels need radio to help them promote these new disks. This is a no-brainer. As Nike would say, "Just Do It!"

(Late Note: At this was written, we have opened discussions with TM Century about creating 5.1 libraries comprising the top 1000 titles in each radio format. This would immediately help jump-start the ability to launch 5.1 programming, while the labels get online with new and re-releases.)

BROADCASTERS' TO-DO LIST

Radio broadcasters need to perform two significant functions: Adopt this tech by installing it, and then promote the heck out of it! Remember how many station ID's used to say something like "101, WMMS, FM-STEREO!" That was how radio subliminally conditioned us to "stereo."

Now it is time to re-enact that discipline again: "100.7, WMMS, FM-SURROUND." Radio can easily tie in with audio stores to promote surround sound. Live remotes from audio outlets, radio give-aways, along with advertising will help tell the story so consumers will have a "top-of-mind desire" for digital surround radio.

Steve Davis, Senior VP of Technical & Capital Management with Clear Channel is an example of someone who "gets it." He recently said regarding 5.1 for radio: "The biggest breakthrough will be 5.1 surround sound using IBOC or similar digital technology. To compete with new methods of delivery, especially the ubiquitous DVD, I believe 5.1 will be key to radio remaining competitive, both in the home and in the car. Consumers have grown to expect this level of quality."

You may be wondering about the technical infrastructure. Yes, your facility will need to be upgraded to surround, but adding distinct 5.1 audio is not the challenge that FM faced when it rolled out stereo in 1961.

While it would be understandable if you were thinking this would require triple the audio channels around your facility with more cabling, switching, and routing, adding multi-channel audio actually is as easy as CAT5. Adding more channels to a network based router and cabling installation is done mostly by changing the software of the system, at very little incremental cost compared to stereo.

(Continued on Page 8)

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- Fully Synthesized (Tx and Rx)
- Internal FCC Code Key Module
- Compact 1RU Design

World Radio History

Distinct 5.1 Surround Audio

A Life Saving Injection for FM Radio

Continued From Page 6

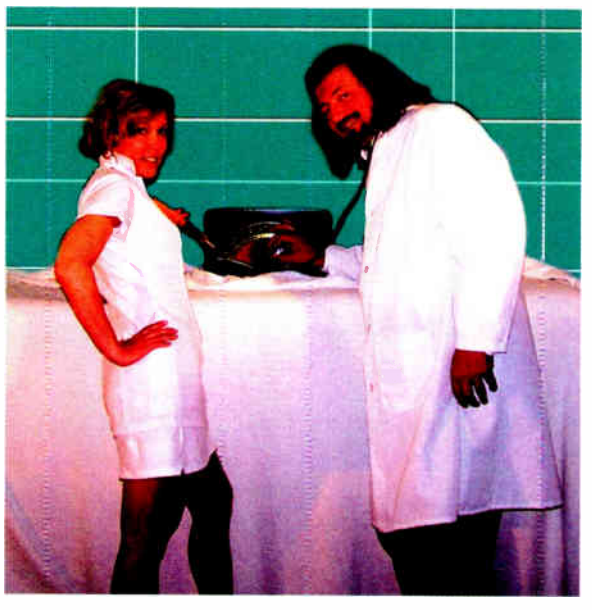
The same is true for delivery systems. Modern consoles use the surface + engine configuration, so existing surfaces might well be connected to upgraded engines. For more information on an innovative networkable solution, check out: www.axiaaudio.com.

SINGLE 5.1 METHOD PREFERABLE

iBiquity, the creator of the HD Radio system, needs to adopt a standardized surround transmission system. As I said earlier, only one surround technology is capable of faithfully reproducing the sound field without degrading both the surround effect and the conventional stereo signal: the coded-discrete system from FhG/Agere.

Contact iBiquity and lobby them to select one single system, as this will hasten the acceptance of this exciting tech. There are other proposed methods out there, but iBiquity has been reluctant to endorse a particular system out of risk of offending the others. Still, the fact is that *all* the others offer degrading performance to both the surround and stereo performance. So get iBiquity off the fence to get this going and make sure we launch surround on FM with the best tech possible.

The last group of people we need to convince are the receiver manufacturers. If the record labels and radio broadcasters are on-board, then the receiver folks will follow. They stand to sell more speakers, amplifiers, and radios – a win all the way around for them.



The FhG/Agere system will appeal to the manufacturers because MPEG standardization means the tech will be universally available to all manufacturers at a reasonable cost. By contrast, the alternative methods are proprietary and thus worrisome for the manufacturers. One of the reasons MP3 has grown so fast is that it is an open standard, available to all.

MAKING IT FUN AGAIN!

All this makes sense does it not? So, are you with me? Just think: we can actually inject life back into radio – make it fun and exciting again! I am hearing a line from that wonderful movie Field of Dreams: "If you build it, they will come." We are losing listeners to many alternatives, a trend that will continue if we do not act.

We have a chance *now* to breathe new life into our medium. Finally, a killer app and a compelling reason for listeners to buy digital radio receivers, and a new reason to listen to radio again. Hopefully you are now jazzed with this excitement.

In closing, broadcasting needs to evolve with the changing world, instead of maintaining the status quo. As my buddy Scott Shannon used to say on the Z-100 Morning Zoo, "If it is too loud, you're too old!" Well, we need to inject life back into radio. Adopting distinct 5.1 audio is just the right dosage of audio channels to excite the patient. If we follow this suggested path, it's quite possible radio listeners will remember another great slogan from Z-100: "Lock It In, and Rip The Knob Off!"

HD Radio is a registered trademark of iBiquity Digital Corporation.

Frank Foti is the driving force behind the Omnia Audio Processor, among other products. Learn more about distinct 5.1 multi-channel audio for HDFM, or share your views, by contacting Frank at Telos/Omnia/Axia:(216) 241-3343. Email: frank@omniaaudio.com

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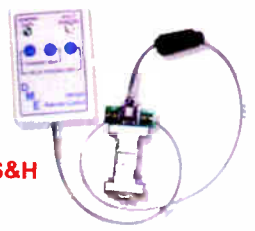

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World Radio History

The Radio Guide Tech Initiative

As announced at the NAB 2004 Radio Show, **Radio Guide** magazine has embarked on a **Tech Initiative** to encourage the sharing of technical knowledge and experience among the engineering community.

As part of this outreach to encourage information sharing, a number of manufacturers have already contributed over $15,000 of gear, to be awarded to the best submissions. Some of the items include:

AUDION

Audion Labs VoxPro Digital Audio Editor

Broadcast Warehouse DSP-X Digital Processor

Comrex DH-20 Digital Phone Hybrid

Henry Engineering Studio Drive Mixer

rfSoftware rfInvestigator (full package)

Orban Optimod 1100 Processor Card

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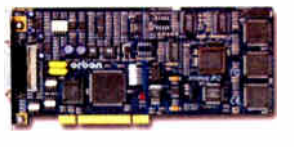

COMREX

What we are asking is for you to share your Tech Tips, User Reports and War Stories as well as longer articles on topics that interest you, from studio construction or renovation, to transmitter site maintenance, or the way in which you research new equipment purchases.

Do not worry about being a perfect writer; we will help you get it done. And besides the personal satisfaction of "giving something back," you will earn re-certification credits from the SBE, a check from **Radio Guide**, and the chance to receive one of the special awards.

More details will appear here. In the meantime, please address any questions or submissions to Editor@radio-guide.com.

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World Radio History

Keeping the Technical Operations Legal

by Alan Alsobrook

[ST. AUGUSTINE, Florida - September 2004] More and more these days with engineering time being spent elsewhere, the technical operations seem to get ignored or receive just enough attention to keep the station on the air. Unfortunately the FCC does not consider how much time the engineer had to spend getting the LAN back up or making sure the remote did not have any problems when they come to visit.

This article should serve as a reminder of what we need to be doing at, and for, our technical operations areas. I will forewarn you: you are about to hear those dreaded words again – logs & records. It cannot be stressed enough about keeping your paperwork up to date.

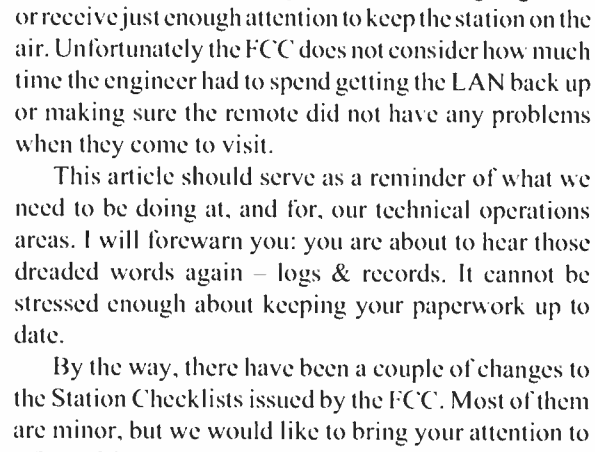
By the way, there have been a couple of changes to the Station Checklists issued by the FCC. Most of them are minor, but we would like to bring your attention to a few of them.

One new item specifies a visual check of your ground system. What will be looked for on a quick visit is that all of your radials appear to be intact and that they are properly buried as per your station license. If your license specifies a buried ground system then you should not have any radial wires showing above ground.

WHERE'S THE PROOF?

For AM stations, checklist items 77 and 78 relate to the required emissions "proof" – or more accurately, the Equipment Performance Measurements (EPM) – including the NRSC measurements (conducted annually, not to exceed 14 months, as per 73.1690). The purpose of the NRSC measurements is to show the station is in compliance with a curve that reduces potential interference with other stations.

These measurements must be made with a swept frequency RF spectrum analyzer or, alternatively, other specialized receivers or monitors with appropriate characteristics, provided accuracy can be compared to measurements obtained by using a calibrated spectrum analyzer. The mask essentially shows the station is down by 25 dB anywhere over 10.2 kHz from the carrier. As the following picture shows, the further away from the carrier, the greater the required attenuation of the signal.



Typical AM NRSC Plot

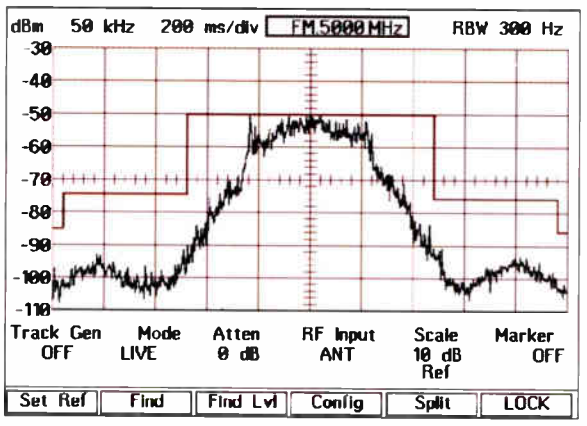
If you are going to take these measurements yourself, you will find it is not all that difficult. You will need to have a spectrum analyzer with a resolution bandwidth (RBW) of 300 Hz or less. This is an area that trips up some engineers; during inspections I have run across quite a few measurements that have been made with equipment not meeting this FCC specification.

When checking harmonic and spurious emissions, the FIM-41 is usually the best receiver for these measurements. However, some stations' 5th harmonic is outside the range of an FIM-41. If this is the case, it is customary to use a communications receiver to ensure the absence of spurs and harmonic emissions above 5 MHz. Be sure you double check any spurs you think you see; make sure you are not detecting "phantom" spurs, created by main carrier overload in the receiver.

If the station operates in different modes, an additional NRSC measurement must be made for each mode. The EPM also must be signed and dated by the qualified person performing it, and retained for two years.

FM DATA

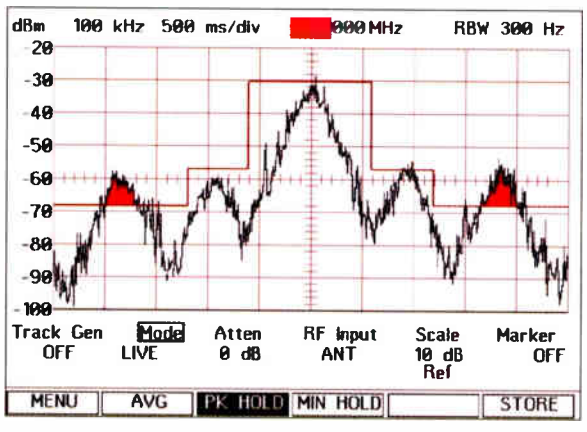
FM stations also need to have an EPM done whenever they install a new transmitter, add an SCA, add stereo, or modify the transmission system or transmitter as allowed in 73.1690. There have been some people who presume a new transmitter arriving with factory test data is sufficient to meet the requirement; this is *not* the case.



A Typical FM Spectrum Measurement

Just as with the AM EPM, the FM EPM requires all emissions to be within a specified "mask," along with a check for excessive harmonic and spurious content.

The Rules specify this must be done "Upon Installation." While it is not specifically stated in the Rules as mandatory, it certainly would be a very good idea to take these measurements on your station after changing the exciter. Changing of the exciter could be considered a change to the transmission system; also, exciters can easily cause an FM station to fall far outside of the allowed bandwidth, as shown by the following screen shot.



This is an example of an actual exciter malfunction.

Notice the spurs created on each side of the main carrier. This sort of situation can also occur after the transmitter has been in operation for some time, if your exciter develops internal problems from dried out electrolytics or other component failure. For this reason, I always recommend periodic spectrum checks of any FM transmitter even if it is not required by the Rules.

SOME BASIC INSPECTION POINTS

Now let us consider some basic questions any inspector – whether from the FCC or the AIP – will ask about. First, what is your transmitter output power? Rule 73.1560 states it must be between 90% and 105% of your authorized power. This means you should know how to accurately determine your power output, whether measuring it directly, or using the indirect method.

Most AM stations use the direct method. For this, you will have to know the resistance at the point where the ammeter is in the circuit (and just where is that antenna resistance documentation?).

Use the formula $P=I^2R$ to determine the operating power. This should be done with an unmodulated carrier for the most accurate results.

To use the indirect method, you will need to know the efficiency factor for each transmitter, and how it was determined. Most often this is obtained from the factory test data, if it was taken at the current frequency and operating level. If you do not have the factory test data, check with the manufacturer. Most of them keep the information on file, even a decade or more later.

If the factory test data is not available, or you are operating at a different frequency or power than when the transmitter was manufactured, you can use the transmitter efficiency found in the transmitter service manual (73.267 (c) (3) (iii)). It is a good practice to verify the efficiency periodically. Verify the front panel meters are properly zeroed, and appear to correctly indicate normal parameters. Then operate the transmitter into a known load using a calibrated line meter (FM) or calibrated current meter (AM) to determine the operating power.

There are a few exceptions to operation with indirect power; some transmitters do not have sufficient parameters metered. Those manufacturers normally will supply an FCC exception letter, which you should keep with your records.

Another point to consider: on many FM licenses, the transmitter power output section has the phrase "as necessary to achieve proper ERP." If you have a license like this, it places an extra burden on you to have the complete calculations to determine your TPO readily available for an inspector, so they will know what your TPO should be. If you do not have this information on hand they may decide to recalculate and come up with a different number and find you in violation.

