

# Radio®

THE RADIO TECHNOLOGY LEADER

# Get Connected

The ins and outs of wire & cable

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## ON THE COVER:

While it all may seem like copper strands, there are some real differences in wire, even between types that are supposedly for same purpose.

Cover design by Michael J. Knust.

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## Currents Online

Highlights of news items from beradio.com from the past month

### Indecency Proposals Die in Pre-election Scramble

The legislation was stripped from a bill authorizing Defense Department operations in the final hours before the Congressional recess.

### CGC Warns of Fraudulent Form 301 Applications

Some of the CGC-confirmed fraudulent applications include filings by KLVE-FM License Corp. and Calvary Chapel of Costa Mesa.

### FBI Investigates Houston Transmitter Break-ins

Thirteen radio stations, two TV stations, cell and pager sites have been vandalized.

### FCC Issues Fine Against XEMO Broadcasts

The FCC fined Uniradio \$25,000 for providing program material from a studio located in the United States to a Mexican AM station.

### Mark Mays is New Clear Channel CEO

His father, Lowry Mays, relinquishes his CEO spot but remains chairman of Clear Channel.

### FCC Auction 37 Bidders Confirmed

The FCC identified 456 applicants found to be qualified to bid in the upcoming auction for 288 FM broadcast construction permits.

### Steinberg Updates Music Production Software

Cubase SL3 offers new features such as an Audio Warp engine that imports ACID files and time-stretching and pitch-shifting in real-time.



## Site Features

### Find the Mic Sweepstakes

Find the hidden mic icon on the *Radio* magazine covers of 2004 and win. Enter online.

### KUVO in Surround

KUVO-FM in Denver featured a surround sound broadcast in September. A diagram of the audio system is available online. Follow the links to this article.

### November issue Online

Read the entire issue online, plus find additional articles and information.

### Online Classifieds

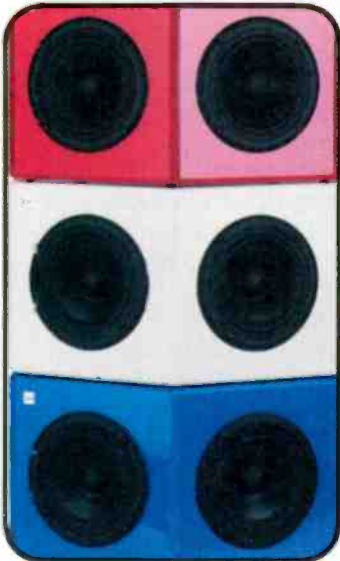
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## Lead, follow or get out of the way

**A**t the end of September, Jeff Littlejohn, senior VP of engineering for Clear Channel, distributed a memo to the Clear Channel station engineers. That memo has created more industry buzz and prompted more people to send us letters than anything I can remember in the past seven years since I have been the editor of *Radio* magazine.

The memo outlines Littlejohn's directive for all Clear Channel AM stations to reduce their audio bandwidth to 5kHz for talk formats and 6kHz for music formats. The decision was based on several factors, but there are three strong reasons: most AM radio receivers cannot produce audio frequencies above 4.5kHz, it will improve modulation efficiency and it will reduce interference to first-adjacent channels.

Littlejohn is also the co-chairman of the NRSC's AM subcommittee, and in his memo he stated that he would propose this standard practice among all AM licensees.

A few days later, Chris Alexander, director of engineering of Crawford Broadcasting, told *Radio* magazine that the Crawford stations had also examined the benefits of reducing the AM audio bandwidth, and that the Crawford stations would follow suit and reduce their audio bandwidths to 5kHz.

It didn't take long for the letters to pour in. The e-mail list servers filled with chatter. The subject was repeatedly brought up on the floor of the NAB Radio Show. Some of the chatter on the e-mail lists was outright mean with personal character attacks on Littlejohn.

While the furor subsided by the end of the Radio Show, the issue itself is still on the minds of radio engineers. You can read some of the letters we received in this issue's Reader Feedback section.

Most of the letters we received opposed the decision. To be honest, I was not surprised to see this because the majority of letters on any topic typically come for

those who oppose the topic. Those who support it tend to be quiet.

Littlejohn and Alexander noted that the decision was based on current analog systems, and that IBOC had nothing to do with the decision. Again, the opponents quickly state that the analog reduction will only help to make the IBOC signal sound naturally better. While it is true that a frequency-limited analog signal will sound dull compared to a fuller-bandwidth digital signal, it's a weak argument to use this as the sole point of opposition to the Clear Channel decision.

Can you summarily accept that there are no receivers capable of receiving anything above 7kHz? Of course not. There are radios that can cleanly receive wideband audio. Based on the research I have seen, there are only a few current designs that can do it. It's also difficult to determine how many older or AM stereo receivers there are still in use that have the wider bandwidth. In the end, you can't please all the people all the time.

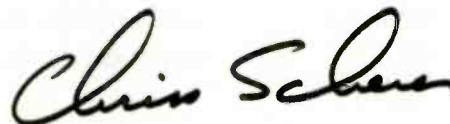
The benefits to the overall spectrum efficiency make sense to me. Reduction of adjacent-channel interference and improved modulation efficiency are valid concerns.

I applaud the efforts of Littlejohn and Crawford for their willingness to make this change to better AM radio today, while still looking ahead to what radio broadcasting might be tomorrow.

Radio broadcasting is constantly challenged by other forms of media, and runs the risk of being left behind in the technology evolution. HD Radio is one form of digital transmission in the latest stages of development and earliest stages of rollout. DRM is being evaluated and implemented for medium-wave around the world. Cam-d is yet another digital AM system being developed.

If radio remains static it is destined to fail. It will be left behind as the listening audience turns to iPods, podcasting, satellite radio and other forms of digital delivery.

You may not like what you see and hear with the current activity in analog and digital radio, but you can follow those who are making a new path, take an active part in clearing a different path or stay where you are and be left behind.



Chris Scherer, editor  
cscherer@primediabusiness.com

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# Managing Technology



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## The value of datacasting

By Kevin McNamara, CNE

**R**adio spectrum is a lot like real estate in that the portion of spectrum controlled by an individual or corporation can be viewed as vacant land. Consider some other similarities:

1. The amount of footprint permitted on that piece of spectrum determines how large an area can be covered (proximity to population centers).
2. The amount of permissible bandwidth for use by an owner (how much land is available).
3. The specific location where the licensee

control unit at the transmitter site.

In 1993, the Radio Broadcast Data System (RBDS) standard was introduced as a means of using the subcarrier to broadcast specific information that permits a receiver to tune stations based on format and provide traffic, program and emergency broadcast information, as well as other capabilities.

### One-way or two-way?

By definition, datacasting was intended as a means to continually broadcast (or stream) real-time information for a specific audience. In some cases, the data may either be streamed to every subscriber or selectively broadcast to subscribers based on their preferences. There are several good applications for one-way datacasting, particularly as a means to send real-time information such as news, traffic, weather, stock info and music titles.

Other less obvious applications include program-associated data (PAD), differential signals for precision GPS, time-shifting, telematics, commerce, subscription, supplemental audio, messaging, electronic program guide and Emergency Alert System information. Of course, some of these applications are currently enabled with the stations' RBDS capabilities. Given the nature of datacasting, having two-way capability may not be a necessity, but it could provide certain interactive capabilities more in line with a traditional Internet connection.

In the past 10 to 20 years, several platforms that permit the broadcast of data to the general public have emerged.

Without a doubt, the Internet is the largest and most economical medium for the real-time broadcast of data. While many would argue that this means of transport is limited because of the need to have a PC connected to the Internet, the reality is that the Internet is commonly available through devices such as the new generation of wireless mobile telephones and PDAs.

Verizon has begun an initiative to provide fiber to every home and business it serves, called FTTP or fiber to the premise. Of course, the realization of this will take several years and a huge financial commitment, but in the end they will be capable of providing more content than any currently available medium. And, let's not forget satellite radio. This service has more than adequate bandwidth to handle any type of datacasting application, including video. XM, for example, recently announced that it will provide a weather service aimed primarily at the aviation industry. It will broadcast high-resolution graphical weather products, as well as other aviation-specific flight information. The service was recently certified by the FAA for use in commercial aircraft.

Compared to other wireless services broadcasters, such as wireless telephone and satellite radio, terrestrial



Datacasting real-time information, such as traffic, program or emergency information, is becoming more commonplace.

has the rights to use the spectrum (more population equals more potential demand).

4. Other spectrum available in the same location (more supply equals less demand).
5. Specific uniqueness of the spectrum (what differentiates the particular portion of spectrum).

### History

For most of its history, the broadcast industry benefited from the fact that it was one of the only media capable of providing adequate and reliable signal coverage over a large area. Beginning in 1955, broadcasters were permitted to use subcarriers for voice and data (also known as the Subsidiary Communications Authority or SCA). Many leased the space to various reading or language services. It was also common to use a subcarrier to provide data returning from the remote

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broadcasters have a significant disadvantage. Wireless telephone carriers have been aggressive with the deployment on current-generation technologies such as GSM (also called 2.5G) and are actively making key markets ready for the expected next-generation of service called 3G, which promises a seamless moderate speed (as much as 128kb/s) mobile data connection. Satellite radio, through a combination of direct satellite broadcast and local repeaters, provides a completely national footprint.

Once again broadcasters have limitations in terms of bandwidth and, more notably, what is available for datacasting. This lack of bandwidth translates to relatively low data rates, which may not be a problem when it comes to broadcasting most text information; however, supporting large data streams such as graphical information or multiple data streams may be nearly impossible. The IBOC system claims to be able to operate at a total data rate of 150kb/s in hybrid mode; this would leave about

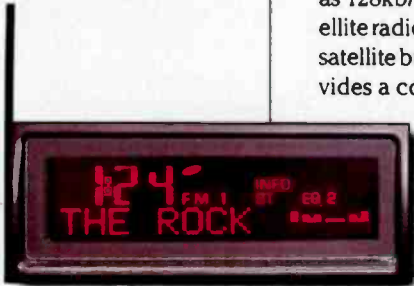
54kb/s available for data services. The rate would increase at least two-fold if operated in the full digital mode. This data rate would certainly support most types of datacasting applications.

## Supply

In established radio markets there are usually several stations capable of covering the same signal coverage to that market. The question is, will there be enough datacasting opportunities to go around? Currently the answer is no, however, as new applications are developed and accepted by the general public there could be some opportunity. It is more likely that the most mainstream applications will use alternative platforms that can reach the highest amount of people before considering terrestrial broadcasting. Consider the economic advantages of using a single platform that can reach most of the U.S. population, rather than entering into agreements with a large number of individual stations to cover roughly the same amount of population. There is also the issue of the cost of managing a large number of stations.

Terrestrial broadcasting doesn't contain any particularly unique qualities. Sure, some stations cover a market better than another due to license class, location or engineering, but in general they all do the same thing and there are about 13,486 stations licensed in the United States.

*McNamara is president of Applied Wireless, Elkins Park, PA.*



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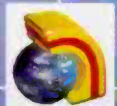
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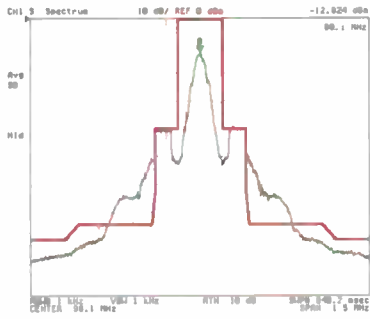
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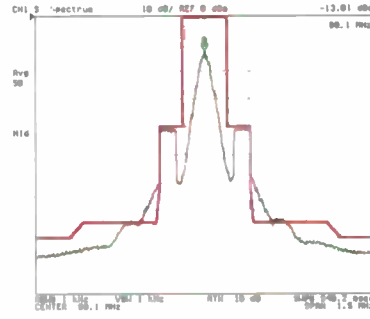
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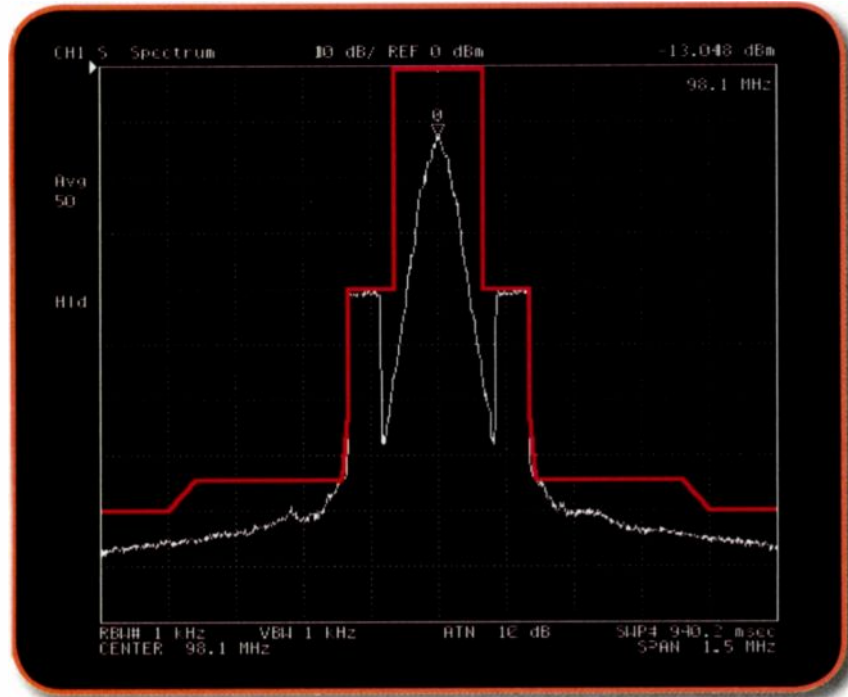
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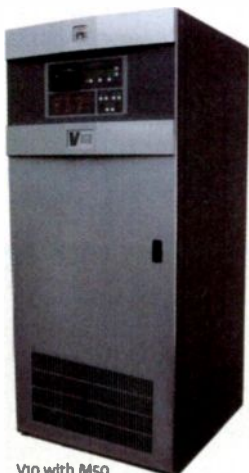


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## FCC gets tough on debts

By Harry Martin



The FCC has adopted new rules in an effort to crack down on deadbeat licensees and applicants. The new rules went into effect on Nov. 1. At that point, the FCC began checking its database to see if anyone seeking a benefit from the FCC is delinquent on any debt to the agency. By comparing the FCC Registration Number (FRN) of the entity seeking the benefit with its roster of reprobate FRNs, the FCC can put a "red light" on the processing of any application by such entities.

Among other things, the FCC indicated that the system will cross-check not only FRNs but the underlying TINs (employer ID numbers or social security numbers) for unpaid debts. This means you can't just open a new FRN to avoid the red light. The Commission explained that debts owed to the Universal Service Fund, the TRS Fund, and other FCC-mandated funds will come under the delinquent debt umbrella, along with the annual regulatory fees and application fees familiar to most broadcasters.

### Good news, bad news

On the positive side, the FCC indicated that delinquent applicants will get a notice of their delinquency so that they can cure it (with appropriate penalties) in time to get their application granted. Now is a good time, then, to double-check the contact person on your CORES account because that person alone will receive the FCC delinquency notice. If your account has an outdated address or contact person, you may not receive timely notice that a fee of some sort has not been paid. A new resource called "Red Light Check" became available on the FCC's website as of Oct. 1. Using your FRN and pass code, you can determine instantly whether you are subject to a red light for any reason.

Unfortunately, the data available through a Red Light Check is minimal. It consists of the FRN, FCC bill number and the amount of the debt, but does not identify the nature of the deficiency. The FCC's staff has been working on ways to improve the system by adding full billing data to its Red Light Check

system. As of this writing such information was not available and debtors must rely on phone calls or e-mail communication with the FCC if they have questions about the accuracy of the FCC's data.