KENNETH, WHAT'S THE FREQUENCY?

During an inspection, you may or may not be asked about the actual carrier frequency of the station. (The FCC tolerance is 20 Hz for AM and 2,000 Hz for FM stations.) However, it is your responsibility to know *exactly* where your station is on the radio dial.

If your AM should get off frequency you are sending a big red flag across the country that you are operating illegally. There is nothing so obvious as an AM at night that is about 300 Hz (as an example) off channel. All over the country, even in areas your station has never been heard, a 300 Hz tone (the error frequency) is created that is quite annoying to listeners in all areas affected. An FM station is a bit trickier; it can slide off the channel and you might not know it until someone with a badge comes knocking at your door.

Your best protection for this is to check your station's frequency at regular intervals, using an accurately calibrated meter or an outside measurement service (see Burt Weiner's article on page 12). Interestingly, I have noticed many TV stations here in Florida – especially on the Gulf Coast – are using GPS receivers for their master oscillator to prevent the picture from rolling when interference is received from across the Gulf. Of course, this also requires the interfering station uses GPS as well. Whichever system you use, be sure to log the information.

In a future article, we will focus our attention on the antenna and station signal.

Alan Alsobrook is a contract engineer in St. Augustine, FL, when he is not out inspecting stations for the Florida Association of Broadcasters AIP. You can contact Alan at aalso@bellsouth.net

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How Frequency Measurements Benefit Your Station

by Burt Weiner

[GLENDALE, California - September 2004] Since the FCC removed the requirement that stations log and verify their frequency daily, many stations have actually operated for years without ever checking their carrier and/or subcarrier frequencies. After all, with digital carrier generation, everything is much more precise than during the days of heated crystals that multiplied their fundamental frequency nearly 1,000 times to reach the station's operating frequency.

STUFF HAPPENS

On the other hand, experience clearly demonstrates that stuff happens and transmitters may indeed slide "out of tolerance" if they are not watched regularly. For example, not long ago an FM station was found at nearly 50,000 Hertz off their assigned frequency. The station had not even noticed, as digital receivers had no problem following the station. Fortunately the problem was discovered and corrected before the FCC discovered it.

This something you definitely do not want to see!

Then there was the station whose listeners called in saying they could not receive it on the normal channel – their digital receivers indicated they were two channels up! Obviously this was an alarming call to action. Fortunately, the station was able to quickly change to a backup exciter while a factory update was applied to the main, solving the problem.

How about this: several years ago an exciter from a well known manufacturer would go off frequency under high modulation conditions, depending on whether the front panel bar graph was set to "dot" or "continuous." It turned out that a fully lit bar graph was loading the 5 Volt power supply just enough to cause the problem.

In addition to the publicized problems of input off-set voltages with digital exciters and exciters jumping to a different channel due to dirty dipswitches, the aging of components can also lead to improper operation.

AVOID ASSUMPTIONS

Just because you use the Global Positioning Satellite (GPS) signals as your frequency reference, do not assume all is well and you need never worry about being off frequency. Recently I was asked to verify the Digital Pilot Frequency of a new DTV facility. The station is required to be within 3 Hz of a specific offset; I measured them 12 Hz high. How could this be? Both their transmitter and counter were locked to the GPS reference, just as I was!

It turned out their GPS receiver was not locked due to interference to the GPS receiver at their transmitter site. However, since they were using the same GPS unit to calibrate their counter and the *transmitter*, the errors cancelled each other, leaving an erroneous "good" reading. I recommend not using the same GPS receiver as the source for your carrier and your counter. And be sure the GPS reference is indeed working properly; some GPS devices just do not tell you enough about their true condition.

While a DTV transmitter itself may be GPS referenced, the data stream may directly affect the pilot frequency's position. Recently a station had upgraded a converter at their studio. This seemingly simple change resulted in their pilot frequency moving 7 Hz outside of their 3 Hz tolerance.

With these interesting situations in mind, let us look at what you need to know.

FREQUENCY TOLERANCES

By way of quick review, the FCC Rules tells us:

- For AM carriers, the departure from the assigned frequency may not exceed +/- **20 Hz**.
- For an AM Stereo Pilot, the departure may not exceed +/- **0.1 Hz**.
- For FM main carriers, the departure may not exceed +/- **2,000 Hz**.
- For FM stereo, the 19 kHz pilot frequency departure may not exceed +/- **2.0 Hz**.
- For TV, the visual carrier frequency departure may not exceed +/- **1000 Hz** *and* the Aural Carrier may not exceed +/- **1000 Hz** from the actual visual carrier plus exactly 4.5 MHz.
- DTV signals are held to a tolerance of +/- **3 Hz** depending on whether or not there is a first adjacency lower side NTSC TV station. This gets tricky at 700 MHz.

CALIBRATION AND ACCURACY

Calibration of frequency measuring equipment can be time consuming. In the past it was satisfactory and accepted practice to calibrate against the National Bureau of Standards (NBS) signals by way of WWV on 5, 10, 15 or 20 MHz.

This works for typical AM, FM and VHF-TV carrier frequency measurements, but depending on where you are in the country, Doppler and other propagation anomalies can cause calibration errors by 2 or 3 parts per million. By the time you transfer this to a FM signal you can easily have an error of several hundred Hertz. At UHF-TV frequencies, the error becomes totally unacceptable.

WWVB at 60 kHz has a higher accuracy. But by the time you go through the process of calibration and maintenance you will have discovered you do not own a frequency standard, it owns you. It is a time consuming process that never ends.

With tight tolerances, particularly in the case of DTV signals, GPS is a must. With the advent of GPS Frequency and Time Standards the calibration procedure has become a lot easier, but as pointed out above, has some pitfalls. My counters are all GPS referenced, using two GPS systems monitored by a phase comparator connected between the two – it alarms if they disagree.

FREQUENCY MEASURING METHODS

There are several commonly used methods to measure frequency. The most obvious is to measure the carrier directly out of a transmitter with a frequency counter. If you are going to make carrier measurements at an AM transmitter it is best to measure from a pre-modulated stage; some AM transmitters even provide a "spigot" ahead of any modulated stage.

Measuring a stage after modulation can produce false readings because frequency counters count the number of pulses they see in a very exact window of time. High negative peaks can cause the incoming carrier or pulse train to momentarily drop below the threshold level of the counter and miss some pulses, resulting in an erroneous reading on the low side. If the threshold is too sensitive, a counter can sometimes count stuff in the upper and lower sidebands in addition to the actual carrier frequency.

Some other interesting problems come into play when measuring the frequency of an FM carrier. Almost all current exciters are direct FM devices where the audio modulates a FMO (Frequency Modulated Oscillator), corrected by some form of AFC. While the exciters are usually "phase locked" to a crystal reference, they are not "hard locked" to that reference. As a result, the AFC circuit has to keep chasing the oscillator around due to modulation and try to corral it back to where it belongs. This can be seen on a spectrum analyzer or by looking at the AFC correction voltage applied to the FMO with a DC coupled oscilloscope.

One other problem when measuring an FM carrier under modulated conditions is that instead of measuring what is supposed to be the carrier "at rest," you are really measuring the "center of modulation." This is the reason the FCC wants to measure FM carriers without modulation.

THE PREFERRED METHOD

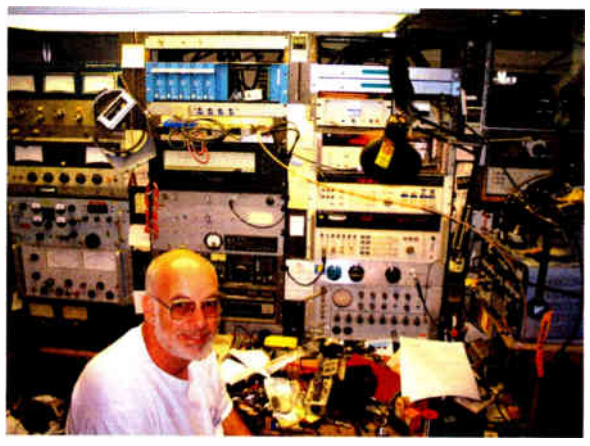
The most reliable method is called the heterodyne method. It affords the best confidence with extreme accuracy as well as being the easiest off-air method for both strong and very weak signals. Because I am seldom at a transmitter site to make carrier frequency measurements, I normally use this method. For heterodyne frequency measurements you basically need three things: a detector (receiver) with a good zero-beat indicator, a stable transfer oscillator to accurately zero beat signals and an accurate frequency counter to measure the transfer oscillator.

In the heterodyne method the transfer oscillator is adjusted to an exact zero beat with the carrier. The transfer oscillator is then counted with the frequency counter to determine the carrier frequency. The heterodyne method can also show you problems not visible with a counter alone – for example, one FM station was dithering about 6 kHz in frequency, near the edge of AFC lock. They did not see this because their counter was averaging the dithering.

I normally use a HP-3336B for frequencies below 30 MHz; and for frequencies near or above 30 MHz I use a highly modified Ailtech/Singer model CSM-1. The transfer oscillators are also GPS referenced but to a different system than for the counters. The transfer oscillator is also fed into an adjustable attenuator and combined with the incoming received signals at the input to the receivers.

Attenuators are adjusted to give the best ratio of signals for the most pronounced beat indication. Many times on very weak signals I find the best results are obtained by using a FM detector. With the right ratio there is a very audible square wave or switching that occurs as you approach zero beat.

Since not all signals to be measured are local, a variety of antennae and receivers are necessary. I use a Sansui TU-717, a Marantz model 707 car Stereo-AM receiver, a HP-3586B Selective Level Voltmeter, an ICOM R-7000, an IFR-1500 Service Monitor and a Panasonic stand-alone VCR tuner with a pick-off point for the 4.5 MHz inter-carrier signal. In my location, I also can hear many of the local 900 MHz STL transmitters. If I can detect it, I can measure it.



Burt in His Frequency Measuring "Laboratory"

WHY USE A MEASURING SERVICE?

While the FCC removed the daily requirement that stations log and verify their frequency, they have never removed the requirement that stations will be held continuously responsible for compliance with the FCC Rules. For many years, broadcasters have come to rely on outside frequency measurements services to assist them in maintaining compliance with the Rules

Over the years my clients have felt that it is more productive to use a reliable outside frequency measurement service on a regular schedule. This is good insurance against any unexpected "problems," and assists them in meeting their required compliance. Using an outside service also saves them from having to spend their time and manpower to make the measurements, as well as to maintain the equipment and standards necessary to meet today's requirements.

Burt Weiner Associates has been serving the Los Angeles broadcast community for many years. Contact Burt at: biwa@earthlink.net

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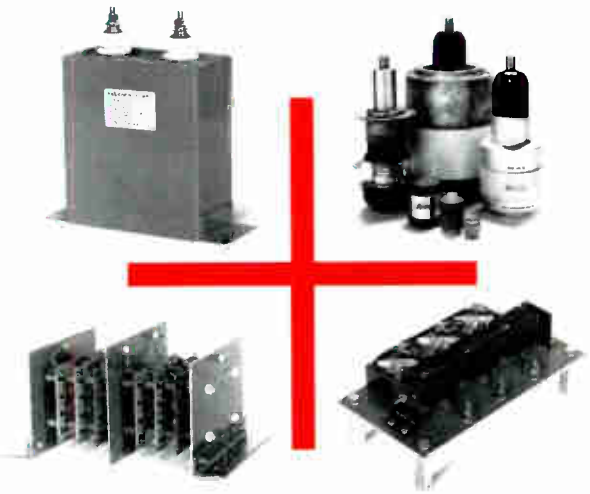

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Practical Engineering

Planning Ahead:

Keeping Mice Out – Keeping the Station On

by Dave Dunsmoor

There are many engineers out there on their own – perhaps as an owner/operator, or even someone new to the trade. Dave Dunsmoor shares some tips based on his personal experiences to help those without all the resources of the big shops. They are all are meant to promote practical, but safe engineering. Get those jobs done, but get home safely!

[MINOT, North Dakota - September 2004] While summer is starting to turn to fall, generally the weather is still nice. The mice are playing in the fields, but soon are likely to get ready to find a place to live for the winter. Other critters will soon be doing the same. The practical engineer will plan now to keep them out of transmitter buildings, storage sheds, ATU doghouses, and even our houses and garages.

Of course, a building out in the middle of nowhere with old wooden doors and tall grass all around is just inviting mice. And mice must be among the worst nuisances with which a transmitter engineer must deal. They get into *everything*, they stop at (almost) nothing, they make a mess, they smell very bad, they eat wires, they are disease ridden. All in all, they are bad – bad for us, bad for equipment.

Therefore it follows that buildings and grounds that are not mice-friendly will have fewer problems with the little buggers.

REMOVING THE WELCOME SIGN

What then is "not mice-friendly?" First of all, they do not like wide-open spaces; they prefer tall grass, short grass, stacked up junk next to buildings, and so on. They certainly do not like to cross 20 feet of open gravel covered ground to get to a building. They do not like to gnaw around a good quality steel door and steel siding to get inside. (They also do not like trying to gnaw through steel wool, or steel hardware cloth.)

Almost like having a sign saying "No Mice Wanted!"

It might seem like an unnecessary expense up front, but the explanation you present to management should be along the lines of increased equipment longevity, outage prevention, lower repair costs, and far lower exposure of disease to the engineering staff, etc. All these points should be immediately recognizable to any good General Manager as positives for the station's business.

By the way, if good building construction helps to keep the smaller critters out, good, well-maintained fences will help to keep the cattle out. Do not forget to ensure the "bigger critters" are contained. Otherwise, they might make it easier for the smaller ones to gain access.

Finally, if you already have some "unwanted residents" at the transmitter building, you may wish to employ the tactic described by Gary Peterson in the August 2003 issue of ***Radio Guide***. A proper application of moth balls will go a long way to serving an "eviction notice" to the critters.

A CAREFUL APPROACH TO TOWER REPAIRS

Whenever you are dealing with tower repairs, there is more than just the danger of the stick coming down, and even when you plan for some problems, others can easily "pop up" and give you a nasty surprise if you are not careful.

Several years ago I ran into a situation where the tower base was gradually tilting and, despite repeated warnings, the owner was not ready to drop the tower and install a new one. Neither could I could get any tower crew interested in trying to re-align it. It was either "drop it," or "forget it, we're not interested."

The concrete tower base (sitting in about 3-4 feet of water, year round) was listing at about a ten degree angle; the tower itself was bent from vertical (at about the 60' point) over to match the base at the ground. The base insulator looked like it was about to slip out of its socket; the feed point had pulled tight and was pulling out of the doghouse. Getting into the doghouse to take antenna current readings required hip waders. It was a mess.

The owner eventually found a couple of old steel workers who said they could brace it up and make it good as new. I wanted no part of this pulling-the-base-back business, and told the owner so.

ANTICIPATING PROBLEMS

However, in case things went terribly wrong while the steel workers were pulling with their cables and winches, or if the tower just dropped during the afternoon news, I persuaded the owner to install a power pole and went to work stringing up a dipole. This was a daytime one kilowatt station, so feeding this "hammed together" antenna seemed a feasible plan.