Applicants who dispute a debt that shows up in the FCC's system may contest the assessment in writing. In the case of documented non-frivolous appeals, the "red-light" will be suspended while the FCC considers the case.

To illustrate the FCC's seriousness about this new initiative, consider the case of one applicant who filed to participate in the FM auction. An auction participant is required to submit upfront payments equal to 50 percent more than the established upfront payment applicable to others if the participant in question "has previously been in default on any Commission license or has been delinquent on any non-tax debt owed to any federal agency." The applicant asked for a waiver of that requirement. It seems that he had obtained a \$2,240 student loan in 1985 to attend broadcasting school. The loan was guaranteed by the Higher Education Assistance Foundation. The loan went into default "due to unemployment and other financial setbacks," and was referred to the IRS. But by 1992 the loan had been repaid (with interest). In light of the fact that the default was cured more than a decade ago, the applicant argued that he should not be subject to the 50 percent penalty in his upfront auction payment.

The Commission denied the waiver request. According to the FCC, its "rules and the integrity of the competitive bidding process are best served by applying the upfront payment requirement in a fair and consistent manner." While this case arose in a context other than the new debt collection rules, it reflects a certain hard-nosed approach likely to apply under the rules, too.

Persons doing business with the FCC should keep receipts of payments made to the agency. Not only could these help to resolve any mistakes on the FCC's part, but the receipts may well be necessary in the context of a station sale to ensure the buyer that all licenses have been validly issued. Under the new rules, all license grants are contingent on the payment of debts owed to the FCC.

*Martin is president of the Federal Communications Bar Association and a member of Fletcher, Heald & Hildreth, Arlington, VA. E-mail martin@fhhlaw.com.*

### Dateline:

Radio stations in the following states must file their renewal applications by Dec. 1: Colorado, Minnesota, Montana, North Dakota and South Dakota.

Also on Dec. 1 stations in Kansas, Nebraska and Oklahoma must begin broadcasting their pre-filing renewal announcements.



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# The Silent Partner

# Wire & Cable

By Chriss Scherer, editor, and Scott Fehl

**T**he next time you have to wire something in your facility, think about what you're about to do. Will you reach for the standard single-pair, shielded wire you have used for the past 25 years without considering what it will do to the signal? With the proliferation of digital audio sources and Ethernet routing, you probably keep two or three types of wire available at all times. While it all may seem like copper strands, there are real differences in wire, even between types that are supposedly for the same purpose.

No one paid attention to the wire being used when all the signals within a facility were baseband analog audio and low bit-rate data. These low-impact uses are not as easily affected as today's high-bandwidth signals. Paperclips and zip cord may pass a signal, but not over any distance with any reliability.

Choosing the best wire for the job is important, but there are realistic limits that can be achieved. The mechanics and physics of a wire or cable are important. I'm not suggesting that you remove all the existing wire in your facility and replace it with some oxygen-free, helium-rich, deuterium-encased boutique wire. That isn't necessary. However, there are considerations that are likely taken for granted.

While wire is a passive component in an installation, the wrong choice can introduce signal losses between the source and destination, as well as introduce possible interference from external noise. The result is lost data and excessive installation time.

## **The physical basics**

There are several operational characteristics that are tied to the physical properties of a cable.

Noise rejection is an inherent trait of a balanced signal if the circuit balance is maintained. The quality of the shielding—if one is used on the cable—and the consistency and tightness of the twist of the wires affect the noise rejection capability.

In general, the cable should have a high number of twists for a given



## Resource Guide

A list of wire and cable manufacturers

### Altinex

800-ALTINEX • [www.altinex.com](http://www.altinex.com)

### Belden Wire & Cable

800-BELDEN1 • [www.belden.com](http://www.belden.com)

### Canare

818-365-2446 • [www.canare.com](http://www.canare.com)

### Clark Wire & Cable

800-222-5348 • [www.clarkwc.com](http://www.clarkwc.com)

### Gepco International

800-966-0069 • [www.gepco.com](http://www.gepco.com)

length. A cable's noise rejection capability will increase with more twists that are consistent and tightly maintained.

Shielding is most effective for EMI and RF rejection. The two most popular forms of shielding, both of which are effective, are braided and foil. Braided shields have excellent rejection and flex-life, while foil shields are more cost effective and offer the best high-frequency rejection. A foil shield is also often easier to terminate.

Attenuation is the loss of signal. The longer the run, the more attenuation the cable will have. The size of the conductor or gauge of the wire plays a significant role in limiting attenuation. For long runs, 22 or 24 gage is better. However, if you are soldering to a multi-pin connector or patchbay, 24 or 26 gage is the best choice.

The type and amount of dielectric also affects the loss in the cable. As the signal travels through the copper conductor it is absorbed through the dielectric and into the shield. The dielectric is the insulation that coats each conductor, which electrically separates the conductors from each other and the shield. Signal absorption is more pronounced at higher frequencies. The lower the dielectric constant and the thicker the insulation, the less signal will be absorbed. This absorption is caused by capacitance, so a lower capacitance will also result in less absorption.

### Working the medium

Each cable has its own specific physical properties that should be considered. Most permanent installations require using a cable that is UL-listed as flame retardant. Each UL classification has specific standards for flame spread and smoke particle. By using specific types of plastic compounds, the desired UL listing will be achieved.

The construction of the cable affects the speed and ease with which it can be terminated. Drain wires facilitate easier ground termination, while certain dielectric types are easier to strip and have high melt temperatures that reduce wick back. Tinned copper conductors are easier to solder, and certain jacket compounds are easier to strip than others.

One often overlooked characteristic is a bonded shield, where the foil shield is attached to the outer jacket. This significantly reduces the effort to strip the outer jacket. The next time you buy your favorite wire, see if the shield is bonded to the jacket. If it's not, substitute a model that it is. You'll be glad you made the change.

# Wire & Cable

## Heil Sound

618-257-3000 • [www.heilsound.com](http://www.heilsound.com)

## RAM Systems

800-779-7575 • [www.ramsyscom.com](http://www.ramsyscom.com)

## Klotz AIS

+49 8106 3080 • [www.klotz-ais.com](http://www.klotz-ais.com)

## Redco Audio

800-572-7280 • [www.redco.com](http://www.redco.com)

## Mogami America

800-800-6608 • [www.mogamicable.com](http://www.mogamicable.com)

## West Penn Wire

800-245-4964 • [www.westpenn-cdt.com](http://www.westpenn-cdt.com)

## Nemal Electronics

800-522-2253 • [www.nemal.com](http://www.nemal.com)

## Wireworks


800-642-9473 • [www.wireworks.com](http://www.wireworks.com)

More information is available online in the  
*Radio* magazine Buyers Guide.



[www.ramsyscom.com](http://www.ramsyscom.com)

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# Wire & Cable

## Digital bits

Digital signal cables include all the considerations listed above, but have additional unique requirements. The most important one is impedance.

The AES3 audio standard specifies a cable with a characteristic impedance of  $110\Omega$ ,  $\pm 20$  percent. While analog audio wire will pass an AES3 signal, that signal will be adversely affected, particularly

over any distance. A conventional analog audio cable has a characteristic impedance of  $30\Omega$  to  $60\Omega$ . Digital signals are more like RF, while analog audio signals are more like dc in a given conductor. When a digital signal is passed through a mismatched impedance, internal reflections can develop within the cable. For an AES3 signal, the  $110\Omega$  impedance should be maintained. Figure 1 shows the effect of an impedance mismatch.

For reference, characteristic impedance is different than conventional dc resistance of the conductors. Characteristic impedance is determined by the ratio of the diameter of the conductor, the shield, the thickness of the insulation and the dielectric constant of the insulation.

Bit errors and jitter are caused when the bit becomes unrecognizable or the spacing between bits becomes inconsistent. Impedance mismatches, as mentioned previously, can cause standing waves within the cable. These standing waves cause additive and subtractive interference to the original signal, causing bit errors and jitter.

External interference and cable attenuation can also cause bit errors and jitter.

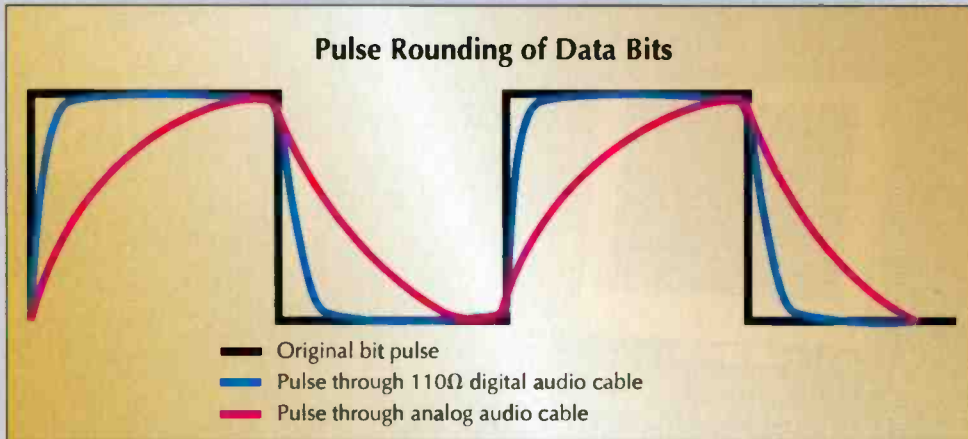


Figure 1. Improper characteristic impedance of a cable used for a digital signal can have adverse effects.

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Digital audio cable should have a bandwidth of 25MHz to effectively be used with sample rates as much as 192kHz. This means that the impedance, capacitance and loss stay within acceptable standards and tolerances up to 25MHz.

Consider a 24-bit sample depth. Added to this sample is an eight-bit header, creating a 32-bit word. Stereo signals are interleaved, creating a 64-bit word per sample. Finally, each bit has leader bit, creating a total of 128 bits per sample. When the resulting 128-bit word is sampled at 192,000 samples per second, the product is 24,576,000 bits per second (b/s), or 24.6Mb/s.

The required bandwidth of a digital audio signal is significantly higher than an analog signal, as the equation above shows: 25MHz vs. 20kHz. A digital cable's high-frequency attenuation is a critical factor. A lower high-frequency attenuation is desirable.

To reduce high-frequency attenuation, reduce the capacitance of the cable. Capacitance is determined by the type and amount of dielectric (insulation). Digital signal cables often use different types of materials and in greater amounts. Common materials include a foam polyethylene, foam polypropylene or foam Teflon. These compounds have lower dielectric constants (between 1.5 and 1.9, compared to 2.26 and higher in analog audio cable). For reference, the dielectric constant of air is 1.0.

Reducing the high frequency attenuation of the cable will also reduce the rounding of the signal. With enough rounding, the signal will fall below the threshold of being distinguished as a 0 or 1. Again, see Figure 1.

### Give a little bit

Digital signal cable can easily be used for analog signals. In fact, digital wire is the best analog wire you can get because of the tighter tolerances.

Ethernet cables operate at even higher frequencies. The twist applied to the conductors plays an even more important role in maintaining signal integrity. The twist should be maintained as far as possible to the connector termination.

Because of the increased use of Ethernet signals, and the application of Ethernet standards to audio, CAT5 cable has been used to carry AES3 signals. The AES3 signal requires a twisted pair cable with a characteristic impedance of 110Ω, ±20 percent. The CAT5 Ethernet standard calls for a characteristic impedance of 100Ω, ±15Ω. This results in a range of 85Ω to

115Ω. Compare this to the AES3 extremes of 88Ω to 132Ω. Except for the low end, the CAT5 range falls within the AES3 standard. If CAT5 cable is used for AES3 audio, it is a good idea to use a CAT5 cable with a tighter impedance tolerance. A range of ±7Ω works well.

*Fehl is product and marketing manager, Gepco International.*



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# Wire & Cable

## Braided shield preparation

By Chriss Scherer, editor

Braided-shield cables provide a flexible method of electrically shielding a cable. The braid also adds strength to the cable. Because of this, braided-shield cables are the best choice for cables used in mobile, remote or live applications. The drawback to using a braided shield, however, is the time and effort needed to prepare the cable for attaching a connector.

The standard approach is to completely unbraided the shield to free the conductors inside, and then twist the shield conductors together. While there is nothing wrong with this method, it is tedious to unbraided the shield. Pulling and twisting the individual wires of the braid also subjects them to a great deal of stress, which often weakens the wires, breaking some of them in the process. In addition, the reformed shield conductor tends to shed wires causing potential electrical problems later on.

An alternate method provides a cleaner way to prepare the shield without subjecting the wires to stress, and it results in a cleaner, more manageable shield conductor.

### The traditional method

The most common method—and most potentially damaging—is to fan the braided conductors and then twist them together. Some of the individual strands will break during this process, and shield suffers a great deal of stress. Figures 1 and 2 show this process.



Figure 1



Figure 2

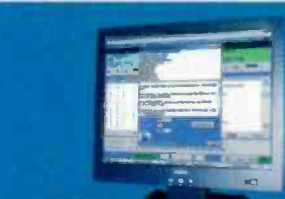
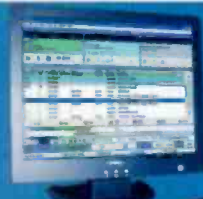
### A better way

Instead of fanning the shield, it is possible to leave the braid intact while pulling the internal conductors out to be terminated. To do this:

1. Push the braided shield away from the end of the wire to loosen the braid.
2. With a pointed tool, carefully push the strands to the side to make an opening in the braid.

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3. Loop the tool around the conductors pull them through the opening in the braid. If there is a paper or plastic wrapper, you may be able to remove this before you create the opening in the braid.
  4. Continue pulling the conductors and filler through the opening.
  5. Cut the filler material.
  6. Lightly squeeze and pull on the empty, loosened braid to tighten it.
- It takes some skill to separate the braid without breaking the conductors, but the skill is easily learned. At first, this will probably take more time to prepare the cable than the fanning method, but with some practice, the preparation time will decrease.

This technical note originally appeared on the *Radio* magazine website at [beradio.com](http://beradio.com) in the Engineer's Notebook.



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## Navigauge IQ Monitor

By Steve Varga

It has been nearly 85 years since the birth of commercial radio broadcasting by KDKA in Pittsburgh and a whole lot has changed...or then again, maybe not. Radio broadcast technology has evolved, content has progressed with the times and radio personalities have pushed the limits of what is considered acceptable over the public airwaves, but for the past 50 years, radio has measured who is listening and what they are listening to the old-fashioned way. The same paper diary methods of the 1950s are still in use today with the same weaknesses and inaccuracies that come from relying on human recollection.

form of collection drives radio station programming ratings, and ultimately the advertising dollars that can be commanded for certain spots.

With \$20 billion spent annually on radio advertising in the U.S., there are significant decisions being made based on 50-year-old methods of ratings data collection.

Technical innovation is changing listener-data collection, and Navigauge has developed and deployed a monitoring, data transmission, storage and Web-based reporting system.

### Technology and methodology

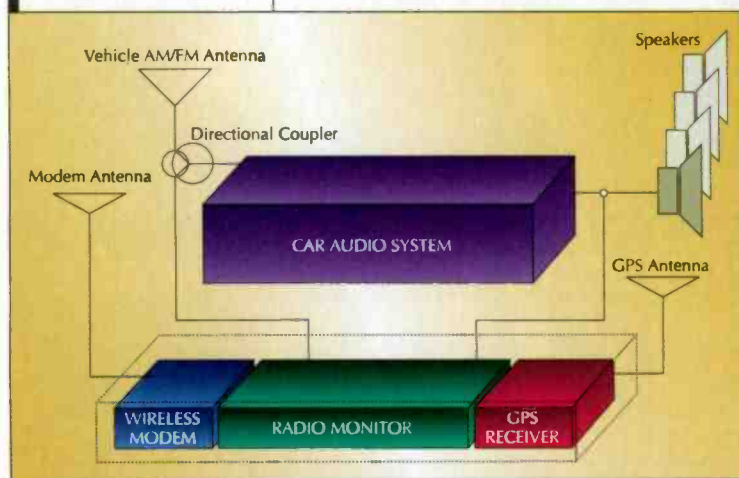
Navigauge's patent-pending technology collects data to develop radio ratings and track mobile behavior and consumer retail patterns. Doing this without significantly affecting a vehicle's audio system components or requiring the radio broadcast infrastructure to be modified on a nationwide basis is the purpose of Navigauge's IQ Monitor and its Automated Audience Reporting Management System (AARMS).

The company's wireless-based technology yields real-time data that reveals where drivers are, what they are listening to and for how long. This measurement system delivers a range of in-vehicle data including:

- radio listening behavior, such as channel changes and station duration, which are automatically and unobtrusively captured and time-stamped without driver interaction or distraction;
- vehicle location and travel patterns, monitored via GPS;
- associated quantitative and qualitative demographic information about the drivers making these decisions.

Navigauge's means of pseudo-passively monitoring radio usage, combining it with GPS location, transmitting the resulting data on a real-time basis and providing actionable Web-based reporting is the result of research and development over the past three years. Six substantive goals were established to do this.

1. The panelist/driver must not be distracted or influenced by the need to do anything out of the ordinary during monitoring.
2. The monitoring device installation must not require internal modifications to audio components or changes to the commercial broadcast infrastructure.
3. The monitoring device installation must be fast and inconspicuous.
4. The collected listening and location data must be available on a real-time basis with no action required by the panelist/driver to upload data.
5. The received data must be securely stored and then presented in an intuitive actionable manner via Internet-based reports that provide immediate value to broadcasters, advertisers, retailers, branded product companies, ad



The functional components of the IQ Monitor.

In-car listening is the most frequent of all radio listening. But to monitor this with the paper reporting method, data must be logged while driving, or the driver must recall the radio stations he listened to and for how long during the drive. The latter is nearly impossible with any level of accuracy or granularity. Listeners that are inclined to bounce around the radio dial during commercial breaks or when an unfavorable song catches their ears are nearly impossible to notate.

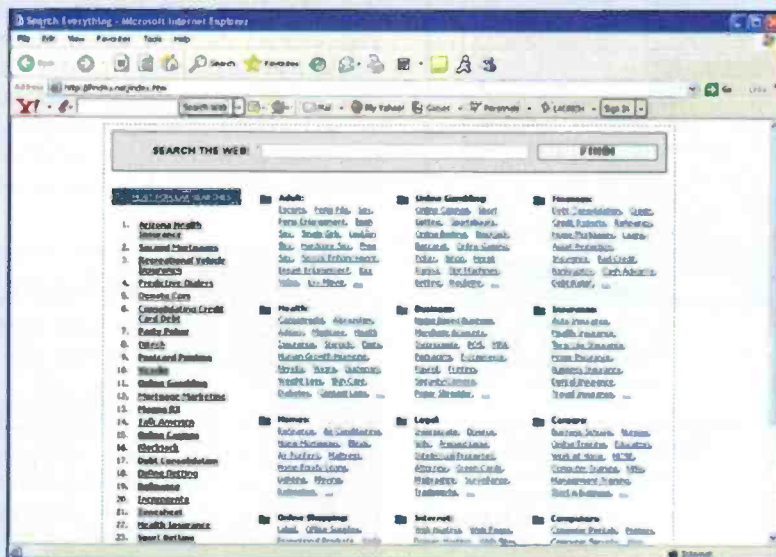
Obtaining such accuracy is not normally a life-and-death situation, unless the listener is trying to make entries into his diary while navigating through rush-hour traffic. However, the data that results from this

# Your Browser's Been Hijacked!

By Allen J. Singer

**C**omputer viruses, trojans and worms are not new phenomena. These pesky parasites have been inflicting electronic pain on computers since Arpanet first went online in 1969. Since then, computers used in both the business office and the home are successfully using firewalls and products made by Norton Antivirus and McAfee to keep safe from unwanted online intruders. But a different epidemic is affecting web users everywhere regardless of profession, social standing and surfing habits. Computers all around the globe are being attacked by software that sneaks through firewalls and even the best virus protection software.

It's called spyware, or malware or scumware; it means the same whichever term is used. Spyware is made up of trojans and other insidious virus programs that are attached to websites and wiggle into computer systems through security holes in Windows. Once installed, the software, or spyware then works behind the scenes doing any of a number of things such as creating endless pop-ups, redirecting the start page to an unwanted search or adult page, recording surfing habits, continuously causing run time errors and low memory alerts, or at worst corrupting important system files. Hapless users waste hours trying to get rid of this unwanted software. Sometimes un-installation is easy, but many times it is nearly impossible without expert help.

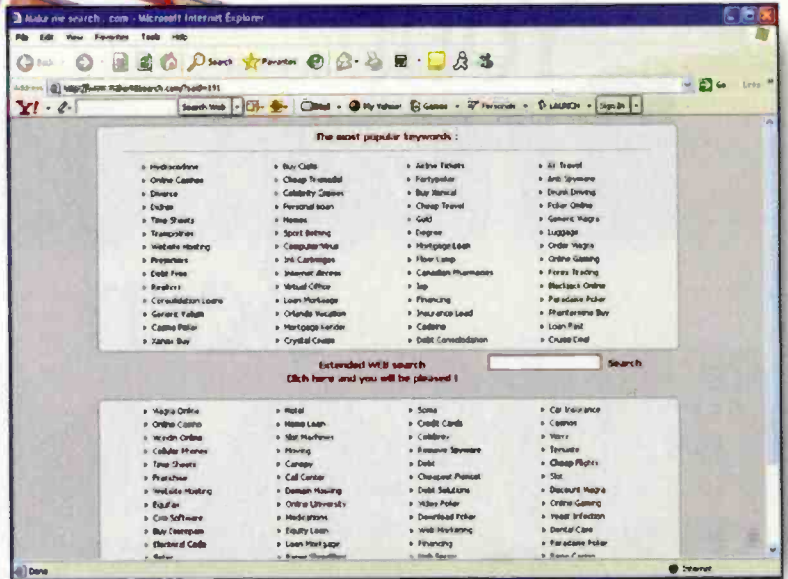


This hijacked home page is the potential result of a spyware trojan.

# Your Browser's Been Hijacked!

Spyware is closely associated with adware, but is not the same thing. Adware will come bundled with store-bought software and a lot of freeware available online. Kazaa and Bonzi Buddy are just two examples of the thousands of types of freeware that infamously include adware and spyware. The user installing Bonzi Buddy, for instance, might have the option of not installing some of its adware. But the included spyware is malicious: it will install itself without the user's knowledge and can be passive or dangerous, reporting surfing habits and slowing down the connection.

The offending spyware can come bundled with nearly any kind of software, or it can hide in websites—waiting for victims to click on the page. When a user opens a website containing a spyware trojan, the browser might freeze and the hard drive may start spinning. Depending on what was installed, any of a number of things might happen next. If it is an




When a browser is hijacked, the user may see a page like this instead of the desired home page.

autodialer, the dial-up connection will be broken and a new call will be made from the computer. If the phone jack isn't immediately unplugged, a long distance call to a far-off land will be made, which can cost the liable user hundreds of dollars.



Other things can happen also: new links may now be in the favorites list, a new desktop image may appear, or pages may take forever to load. Or possibly, a surprising new home page may have taken place of the old one thanks to the hijacker, one of the most prevalent and irritating trends in spyware today. The variety most often seen is made by a Russian company called CoolWeb Search, or CWS. This hijacker affects an amazing number of users, who, once infected, tear their hair out in hopeless frustration.


CWS developed a clever program. When it inflicts itself onto a computer, it installs new keys into the registry and look-alike files in various Windows directories. Many of the files are hidden and difficult to locate without using special software. The new home page address under the tools menu is "About:Blank," or something similar, and it cannot be changed back to the desired homepage. Page transitions are much slower and the user may not be able access his webmail, music networks or radio stations without being immediately redirected to the CWS page. At first this hijacking is annoying, but it quickly becomes a significant problem.

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## Where to find help.

These sites contain active help forums and links to free spyware removal software.

- [www.spywareinfo.com](http://www.spywareinfo.com)
- [boards.cexx.org](http://boards.cexx.org)
- [www.dsreports.com](http://www.dsreports.com)
- [www.net-integration.net/index.php](http://www.net-integration.net/index.php)
- [www.lavasoftsupport.com](http://www.lavasoftsupport.com)
- [www.tomcoyote.com](http://www.tomcoyote.com)
- [forums.techguy.org](http://forums.techguy.org)
- [computerops.biz](http://computerops.biz)
- [www.malwarebytes.biz](http://www.malwarebytes.biz)

# Insight to IBOC

November 2004

Part of the *Radio* magazine DAB Answer Series

## Sound all around IBOC in Surround Sound

by *Chriss Scherer, editor*

The development of IBOC technology has spanned more than 10 years. We are now seeing IBOC systems deployed, and several major groups have committed to installing HD Radio equipment in a majority of their stations. The technology itself is seeing greater acceptance from some of its long-time opponents. One promise of IBOC is that it will provide enhanced services compared to the analog technology it will replace. Until a year ago, the technology had little to show on this promise. The available enhancements were about equal to existing technology. This is no longer the case.

IBOC's data capabilities have received new-found attention, and ongoing tests of multichannel audio show that IBOC is already evolving. While some still consider it flawed technology, the re-

sources being devoted to make IBOC a viable source of audio entertainment to today's media consumer are propelling HD Radio forward.

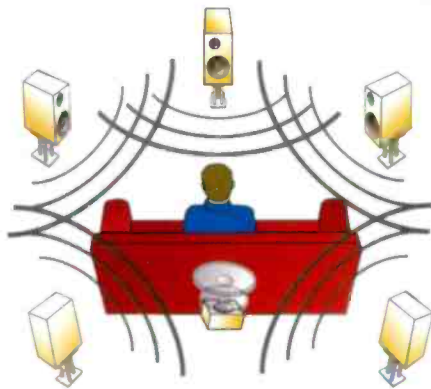
Consumers have embraced surround sound in their homes. A Jupiter Research study shows that 24 percent of American homes have a surround-sound system already installed. Forecasts show that the penetration of surround-sound systems

will steadily increase. As consumers expect to hear surround sound material, several companies are looking at IBOC as the delivery vehicle for surround sound to keep radio current with consumer expectations.

Work has begun to implement surround sound into the HD Radio system. Four companies have identified this opportunity, and they are working to see surround added to the list of HD Radio enhancements in pursuit of finding the killer app for IBOC.

### Strict definition

The term "surround sound" is not strictly defined. There are several systems available that provide multiple audio channels of information for playback over a system with speakers distributed around a listening sound field. All the surround systems use a low-frequency channel to provide the deep bass of the listening experience. Because of the omnidirectional properties of low frequencies, this deep bass channel feeds a single subwoofer that is usually placed near the front of the sound field. From there, five, six or seven speakers can be placed around the listener to provide the surround soundfield. The subwoofer provides the .1 element of a 5.1, 6.1 or 7.1 system.



### Processing Surround

By *Mark Krieger*

Is there a surround audio processor in your future?

Without a doubt, say industry leaders Orban and Omnia Audio. But if you're expecting something like a five channel version of your current stereo processor, think again.

Processing for 5.1 surround will become a must-have, says Greg Schulke, sales and marketing manager for Orban Labs, because broadcasters transmitting a digital signal in that format will want to maintain a consistent product while drawing surround content from different sources. But achieving the practical realization of such a product will require "entirely new algorithms."

Omnia Audio's Frank Foti agrees. Any processing of the 5.1 signal has to pay close attention to correlating channels dynamics in order to faithfully preserve the spatial imaging present in the sound field. The change will be almost philosophical in nature for many broadcast engineers because the surround environment, by its nature, eliminates the current imperative for stereo loudness. "The need for aggressive gain reduction is just not there," says Foti.

*continued on page 3*

### Inside

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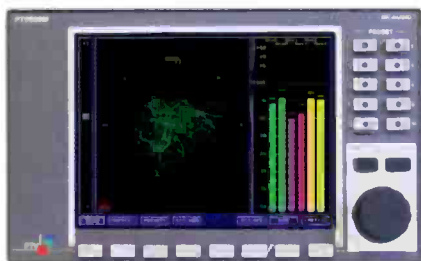
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# Sound all around

There are two general approaches to providing surround sound audio. The multiple channels of audio can be carried through a system as discrete elements. A 5.1 audio system would need six discrete audio paths. The other approach is to use an encoded signal to carry the surround information. One example of this is matrix encoding, which takes into account the amplitude and phase differences of the various audio channels. The matrix approach reduces the number of discrete paths needed to transmit a signal and has been tried several times in the past with mixed results.

Moving ahead with surround sound technology for IBOC, the four companies that are developing systems are SRS Labs, Neural Audio, Fraunhofer and Coding Technologies. All four systems are different, and accomplish the surround effect in different ways.



New methods of metering will be required for surround sound.

The Neural and Fraunhofer systems were demonstrated at NAB2004. SRS received Ibiqity's approval for compatibility with the HD Radio system in June. Coding

Technologies unveiled its system at the 2004 NAB Radio Show. All four systems are different technically.

## Neural Audio

Neural Audio has partnered with Harris to produce products based on Neural's technology. The product that applies to surround sound for IBOC is the Harris Neustar 5225. This processor accepts a 5.1 audio stream and creates a stereo signal with a watermark that is used to reconstruct the surround signal when it is decoded.

The resulting stereo audio and watermark stream can be transmitted through a stereo signal path. Additional mono or stereo audio can be mixed with the watermarked audio without affecting the watermark. This enables a station to add audio elements, such as an announcer's voice, to the surround source. When decoded, the surround material remains intact, as do the mono or stereo elements that were added.

Once transformed into the two-dimensional version, the azimuth of the original 5.1 image envelope is represented by inter-channel intensity differences. The depth of the original image envelope is represented by average inter-channel coherence. Neural believes that intensity/coherence watermarking is the ideal choice because of its similarity to the image construct of naturally occurring two-dimensional stereo while providing stereo compatibility.

On the decoder, the 5.1 image is restored by a programmable, transform-based spatial rendering system, called a Spatial Environment Engine (SEE). The SEE can render any two-dimensional audio source into a signal with two to 256 outputs.

An on-air demonstration of the Harris/Neural system was created by KUVU in September. See *KUVU in Surround* on page 4 for more.

## Telos/Fraunhofer

The level difference, time difference and coherence between channels creates the perception of a spatial image. While transmitting discrete surround channels would preserve the surround sound field, transmitting

## Processing Surround

*continued from page 1*

While neither manufacturer will say for sure exactly when they intend to introduce a surround processor, development is clearly on their minds. "We're not going to ignore it," Schulke said in a brief interview, "but there has to be sufficient demand to justify the R&D costs—it's the chicken and egg syndrome."

Foti's outlook was similar, if a bit more specific. "It's going to take about 18 months to two years for surround to move into the broadcast market...right now the product field is very limited, [oriented] mostly toward TV."



The on-air surround processor of tomorrow? Probably not.

Nevertheless, momentum for 5.1 surround radio broadcasting for FM IBOC is already building among forward-looking broadcasters. These people realize they'll have to compete for audience with audio streamers wielding the same technology in the very near future, as evidenced by Orban's streamed 5.1 demonstration at the Surround 2004 exposition in Los Angeles in September. Seemingly in answer, Fraunhofer demonstrated a 5.1 surround HD Radio hardware demo at the NAB Radio Convention in San Diego. Can surround processors really be far behind? Time will tell. ▲

### Photo credits:

Page 1 - Illustration base and concept courtesy of SRS Labs

Page 3 - Meter image courtesy of DK-Technologies

Page 3 - Processor mock-up inspired by Omnia Audio and Orban

Page 4 - Dianne Reeves in concert by Grant Leighton

The *DAB Answer Series* is an ongoing series of supplements dedicated to covering the technology of digital audio broadcasting.