Dave Dunsmoor is shown rigging the dipole antenna.

We used some heavy wire and a center insulator, and strung it up on the pole with the help of the utility company's cherry picker. Then we went to work to match it up to the transmitter. As I recall, this took most of the afternoon and well into the evening.

I set the power to about 200-300 watts and ran it into a 160 meter amateur antenna tuner, and then to the dipole. After cutting and tying the ends, checking the VSWR, then cutting some more and checking some more, little by little we got the dipole fairly well matched. To check, we drove down the road about 20 to 30 miles and found the signal was acceptable, so now it was time to let the guys work on the tower.

NO HURRY, JUST GET MOVING!

As we finished up, the summer thunderstorms were coming up from the southwest. At first they were still quite distant – the sky was darkening and only a little lightning poked out beneath the clouds on the horizon, so we felt there was no reason to worry. We just had to get the cable troughs covered up, tie the RG-8 carefully into place, hook the old coax back into the transmitter, and get the transmitter properly loaded and tuned. It seemed like a piece of cake.

An emergency antenna right on site.

Snap! "What was that?" Snap!! (again) I opened the cable trough cover and the RG-8 coax is snapping a good spark to ground every time lightning hits in the distance. As the storm drew closer, I started pulling the new coax out, rolled it up outside and grounded it.

The coax was just about all tied to the ground rod outside the building when the guy who was working with me said, "it's time to go now!" Lightning had struck again in the (much closer now) distance, and this time sparks jumped the guy wire insulators on the tower behind us as well as creating a large spark between the coax and ground rod on which I was working.

I have seen this particular phenomenon several times over the years, but usually during a dry wind (a snow or dust storm). The sparks that jump from the coax to ground usually are fairly low energy. But this time it was a substantial spark, and I suspect it could have done some severe damage to either me or my assistant. I (re)learned that an antenna does indeed carry energy both directions.

The moral: Remember to plan your work carefully; you will not do anyone any good if you are in the hospital (or the morgue). After all is said and done, it is just radio.

IT DOES NOT TAKE LONG

A final story will illustrate why you should plan *before* you start a job, and how quickly things can go wrong. Most engineers rarely will be directly involved in the joining of metals by the application of heat and filler material (welding/brazing type repairs or fabrication), but it is an occasional task I have seen accomplished in the back room of a well-equipped transmitter shop. Personally, I happen to like working with metal.

I was welding something one time, a small item held firmly in place by the metal bench vise. The shop was large enough and well lit, but had plenty of stuff to fill it up. The trouble was, I had not paid much attention to an object lying on the floor near the vise.

As I was nearing completion of the job, I heard a muffled "pop." I stopped and looked around but, seeing nothing out of place, went back to my task. Shortly, there was a louder "POP," and my hands, arms and the exposed parts of my face and neck began to burn slightly.

The object on the floor was a battery under charge, and the generated hydrogen gas ignited briefly, spewing battery acid all over the place. Twice. A quick trip to the sink got me all cleaned up. Fortunately, I was wearing goggles and that protected my eyes, but it could have been much worse.

So I repeat: think about what you are about to do, and how you are going to do it. Be safe, not sorry.

Dave Dunsmoor is a contract engineer in the Minot, ND area, as well as a Navigation/Communications (NAVCOM) ET for the FAA. You can contact Dave at: mrfixit@minn.midco.net

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Radio War Stories

When Good DA's Go Bad

By Frank Giardina

[BIRMINGHAM, Alabama - September 2004] Nothing can turn a nice summer day into a nightmare faster than finding out that your stable monitor point readings on your reliable AM directional system have headed north. When this happens, visions of traveling miles of back roads with an FIM in tow, followed by days of adjustments, repairs and finally the infamous Partial Proof and FCC filings come to mind.

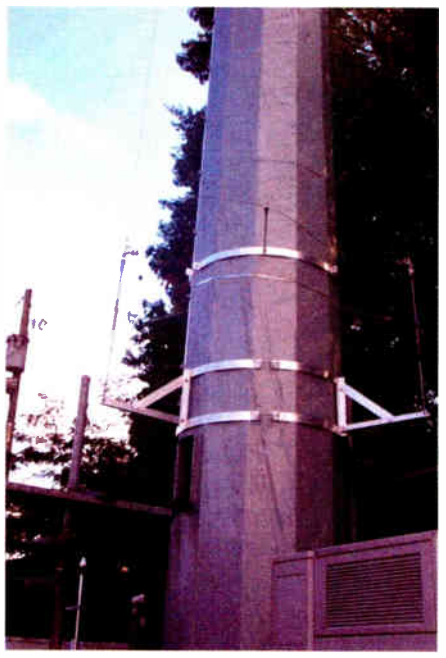
JUST A LITTLE HIGH

While taking my monthly monitor point readings a couple of months ago I discovered one of my null points was quite high. It normally reads between 8 and 10 mV/m with a limit of 12; this time it read 22 mV/m! The other monitor points were virtually unchanged. I headed back to the transmitter to verify the phase, ratio, common point and base currents were within limits. They were well within tolerances.

This being a simple two-tower array with only two nulls, I knew any change in the system would result in all the points changing to some degree. Not only this, but the old "Don't touch anything until you have investigated everything" warning came to mind.

TRACKING THE PROBLEM

I headed back to the monitor point and re-measured; it was still 22 mV/m. Being near a highway in an urban area with cell towers around, I headed to the nearest cell tower (.5 miles from the point). It was about 150 feet tall with a single detuning wire on the side. Since my frequency was 1070 kHz, I knew the cell tower would be a fairly efficient radiator if not properly detuned.



New Skirt for a Former Culprit

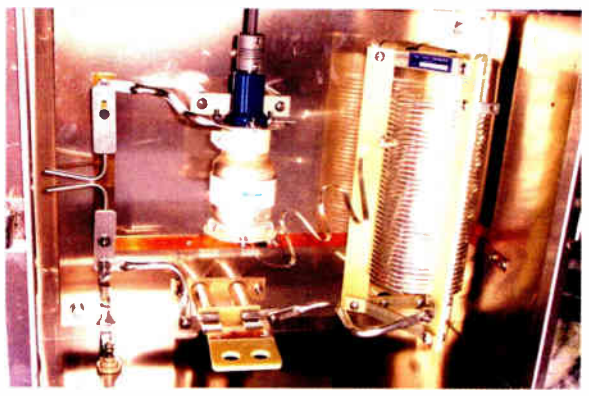
Setting up my field strength meter at a right angle to the transmitter, and in line with the cell tower, I got a whopping reading off the cell tower. Immediately, I thought this would be the beginning of a long and hard fight with someone at the cell company. Would they understand my dilemma? Would they even care?

There was a sign posted on the site with a site ID number and a telephone number. I took down the info and headed to the office.

I then placed a call and found out that Sprint PCS owned it. They had a menu item for "site issues," so I left a message with the details and a call back number.

QUICK AND EFFECTIVE COOPERATION

About four days later, I received a fax from Larry Giessman of SiteSafe. He informed me that Sprint had contacted him concerning the issue and he wanted to let me know he was getting all the details and would shortly send me a plan of action to take care of the problem.



Larry determined the old single skirt wire detuning skirt was ineffective and the detuning unit was not designed for long-term reliability. He proposed to Sprint to install a new 3-wire skirt and new detuning box, a solution they approved.

In a very short time, Larry called and made an appointment with me to meet at the site. When I arrived, I found the new three-wire skirt installed on the tower and it was connected to a new detuning network.

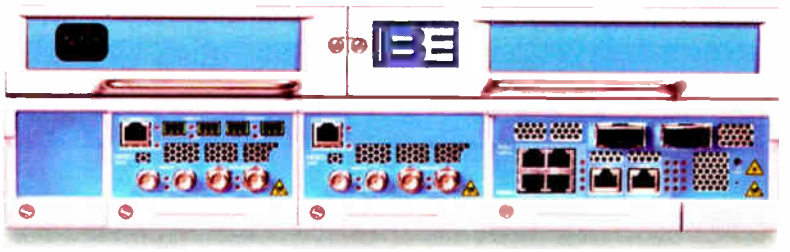
The detuning system was very impressive: it was installed in a sturdy box with at least a 20 Amp inductor, a vacuum variable and a rugged arc gap to cut down on lightning damage.

SUCCESS!

Larry had just completed the tuning on the system and he demonstrated the depth of detuning by shorting out the skirt. A 34 dB change in signal strength on the FIM verified the system was indeed detuned. I headed to the monitor point in question and checked the reading. It was back to normal. My workload had just been reduced considerably.

It is good to know there are those in the cellular industry who take their responsibility seriously to see that their towers near AM facilities do not interfere.

Frank Giardina is the Chief Engineer for Citadel's Birmingham, Alabama cluster. He can be contacted at fgiardina@citcomm.com



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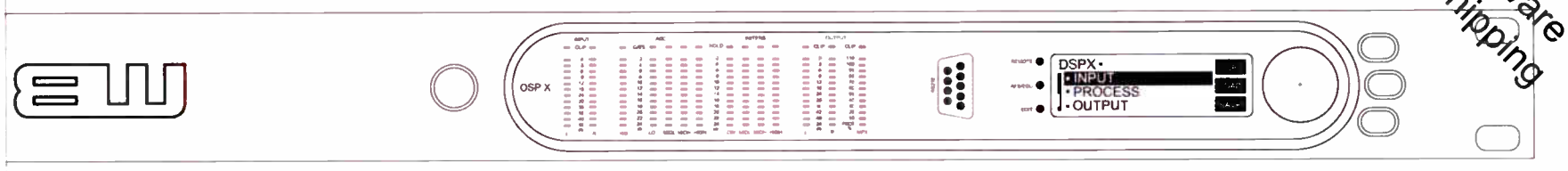

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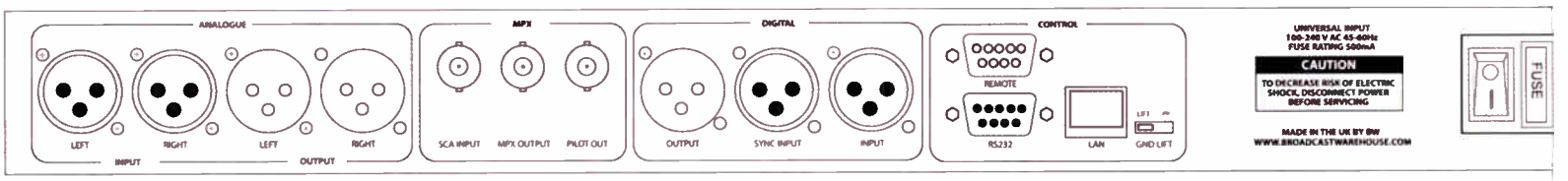

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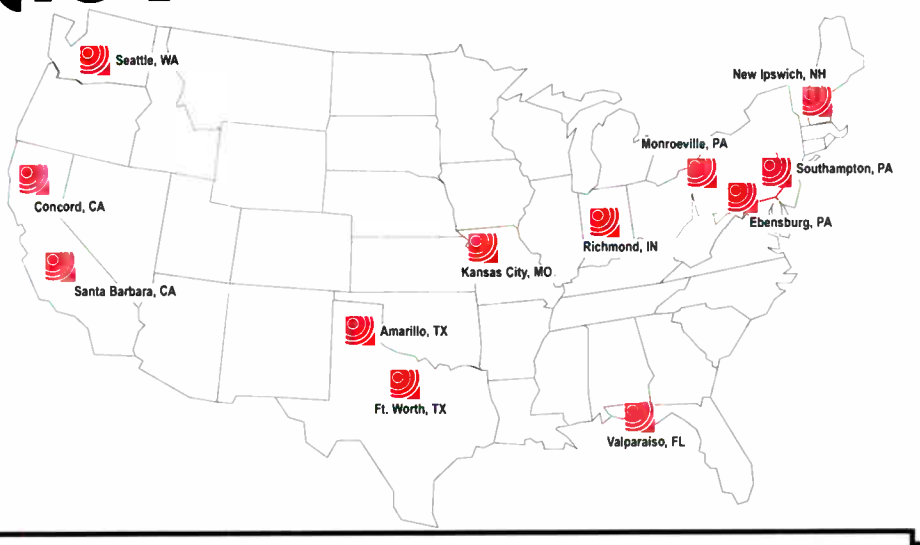

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World Radio History

FCC NPRM Puts Spotlight on EAS

by Clay Freinwald

[SEATTLE, Washington - September 2004] The mystery is officially over! The FCC has released Docket 04-296. Those following this process knew the Feds had to do something with all the input they had been receiving from PPW, MSRC and others to address the shortcomings of EAS. (The last revision to the EAS Rules added some new event codes and relaxed some testing issues, but clearly did little to enhance EAS as a public warning system.)

The FCC's traditional stance has been simple: EAS is a "last-ditch" system for the President to address the country in the event of a national emergency, *and* a system useful "on a voluntary basis" for weather, state and local emergencies. Perhaps the FCC has been surprised at the distinct lack of "volunteers" to use EAS – on the part of broadcasters as well as government entities.

Today we have a patchwork of functional and dysfunctional EAS systems – some states have none at all – a situation that has been universally criticized. It is true: EAS could be a lot better!

However, if you think the NPRM is another "warm over," think again. Anyone with even a remote interest or connection to EAS should download this NPRM and do some serious reading. As with many FCC actions, the introduction will give you great insight as to their thinking, and what EAS is likely to look like when the process is complete.

THE FCC SPEAKS

Here are some examples of what I mean:

• The opening comments refer to the EAS as a *public warning system*, which appears to deviate from the historic FCC thinking about EAS.

• They note that citizens/public and private groups and government entities at the federal, state and local levels want more out of the system.

• They acknowledge the "permissive nature" (Federal speak for "voluntary") is not working very well.

• The FCC is already working with DHS, FEMA and NOAA on the changes.

• They are seeking input from state and local governments.

• The FCC makes it very clear that they – the FCC – have the authority " ... to regulate emergency broadcasting" and EAS. Quoting from The Communications Act:

"In section 4(i) there is a general grant of authority to perform any and all acts, make such rules and regulations, and issue such order, not inconsistent with the Act, as may be necessary in the execution of the Commission's functions.

Section 4(o) provides the Commission with authority to investigate, study, and propose best methods to resolve any and all problems preventing the maximum effective use of radio and wire communications in connection with safety of life and property"

WHAT IT ALL MEANS

In a nutshell: NWS, state and local governments *want* a public warning system. There are very few tools out there capable of delivering what they want. Currently the EAS, in conjunction with the NWS and its NWR system, is the only game going. But we have a big problem: the very fact that broadcasters and cable operators do not have to participate severely limits the effectiveness of the system.

The NWS knows broadcasters can ignore a tornado warning or other severe weather message; state and local emergency managers know their emergency messages may not reach the public. This is a real problem, especially when the receipt of those messages could well save lives. They view EAS as something that could work, but may not. This is one of the primary reasons many governmental entities have chosen not to participate with EAS.