*Insight to IBOC* - a supplement to *Radio magazine*, Fall 2004, © 2004 Primedia Business Magazines & Media. All rights reserved.

## KUVO in Surround

On Location: Dianne Reeves and the CSO

by Chriss Scherer

**O**n Sept. 24, KUVO-FM, Denver, featured a surround sound broadcast of Dianne Reeves performing with the Colorado Symphony Orchestra. The on-air demonstration is part of KUVO's efforts at implementing HD Radio to its fullest potential. KUVO already claims the title of Colorado's first FM



Dianne Reeves performing with the CSO on KUVO.

HD Radio station.

Held at the Boettcher Concert Hall in Denver, the jazz performance was recorded and broadcast in 5.1 surround sound. KUVO carried the performance live with a system that used two mixing consoles, the Harris/Neural Audio Neustar 5225 encoder and Neustar codec preconditioner, and a pair of APTTokyo codecs.

The performance was first mixed on an Allen and Heath ML-3000 5.1 mixer. This mix was then encoded to the watermarked stereo mix through a Harris 5225. The stereo mix then added stereo elements for the broadcast, such as announcer mics and transition audio. The system ensures stereo compatibility if a 5225 decoder is not present. When a decoder is used on the receive side, the stereo elements remain in stereo and the surround elements are distributed to the appropriate speakers.

A diagram of the audio system is available at [beradio.com](http://beradio.com). Follow the links to this article.

# Sound all around

multiple channels requires substantial bandwidth, which is not possible with IBOC. The Fraunhofer method relies on a stereo mix for the significant part of the bitstream, with an ancillary data stream to provide the surround sound when decoded. The process begins with a 5.1-channel audio feed. A stereo version is created from this stream, which can be done manually or automatically. An encoder then creates the ancillary surround data by comparing the stereo and 5.1 versions to estimate the values as a function of frequency within several sub-bands.

The result is that the 96kb/s FM channel carries two elements: an 80kb/s stereo encoded stream, which can be played on a stereo IBOC receiver, and a 16kb/s ancillary data stream that is used to recreate the surround sound. There are no changes to the basic codec, so the stereo portion remains intact. This division of the data stream is similar to the method used in the Tomorrow Radio Project to create two independent audio streams. The system uses High-Efficiency Advanced Audio Coding (HE-AAC).

## Orban/Coding Technologies

Having debuted at the NAB Radio Show, Coding Technologies has entered into the IBOC surround area, and has partnered with Orban to do it. Coding Technologies, a company that specializes in enhancing perceptual audio encoders with its Spectral Band Replication technology, has developed the "plus" of AAC Plus and the "pro" of MP3 Pro. Coding Technologies also worked with Ibiquity to develop the HDC codec used in HD Radio.

Because this system is based on HDC, Coding Technologies touts that the surround system is fully compatible with the existing codec, eliminating the need to add hardware or software elements to decode the surround information.

Similar in approach to the Fraunhofer method, Coding Technologies uses a stereo downmix to provide compatibility with stereo receivers, and adds a data stream that contains the information needed to create the surround channels when the decoder is present. The main difference is that while Fraunhofer locks the rate of the stereo and surround streams, Coding Technologies allows the streams to be dynamic in their bit allocation without exceeding the 96kb/s limit. This allows for greater flexibility in the datastream application.

Coding Technologies notes that its system is designed to handle surround or the multichannel Tomorrow Radio system being tested by NPR.

Orban and Coding Technologies are working together to ensure that HDC surround can be deployed within a modern digital radio station without a complete overhaul of the existing stereo infrastructure.

## SRS Labs

SRS has developed a technology called Circle Surround, which can encode 6.1 channels of discrete audio for distribution over two-channel carriers. SRS Labs has built relationships with major broadcasters, who are providing some television broadcasts in Circle Surround. In addition, SRS has agreements with Kenwood, Marantz, M-audio and other manufacturers to provide

## Surround scorecard

Currently, four companies are pursuing systems to provide surround sound for IBOC.

- Coding Technologies, through its partner Orban  
[www.orban.com](http://www.orban.com)
- Fraunhofer, through its partner Omnia Audio  
[www.omniaaudio.com](http://www.omniaaudio.com)
- Neural Audio and Harris  
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immediately integrate text-based data services into their HD Radio programming and lays the foundation for the next-generation HD Radio that fully leverage the potential of rich media in radio broadcasting."



Shown above is Los Angeles morning personality Shawn Parr of KZLA (FM) at his SS32. Emmis also uses Scott systems at KPWR (FM) in LA, in Chicago, St. Louis, and more.

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# Sound all around

Circle Surround decoders in playback equipment. Circle Surround and Circle Surround II encoding is compatible with mono and stereo playback.

SRS has also worked with Ibiquty to obtain a certification of compatibility with HD Radio. The certification process began about two years ago.

SRS states that Circle Surround encoding can be distributed via a bit-rate as low as 48kb/s, but states that 128kb/s will provide maximum separation. At 64kb/s, a station could transmit a surround signal with some separation in the main signal and use the Tomorrow Radio secondary channel as well.

Circle Surround is a matrix encoder, using a summing and difference network to downmix the surround signal into a stereo

format, which includes a bias signal that is used to reconstruct the surround information when decoded. Additional stereo information can also be added to the encoded stream.

On playback, the decoder detects the surround-encoded information in the stereo signal by analyzing the ratio between correlated information and anti-phasic surround material inserted by the encoder. This ratio is generally much higher in an encoded stereo signal than in a nonencoded signal.

## From theory to application

All four of these systems are similar in that they create a stereo version of the surround source and add some additional element to reconstruct the surround information when decoded. This approach ensures compatibility on stereo systems if the surround decoder is not available. With IBOC surround in its infancy, this design allows the HD Radio system to continue its stereo introduction without compromising the ability to add surround later.

For broadcasters, backward compatibility is ideal for existing facilities with a stereo infrastructure because tripling the audio channel capability for discrete 5.1 is not an easy task.

With four companies developing potential systems, there could be a conflict in deploying them in consumer devices. Stations can only implement one system for transmission. If all four prove to be viable, it is possible that consumer receivers will only be able to decode one or two of the formats. One possible solution to this problem would be a software-defined receiver that would automatically sense and decode the proper system.

## Random Sample

Surround sound is not a new concept to consumers. The advent of HDTV, DVDs, SACD, DTS and other media have increased consumer awareness of the enhanced audio experience of surround sound.

For radio and IBOC, surround is yet another way to show that technology is improving the radio listening experience. But what is the future of surround sound? According to data from the Consumer Electronics Association, consumers will continue to spend a great deal on surround electronics over the next few years.



According to the forecast, sales of surround system for home installation appear to have already peaked. Over the next three years there will be a slow decline in sales, but the predictions show that the numbers will continue to be strong.

On the positive side, the forecast calls for a steady increase in sales of surround systems for car audio use. This holds promise for radio and IBOC, because in-car listening has always been one of the more prevalent uses of terrestrial radio. In addition, the number of surround-sound systems being installed in automobiles is increasing.

Data courtesy of CEA Market Research.

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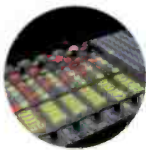
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The IQ Monitor learns which stations are most often listened to by a listener, which reduces inject-and-detect time to a few of seconds. The tone injected is only a few seconds in duration and virtually undetectable by the listener. By developing an unobtrusive localized monitoring schema, Navigauge has avoided the need to broadcast signature tones over the air.

Combining radio listener data with the physical location of the panelist is accomplished with an integrated Global Positioning System (GPS) receiver within the IQ Monitor. The real-time physical location of a panelist as it varies with radio listening habits to outdoor advertising, retail locations and shopping centers provides a new level of media and market intelligence.

The IQ Monitor sends the collected data to the Navigauge Network Operations Center (NOC) via any number of wide-area wireless data networks. Depending on the network architecture used, the data transmission can occur at set trigger points or continuously. If the IQ Monitor is out of network coverage it will buffer the data until it comes back into coverage. This process is automatic and internally governed by the IQ Monitor. The networks of choice include satellite data-specific narrow-band and digital providers, as well as low Earth-orbiting satellites (LEOS) in rural areas that do not have terrestrial network coverage. Like a GPS receiver, the network-specific wireless data transceiver is embedded in the IQ Monitor and operates as a fully integrated component of the monitor. The transceiver provides new opportunities for sending messages, data or new software down to the panelist vehicle if desired.

Combining an equal-probability-based, statistically generated sample representative population being measured with continuous, automated data collection, Navigauge provides its clients real, not anecdotal, data. As noted previously, the IQ Monitor

sends its data to the Navigauge NOC where it is securely stored. On a continual basis, terabytes of data feed the calculations that drive the statistical models behind the reports that the company's Automated Audience Reporting Management System (AARMS) produces. AARMS is a Dot-net-based application that allows the configuration of any number of reports that a broadcaster, retailer or media buyer might wish to define. The end result is highly available, up-to-the-minute reporting that provides the basis for informed programming, media spending and placement decisions.

As with all companies in today's highly competitive service-oriented business climate, delivering products and services that improve the customer experience, capture market-share and significantly reduce churn will prove invaluable. This is no less true in the advertising and media markets of today.

*Varga is the chief technology officer of Navigauge.*

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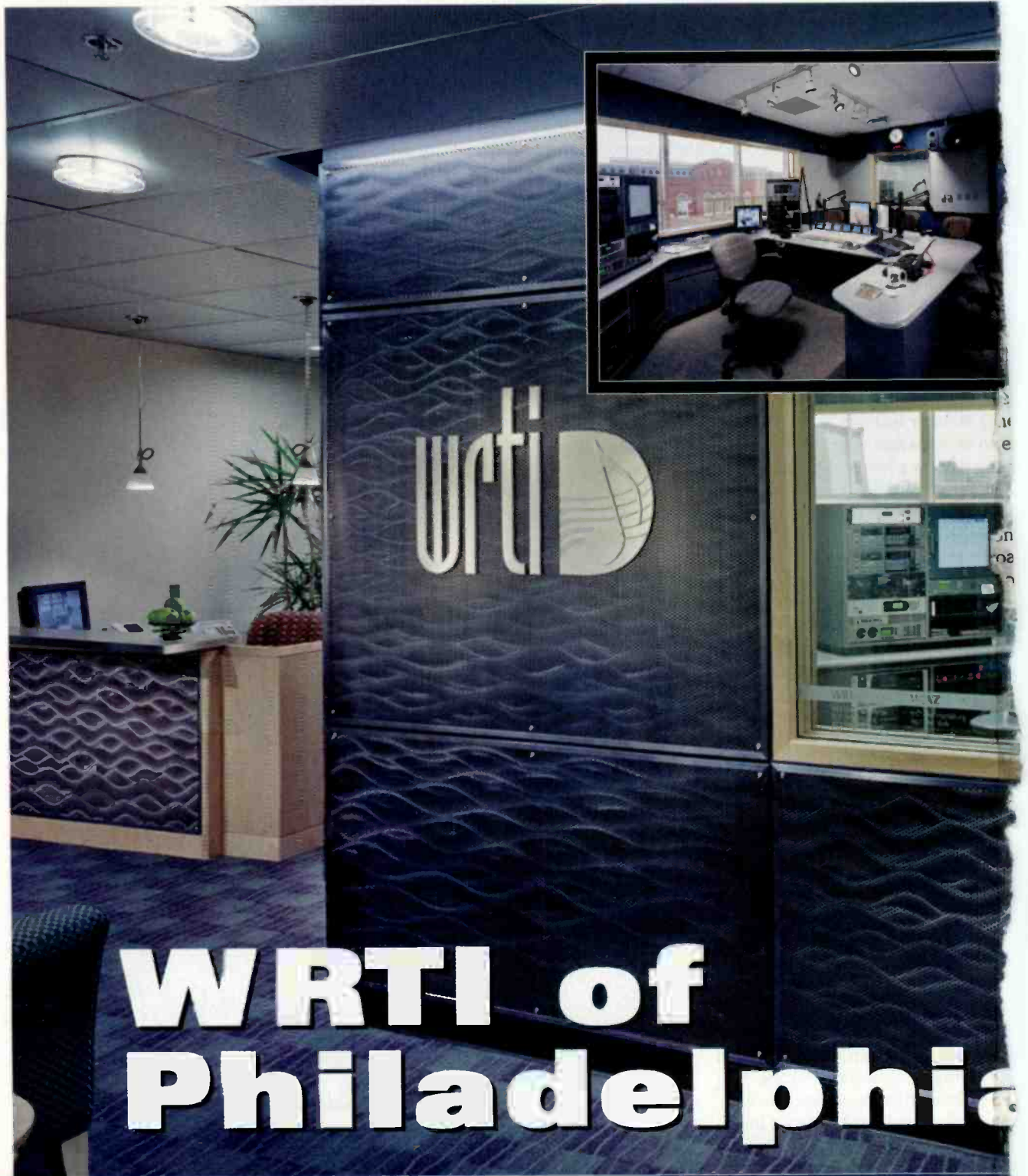
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# WRTI of Philadelphia

Full Circle After 56 Years



Photo by Burt Hill, courtesy of Kosar Rittelmann Associates.

By Allen J. Singer

It's a familiar story. The studios were too small. The equipment was 20 years out of date. The staff was forced to share their desks and small offices, and schedule studio time to avoid conflict. The confined employees had begun snapping at each other in their enclosed, windowless environment. All this was going on in the City of Brotherly Love at the classical/jazz station WRTI. This flagship station of the Temple University Public Radio Network in Philadelphia desperately needed to move out of the building it had occupied for more than three decades.

Philadelphia shone to Temple University, founded in 1884 and chartered as Temple College in 1888. Temple has become the 36<sup>th</sup> largest university in the United States; more than 34,000 students attend this comprehensive public research university. And like most universities, Temple houses a public radio station, WRTI, which features National Public Radio and classical and jazz programs.

WRTI was formed during the Golden Age of Radio in 1948 as a campus-only carrier current station on 640 AM. The *Philadelphia Inquirer* and local FM radio station WFIL donated \$25,000 to build and outfit WRTI with "ultra-modern studios" in the basement of Thomas Hall, one of the oldest buildings on campus. Its call letters stood for Radio Teaching Institute, and was to be used as a professional training ground for students aspiring to become radio broadcasters. Along with the latest popular records, the university planned to broadcast faculty information and educational programs to the students over the airwaves.

It quickly became popular with students and faculty, and in 1953 it became a licensed FM station operating at 10W on 90.1. The new transmitter was situated on the 12<sup>th</sup> floor of Conwell Hall, and the tower was installed on the roof at a height of 125 feet. Among its programs, the playlist included dramas, book reviews written by instructors from the English Department, and live performances by soloists from the Music School. By this time, 200 students studied radio broadcasting on WRTI, which was used as a laboratory for those taking communications courses.

# WRTI of Philadelphia

Also that year, WRTI started carrying Owl football games, beginning with the Owls-Scranton Royal game on Oct. 24. Five years later the station increased its power to 790W, making it the most powerful university station in the area.



The main air studio is built around Wheatstone G5/20 control surfaces. Photo by Tom Crane Photography, courtesy of Burt Hill Kosar Rittelmann Associates.

In 1968, WRTI was moved from the basement of Thomas Hall to the new Annenberg Hall, in what was supposed to be the beginning of a new era for the station. This new space for WRTI included four studios equipped with RCA equipment: a BC-7A stereo audio console, two tape recorders, five cart machines and two turntables. The production studio used a BC-19 stereo audio console; two tape recorders, two cart machines and two turntables. One studio contained an Allan electric organ, and the other had a Steinway baby grand piano. There were four offices for traffic, continuity and personnel; and a separate newsroom with a LPI teletype machine. The new station was to be run by a professional paid staff and student volunteers, and operate 365 days a year. It would serve the entire Philadelphia community, and no longer operate solely as a training lab for future broadcasters. It also introduced an all-jazz format.

By 1970, WRTI was the number-one jazz station in Philadelphia. That year an anonymous donor bought the station a new 5kW transmitter and antenna, and the antenna was relocated to a tower site in Roxborough in 1972. During the 1980s Temple University Public Radio added five repeater stations and six translators, extending its coverage into central and northeastern Pennsylvania, New Jersey and Delaware. In 1989 the station increased its power to 50,000W, a class B station.

## Natural growth

During the Reagan years, WRTI outgrew its 4,000 square feet of space in Annenberg Hall. This area included an air studio, two small production rooms, a news booth and a tiny wiring closet stuffed with equipment. Size wasn't the only issue; high ambient noise

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# WRTI of Philadelphia

plagued the studios, and old underground cabling introduced noise and intermittent hum to the signals passing through them. The HVAC was poorly regulated, static electricity caused erratic operation in the studio equipment, and there was no backup power source.

These problems went on for years, and as early as 1990, management began making plans to move

out. Over the course of the decade, station personnel explored potential locations around campus. They presented several proposals to the university administration, but nothing could ever be decided. Finally, after the turn of the century, definite plans were made. Construction of a new building would begin in 2002 in which WRTI would occupy the entire third floor. This was the new Entertainment and Community Education Center, the ECEC.

The architecture firm of Timothy Haas and Associates was selected by the University to design the ECEC building shell. Burt Hill Kosar Rittelmann Associates was chosen by WRTI for the interior design due to its prior experience with National Public Radio's facility. Construction of the ECEC began November 2002, and by the following November, wiring and equipment installation was under way. Chief Engineer Jeff DePolo installed the equipment with the help of Mike DePolo, WRTI's Operating Manager Tobias Poole and electricians from M. Gitlin Company. The furniture was created by Studio Technology and installed by Vince Fiola and his team.

The studio walls are built of multiple-layer sheetrock and sound-proofing to try to achieve the best acoustical isolation. The windows are  $\frac{3}{4}$ " sound-rated laminate glass, and acoustical tiles are installed on the walls. There are no wall penetrations between studios, and ceiling tiles are heavily insulated. The HVAC system puts out low airflow noise, sound locks are installed on the main studios and low-noise PCs are used throughout.

The third floor of the ECEC building has given WRTI the breathing room it so sorely needed with 13,200 square feet of available space. The 50+ year-old station now consists of a TOC, 10 studios and control rooms, 19 offices, a conference room and a 400 square-foot



Underwriting sales manager Rick Torpey and undergrad student assistant Jillian Kepton review copy in a production studio. Photo by Joseph V. Labolito.

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With enough space and hardware for a host and six guests, the interview studio is used daily in the new facility. Photo by Joseph V. Labolito.

music library with a capacity of 70,000 CDs and 9,000 albums.

### A modern facility

A key feature in the new facility is the live-performance studio and adjoining high-end multi-track control room. The studio is designed for live classical and jazz performances and contains an 800 square-foot hardwood floor. In the studio, live-to-air mixes and multi-track recording is done on an Automated Processes (API) Legacy series console, which includes 960 patch points for total flexibility in interconnecting the console, auxiliary equipment and 160 audio tie-lines. Multitrack recordings can be made to both Protocols on a Power Mac G5 and Tascam DA-78HRs independent of, or in conjunction with, the API console. This arrangement allows

operators to run digital multi-track recording sessions while creating live-to-air mixes on the API.

Instead of going with typical consoles for the other studios, the engineering team chose the Wheatstone Bridge router system with G5 control surfaces. A stand-alone Wheatstone D5000 digital console was brought over from the old facility to serve as the console in the backup air studio in case of router failure. Wheatstone Bridge router cages were installed in the primary air studio and the interview control room, and two in the TOC. The remaining studios were slaved off these

cages, helping reduce the amount of cable runs. All inputs and outputs between the Wheatstone components were done with four-pair CAT-6 Ethernet cabling.

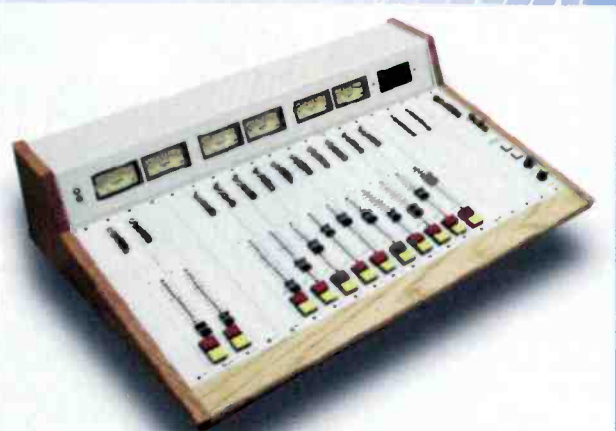
Twenty-five-pair CAT5 cables carry AES3 digital audio separate of the Wheatstone Bridge network. The audio plant uses AES3 digital interconnects, except for the analog console, cassette decks and mic processors. Analog audio carried on snake AES3 digital cable will be replaced with digital as the old analog equipment is eventually phased out. Telephone, ISDN, control circuits and other miscellaneous circuits are carried on 25-pair CAT5e.

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# WRTI of Philadelphia

Finally, a 12-strand multimode fiber line from the TOC runs to each studio. Wires are laid out on cable trays run down all corridors at the same height as the drop ceiling, providing easy access and a visually appealing layout.

No major problems were experienced during the build-out, and by February 2004 the administrative staff moved in. By late February the project was finished under budget, and on March 1, WRTI went live. Board operators quickly adapted to the

new Wheatstone control surfaces, which have performed well since installation. The staff's energy has risen to new levels, contributing to the much-improved sound quality of the station.

A new equipment room and antenna tower for microwave STL has been located on the roof of Wachman Hall, the tallest building on campus. Fiber optic lines take the signal from the station to this hub using SAS Riolinks units, which provide 32 channels of bidirectional audio. Equipment is remotely monitored by a Burk GSC3000, and it all operates with its own 10KVA Powerware UPS. A network of Moseley Starlinks and DSP6000 STLs distribute program audio to the six transmitter sites, along with redundant Starlinks, ISDN and analog RF STL backups. Burk GSC3000, VRC2000 dial-up remote controls and a Burk ARC-16 with RF links are used to control the stations in the network.

The new WRTI facility is part of an expansion program that began when Temple University Public Radio Network added the repeater stations in the 1980s. Just recently, Temple received construction permits for eight additional translator stations in Pennsylvania, New Jersey and Delaware, and an additional 13 translators and another class A facility are still pending with the Commission. The installation of new IBOC transmitters has begun, and within the next two years, all six stations in the network will be broadcasting digital. The few remaining analog STL feeds are being replaced with Starlinks, with five additional STL/ICR relays being added next year to complete the distribution network.

With its new facility, WRTI looks forward to reaching out to the Philadelphia community, bringing live and recorded performances to the network listeners. And not only can the production department efficiently serve the station, it can now offer its services to organizations outside station walls. And the new studios enable



Executive Director Dave Conant broadcasts a Classical morning air shift in WRTI's main studio. Photo by Joseph V. Labolito.



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## Equipment list

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Aphex 320A Compellor	Moseley SL9003Q
AKG C414B-XLS	Neumann TLM 103
ATIDDA206	Neutrik connectors
Belar Wizard	O.C. White mic booms
BroadcastTools 16x1	Omnia Toolvox
Burk ARC-16	Orban 8200
Burk GSC3000	Orban 8400
Clark Wire panels and plates	Shure SM7B mics
Crown D-45	Sony MDS-E12 Minidisc
Dalet Plus Radio Suite	Sony PCM-R500 DAT
Denon DN-780R cassette	Symetrix 528E
Denon DN-C680	Tannoy Reveal
Digidesign Protocols	Telos 2101
Dorrough 1200	Telos Zephy Xstream
Dorrough RW-100 and 280-D	Ward Beck ABB-1
Electro-Voice RE-20, RE-50	Wheatstone Bridge router and controllers
ESE master clock	Wheatstone Bridge
Genelec 2029A	Wheatstone G5/20 consoles
Hafler power amps	Wheatstone G5/8 consoles
Henry Engineering Superelay	Z-systems Z8.8
JBL 4412, Control 5	Primary dealer: SCMS
LEA surge arrestors	



Jill Pasternak on the air at WRTI, the flagship station of Temple University Public Radio's network. Photo by Joseph V. Labolito.

networks instead of tube-powered consoles and ancient turntables, its basic mission is the same as it was so long ago in 1948: to train future broadcasters and serve Temple University and the community of Philadelphia.

*Singer is a freelance writer and former radio engineer in Cincinnati.*

*Thanks to Jeff DePolo, broadcast and communications consultant, for technicals details in this article.*

the station to train students for the real world of radio, allowing them to operate the latest state-of-the-art equipment, which is exactly why WRTI was created in the first place. Although the station now uses modern digital equipment and computer

# Facility Focus

## the technology behind WRTI

### AKG C 414B-XLS



The new AKG C 414B-XLS has the sonic character of its legendary predecessors with 15 new features and performance enhancements. Among its most notable new features are a transformerless output circuit and an elastically suspended, edge-terminated capsule. The mic has electronic switches with LED indicators for selection of 5 polar patterns, three pre-attenuation settings and three bass roll-off filters with two different filter slopes. The new XLS has vastly improved electrical performance with self-noise of only 6dB, 134dB of dynamic range and is usable in sound fields as high as 158dB. The C 414B-XLS comes complete with shock mount, wind-screen, gooseneck-mounted pop filter, dust cover, individual response measurements and

all-metal road case. Built in Vienna, Austria, the XLS comes with a three-year warranty.

[www.akgusa.com](http://www.akgusa.com)  
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### Moseley Starlink SL9003Q



Starlink SL9003Q system was chosen to provide 16-bit 44.1kHz AES audio feeds to the multiple transmitter sites that compose the WRTI network. With digital audio the signature air sound created at the WRTI studios is delivered to the broadcast transmission point with no added noise or distortion after passing through multiple 950MHz RF links. RS-232 data for RBDS is conveyed along with the audio signal. The STL will allow the addition of a LAN module for secondary NPR Tomorrow Radio programming when it becomes available.

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# 2004 Salary Survey



## What's *in your* wallet?

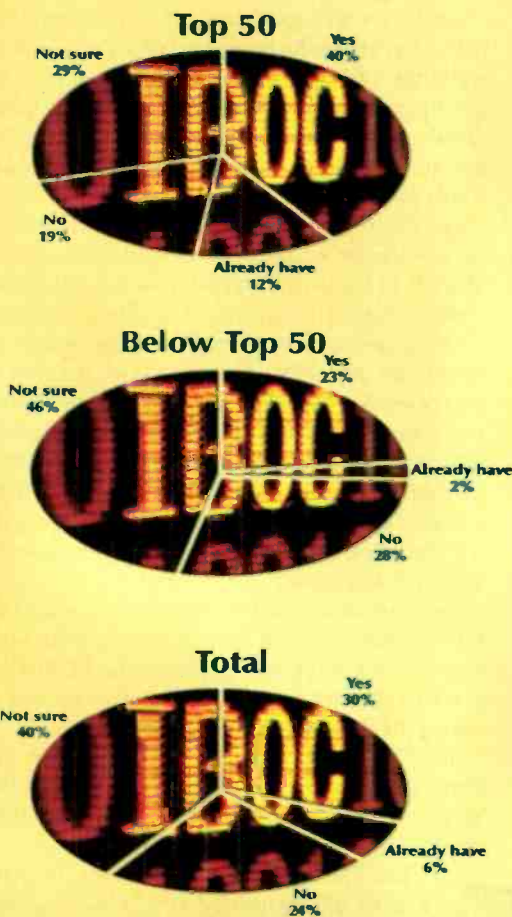
By Kari Taylor, associate editor

Besides the debit card, the credit card and the video rental card, where's any actual money in your wallet? Either way, the results from this year's *Radio* magazine salary survey will provide a better understanding of the average salary ranges for various job titles in different market sizes. After studying the stats, not only will you have a better sense of how much money should be in your wallet, but also what is in the wallets of those around you.

## Beyond your wallet

With all the discussion the past couple of years, we included some IBOC-specific questions in our survey to find out what the radio industry really thinks.

### Percent intending to commence IBOC operations



## Crunching the numbers

Want to know where these numbers came from? Each year a *Radio* magazine-exclusive survey is conducted. For one month, beginning in June, e-mailed invitation letters containing a link to a survey were sent to more than 3,000 subscribers selected on an *n*th name basis.

The results of the study are presented by job title group and market rank (Top 50 and Below Top 50). Where appropriate medians have been presented for numeric responses. The median represents the middle value.

The information gathered in the survey is intended to illustrate the broad trends in the industry. Treat the data as a starting point for salary ranges. Factors such as cost of living and the demand for a particular job are also important in determining a salary range.

### What is the anticipated start date of commencing IBOC operations?



### Why won't your station commence IBOC operations?



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## Broadcast Electronics FMI-703

By John D. Kennedy

In early 2003, we had the opportunity to upgrade WQSX-FM in Boston to IBOC. Because this was in the early days of the IBOC rollout, our choices for transmitter components were limited, but the choices were between reputable companies. We knew that whichever company we chose would stand behind its product.

We calculated that the TPO of the IBOC transmitter would be 2,950W. So, with the need for that power level, not only would we need an IBOC signal generator and an IBOC exciter, but we would also need a transmitter capable of that power level.

Our decision was to purchase the Broadcast Electronics FMI-703 IBOC transmitter.

The product consists of three components: the FSI-10 signal generator, which provides baseband IBOC directly to the IBOC exciter, the FXI-60 IBOC exciter and the FMI-703 trans-

### Performance at a glance

- Suitable for analog, digital or hybrid operation
- Hot-pluggable, solid-state RF modules
- Redundant power supplies
- Direct-to-channel digital frequency synthesis
- Frequency agile
- 1.25kW to 2.8kW digital
- 3kW to 7kW hybrid IBOC

mitter. The FMI-703 is basically the BEFM-10S solid-state transmitter but has been adapted to operate up to 3kW in the digital mode. The FSI-10 and the FXI-60 are rack-mountable components and mount nicely in the FMI-703, although the option exists to mount them in an external rack.

### Making connections

Installation was quite easy and can be completed in less than a day's time; the remote control interface was simple, using the optional positive or negative control logic. There are many choices of metering including forward and reverse power, inlet and exhaust temperature, PA voltages and currents along with many status indications available if you choose to use them.

The FSI-10 provides a low voltage data stream (LVDS) into the exciter where it combines with the analog signal. The FSI-10 features a touch-screen monitor for all of the system controls. I found that if you don't like working with touch screens, it's convenient to have a stylus that you would use on a PDA. It is imperative that you have this component, if no other, on a UPS for two reasons: first, if you don't follow the sequence of powering down properly, you may corrupt the unit's software. Second, the time to boot the FSI-10 is a few minutes, which will all be off-air time. A UPS will get you through those power glitches without any trouble at all. The FSI-10 also has an optional GPS antenna input.

The last feature that I want to mention on the FSI-10 is the modem and network connections on the unit. These connections made it possible for the BE service department to dial in and upgrade software on one occasion saving the time to send it on CD-ROM.

The FXI-60 combines the LVDS with the AES audio coming in from our STL. It has a 640 x 480 GUI display that is easy to read and provides all the data you could possibly want for troubleshooting.

The FMI-703 transmitter is used to provide our 2,950W of TPO needed for our IBOC operation. The transmitter is a well-designed unit that can be broken down into three parts: the PA module section, the power supply section and the controller. The PA is a hybrid of 16 PA modules, all of whose status can be monitored on the front-panel LCD multimeter. A loss of a PA module simply reduces the TPO of the transmitter without shutting the transmitter down completely. It does this by reconfiguring the combiner internally. The same theory is in the power supply section of the transmitter: four power supply modules provide more than enough power for this system. In fact, we lost one power supply module and still maintained full power operation with the three remaining modules. The controller is well designed and provides many readings on the LCD multimeter and enough status lights on the front panel of the transmitter to make troubleshooting easy.