CHANGING APPROACH

The key is to change the approach. To be truly effective, emergency messages need to reach everyone – using every communications system possible – at the same time. One method clearly under consideration by the FCC is to *require* broadcasters and cable operators to air certain emergency messages or Event Codes – and to bring emergency messaging into other communication systems.

The impact on Broadcasting is significant. Some feel this will be a major intrusion into their ability to make a profit by decreasing the entertainment value of their stations. Others express support, feeling they have an obligation to utilize their licenses to benefit citizens and – where possible – save lives. The FCC is likely very aware not all will embrace this proposed change and perhaps that is the reason why they reminded us of their authority.

What the FCC is asking among the barrage of questions posed in the NPRM is *how* the system will be structured. The eventual outcome will likely be a mixture of what the FCC, DHS, FEMA, state and local governments require to transform EAS from a presidential message device to a true public warning system and what responders to the NPRM have to say.

THE NPRM AND THE SOLUTION

Does this NPRM go far enough? I feel at least two more issues need to be addressed: 1) adding Text Transmission to the EAS so announcers and TV crawls can automatically have correct information, and 2) state and local governments should establish radio Relay Networks so the "daisy chain" distribution method finally can be scrapped.

I view this process much as I would voting. If you do not vote (participate), you should not gripe when things do not turn out the way you wanted. Who should file comments? Every company or person with an interest in the future of EAS, or in creating a robust and effective public warning system. Make sure your voice is heard on Docket 04-296.

Clay Freinwald is a frequent contributor to ***Radio Guide****. He is chair of the Washington State SECC as well as the SBE's EAS Committee. Clay is a corporate engineer for Entercom based in Seattle.*

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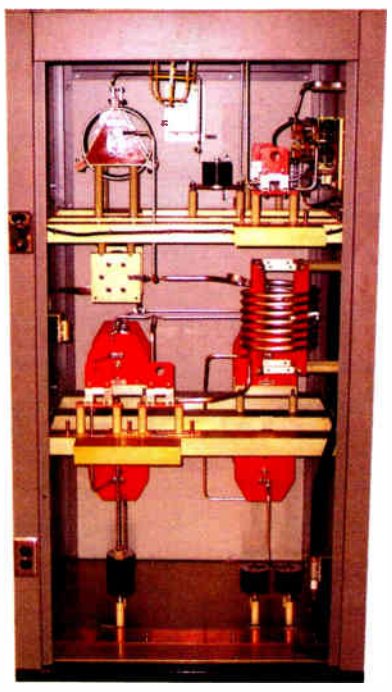

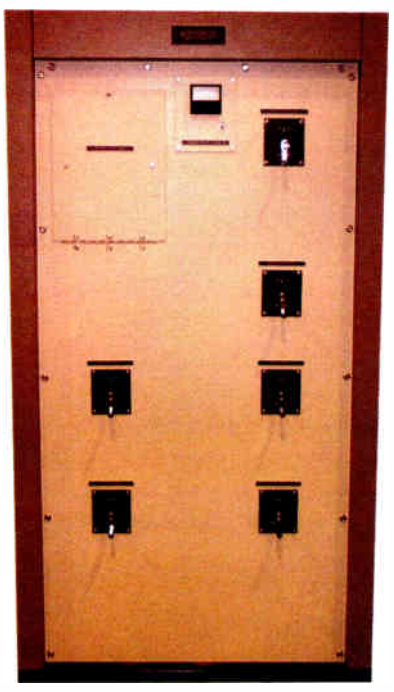

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World Radio History

EAS at the Crossroads

by Tom Taggart

[ATHENS, Ohio - September 2004] On August 4th the FCC began yet another EAS inquiry, citing the tragic events of September 11th as a basis for this *Notice of Proposed Rulemaking (NPRM)*. Ironically, the events of the that day did not trigger a national alert; yet no one would deny that the nation's broadcasters quickly relayed emergency information to the public.

Reviewing the Partnership for Public Warning report, the Commission throws out dozens of proposals. (See the FCC Daily Digest of August 12, 2004 at www.fcc.gov for the full text.) Comments are due by October 29th – you can e-file using procedure number 04-296.

Here are a few of the points that grabbed my notice.

THE PROPOSALS

Mandatory Carriage of Alerts. The Commission proposes mandatory EAS participation, with all stations monitoring the National Weather Service (NWS) radio. They suggest the new EAS codes (e.g. AMBER alert codes) be mandatory. They ask if there should be Federal standards for activating EAS. Should Broadcasters be prohibited from originating alerts? Or should they be required to get permission from emergency management officials before transmitting alerts? Who will determine what messages we have to run?

We presently are required to carry only the EAN, the RMT, and the weekly tests. We must monitor at least two sources. However, many stations no longer monitor the NWS; they resent the many duplicative alerts and too many well-meaning but silly messages such as "don't drive through flooded roads."

Our listeners are trickling away to XM, Sirus and I-Pod. If we become "All NWS, All the Time," with new severe thunderstorm alerts "every hour on the tens," this trickle will become a flood. Remember the little shepherd boy who cried "wolf" once too often?

State Plans. The Commission proposes requiring all states establish a "State Plan." They ask whether there should be regional or multi-state plans as well. Indeed, the Commission wonders whether uniform national guidelines would not be better than a variety of individual state and local plans

Some states have excellent plans; others have no plans at all. But a top-down bureaucracy never improved any system. The EAS people at the Commission now call themselves the "Office of Homeland Security." I smell a power grab here. If they get the power to coordinate all emergency communications, just watch how big this office will grow.

End of the Daisy Chain? The Commission questions whether the "daisy-chain" relay system is obsolete. Should they require the states to establish internal networks, either microwave or satellite, for this emergency traffic?

EAS on Your Pager. Should other services – including cell phones, pagers, automatic dialing services, even subscription market information services for farmers – be mandated to carry EAS?

This is a very bad idea. Pagers and automatic dialers are used to alert emergency personnel, volunteer fire departments, hospital staff, and other safety personnel. Local police rely on cell phones for secure communications and back-up when they are in radio dead zones. Tying up these systems with general "Severe Thunderstorm Alerts" may turn a local emergency into a local disaster.

Automatic Alerting. Should all new radios and TVs be required to automatically turn on when alerts are received? If so, who will program the FIPS code into these TVs and radios? The stock clerk at Best Buy? And what if people move? Who gets the blame when an AMBER alert goes off at 3:00 in the morning?

Other Languages. How do we reach the disabled and non-English speakers? Should all radio stations in areas with large numbers of non-English speakers be required to air alerts in other languages?

I fail to see the logic in requiring English language stations in Texas or South Florida to run warnings in Spanish. Presumably, people listening to an English language station understand English. Besides, who will translate? I even see the danger of a new "entitlement:" alerts in Hmong for stations in St. Paul, MN, or Hopi and Navajo for Tucson and Phoenix.

Security. How can we secure the EAS network to verify alerts? I hope we are not bringing back those notorious red Envelopes?

Impact on small markets. The Commission proposes to increase fines to $32,500 for one EAS violation, to a maximum of $325,000 for multiple violations. This could bankrupt small stations.

THE VIEW FROM MY WINDOW

It seems to me the Commission smells that heady Washington aroma of money and power available for the taking and they want to be the "Czar" of emergency communications. On the other hand, we could have a very effective public warning system without requiring stations abandon their programming to the Federal Government.

The NWS has the people to issue alerts 24/7; their weak link is the NWS stations. Usually fed by phone lines, NWS radio uses just seven narrow-band FM channels nationwide at 162 MHz.

Congress is already considering LPFMs on third adjacent channels, so why not allot FM channels to NWS on these third adjacent FM frequencies? With limited response (5 kHz mono, using gentle pre-emphasis) they would cause much less interference than an LPFM station. But they would be *on the FM band*, where the general public can find them or utilize automatic tuning radios for alerts.

The public then would have a choice. They could listen to NWS FM stations, receiving all the alerts – including those thunderstorm watches for 49 counties – or allow broadcast stations to be the editors or filters, relaying only alerts of immediate importance, such as thunderstorm spawned tornados.

Tom Taggart is part-owner of two FM stations in the Ohio Valley. He holds a lifetime General Class license, and is an attorney with a private practice in Athens, Ohio. His email is tpt@eurekanet.com

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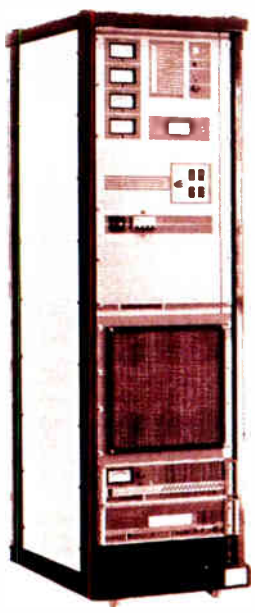

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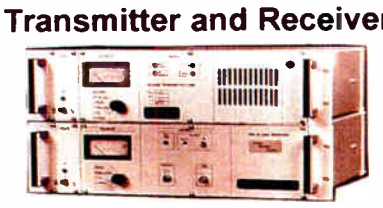

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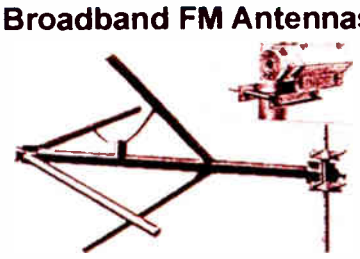

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bdi

World Radio History

Leading POTS Codecs Compared.

	Comrex Matrix	Tieline Commander	**Zephyr Xport**
Audio Bandwidth @ 24 kbps	14 kHz	15 kHz	**15 kHz**
@ 19 kbps	11.2 kHz	9 kHz	**15 kHz**
Direct Internet Software Updates	No	No	**Yes, via Ethernet port**
Digital PC Audio Input	No	No	**Yes, via Ethernet port and supplied driver**
Audio Metering (XMIT/RCV)	Transmit only	One-at-a-time	**Simultaneous**
Audio Processing	None	Simple AGC	**Digital multi-band AGC with look-ahead limiter by Omnia**
Remote Control	No	RS-232 and dedicated computer	**Ethernet via Web browser**
Auto Dial Storage	19 Numbers	50 Numbers	**100 Numbers**
Frequently-Used Settings Storage	none	none	**30**
Standards-based POTS Codec	No - Proprietary	No - Proprietary	**Yes - aacPlus (MPEG HEAAC)**
Transmit-Receive Quality Display	No	Yes	**Yes**
Contact Closures	2	2	**3**
Display Resolution	120x32 LCD	120x32 LCD	**128x64 LCD**
Analog Cell Phone Interface	Optional	Standard	**Standard**
Mixer Inputs	1 mic, 1 mic / line	2 mic / line	**1 mic, 1 line**
Phantom Power	No	No	**Yes - 12 volt**
Automatic Voice-Grade Backup	No	No	**Yes**
Power Supply	External	External	**Internal auto-switching**
Local Mix Audio Outputs			
Headphone	Yes	Yes	**Yes**
Line Level	Yes	No	**Yes**
Direct Receive Audio Output	No	Yes	**Yes**
Uses ISDN at the Studio Side for More Reliable Connections	No	No	**Yes - your Zephyr Xstream becomes universal POTS and ISDN codec.**
Available ISDN Option	$850.00 (adds MPEG L3 & G.722)	$850.00 (adds G.722)	**$495.00 (adds G.722 & state-of-the-art AAC-LD) for high fidelity and low delay)**
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The world's most advanced POTS codec
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World Radio History

The routing switcher gets a new twist.

(About five twists per inch, actually.)

Everybody needs to share audio. Sometimes just a few signals — sometimes a few hundred. Across the hall, between floors, now and then across campus. Routing switchers are a convenient way to manage and share your audio, but will your GM really let you buy a router that costs more than his dream car? Unlikely.

If you need a routing switcher but aren't made of money, consider Axia, the Ethernet-based audio network. Yes, Ethernet. Axia is a *true network*. Place our audio adapter nodes next to your sources and destinations, then connect using standard Ethernet switches and Cat-6. Imagine the simplicity and power of Ethernet connecting any studio device to any other, any room to any other, any building to any other... you get the idea.

Routers are OK... but a network is so much more modern. With Axia, your ins and outs are next to the audio, where they belong. No frame, no cards, no sweat.

Scalable, flexible, reliable... pick any three.

An expensive proprietary router isn't practical for smaller facilities. In fact, it doesn't scale all that well for larger ones. Here's where an expandable network really shines. Connect eight Axia 8x8 Audio Nodes using Cat-6 cable and an Ethernet switch, and you've got a 64x64 routing switcher. And you can easily add more I/O whenever and wherever you need it. Build a 128x128 system... or 1024x1024... use a Gigabit fiber backbone and the sky's the limit.

Are you still using PC sound cards?

Even the best sound cards are compromised by PC noise, inconvenient output connectors, poor headroom, and other gremlins. Instead, load the Axia IP-Audio Driver for Windows® on your workstations and connect *directly* to the Axia audio network using their Ethernet ports. Not only will your PC productions sound fantastic, you'll eliminate sound cards and the hardware they usually feed (like router or console input modules). Just think of all the cash you'll save.

Livewire

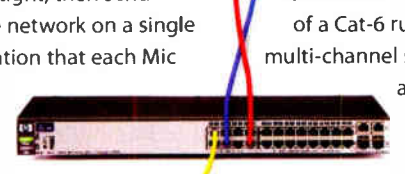
< · · · > 100/1000

There's a better way to get audio out of your PC. No more consumer grade ⅛" connectors — with Axia your digital audio stays clean and pristine.

Put an Axia Microphone Node next to your mics and send preamplified audio anywhere you need it, over Ethernet — with no line loss or signal degradation.

Put your preamps where your mics are.

Most mainframe routers have no mic inputs, so you need to buy preamps. With Axia you get ultra-low-noise preamps with Phantom power. Put a node in each studio, right next to the mics, to keep mic cables nice and tight, then send multiple mic channels to the network on a single Cat-6 cable. And did we mention that each Mic Node has eight stereo line outputs for headphones? Nice bonus.



Put your snake on a diet.

Nobody loves cable snakes. Besides soldering a jillion connectors, just try finding the pair you want when there's a change to make. Axia Audio Nodes come in AES/EBU and balanced stereo analog flavors. Put a batch of Nodes on each end of a Cat-6 run, and BAM! a bi-directional multi-channel snake. Use media converters and a fiber link for extra-long runs between studios — or between buildings.

An Axia digital audio snake can carry hundreds of channels of digital audio on one skinny CAT-6 cable. We know you're not going to miss soldering all that multi-pair...

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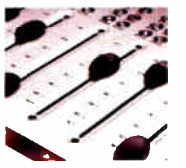
Axia is already working with some great companies. Like Enco Systems, Scott Studios, Radio Systems, Balsys Technology Group, and of course Telos and Omnia. Check AxiaAudio.com/partners/ to find out who's next.

With a little help from our friends.

A networked audio system doesn't just replace a traditional router — it *improves* upon it. Already, companies in our industry are realizing the advantages of tightly integrated systems, and are making new products that reap those benefits. Working with our partners, Axia Audio is bringing new thinking and ideas to audio distribution, machine control, Program Associated Data (PAD), and even wiring convenience.