On initial turn-on, we found it came up to our power level just fine. The first glitch we noticed, however, was that the power controller was a little unstable and that the power level would drift unreliably. As mentioned before, though,



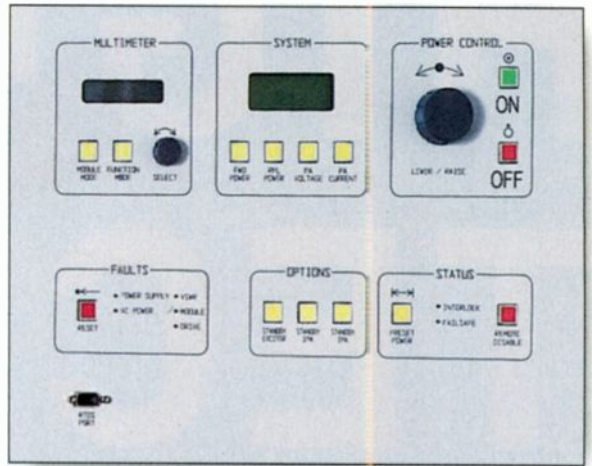


this was an early transmitter and BE was quick to find that we needed to upgrade the firmware in the controller board and that repair was completed quickly. As the factory has made improvements to the transmitter, we have implemented those improvements and the overall reliability and

## Broadcast Electronics

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*Editor's note: Field Reports are an exclusive Radio magazine feature for radio broadcasters. Each report is prepared by well-qualified staff at a radio station, production facility or consulting company. These reports are performed by the industry, for the industry. Manufacturer support is limited to providing loan equipment and to aiding the author if requested. It is the responsibility of Radio magazine to publish the results of any device tested, positive or negative. No report should be considered an endorsement or disapproval by Radio magazine.*



Detail of the transmitter's control panel.

stability of the transmitter has been great. This system has been operating for about a year and a half now. We were pleased to not only be the first IBOC on-air in the Boston market, but we were also happy to be able to work with Broadcast Electronics, using an ISDN link from our transmitter site, to provide analog and digital audio to its booth at NAB2003 for the IBOC demonstration.

Kennedy is director of engineering, Entercom Boston.

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## Telos Systems Zephyr Xport

By Kirk Chestnut, CSRE

Doing more with less; that's the name of the game in broadcasting today. As revenue dollars shrink, I don't have to tell you how it affects the size and expertise of your technical staff. Running an efficient remote engineering department is becoming more of a challenge. Equipment needs to be flexible, yet easy enough for employees with entry-level skills to operate.

I had the opportunity to examine the features and functions of the Zephyr Xport from Telos. In short, the Xport is a full-duplex mono audio codec to

accordingly. To communicate with other ISDN units the Xport can be configured to transmit with G.722 encoding. I found that the MPEG AAC Plus low bit-rate encoding delivers superior quality down to 64kb/s using spectral band replication techniques.

Think of this box as the Swiss Army knife of remote equipment. It includes a mixer with one microphone and one line-level input, as well as a headphone local/remote mix and volume control. Telos has incorporated an Omnia multi-band digital AGC/limiter on board. You can tell that the designers at Telos are thinking of us in the field with stowable control knobs that tuck neatly into the front panel. Set the level, press the knob in and you're ready to go. No more accidental bumps to knock you off the air.

Configuration, dialing and signal monitoring can be observed on the front-panel LCD display. Instead of showing you a static data rate screen, the Xport displays a line quality bar graph for incoming and outgoing data streams. Status prompts inform the user of modem activity such as off-hook, connecting and renegotiation request. The design is clean and simple with just a few navigation buttons. Of course, there are manual-dial and speed-dial buttons as well as 100 memory dial locations. The Xport's built-in power supply will accept voltages from 100Vac to 240Vac.

The Xport uses a custom-designed modem as opposed to a standard off-the-shelf variety modem to achieve a robust data stream. The Xport will work under the most difficult of line conditions. In the event that line quality goes to pot (no pun intended) the Xport will revert to a phone-line quality mode so the show can go on.

### Connection U

Throughout North America, two-wire U ISDN service is used. Four-wire S ISDN service is used elsewhere around the world and in parts of the United States and Canada. The Xport is equipped with RJ-style jacks to accommodate both formats. Thirty location setups are provided to store SPID or MSN numbers. I like the fact that two Xports can share a single ISDN to achieve two-channel audio when needed. When landlines are unavailable or impractical, a cell phone jack is provided on the back for phone quality audio over wireless telephone networks.

An Ethernet port on the rear panel allows connection between the Xport and a PC. If the Telos Soundcard Emulator driver is loaded on the PC, it can stream audio from the computer back to the studio. Remote control is accessed through the Ethernet port using a standard Internet browser. Other features include dry contact closures for remote starts/stops and auxiliary audio outputs for recording.



### Performance at a glance

- 20Hz to 15kHz audio over ISDN and POTS
- Automatic phone coupler backup
- Full-duplex operation
- AAC Plus encoding
- Integrated mixer and multi-band AGC/limiter
- Remote control via Ethernet
- Computer audio streaming via Ethernet
- ISDN line sharing
- Ancillary dry contact closures

send audio via POTS or ISDN. The unit is designed to communicate with its companion, the Telos Xstream ISDN studio unit. The Xport can use the new MPEG AAC-LD coding at a 64kb/s rate.

The Xstream ISDN studio unit automatically detects when the incoming call is POTS or ISDN and configures itself

## Down on the farm

When the field test Xport arrived, I was impressed with the sleek stainless-steel look, but I wondered if the audio quality would match this look. On the bench, the Xport performed with jaw-dropping clarity in the POTS AAC Plus mode. This was fine in the studio test, but I needed to see it in action in the field.

My opportunity to field test the Xport came when one of our morning-show announcers took maternity leave. Being the trooper that she is, she was prepared to work the show from her home studio right up to the last minute. This was my chance to test the Xport under real-world conditions. We had no idea how hard this task was going to be.

Not only does this announcer love country music, she also loves the country. Her home and studio are in rural Missouri nearly 60 miles from our studios. An RPU shot was out of the question because of the terrain. I turned to ISDN, but the telephone company that promised the ISDN service backed out within a week of our first remote broadcast. Our only remaining option was POTS.

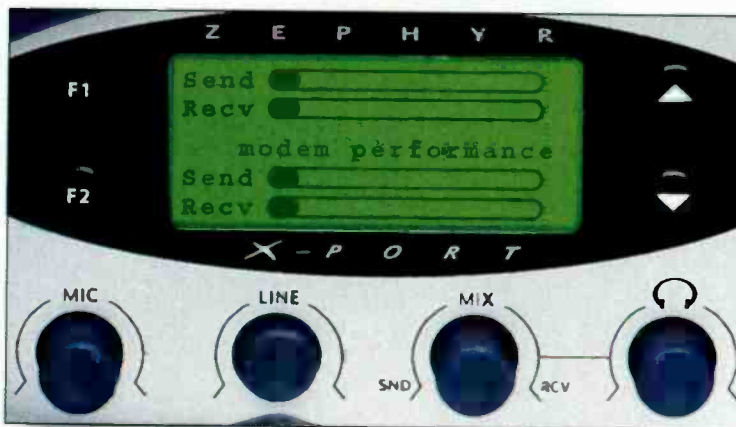
We successfully connected the first time with amazing results (considering the age and distance of the copper through which this signal traveled). The Xport had to negotiate to a low rate to work over the poor lines. We had a little delay because of the low data rate, but the host was able to keep up with callers and her sidekick on-air. It wasn't an ideal solution considering the circumstances, but we were able to pull it off thanks to the Xport.

The Xport lacks a direct way to read connection speed. Personally, I like to know in discrete terms what my line quality is. Another negative for me is its lack of operator control over rate renegotiations, but I can understand the need to automate or mask such operations so as not to confuse operators.

If you're considering the purchase of an Xport, keep these things in mind. You must own a Telos Zephyr Xstream ISDN studio unit. It must have software version 2.5 or greater. Software upgrades for the Xstream are free.

The author of the operator's manual alludes to the fact

that the AAC Plus algorithm is open to everyone to license and use. His hope is to encourage standardization and interoperability among vendors for the sake of the customer. History has proven that



Detail of the screen showing audio metering and connection quality.

companies who share knowledge tend to be survivors unlike past blunders like Betamax and Mac computers.

*Chestnut is assistant chief engineer at Entercom Kansas City.*

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**MONITORING TO THE POWER OF 8.**

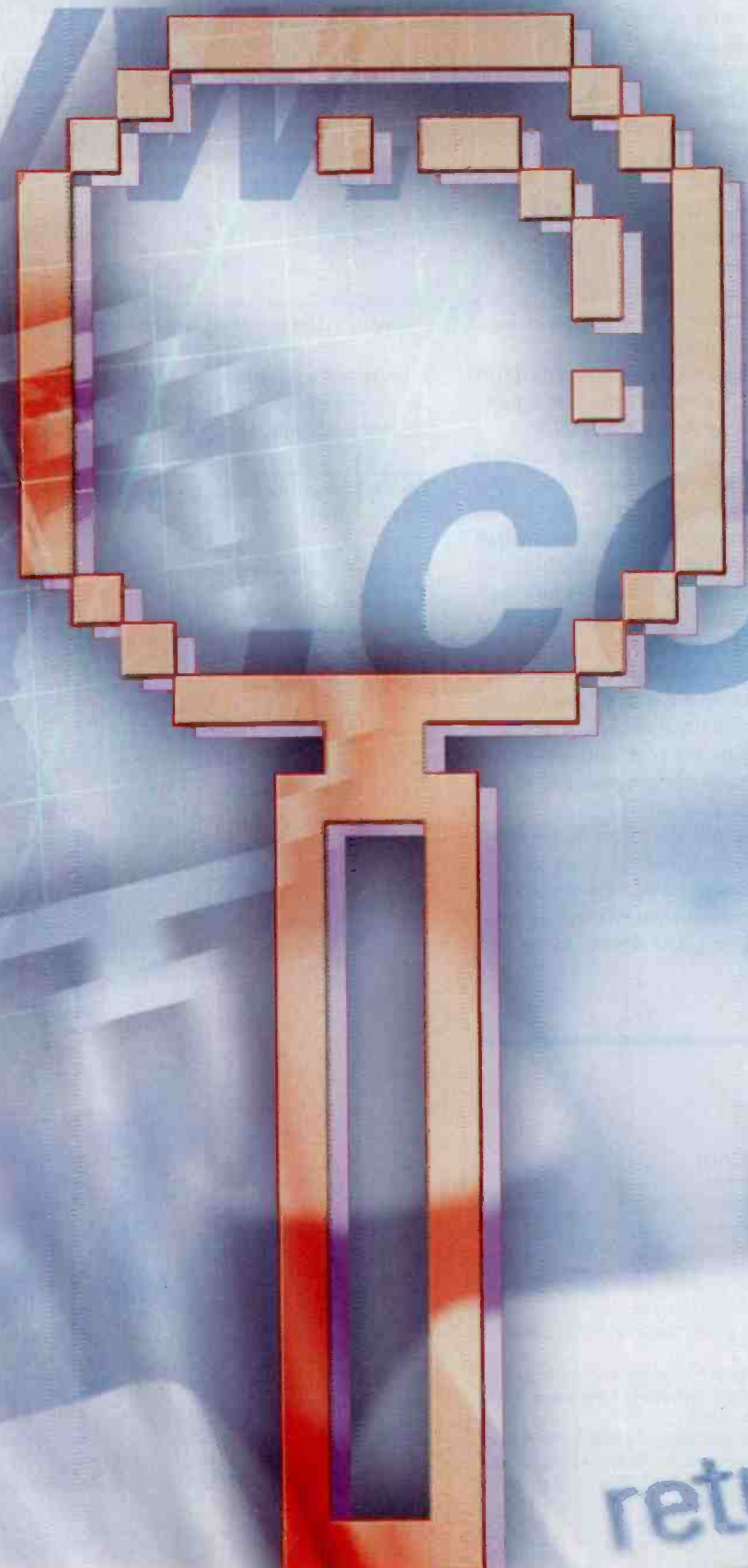
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## Estimated median salaries for station management

Trend: Slight increase in salaries in large markets; small decrease in small markets

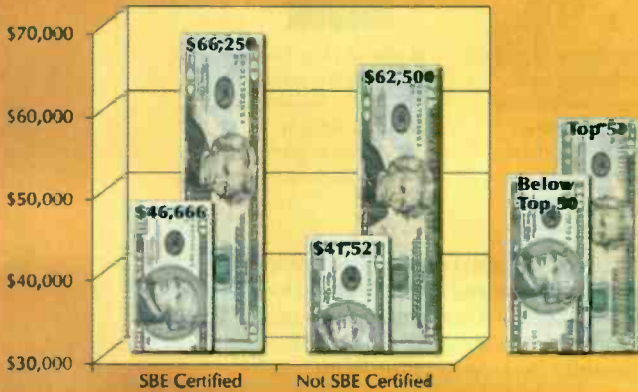


## Estimated median salaries for staff engineers

Trend: Slight increase in all markets



## Estimated median salaries by SBE Certification

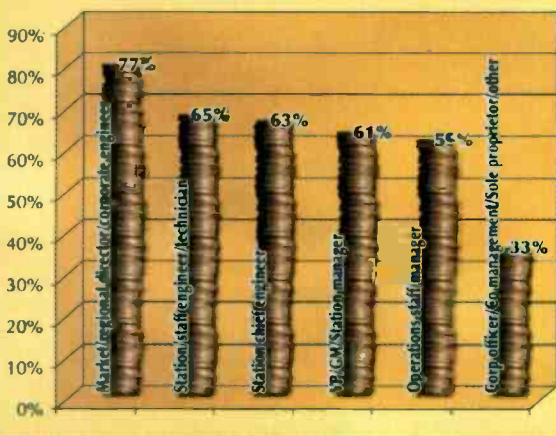


## SBE Certification Impacts Salaries

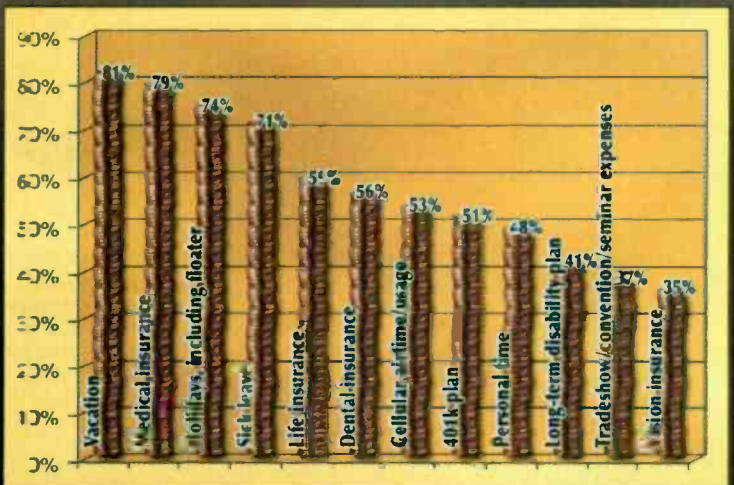
### Percent holding SBE Certification



## Percent receiving a salary increase in 2004



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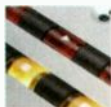
If you need a routing switcher but aren't made of money, consider Axia, the Ethernet-based audio network. Yes, Ethernet. Axia is a *true network*. Place our audio adapter nodes next to your sources and destinations, then connect using standard Ethernet switches and Cat-6. Imagine the simplicity and power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



*Axia SmartS rface provides the perfect blend of flexible features and intuitive control. Easy to learn and easy to use, it's tailor-made for talent-intensive formats.*



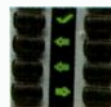
*Programmable soft keys and recording device transport control buttons give instant control of all a dio functions.*



*Ergonomically designed channel start and stop buttons, with guards that prevent accidental activation.*



*Each channel's main, special-purpose, phone and preview assignments are quickly accessible. Automatic mix-minors for each fader!*



*Available Telos Console Director panel with Stat Symbols® provides easy, intuitive control of phone-based segments.*



**"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](http://AxiaAudio.com)



*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.*



*Place 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.*

**ENCO**  
SYSTEMS INC.

**PS**

**radio**

*Scott Studios*

**ALY**

*We're already working with some great companies. Check [AxiaAudio.com](http://AxiaAudio.com) to find out who's next.*



Axia products are available in the USA from Broadcasters General Store and Broadcast Supply Worldwide. See [www.AxiaAudio.com](http://www.AxiaAudio.com) for more information.



# broadcast studio system.

radio broadcast studio system. Damned marketers.

### **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.

### **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.

### **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.

### **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.

### **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.

### **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.



There's a better way to get audio out of your PC. No more 1/8" connectors - with Axia your digital audio stays clean and pristine.

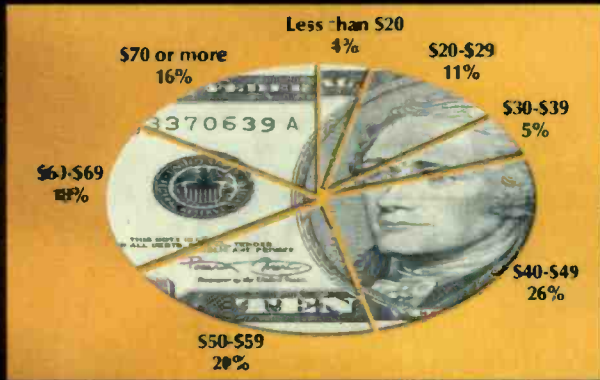


An Axia digital audio snake can carry hundreds of channels of digital audio on one skinny CAT-6 cable. We know you're not going to miss soldering all that multi-pair...



Control freaks, rejoice: PathFinderPC software for Windows® gives you systemwide control of all routing functions with just a click of your mouse.

# 2004 Salary Survey

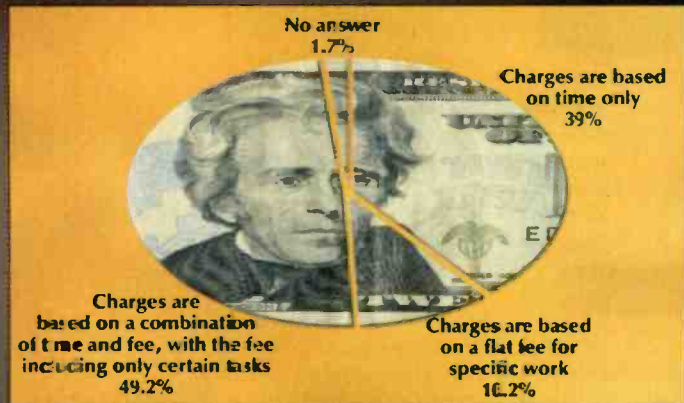


## Average hourly rates for contract engineers

**Trend:** Contract engineers earn an average hourly rate of \$52.

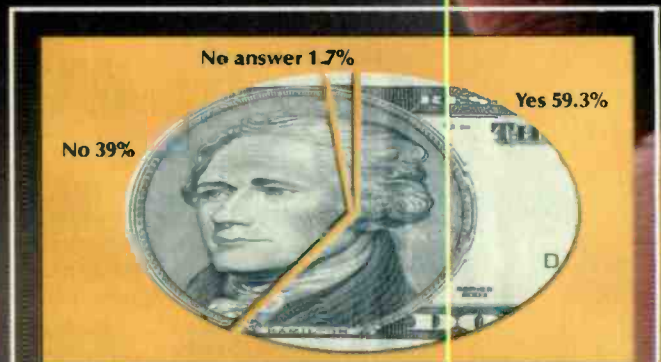
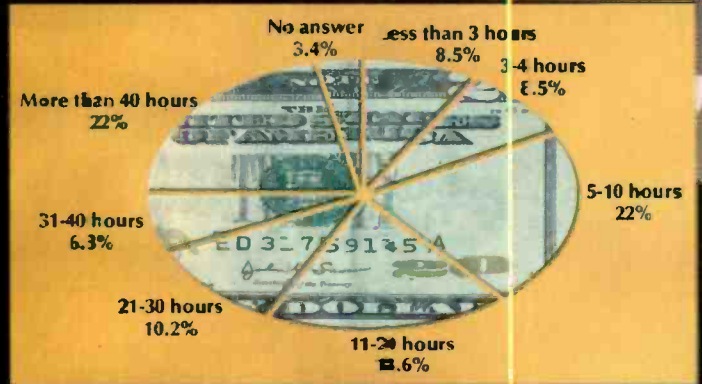
## How many hours do you typically bill during an average week?

## How do contract engineers charge their hours?



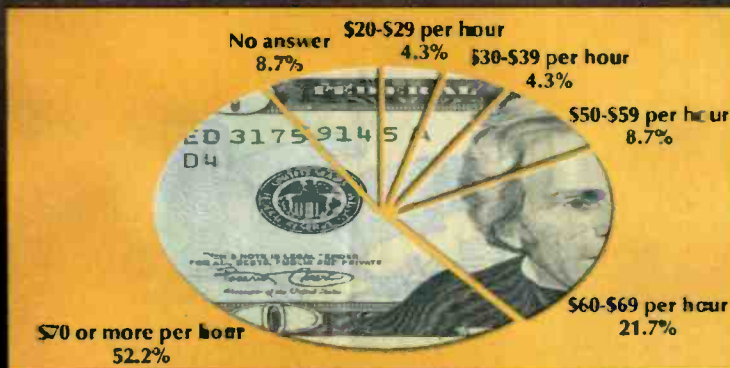
## What's in contract engineers' wallets?

Dedicated to contract engineers, this page provides these professionals a better idea of how much they charge clients compared to other contract engineers, as well as the general consensus on rates for emergency calls.

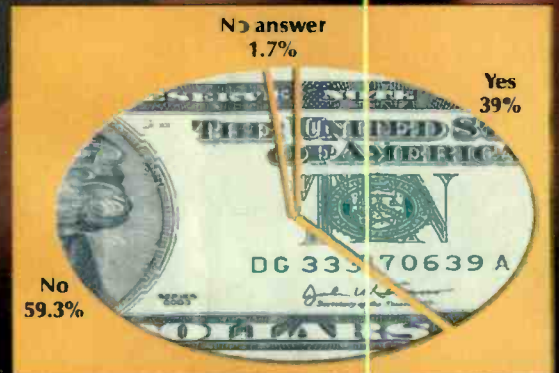


## Do contract engineers have a minimum charge for an emergency call?

## If you charge a different rate for emergency calls, what is that rate?



**Trend:** \$75 is the average hourly rate that contract engineers charge for emergency calls.



## Do you charge a different rate for emergency calls?

## Variations on a theme

Different variants of CWS and other hijackers include Cool Search, Search For, Make Me Search, Find4U, Smartsearch and Gonnasearch. The basic idea behind hijacking is that a website company can increase its number of page hits by secretly installing a trojan into users' browsers, creating a third-party hijacker pay-per-click search engine. This in turn generates money for companies like CWS. It must be effective and profitable because there are thousands of websites that include hijackers. And a common misconception is that only adult websites contain hijackers. Many legitimate websites, including popular bulletin boards, can contain hijackers secretly installed by hackers or the site operators.

The programmers at Cool Web Search modify their parasite daily by altering its program so it cannot be easily eradicated, and make it self-replicating so it will change every time an attempt at removing it is made. A CWS infection will even prevent the user from accessing spyware information websites. New versions are released so often that virus programs cannot keep up.

Fortunately, several companies and private programmers have created utility programs to help users deal with CWS and many other forms of spyware. Most spyware removal programs are free online and are equally as effective as the \$40 spyware removal programs that appear on pop-ups. Ironically, these costly removal programs contain spyware of their own. The most useful free utility released is Hijack This, created by Merijn. This program

### Available software

- Hijack This
- CWShredder
- About Buster
- Ad-Aware 6 or SE
- BHO Demon
- BugOff
- Spybot Search and Destroy
- Spyware Blaster
- XCleaner
- Browser Hijack Blaster
- Registry Mechanic

Keep in mind that this software is useful for identifying problems and correcting issues. If you have a problem that just cannot be solved after using the software, feel free to visit the forums at SWI or any of the other sites. Don't waste all day manually searching for hidden files or registry keys you cannot identify. This gives you a place to start, and the helpers on the forums will take it from there.

## The Anti-Spyware Act

by Kari Taylor

In an effort to control "illicit indirect use of protected computers," the U.S. House of Representatives passed the Internet Spyware Prevention Act with a 415-0 vote on Oct. 7, 2004. Sponsored by Rep. Bob Goodlatte, R-VA, the bill states that whoever intentionally accesses a protected computer without authorization and uses that program or code for illegal acts will be fined, imprisoned for a maximum of five years or both.

The bill was prompted by an increase in software and electronic communications used by criminals to invade individuals' and businesses' computers; particularly the use of spyware and phishing scams. These schemes are often used to obtain personal information, such as bank account and credit card numbers.

If this bill passes in the Senate, which is currently not in session, a sum of \$10 million will be appropriated to the Attorney General for prosecution of users of spyware and the practice called phishing. However, the bill does not pertain to international companies such as CWS.

The House also passed another anti-spyware bill called the "Spy Act" two days prior to the Goodlatte bill. This bill, sponsored by Rep. Mary Bono, R-CA, would add hefty civil penalties over the use of spyware. Lawmakers are expected to combine these two bills for a vote by the end of the year.

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savings in electricity and maintenance costs over an older transmitter...and as a bonus they get exceptional reliability and that major market sound for free.

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\* HD Radio is a registered trade mark of iBiquity Digital Corporation.

# Your Browser's Been Hijacked!

quickly lists the computer's autoloading programs, toolbars, browser helper objects, search pages, Internet Explorer plugins and other key elements surrounding IE. The user then removes anything on the list that looks unfamiliar. Merijn's second most-useful utility is CW Shredder, designed to quickly scan key files and remove anything known to associate with CWS, effectively uninstalling the hijacker.

And if the user is lucky, after a reboot CWS is gone. But it is rarely that easy.

This will only do so much to help the user remove the always-evolving CWS infection. Luckily, other programmers have jumped to the challenge and created more useful free removal programs to help fight the war against spyware. One such program is the current release of Spybot Search and Destroy. When used in conjunction with Hijack This, hijackers and other forms of spyware can be easily eliminated from an infected system. The free version of Ad-Aware by Lavasoft is also an effective tool; it can further seek out the bad files missed by Spybot S&D.



A computer gets hijacked when the user visits websites that have spyware trojans embedded in them. "Search For..." is a famous CWS hijack.

net Explorer from a long list of known websites containing spyware trojans.

Users can usually remove hijackers or autodialers with the aid of a spyware removal program. Depending on the particular infection though, (and there are hundreds of varieties) the user will not be able to locate all of the hidden files, and the infections will come right back. At this point, it may look like the user cannot do anything else and is stuck with the hijacker and must wipe the hard drive clean and start over.

Thankfully there is free help online. Desperate affected users are jamming the help forums at anti-spyware websites like SpywareInfo.com. Here site visitors learn where spyware comes from, how to remove it, where to locate the programs to remove it, and best of all, the Malware Removal forum helps users with the spyware they just can't eradicate. Friendly and accurate information is available 24 hours a day from trained experts who enjoy the challenge and like to help people.

## Available help

SWI asks infected visitors to first read the posted FAQ and download and update available free spyware removal programs before asking for help. If still unsuccessful, the user posts a Hijack This logfile in the Malware Removal forum and describes the problem. A board helper will read the file and either ask more questions or post a detailed response that explains what software to run and which files to remove. Users may have to download additional utility programs that isolate and remove hidden files, but after the necessary log analyses and instructions, the user will finish with a clean, smoothly running system.

SWI recommends users to run Spybot S&D and Ad-Aware weekly to prevent future re-infections. Spywareblaster and Spywareguard can also be installed to protect IE and to prevent unwanted sites from popping up in the browser. IE Spyad will put 4,000 bad sites into the restricted-sites list to keep the browser from accidentally getting sent to an unwanted site. At the same time, the user should install a firewall and constantly update the virus protection software.



Ad-Aware by Lavasoft is one of several programs that are effective tools for seeking out bad files and removing infections from a computer.

Another useful tool is Registry Mechanic by Winguides Software. Registry-ignorant users will find the free evaluation version useful as it performs deep scans into the registry, identifying and deleting unwanted hidden spyware keys.

And that's not all. The frequently updated utility About: Buster by RubberDucky (Marcin Kleczynski) cleans an affected system of the trojan Home Search Assistant, closely associated with CWS. X Cleaner by X Soft is a great utility for an overall system cleanout. This program even blocks Inter-

Regular Windows updates will also help keep a computer performing to modern standards.

Microsoft has recently released Service Pack 2 for XP, which deals with the security issues plaguing the earlier editions that allowed trojans to infiltrate the systems. It also added a decent firewall to the package. However, it has been reported that SP2 has negatively affected some computers using anti-virus protection.

In the radio station environment, multiple users have access to individual machines, such as in the sales office, on-air studio or jock-prep area. Workstations such as these are more susceptible to trojans; these computers are used mostly for research and e-mail, and many untrustworthy sites may be visited while surfing. Users might be tempted to download freeware such as clock-syncers, weather bugs or the aforementioned Bonzi Buddy.

The IT administrator can spend hours manually searching for files in an infected machine. But because help is available on the Web to deal with the problem, problems can get solved much more quickly. With proper protection—

not just limited to virus protection—a computer can be set up to prevent unauthorized downloads of unnecessary applications that could contain spyware. As the saying goes, an ounce of protection is worth a pound of cure. Invest in several pounds of protection for the home computer and office machines. At least it won't cost anything.

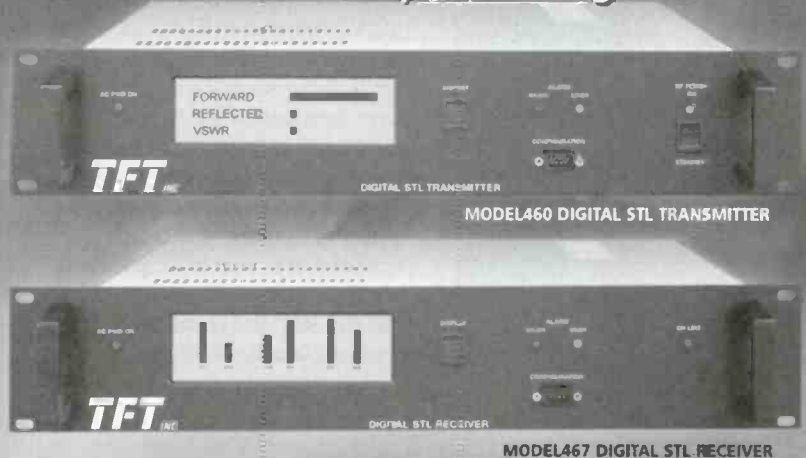
*Singer is a freelance writer and former radio engineer in Cincinnati.*

## Avoiding trouble

Here are some steps that you can take to avoid the trouble of spyware.