Would you like some control with that?

There are plenty of ways to control your Axia network. For instance, you'll find built-in webservers on all Axia equipment for easy configuration via browser. PathfinderPC® software for Windows gives you central control of every audio path in your plant. Router Selector nodes allow quick local source selection, and intelligent studio control surfaces let talent easily access and mix any source in your networked facility.



Control freaks of the world, rejoice: intelligent Axia mixing surfaces give talent complete control of their working environment. Reconfigure studios instantly and assign often-used sources just where they're most useful.

"This sounds expensive." Just the opposite, really. Axia saves money by eliminating distribution amps, line selectors, sound cards, patch bays, multi-pair cables, and tons of discrete wiring — not to mention the installation and maintenance time you'll recover. And those are just side benefits: our hardware is about half the cost of those big mainframe routers. That's right... *half*. Once you experience the benefits of networked audio, you will never want to go back. AxiaAudio.com for details.

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World Radio History

A Reminder to Be Careful

By Marty Hadfield and John Price

[SEATTLE, Washington - September 2004] It is 2:00 AM, Monday morning. The station's main transmitter is down. The problem appears to be no high voltage to the final. Unfortunately, you were out late and the unwelcome trouble call from the studio came at 1:00 AM just as you were climbing into bed, dead tired.

Having been in this transmitter before, you know all the HV places not to stick your hand. Even with some of the front panels removed and an interlock or two jumpered to aid in the troubleshooting, you feel relatively safe.

Suddenly a screwdriver accidentally drops across a capacitor, and BAM! The resulting flash and bang has you now very wide-awake — and a little scared. You can consider yourself lucky, unlike Rob Thomas.

SAD REPORT

The Associated Press reports 39-year-old Robin "Rob" Thomas died at a tower site in Northern Colorado. According to the coroner's office, Thomas was working alone, installing a transmitter. "He apparently leaned into the wrong piece of equipment and was electrocuted," the AP stated.

An experienced engineer who worked for Sinclair Broadcasting and Entercom Communications (among others), Rob worked around the U.S. building and improving broadcast facilities. Rob was a very good, conscientious engineer who knew the dangers confronting us when working with "live" circuits.

REMINDERS FOR ALL OF US

Rob's death is a poignant reminder of how transmitter work can be potentially lethal; adequate precautions and measured steps must be exercised at all times. It is far better to work slower and more cautiously than to suffer an accident.

These simple reminders could help save a life — perhaps yours:

1) Whenever possible, turn off the main AC disconnect and any front panel breakers before opening any equipment.

2) Put the remote control in "local" mode, or otherwise disable it.

3) Use a shorting stick on every exposed terminal. If your transmitter does not have one, install one now!

4) When reaching into equipment, keep one hand in your pocket to avoid creating a circuit path through your body. Remove all jewelry and watches.

5) Whenever possible, have someone with you – even if not an engineer. Otherwise, have someone periodically call and check on your well-being.

6) Always be careful out there!

Marty Hadfield is the Entercom VP of Engineering; John Price is an Entercom Corporate Engineer. Both are based in Seattle, Washington.

Things You Need to Know

[WASHINGTON, D.C. - September 2004] If you are planning to file any applications at the FCC, you need to know several things. They may have a major impact on your filings.

FEE INCREASE

First: newly raised FCC fees are in effect as of 8/1/04. The entire fee schedule is posted on the FCC website at http://www.fcc.gov/fees. Click on "Application Processing Fees" and look for document 04-150; the Radio fees start on page 32. Also, do not forget that errors in amounts (or bounced checks) will delay or possibly even cause your application to be returned.

WATCH OUT FOR BAS PROBLEMS

Broadcast Auxiliary Service (BAS) authorizations need special attention. You may recall the FCC "locked down" the BAS database a couple of years ago as it was — complete with quite a few errors and a good deal of incomplete or missing information. An SBE filing was unable to get much relief from the FCC regarding the filing fees to make corrections.

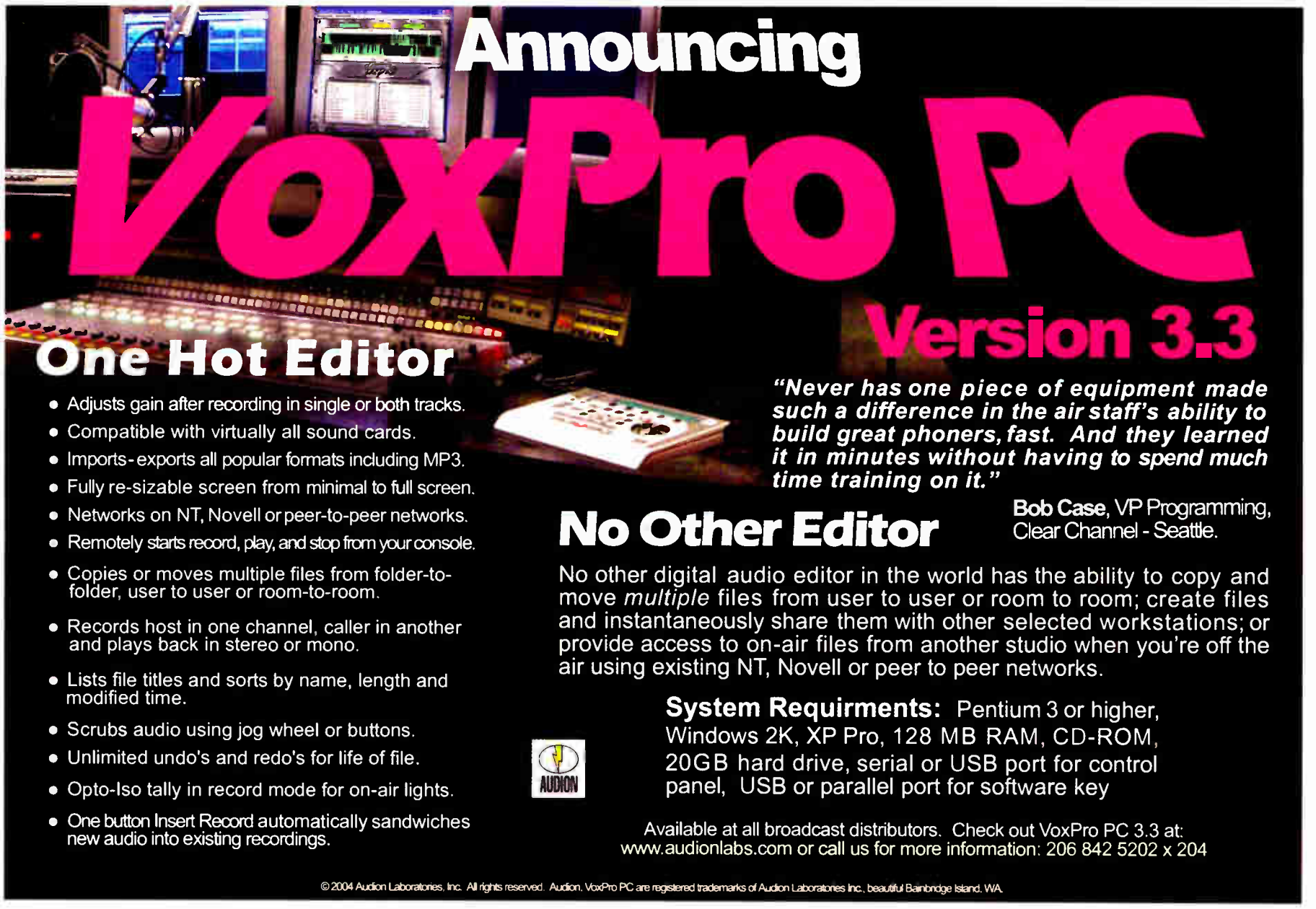
Nevertheless, if your STL renewal, for example, does not contain "key data" including the Facility ID for the "Parent Station," it is quite possible the FCC will refuse to renew the license. Their position is that incorrect entries in the database are no longer an FCC problem.

By the way, if you need to license a new STL, do not forget the new Prior Coordination Notification (PCN) Rules. It can get pretty convoluted, and you may wish to check with your consultant before sending in the application.

EAS NPRM

The recent Notice of Proposed Rule Making (NPRM 04-296) is an extensive document relating to the FCC's intention to change some aspects of the EAS operations, even making more EAS participation mandatory. See Clay Freinwald's commentary [Page 18] for other high points.

With publication in the Federal Register, Comments are due by October 29th, with Reply Comments due by November 29th. If your company wants to be heard, this is the time to speak up. Even if several state broadcasters' associations and the NAB comment, that should not stop individuals or stations from making their views known. – *Radio Guide* –



World Radio History

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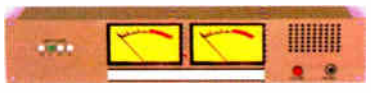
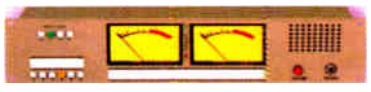
VPM-4 – Dual VU/PPM Meter Set

VPM-4M – Dual VU/PPM Monitor Set

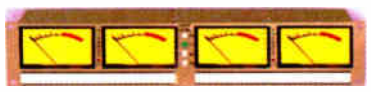
VUM-2 – Dual VU Meter Set



VUM-2M – Dual VU Meter Monitor Set



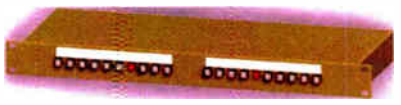
VUM-2MS – Dual VU Monitor/Switcher Set



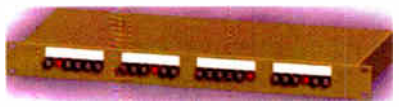
VUM-4 – Quad VU Meter Set

– Audio Routing –

SR-10 – 10 x 1 Stereo Switcher



SR-210 – Dual 10x1 Stero Switcher



SR-64 – 6 x 4 Stereo Switcher

SR-10M
10 x 1 Stereo Switcher with Metering & Monitoring

SR-201 – 20 x 1 Stereo Switcher

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World Radio History

Real Job Satisfaction In Radio Engineering

by Greg Rickaby

With consolidation affecting the working conditions of engineers all over the place, many find themselves no longer enjoying their craft. Greg Rickaby contends that one's mindset can make a big difference in achieving job satisfaction.

[DOTHAN, Alabama - September 2004] Sure, I am asked to fix everything from the phone system to the front door. But I like it like that!

Sometimes it sounds like there are a whole lot of worn out Crabby Old Guys (COG) out there, with no hope for the future of the industry. "There is no respect." Mr. Dangerfield: maybe there is no respect because you give no respect!

True, with the increased workloads at many stations, more than a few engineers today really are stressed out as they search for some Holy Grail of engineering satisfaction. You know what I mean: that feeling of accomplishment when something gets fixed, brought back from the dead, or just plain works the first time you turn it on? *That is the Holy Grail for engineers!*

CHANGE OF MINDSET

That really is what it is all about. Yes, we are all busy, and often cannot seem to accomplish more than just "putting out the fires." However, instead of moaning and groaning, "I'm an old engineer and the world of IT is swarming all around me," why not pick up a book and read, or make friends with the IT guy?

When the announcer comes into the shop and says: "Hey, Mr. Engineer, the CD player in the prod room will not play CDs," how do you respond? Do you a) Roll your eyes and moan, "I'll get to it when I can," or b) Follow the jock into the prod room and act like you care. If you normally respond with a), it is no wonder you whine about getting no respect. You *are* a COG!

After all, he is just letting the guy whose job it is to make sure this stuff works know that it is not working. By responding positively, not only are you making him feel better, he will feel less apt to get testy with you. Remember, he needs the CD player to get his job done. If he thinks you do not care, then he thinks you are a roadblock to getting the job done.

ARE YOU AN INVISIBLE ENGINEER?

If you are a full-time CE for a group, do you show up during normal business hours? Or are you the mysterious engineer who is only seen in the shadows of the night? Do you attempt to show up at any of the company functions? Or do you scoff at the event because you have transmitter maintenance scheduled for that night?

Yes, there is a lot going on at the transmitter site. And, no one is asking you COGs to become drinking buddies or even work 8-5 every Monday to Friday – just show your face and act like you care. Perception is realty! We always talk about the average listener; well there is such a thing as an average jock. You do not have to tell lies to the jocks or management, just make them feel like they have been heard and you have a plan for the situation.

I have worked for and with a number of engineers who only showed their face when it was an emergency. And when they did, they complained the entire time because they were busy fishing. One engineer actually said he could not come in and fix our ailing studio console because he was cleaning the mussels off his new boat. *It must be nice!* It is no wonder the jocks hate his guts!

DOING WHAT IS NEEDED

Quit being a COG and remember why you chose engineering as a profession. Nobody forced you to become one. There was no dictator pointing his finger of evil power at you saying, "You will be a broadcast engineer and like it!" This is America, home of the free. The choice is yours. If you do not enjoy it, then keep it to yourself because there are young impressionable people out here who look up to you guys. Have you ever been disappointed in your dad, mom, grandparent or mentor? It certainly does not feel very good.

Sure, before I can fix the front door I have to call a few engineering buddies to hear how they have fixed doors in the past, then make a list of the things I will need to fix it, call a few of my engineering buddies to double check the list, and e-mail the list to management. When it finally is approved I can fix the door – as long as it is after hours and on Sunday.

But you know what? When the front door gets fixed I feel like a million bucks.

When I got started in this business, I was told: "radio is not a job kid, it's a lifestyle!" Ten years from now I fully intend to still believe in this statement, and pass it on to others. And if there are those who no longer feel that way, they ought to give strong consideration to choosing a new and different lifestyle.

Greg Rickaby, aka "Frogman," is the Chief Engineer for Dothan Radio People's WDJR - WDBT - WESP. You can contact him at frogman@wdjr.com

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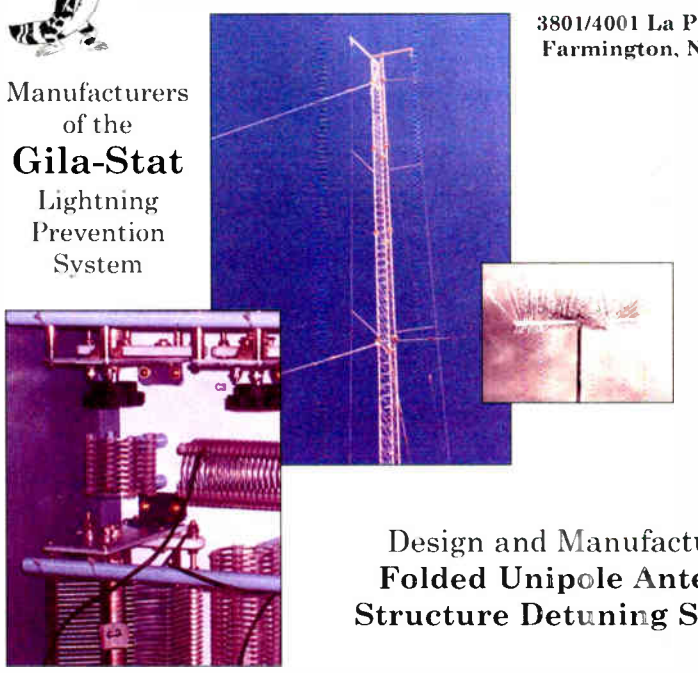

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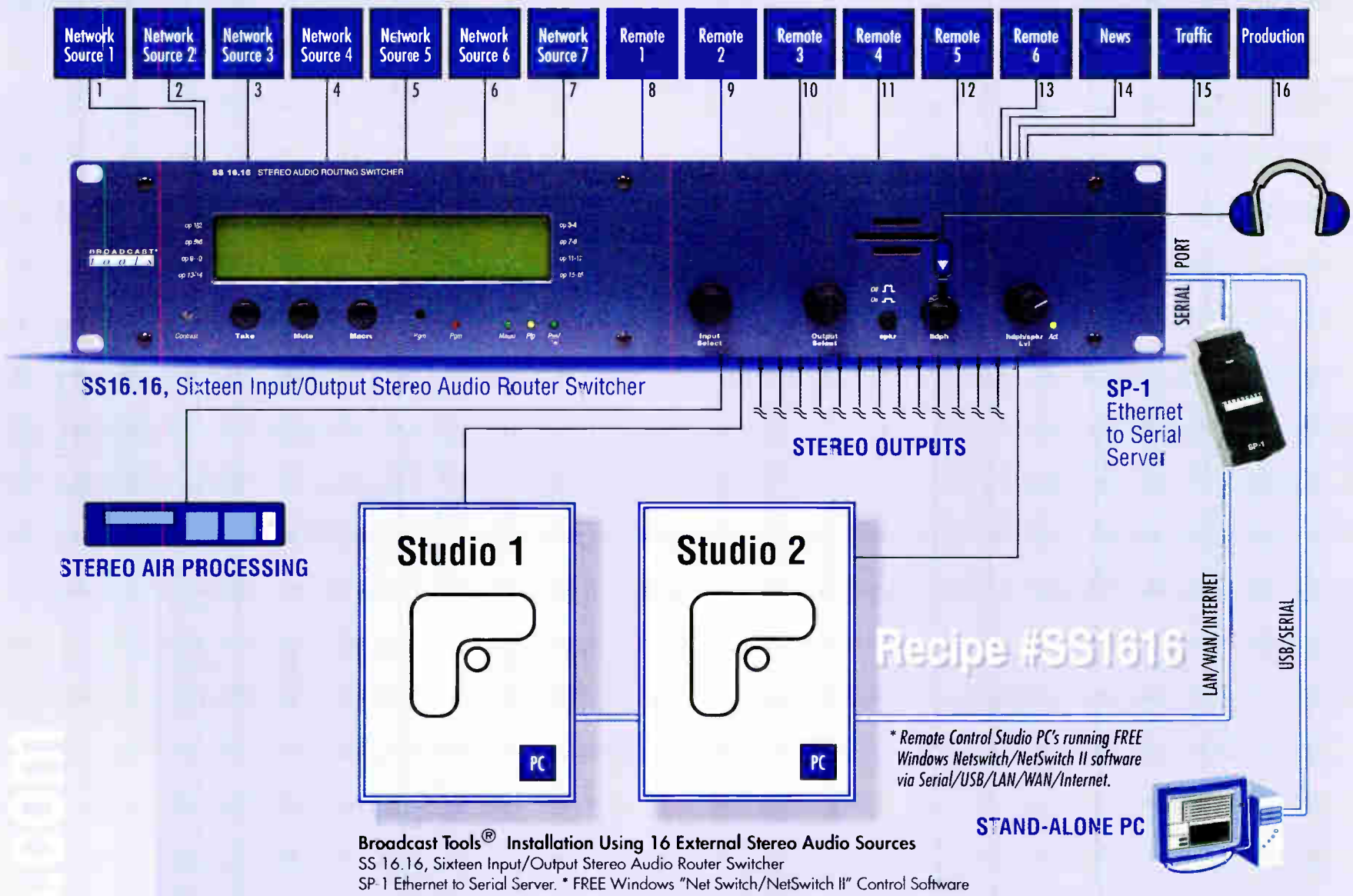

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Public File

Some Quick Tips on Avoiding Pubic File Problems

By Ken Benner, NCE

[TUCSON, Arizona - September 2004] Almost any time a broadcasters' convention session discusses the Public File, my email increases dramatically. Tremendous anxiety is expressed over what normally should be relatively simple record keeping.

Under the FCC's Alternate Broadcast Inspection Program (ABIP), I have inspected hundreds of stations throughout the country. Approximately one-third of these stations cannot recall someone ever requesting access to their Public Files. Of the remainder, 99.9% are requests for the Political File by candidates trying to determine what their opponent is spending.

Nevertheless, although some bureauerats continue to try to turn the Public File into a revenue generator for their career enhancement, perhaps I can help you avoid some of the traps.

FINES UPON REQUEST?

Often most FCC Rules come with minimal explanation – often without even the proper forms available. Exorbitant fees are charged for everything we need to do, and many things we do not even want. Stations are left to the mercy of their law firms for expensive interpretation, often with divergent implications. Sometimes it may even appear that stations are expected to self-report any – even inadvertent – violations of unclear Rules.

Furthermore, recent events have brought considerable political pressure to require the recording of everything aired. This could well add up to mandated "self-incrimination," making it easier for "Enforcement Specialists" to churn out Notices of Violation.

For example, on renewal form 303-S, Section II, Item 4, we find: "FCC Violations during the Preceding License Term: Licensee certifies that, with respect to the station(s) for which renewal is requested, there have been no violations by the licensee of the Communications Act of 1934, as amended, or the rules or regulations of the Commission during the preceding license term. If No, the licensee must submit an explanatory exhibit providing complete descriptions of all violations."

Typical was a recent memorandum distributed to State Broadcasters' Associations detailing one station's experience filing its license renewal. In vague lawyer-eez, the message implied the station faced a fine in the hundreds of thousands of dollars merely for improperly addressing an item in its license renewal form 303-S.

Such memos or speakers almost invariably fail to mention that such "... does not include 'violations' identified by the station itself or in conjunction with the station's participation in an ABIP." While it is one thing to be honest with the FCC – something we must always be – it is quite another to volunteer for fines!

POLITICAL AND EEO TIPS

Political advertising is another example where repeatedly reinterpreted Rules make it hard for the station to know exactly what to do. Initially conceived to provide equal access to the airwaves, the whole procedure has become entangled and complexified. Now tiered (i.e. pre-emptable) rates allow candidates with the deepest pockets to buy their way into office. And the new Rules relating to Federal candidates add more paperwork.

Fortunately, I can help somewhat on this issue. One of the state broadcasters' associations has permitted me to share with you the forms they constructed to comply with the Public File requirements. This self-explanatory form can be downloaded free at: **www.radio-guide.com/political.html**

Also, take a moment to review §73.2080, the Rules involving Equal Employment Opportunity (EEO) – another over-complicated Public File trap that most stations just simply shovel scads of money to their lawyers to sort out. Yet, so seriously is the FCC concerned about proper EEO compliance that a large-scale mail audit is being conducted randomly on hundreds of stations and their websites looking at EEO compliance.

However, a problem yet to be addressed is that a station can crawl through all the hoops of §73.2080 and still discriminate freely with its hiring practices. Hence, many consider EEO a perfect example of legislation serving little purpose other than enhancing the wealth of the DC legal lobby, the whims of a special interest group or some fame-seeking congressman.

To help you see what is involved, I have arranged to post on the internet EEO forms 396, 397 and one of the previous 395-B forms the FCC is trying to get reinstated. You can grab them at: **www.radio-guide.com/EEO.html**

Once you read it over and discuss it, perhaps your station will feel impelled to let the FCC know of your concerns.

Why do these things get adopted so easily? In general, broadcasters do not take the time to let the FCC know how these Rules will affect them. Recently, one of the state broadcaster associations requested its members to write the Commission opposing the proposed requirement to record daily broadcasts. Suggested letters were even supplied. But out of over one hundred and fifty member stations, only one station (along with yours truly) responded to the request.

How did we get to this? My friend, Harrison Edwards once wrote many years ago: "Apathy is the cancer of democracy." Do not leave these issues to the lobbyists. Let your state broadcasters' association and the Commission know about your concerns.

Ken Benner is an active ABIP inspector, based in Tucson, Arizona. Ken can be reached at bennerassociates@aol.com

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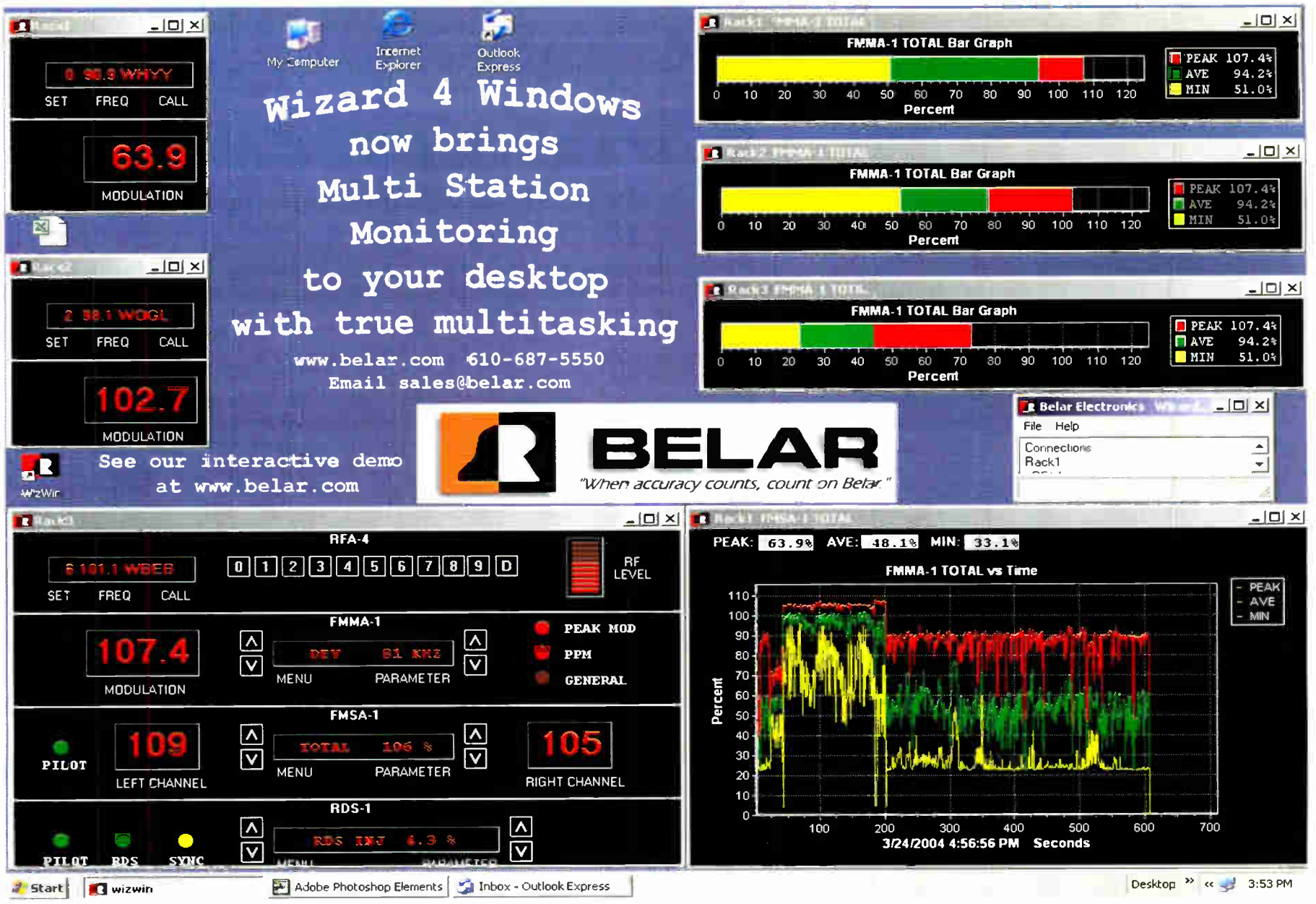

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Subcarrier Radio: FM's Hidden Gem

Part 1: An Old Tool Fills a New Need

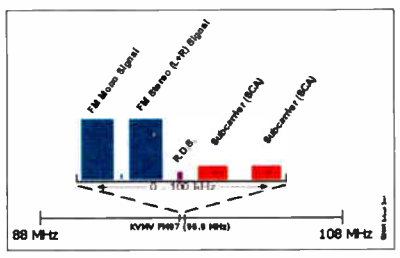
by Robert Sims

[PHARR, Texas - September 2004] It seems most of the major types of RF transmission have their own little "side opportunities." The Shortwave/Ham community has the upper and lower sidebands, TV has VSB and SAP, AM has stereo (though not widely used anymore). How about FM?

FM does have stereo, but that is taken for granted due to its general acceptance decades ago. So, at least as far as "novelty" goes, it seems like FM gets the short end of the stick. Yet, that is where perception misses reality. A technology birthed over 50 years ago is on the verge of making a comeback: enter Subcarrier Radio!

EXTRA PROGRAM CARRIERS

Subcarrier radio offers today's FM broadcaster the opportunity to serve the local community with additional programming or music – up to two additional broadcast "stations" – and at minimal cost. With all of the present day rumblings about Digital Broadcasting (IBOC) and the possibilities of splitting it up into multiple parts, it only makes cents (pun intended) to look at the existing and much more cost-efficient options available to broadcasters via analog subcarrier.



Though widely overlooked, radio transmission using Subsidiary Communications Authorization (SCA) subcarriers is once again getting noticed, both by broadcasters and listeners.

EARLY SCA

Developed in the late 40's when FM radio just had not caught on yet, it was seized upon by a number of broadcasters in hopes of using the technology to generate additional revenue. The plan: use subcarrier technology to transmit "secret" programming – primarily music – that did not have those pesky commercial breaks.

Prior to this, public places of business (banks, retail spaces, offices, etc.) would play FM music over their speaker systems and, by means of tones, mute out the commercials. Given the comparatively young age of radio (and the temporary construction freeze during World War II), you have got to admit that kind of technology was pretty advanced.

Nevertheless, the FCC was nonplussed and declared the practice of muting commercials to be illegal. After all, why run the risk of Joe Consumer muting out the commercials too? Advertisers raised sufficient fuss and the FCC took action quickly. However, the brief time such an opportunity was available served to set the stage for further development of the "background" music concept.

Realizing that FM transmission by nature had a lot of unused bandwidth (FM stereo was not yet on the scene), the subcarrier concept was finalized and the FCC permitted SCA operations beginning in 1955.

ELEVATOR MUSIC AND MORE

Using SCAs, "subcarrier broadcasting" became well accepted. Numerous uses sprang up, including background music with Muzak as the "power player" of the day. Other uses included Radio Reading Services for the Blind, news, stock & business reporting, and even sports. New York State went so far as to authorize its use for carrying information and race coverage from horse tracks. FM Stereo (the stereo portion is itself a subcarrier) cut into the available space, but with a little tweaking there was still enough room for two SCA channels.

As the SCA trend gained momentum, Radio Reading Services (which were nearly all non-profit) began to lose their foothold. The FCC stepped in and issued a ruling that non-com FM stations were required to lease one subcarrier channel, at a fair rate, to a Radio Reading Service, if so requested. Though specific rate rules and non-compliance penalties were not detailed, the regulation still stands today.

With the rise and fall of trends (such as Muzak, which is now often delivered via satellite) came the opportunity for additional technological development, and subcarrier channels began to find use as data transmission facilitators. Why build new towers and design transceivers with different frequency ranges when you can just stream the data digitally in a subcarrier that already has most of the required equipment in place and operational?

Paging technology emerged and in some places latched strongly onto subcarriers. Even Atari entered the fray ever-so-briefly with an ill-fated game cartridge that contained a wireless data modem to download games via subcarrier.

While it never got off the ground, the leader of that project, Larry Karr, maintained his interest in the technology, founded SCA Data Systems Incorporated (based in Santa Monica, CA), and is now cooperating with Microsoft on project SPOT (Smart Personal Objects Technology). SPOT represents a big leap in wireless digital transmission, and while very slow in catching on, does show serious potential.

DEREGULATION

But back to the recent past: as overall subcarrier use slowed, the FCC relaxed its SCA standards, declaring an end to regulation of subcarriers in 1983. The playing field was wide open and data services (specifically paging) took off. Deregulation effectively saved subcarrier.

The only rules still in place restrict the upper end of the frequency to the 100 kHz cutoff that FM broadcasters already observe (there is some "wiggle room") and require broadcasters to observe the same decency and appropriateness standards that apply to main channel broadcasting. Otherwise, the sky is the limit.

The biggest established technology to hit subcarriers in the recent past would have to be Radio Broadcast Data Systems (RBDS). RBDS provides those text messages on the face of many new car stereo systems. Stations use them in applications ranging from simple call letter, song title & artist name display to exclusive contest announcements. Advertising by RBDS is also very close to becoming a reality.

Inovonics 701 RDS Generator

Currently, subcarrier radio is used in many locations across the US, serving functions which include: STL Telemetry Data relay, Paging & Data Transmission, Radio Reading Services, Ambient Music, and in a few cases – including my station – auxiliary broadcasting channels. I believe this last use has the most potential for growth.

POSSIBILITIES

Recently KVMV-FM, the Christian Broadcaster for whom I work in Pharr, Texas, modified our programming and eliminated most of the teaching and preaching programs from the daytime rotation. Market research, listener feedback, and industry trends all indicated our Adult Contemporary format would be better served by running solid music (and occasional short features) during daytime and moving most teaching & preaching to late night slots.

What we did not want was to forget or isolate a sizeable portion of our more dedicated listeners. A solution was found using a subcarrier.

Prior to our programming shift, we had already launched a subcarrier broadcast geared toward the younger set with content provided exclusively from the His Kids/Sonshine Children's Network. By making a one-time purchase of a fix-tuned SCA capable radio, listeners would have something to put on for the kids that they knew would always be "family safe and friendly."

The hope behind the "one-time fee" for the SCA tuner was that, as they received a benefit from the service, listeners would begin supporting it on a contribution basis. Since we are a non-profit, listener-supported station anyway, that seemed like a natural fit.

With that experience in hand, we were ready to offer an innovative solution with a decent sound at a modest one-time fee, which would surpass the programming we had formerly carried on our main channel. The first step was procuring the necessary equipment.

PLANNING THE SERVICE

Just like a "normal" broadcast, certain pieces of equipment are necessary for operation of a subcarrier. We set up an automation computer that networked seamlessly with our existing automation to facilitate sharing of music and programming. We purchased an SCA modulator that would take care of the necessary encoding, and linked that to our FM encoder so we could inject the subcarrier into the primary FM carrier.

We also purchased an SCA modulation monitor that was fed from the same source as our FM Modulation Monitor. While the monitor is not required, it is very useful for tweaking & making initial adjustments, as well as day-to-day signal evaluation. That was it. We were good to go.

(One could add equipment such as phase correctors, AGC/stereo levelers, and equalizers can be used for further processing, but they are strictly optional.)

We also keep an SCA tuner on hand to get an exact idea of what our listeners are hearing. You can take the utmost care to produce a quality product, but until you can hear it exactly as your audience hears it, you have no guarantee. Like my math teacher used to constantly remind me: "take the time to check your work. No excuses!"

In part two, we will discuss getting everything running correctly, and how your station can derive benefits from using the SCA spectrum available on your existing carrier.

Robert Sims is a producer and the Webmaster at HCJB/World Radio Network affiliate KVMV-FM in Pharr, Texas. Formerly Station Manager of KCAS-FM in Mission, Texas, Robert is happy to respond to your SCA questions. Contact him at: rsims@hcjb.org

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World Radio History

User Reports From Radio Guide Readers

Field Guide

Omni-3fm Turbo:

Solid Audio – Modest Price

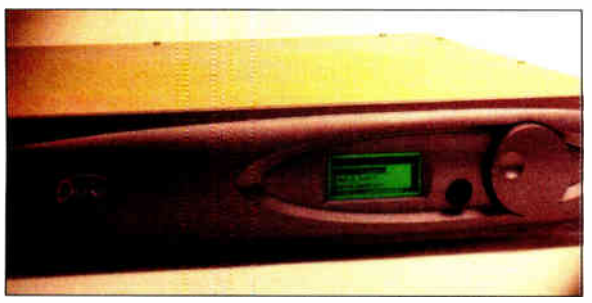
by Peter Stewart

[AKRON, Ohio - September 2004] Many stations looking to upgrade their audio processors are daunted by the costs of the "top of the line" digital processors available. And in some cases, they really may not need that level of processor, nor the price tag that goes with it.

Such stations are not in the "modulation wars" typical of some markets. They are under no pressure to be loud for the sake of being loud. Instead, they are looking for the best "bang for the buck" in getting control of their air sound, with a processor that is clean and easily adapted to their format.

UPGRADED MODEL

We recently received a Beta version of the Turbo upgrade for the Omnia-3fm series audio processor. The Omnia-3fm Turbo features something new the previous versions did not have – a three-band AGC/Leveler section. This makes the Omnia-3fmt ideal for cash strapped stations needing to upgrade from an older, basic audio processor, such as an Optimod 8100, CRL Amigo, etc.

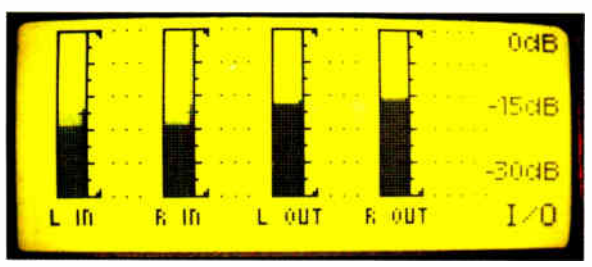


Although being a basic audio processor itself, the Omnia-3fm gives you more processing power than its predecessors. And now these new enhancements from the folks at Omnia have "turbo-ized" the unit, making it a great value among the mid-range processors.

For those of you who have not been exposed to the Omnia-3fm, its original design was a wide-band AGC followed by an EQ enhancement stage, then three bands of limiting, distortion cancelled clipping, and finally the stereo generator stage with built-in composite clipping. The composite clipping features Omnia's composite filtering to remove out of band components created when heavy amounts of composite clipping is used.

MAKING THE SOUND CONSISTENT

One of the difficulties with the classic Omnia 3 was trying to maintain cut-to-cut consistency without having to use the limiters way outside their "sweet spot" operating range. What was needed was some sort of multi-band AGC stage. Omnia provided that with the Omnia3 Turbo upgrade. This upgrade comes free for all existing users of the Omnia-3fm audio processor. If you are one of these users, you *will* want this upgrade!



I have found adding three bands of AGC allows this processor to have enough power to give a nice presence on the dial. Even running the AGC section lightly and/or with slow attack/release times will provide significant improvement, as the gentle EQ action of the multi-band AGC delivers a much improved source-to-source consistency.

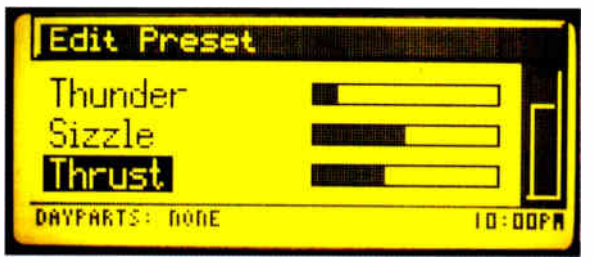
HOW DOES IT SOUND?

Call me a nostalgia freak, but a nice plus for me is how the Omnia-3fmt comes extremely close to re-capturing the aural charm of the original Omnia-fm (now called Omnia-Classic) – and I like that! When comparing this to the Omnia-Classic, I find the Omnia-3fmt has a much better range of operation than the old classic had.

The Classic just had insufficient range to correct large level errors and an outboard processor, such as a Compellor, was needed. Not so with the Omnia-3fmt. It has plenty of level correcting power.

The Omnia 3 Turbo comes with a full bag of tools to get the sound you want. This includes two different editing modes ("Normal" and "Expert"), which is a nice touch. The Normal mode is meant for the average processing user, and Expert mode for folks who are not afraid to dig into things and get their feet wet!

A quick warning: The Expert mode gives you the ability to adjust quite a few different parameters. If you are unfamiliar with the finer points of audio processing, I would advise you to stick to the Normal mode at first, trying out the "advanced" options cautiously, one at a time!



Normal mode consists of the following controls:

- **Thunder** - which adjusts the "bass boom."
- **Sizzle** - which adjusts high frequency components (treble).
- **Thrust** - This is your loudness vs. distortion control.

I think these controls will get most users close to the sound they want.

CRANKING IT UP

When you have access to an audio processing guru, and need to really create a custom sound, the Omnia-3 Turbo Expert editing mode has the tools you need. In Expert mode, menu navigation for adjusting the various parameters is done through a useful block diagram flow chart of the Omnia-3fmt's processing stages.

Amongst the many useful adjustments, the Expert mode features a two-stage bass EQ to separately fine-tune deep bass with "normal" not-so-deep bass, as well as a bass warmth adjustment.

The Expert mode also opens the flood gates on a wide range of adjustments on each of the AGC and Limiter systems, ranging from attack and release to "makeup gain." The "makeup gain" feature allows the Omnia Turbo to make quick adjustments to catch quieter passages, while "remembering" where it was before, and jump back to its normal operational state when the quiet passage is over.

QUICK SETUP

How was it to work with? We had no problems getting the most out of this processor on our format within one evening. Since this unit is quite a bit less complex than its bigger brothers, it was simpler to quickly get close to a sound we liked, a big plus when you have a ton of other tasks to get to around the station.

Another plus: the Omnia-3fmt also offers dual composite outputs to feed two composite transmission paths, each separately adjustable, which definitely comes in handy. In our case, our main and auxiliary STL's require different drive levels, and we were able to adjust both for correct modulation.

RATED: A "BUY"

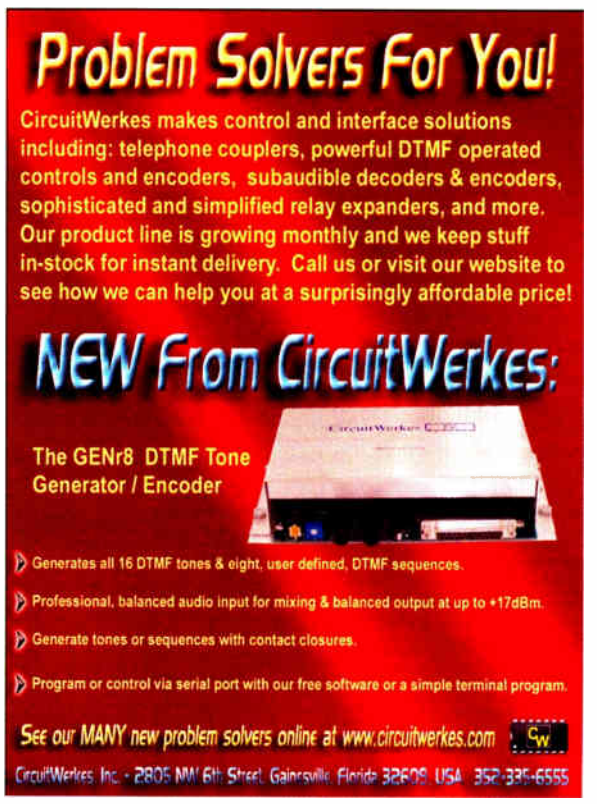
Overall I have to say the Omnia-3fmt is a great audio processor for the money. It definitely gives you enough power to compete loudness-wise with the bigger more expensive boxes. Jazz, Classical, and other "purist" formatted stations may find this processor a perfect fit. And when funds are limited, it fits the bill nicely for most other formats too.

Downsides? As a three-band unit, the Omnia-3fmt does lack the sophisticated EQ correction available on the more expensive processors, to standardize a station's sound across a wide range of musical types. And this processor will only work for analog FM service. If digital transmission is on your near horizon and you will need to process for IBOC-FM, Omnia recommends picking up an Omnia-3net HD radio. At this stage of the game, I would rate it a minor issue.

In conclusion, I find the Omnia-3fmt a much-needed improvement on the Omnia 3 design. If you have an existing Omnia-3fm, run – do not walk – to your dealer for this free upgrade! My only question: Frank – what took so long?!

This is a worthy processor to consider in your next purchase evaluation. You will not be sorry you do.

Peter Stewart is a contract engineer in Akron, OH. Peter can be contacted via: editor@radio-guide.com



World Radio History

Gear Guide: Consoles – Processing – Audio Distribution

Broadcast Warehouse

Broadcast Warehouse has just released **Version 2 Software** for their broadcast processor, the DSPX. The DSPX processes audio for FM and digital radio services such as IBOC HD and internet streaming. The DSPX can also process for FM and digital radio simultaneously. V2 offers users remote control via serial and TCP/IP connections. Users now also have the ability to switch presets via the in built real time clock (day-parting). The processing has been overhauled and the DSPX is louder and cleaner than ever before.

V2 adds: Remote control from an ultra-cool Windows application. Day-parting. Analog to Digital and vice versa silence fall-back. Adjustable X-overs. Multi-band AGC window gating. Multi-band limiter delay controls, lower distortion, more presets and much much more.

Existing DSPX users can simply FLASH upgrade their DSPX by obtaining the update file from BW.

Broadcast Warehouse
Phone: 888-866-1672
Website: www.broadcastwarehouse.com

Broadcast Devices

The **UTA-200 Utility Amplifier Series** is a versatile interface and routing solution for broadcast and professional sound applications. The system comprises of a mainframe and various plug in modules which can be ordered and configured as the application dictates. There are several standard configurations to choose from, including a 1 X 11 stereo DA, a pair of 1 X 5 stereo DA's or three 1 X 3 stereo DA's in the same mainframe. Analog line, microphone or digital inputs are available on all DA configurations. Other configurations include various combinations of digital and analog interface. Consumer-to-pro and digital standards conversion are typical applications. All frames are pre wired, labeled and ready for installation. Visit www.Broadcast-Devices.com for a complete catalog.

Broadcast Devices
Phone: 914-737-5032
Website: www.broadcast-devices.com

Broadcast Tools

Broadcast Tools® is proud to introduce the **SS16.16**, the latest in an expanding line of audio switchers routers providing a variety of solutions for the broadcast industry.

The SS16.16 Stereo Audio Routing Switcher has capacity for 16 stereo balanced inputs and 16 stereo balanced outputs. Any one input may be routed to any or all outputs. The switcher is controlled by front panel controls and or the RS-232 port, while the source and destination is displayed on a 40x4 back-lit LCD. The optional SP-1 Ethernet interface offers software control over your LAN/WAN.

The SS16.16 is equipped with a front panel monitor speaker, headphone jack and level control. All audio connections are made to removable Euro screw-terminal connectors. Free remote control software for the SS16.16 is available in both RS-232 serial/USB and TCP/IP, via a software download from our web site.

Broadcast Tools
Phone: 360-854-9559
Website: www.broadcasttools.com

Henry Engineering

Henry Engineering's new **StudioDrive PC** audio system is a broadcast audio mixer that mounts in the drive bay of a PC. It makes any PC with a soundcard into a fully integrated studio that is ideal for radio automation, PC-based edit suites, voice-over studios, LPFM, emergency studios, remotes, webcasting, and similar broadcast applications.

StudioDrive accommodates 5 inputs (1 Mic + 4 stereo Line), via four mixing channels. There is also a built-in telephone coupler for recording from a POTS line. There are two stereo outputs: Program is for on-air use; Record is for recording to the soundcard. The built-in Mix-minus output can be used with a telephone hybrid.

StudioDrive features a comprehensive Monitor system. You can monitor the Program output, as well as the station's off-air signal or the output of the soundcard during PC editing or production.

By adding a few peripherals, e.g. a mic and CD player, any PC can be used for live broadcasting and/or PC audio production tasks.

Henry Engineering
Phone: 626-355-3656
Website: www.henryeng.com

Inovonics

The **DAVID-III** from Inovonics is the firm's third-generation product in the long-running "DAVID" series of budget-conscious audio processors for FM broadcasting.

The simplicity of this new design makes it exceptionally easy to set up and use. The unit incorporates gain-riding AGC, three-band 'Spectral Loading' average-level compression, and the firm's patented PIPP* limiter that delivers full carrier modulation with any program feed.

The DAVID-III utilizes colorless PWM gain control and true digital synthesis of the composite multiplex signal. Control over the audio signature is afforded with front-panel adjustment of program density, LO/HI equalization and pilot-protected composite clipping.

An on-site demo of the DAVID-III can be arranged through most broadcast equipment distributors.

Inovonics
Phone: 831-458-0552
Website: www.inovon.com

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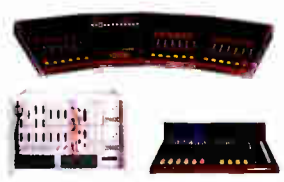
Logitek Electronic Systems brings you integrated routing, distribution, and mixing of your audio sources with our **Console Router Systems**. Systems start with the Audio Engine, a full featured X-Y router. The Audio Engine can accept analog or digital I/O and is expandable via fast, reliable fiber networking. Multiple mix-minus busses, intercom/talkback, and audio processing functions are available for flexible operation on any format.



Console control surfaces include the Numix, Remora and vMix consoles. Control surfaces can have as few as 4 faders or as many as 24; multiple surfaces may be operated from a single Audio Engine. Faders and surface buttons are user-assignable for maximum flexibility. Several stand-alone router controllers are also available. Call today for more information!

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Phone: 800-231-5870
Website: www.logitekaudio.com

Orban

Quality sound is what the **Optimod-FM 8300** is all about-sound that attracts audiences by providing a polished, outstandingly professional presentation regardless of format and source material.

Exceptional versatility allows you to adjust the processor's audio texture to brand your sound, knowing that the resulting signature sound will remain consistent, cut to cut and source to source.

With the 8300, your signature sound is just a preset away. An easy, one-knob Less/More adjustment allows you to customize any factory preset, trading cleanliness against processing artifacts according to the requirements of your market and competitive environment.

The 8300's built-in stereo encoder, AES/EBU digital inputs and outputs, and analog I/O permit hassle-free interfacing to any broadcast plant, whether the 8300 is located at the studio or the transmitter.

Orban
Phone: 510-351-3500
Website: www.orban.com

RAM Systems

The **SR-64** is a passive/mechanical 6x4 router designed buy broadcasters, for broadcasters. It has six stereo inputs and four stereo outputs. All inputs and outputs are on connectors for ease of installation. The switcher has separate chassis and audio grounds that may be strapped. It is one of many versions of switchers made by RAM.

The **SR-10M** is a passive/mechanical 10x1 switcher, with 10 stereo inputs switching to 1 stereo output. It has LED level metering, a mechanical interlock, and a headset jack with level control. Inputs and outputs are on removable connectors, and the unit is rugged steel construction with a wide designation strip.

RAM Systems
Phone: 800-779-7575
Website: www.ramsyscom.com

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Axia, the new approach to studio audio. Using patented Livewire™ technology, Axia networks employ a framework of standard Ethernet hardware to transport high-performance audio throughout your entire facility.

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NAB Guide:

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Orban – ***Booth #413***
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New products include our DigiLogger and NewsGen software. DigiLogger allows you to retain as much of your station's audio as you need to, using compressed or non-compressed, multiple channels, and easy access via the network. NewsGen is a standalone newsroom production package enabling reporters to write newscasts, receive and manipulate wire copy and digitally record, edit and playback audio.

Prophet Systems – ***Booth #709***
Phone: 877-774-1010
Website: www.prophetsys.com

Radio Systems

The **Millenium Digital** is 100% AES/EBU capable on every input and output. In addition, performance has been enhanced with 10 fully programmable mix-minus outputs and a serial interface to third party equipment.

Major new features include: analog or digital capable on every channel, 32 bit resolution, sample rate conversion on every input, CRT companion metering/timer and set-up display, all outputs available in analog or AES/EBU digital format, 10 extra auxiliary output busses, up to 10 fully programmable mix-minus outputs, serial RS-232 interface and sleek new front panel styling.

All Millenium consoles are fully upgradeable to Millenium Digital.

Radio Systems – ***Booth #1110***
Phone: 856-467-8000
Website: www.radiosystems.com

Superior Electric

The **STABILINE PT1 Series** offers all-mode protection (Line-to-Neutral, Line-to-Ground, Neutral-to-Ground and Line-to-Line). Models are available with surge current ratings of 25kA, 50kA, 80kA and 100kA per mode for single and three phase electrical service.

The PT1 Series TVSS are intended for permanent installation at service entrance and/or distribution panels.

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Thermo Bond **Communications Shelters** are currently in use in Maine, Florida, California, Washington and almost all states in between.

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Thermobond Buildings – ***Booth #310***
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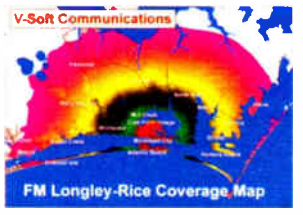
Website: www.thermobond.com

V-Soft

V-Soft Communications is the leader in innovative and reliable broadcast engineering software. A wide variety of software for producing AM/FM/TV studies, including propagation prediction, frequency searches, path profiling and RF hazard is available.

Probe 3 is the complete package for predicting radio propagation in the 20 to 20,000 MHz frequency range. Probe 3 creates "real-world" maps and performs coverage and interference analysis using Longley-Rice, FCC, TIREM and other models.



AM-Pro is a grouping of powerful routines in one integrated program designed to calculate AM standard band broadcast coverage and perform allocation studies.

V-Soft – ***Booth #1109***
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Website: www.v-soft.com

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BMI	1407
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Mary Catherine Sneed
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Navigating New Waters Together

Thursday / October 7

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Jonathan Adelstein
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Thursday / October 7

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Entercom Communications, inc.

Chesley Maddox-Dorsey
Access.1 Communications

Mark Mays
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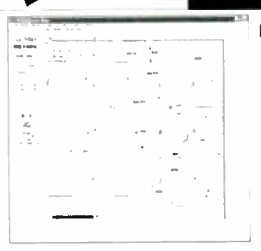

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Radio Conference Guide

List your Convention or Gathering Here
Email: radio@broadcast.net

32nd Annual SBE22 Broadcast & Tech Expo
September 23 – Verona, NY – www.sbe22.org
Electronic Equipment Expo
September 28-29 – Seattle, WA – www.emexpo.org
Pittsburgh Chapt. 20 Regional SBE Convention
October 6 – Monroeville, PA
www.broadcast.net/~sbe20
NAB Radio Show – October 6-8 – San Diego, CA
www.nab.org/conventions
2004 Broadcaster's Clinic – October 12-14
Marriot-Madison West Hotel, Madison, WI
www.wi-broadcasters.org
Southwest Communications Expo
October 19 – Phoenix, AZ – www.sbe9.org
Broadcast Engineering Expo, SBE Chapter 67
October 22-23 – Grapevine, TX
www.sbe67.org
Bos-Con Boston SBE Regional Convention
October 26-27 – Boston, MA – www.sbe11.org
National College Media Convention
November 4-7 – Nashville, TN
www.collegebroadcasters.org/convention.shtml

Radio Guide at TAB Convention

Radio Guide was pleased to be present for the 2004 Texas Association of Broadcasters' Convention in Austin, August 11-13.

Among the state conventions, the Texas confab was first class. The exhibit floor was full, and for most of the day, reasonably well populated. The range of radio manufacturers was pretty good, and while most were there with existing product lines, it was interesting to see several who were talking about some very interesting "coming attractions."

As you can imagine, the recent announcements that a couple of large corporations are going to implement IBOC aggressively fostered a lot of interest in transmitters, antennas, and related products. A new 50 kW transmitter from one manufacturer was certainly an indication of the serious way the manufacturers are betting on the technology.

Radio Guide appreciates the warm Texas welcome!

BE to Host HD Radio Seminar

HD Radio™ generation from the studio and the latest delivery methods will be among the topics to be discussed during Broadcast Electronics' upcoming HD Radio Seminar in San Diego, October 6, which coincides with the NAB Radio Show.

The seminar is free to all broadcasters and will be held at the Embassy Suites Hotel – Downtown, 601 Pacific Highway, from 1 p.m. to 3 p.m. on October 6. Reservations can be made by emailing HDR@bdcast.com.

Henry Engineering Announces a Cool New Product!

AutoSwitch

Automatic Audio Switcher & SilenceSensor

AutoSwitch is a multi-purpose stereo audio switcher and silence sensor. It can be used to manually or automatically select between two stereo audio sources.

The most common applications for AutoSwitch:

1. **Monitor Audio Switcher:** Monitor (and headphones) audio switches from AIR to LOCAL when the mic is on. This solves the problem of "digital processing echo" in DJ's headphones (like the original MoniSwitch).

2. **Automatic "Backup Audio" Switcher:** Unit senses loss of Main audio source, and switches to a Backup source until Main audio source returns to normal levels.

AutoSwitch can be used anywhere an "A/B" audio switcher is needed. It has gain-trims for easy level-matching, and uses electronic audio switching for smooth transitions.

AutoSwitch is now in stock at all Henry dealers. Price: $285.

Henry Engineering
503 Key Vista Drive, Sierra Madre, CA 91024
Phone: 626-355-3656 Fax: 626-355-0077
henryeng@aol.com www.henryeng.com

VoxPro Offering Free Upgrade to 3.3

Legendary Digital Audio Sound Editing Software With Optional Control Panel

Bainbridge Island software manufacturer, Audion Labs has released VoxPro PC™ 3.3

This upgrade of our fast, easy-to-use, reliable VoxPro PC voice editor comes with features that maximize the products speed, simplify administration, and satisfy customer requests received over the past year.

As is common with past upgrades and releases, purchasers of the most recent version (VoxPro 3.2) can upgrade FREE within 12-months of their original registration date. VoxPro PC customers upgrading from previous versions or outside this 12-month window can do so for $99 USD. This cost includes shipping via ground.

A list of the features included in the new upgrade are attached for your immediate use. A press release will be sent early next week with a product review as well.

Audion Laboratories
12903 Manzanita Rd NE, Bainbridge Isl, WA 98110
Phone: 206-842-5202 Fax: 206-842-6029
www.audionlabs.com

Axia Launches Ethernet Adapter for Professional Audio

Axia Audio announces a new audio networking component that provides a real-time, low-delay interface between pro-audio equipment and Ethernet.

Using the Axia Analog Line Node, analog audio is converted to and from 24-bit PCM digital audio network streams; once on the network, audio can be routed and shared and mixed in the network domain.

"Modern Switched Ethernet is ideal for networking audio devices," comments Axia president Michael Dosch. "Using adapter nodes, our clients have been able to eliminate snakes, routing switchers, distribution amps and miles of discrete audio cabling. The nodes are placed nearby the source and target equipment and all interconnection is over Ethernet."

Each Analog Node contains eight balanced stereo inputs and outputs, as well as high-end 24-bit A/D/A converters throughout. The Livewire-enabled Ethernet port connects them to a high-capacity media network based on standard Ethernet switching technology; nodes are connected with the same CAT-6 cable used for Ethernet data networks. Livewire networks are capable of thousands of simultaneous streams.

The Analog Line Node is part a family of Axia audio nodes that allows elimination of PC sound cards, and mixing and matching of digital, analog and microphone audio. Using standard Switched Ethernet, Axia users can construct a scalable audio network of any size - connect a few rooms or an entire stadium.

Axia Audio
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Phone: 216-241-7225 www.axiaaudio.com

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Live Control Package $404 *Buy Now* ☐
Useful for high energy morning shows. Create and play audio elements outside of the log for random access or auto-play, send artist/title information. Includes: Electronic Copy module, Cart Deck module, Button Bar module and RDS Export module.

Satellite Package $404 *Buy Now* ☐
Enables your station to run in satellite mode and automatically record satellite feeds, with local spot insertion and time and temperature announcements in your staff's voices. Includes: Satellite Mode module, Time & Temperature Announce module, DRR Automated Capture module, and GPI module.

MusicGen 101

Scheduler Package $404 *Buy Now* ☑
Schedule your station using either internal or external scheduling systems. Includes: MusicGen101 integrated music scheduler module, Traffic and Music Load module, Multi-User Access module for setting unique user permissions, and the Audio Archive module for enhanced audio management.

VoiceTRAC Package $404 *Buy Now* ☐
Record breaks, intros and outros for when you can't be live, but still want to sound like it. Includes: Basic VoiceTRAC module, Enhanced Production Interfaces module for third-party audio editors, CD Extractor/Audio Format Converter, and the Graphic VoiceTRAC Upgrade module for graphically based voice tracking and quick segue reviewing.

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