- **Update virus protection daily.**
- **Update Windows.** Not only with service packs, but if there are office machines still using Windows 98, it's past the time to upgrade to Windows XP.
- **Install a firewall.** Small stations take note.
- **Train the staff** not to download the cute applications (on private machines too). Usually one infection is enough to teach the lesson.
- **Use an alternate browser.** Following the release of Service Pack 2, companies like CWS will continue to search for security breaches in Internet Explorer. Use Mozilla or Opera instead.
- **Use server-side e-mail filtering.** Suspicious e-mails are quarantined and are held until the user allows them to pass through.
- **Budget willing, use thin clients for shared machines.** These workstations are read-only, and when rebooted they will turn back to the state when they were first installed.
- **Use client desktop-level firewalls** with central administration, in case the server firewall just isn't enough.

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# New Products

By Kari Taylor, associate editor

www.beradio.com

## HD Radio transmitters Harris

**Mini HD:** With the addition of Mini-HD, a new line of 10W to 600W HD Radio transmitters, Harris can now support multiplexer input, interleaved antenna and separate antenna applications. Like Harris' Z-HD Radio transmitters, the Mini-HD line is available with Harris' Neustar option, which enables supplemental audio channels and 5.1 surround-sound applications. Designed for FM radio stations using space combining to implement HD Radio, applications of this transmitter include separate antennas, interleaved antennas, dual-port antennas and FM combiner port injected feeds. The transmitter integrates with the Dexstar HD Radio exciter with a linear RF amplifier in a single rack cabinet.

800-622-0022; fax 513-459-3890

www.broadcast.harris.com; broadcast@harris.com

## Signal preamp and voice processor Behringer

**VX2496:** This 24-bit/96kHz compatible product features an additional AES/EBU output besides the voice processing functions. The unit houses a discrete ULN mic/line input stage with soft mute 48V phantom power. Its AES/EBU output with selectable 44.1, 48, 88.2 and 96kHz sampling rates or external clocking ensures digital compatibility. It also offers a true RMS expander for smooth noise reduction and authentic tube-emulation circuitry for typical tube and tape saturation sounds. An opto-compressor with integrated dynamic enhancer provides musical compression, while the voice-optimized equalizer offers three specially selected bands of equalization, one of them sweepable.

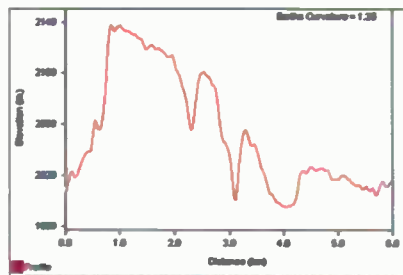
877-672-0816; fax 425-673-7647

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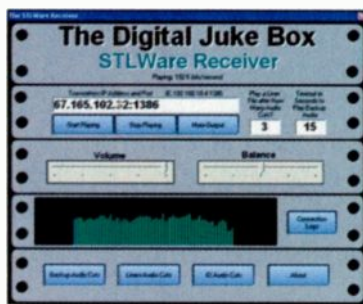
## Terrain database V-Soft Communications

**NED 30m database:** V-Soft Communications has compiled the USGS National Elevation Dataset (NED) 30-meter database for use with Probe 3, Terrain-3D, Plot Path and other V-Soft Communications programs. The satellite corrected, terrain database, which includes the continental United States, Hawaii and Puerto Rico, offers increased resolution. The 30-meter dataset is useful for plotting critical STL paths and analyzing Longley-Rice coverage.

800-743-3684; fax 319-266-9212; www.v-soft.com; info@v-soft.com



## Internet STL software Digital Juke Box



**STL Ware:** The STL Ware receiver will never be off the air for more than the amount of time the user sets it to silence sense. If the Internet connection should ever be lost, the software will automatically

start playing pre-recorded audio cuts so that it will appear to listeners that the station is still on the air. Users can have as many audio cuts as they want and they can last as long as they wish. Air-talent can record several four-hour audio cuts and the listeners won't know it's recorded.

740-282-SOFT; fax 443-241-2514

www.digitaljukebox.com; Sales@DigitalJukeBox.com

## Tower duplicator Microboards Technology

**Copywriter Tower:** A 10-recorder duplicator, this CD/DVD copying system can be operated without being connected to a computer. The unit provides configurations of 16 recorders in a twin-tower system. Features include the ability to store disc images, change recording speeds, keep job counts and perform audio track extraction. A two-line LCD display and two-button interface make accessing those features easy.

612-470-1848; fax 612-470-1805

www.microboards.com; sales@microboards.com



### Ethernet audio interface Axia Audio

**Analog Line Node:** This audio networking component provides a real-time, low-delay interface between pro-audio equipment and Ethernet. Using the system, 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. Each node contains eight balanced stereo inputs and outputs, as well as 24-bit A/D/A converters throughout. The Livewire-enabled Ethernet port connects 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.

216-241-7225

[www.axiaaudio.com](http://www.axiaaudio.com); [inquiry@AxiaAudio.com](mailto:inquiry@AxiaAudio.com)



### Microphones

#### Pearl Microphone Labs

**Elm-B and Elm-C:** The Elm-B in its figure-eight pattern and the Elm-C in its cardioid polar pattern are designed for stereo recording. The mics offer more than twice the surface area of large-diameter round capsules, providing a good S/N ratio, but avoiding high levels of in-band resonance. This mic features a sensitivity of 18 mV/Pa, self noise IEC-179 of 12dBA; impedance of 100Ω, maximum SPL of 126dB; operating voltage of 48V; and a three-pin XLR connector. The frequency response is from 20Hz to 20kHz. It measures 7.75" long and weighs 10.75 ounces.

207-773-2424; fax 207-773-2422

[www.independentaudio.com](http://www.independentaudio.com)

[info@independentaudio.com](mailto:info@independentaudio.com)

### Satellite assemblies

#### Patriot Antenna Systems

**LNB line:** This is a new series of low-noise blocks for C and Ku band use. Various models cover different bandwidth needs and specifications for various applications. Eight C-band units and eight Ku-band units are in the standard product line, including minimag, DRO and PLL varieties. Additional frequency ranges and stability ratings are available by special order.

800-470-3510; fax 517-629-6690

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[www.scmsinc.com](http://www.scmsinc.com)



## Battery-powered mixer Professional Sound

**DV Promix 3:** This three-channel mixer is battery operated for portability and provides audio in a compact and lightweight package.

The mixer allows the operator to easily mix three audio sources. The unit features low cut filters (80Hz, 20Hz, 150Hz), pan switches (left, center, right), channel faders, meters (-20 to +3dBv, green, amber, red), a headphone monitor, battery compartment (2x 9V Alkaline) and an external power input (7 to 16Vdc).

661-295-9395; fax 661-295-8398; [www.professionalsound.com](http://www.professionalsound.com); [sales@professionalsound.com](mailto:sales@professionalsound.com)



## Thermal CD/DVD printer Primera Technology

**Signature Z1:** Capable of printing directly onto CD-Rs and DVD+/-Rs, as many as four separate areas of a disc can be printed with this printer. The system prints each of four quadrants by spinning the disc and then applying ink in each area. The unit connects to any PC running Windows 2000/XP via USB 1.1/2.0.



Enter the data, import graphics and logos, and print. The printer's label design software can use any font on the PC and over 250 clip art images are included. Each disc takes less than one minute to print.

800-797-2772; fax 763-475-6677

[www.primera.com](http://www.primera.com); [sales@primera.com](mailto:sales@primera.com)

## Rugged XLR connectors Pomona Electronics

**6852, 6853, 5109 and 5110:** The clamping mechanism of these connectors can withstand 100 pounds of pull without disconnecting the cable. Designed to deliver



low-noise audio transmission, the XLR connectors feature gold contacts and black nickel coating to reduce reflection. They also feature a smooth, best-of-breed latching mechanism for easy, more secure connections.

These connectors are also available on 10 to 25 foot cable assemblies made with Belden 1172A four-conductor Star Quad, low-impedance cables.

800-490-2361; fax 425-446-6070

[www.pomonaelectronics.com](http://www.pomonaelectronics.com); [info@pomonatest.com](mailto:info@pomonatest.com)

## Upgrades and Updates

Burk Technology has released new firmware for the ARC-16 transmitter remote control system. Firmware version 5.6 offers faster baud rates for digital communication links, providing more responsive site-to-site communication, especially with multiple remote sites. Supporting 4800 and 9600 baud benefits the performance of the ARC-16 without requiring more than one T1 slot.

[www.burk.com](http://www.burk.com)

Audion Laboratories is now shipping Voxpro PC 3.3. Version 3.3 adds customer-requested features and functionality to the Voxpro PC broadcast recording and editing software system. The upgrade includes the ability to increase gain for selected audio for one or both tracks, a resizable interface from minimal to full screen, compatibility with virtually all sound cards, MP3 import and export of multiple files, and faster access to folders containing thousands of files.

[www.audionlabs.com](http://www.audionlabs.com)

Broadcast Electronics has released a software upgrade to its FX1 digital FM exciter that makes it possible to calibrate audio levels within 1/10 of a decibel. The upgrade applies to the FX160 and FX1250 models.

[www.bdcast.com](http://www.bdcast.com)

Dan Dugan has released an upgrade to the Model D and Model D-1 automatic mixing controllers. One type of connector, used for internal audio connections between the back panel and the circuit boards, has begun to be unreliable due to vibration and insufficient contact pressure. Dugan recommends replacing all these connectors with a higher-contact-pressure type as soon as possible. Dugan can provide this service and give a unit a complete factory check up for a fee. The upgrade can be done in the field.

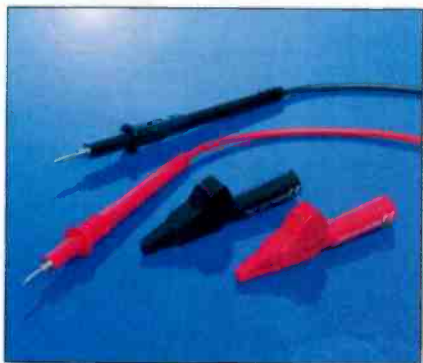
[www.dandugan.com](http://www.dandugan.com)

Adding to their versatility, the Intelix 8002MCB-PHNX and 8002MCB-XLR mic/line mixers now feature upgraded 30Vdc phantom power. The 8x2 8002MCB features eight-channel, dual bus mic/line mixing, compression and limiting, actively balanced inputs and outputs, a dual-function LEDVU meter, phantom power, a headphone out and either XLR or Phoenix-style connectors depending on model.

[www.intelix.com](http://www.intelix.com)



## Test probes Pomona Electronics



**6723:** The 8-32-UNC 2A-threaded tips are designed for secure attachment to test probes providing R&D engineers and electronics service technicians stable measurements for consistent test results. The leads are rated at IEC1010 1000 V CAT III for the probe alone, and the screw-on alligator clip Model 6723 is rated at 300 V CAT II with 10A current maximum. The leads are flexible with silicone insulation for better temperature performance over a wide temperature range, from 14° F to 221° F (-10°C to 100°C).

800-490-2361; fax 425-446-6070  
www.pomonaelectronics.com; info@pomonatest.com

## Mic mute switch Rolls

**MM11:** This passive switch temporarily mutes a balanced XLR signal. A user presses the switch to mute the signal, releasing the switch to restore it. Primarily designed for use as a mic mute, the unit provides a large actuator switch that can be used by hand or as a footswitch. The unit is housed in a hefty 0.09" steel chassis. It features a one-million-cycle switch that exceeds common switch ratings of 10,000 cycles. It can be placed on a tabletop or attached to a Rolls MSC106 mic stand clamp. Because it is a passive device it can also be used to switch line-level signals.

801-263-9053; fax 801-263-9068  
www.rolls.com; rolls@rolls.com



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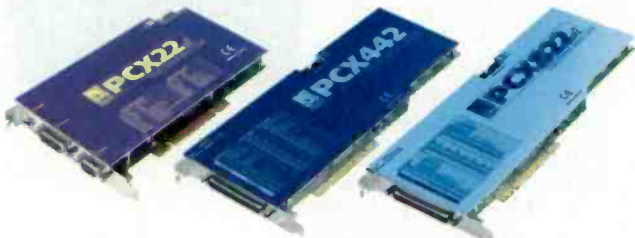
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PCX924v2 features 24-bit converters, balanced analog and AES/EBU I/Os, an external AES/EBU synchronization input, a headphone jack, as well as Wave and Digigram np Runtime drivers. A playback-only card, Digigram PCX22v2 offers two analog or digital outputs only. The VX222v2 sound card includes balanced 2/2 analog inputs and outputs with 24-bit converters, as well as a stereo AES/EBU input/output.

703-875-9100; fax 703-875-9161  
www.digigram.com; input@digigram.com

## Mirrored UPS MGE UPS Systems

EX RT: Offering a double fault-tolerant design, the 5kVA, 7kVA and 11kVA systems allow high performance online operation with dual-feed ac input sources to provide a double layer of power availability to protected equipment. At 6RU, the UPS' flexible modular design allows users to deploy the systems in high-density rack or stand-alone tower configurations for server room, testing or manufacturing environments. The system provides two hours of battery backup time and eight hours with the optional charger module and extended battery cabinet. The unit's redundancy capability provides separate normal and bypass ac input as well as hot standby functionality when installed with multiple units in an N+1 configuration.

800-523-0142; fax 714-557-9788  
www.mgeups.com; info@mgeups.com

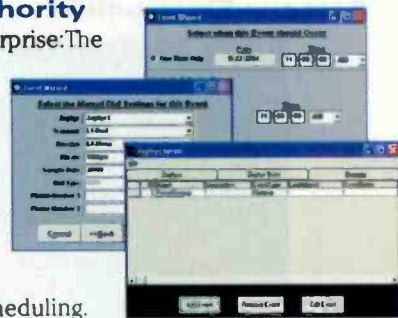
## Codec control software Software Authority

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877-504-9494; fax 216-642-0615; www.softwareauthority.com



## Spanish language training course RSI

RF Site Safety Awareness: RSI now offers an online Spanish language version of the RF Site Safety Awareness training course. The course is recommended to understand FCC and OSHA policies on RF safety, inform employees about the hazards of RF and other safety issues found when working on or managing an RF site. This online interactive training session focuses on hazard recognition, hazard avoidance and hazard abatement techniques in connection to working at a telecom or broadcast site. Both the Spanish and English versions have been updated to include how NEPA policies affect an RF site, proposed FCC rule changes, current enforcement actions and new audio and video features.

888-830-5648; fax 620-825-4324; www.rsicorp.com; info@rsicorp.com

## Voice alarm dialer Broadcast Tools



VAD-2: The tiny tools VAD-2 is a user-programmable, two-input, multi-number voice/pager auto

dialer designed for dial-out voice message notification. The unit features two dry contact inputs, which, when tripped, will sequentially dial one pager and as many as three phone numbers and play back a user recorded message corresponding to the tripped input. The technology is capable of remote or local configuration and message recording with a total recording time of 16 seconds. The two SPST relays may be programmed for momentary, latching or tone duration operation. The dialer may be set on a desktop, mounted on a wall or four units can be mounted on the RA-1 rack-mounting shelf.

877-250-5575; fax 360-854-9479

www.broadcasttools.com; bti@broadcasttools.com

## Headphone amplifier Mackie

HM54: A 1RU headphone amplifier, this unit features balanced left and right TRS main inputs, as well as left and right TRS direct inputs on each of the four channels. From the front panel, users can select the main stereo mix with its own input level control, or the stereo direct input on each of the four available channels. In addition, each channel offers dedicated headphone volume control, and a button that allows musicians to switch between their custom-crafted direct mixes and the main mix at any time. The amplifier offers eight headphone output jacks, four on the front of the unit and four on the rear, so that cables can be hidden.



800-898-3211; fax 425-487-4337

www.mackie.com; productinfo@mackie.com

## Reference monitors TOA Electronics



ME-120, ME-160: The monitors are available in two models: ME-160 two-way reference monitor (6.3" cone driver and 1" soft dome tweeter) and ME-120 full-range reference monitor (4.7" full-range cone driver). Both models offer high power handling (90W), flat frequency response and magnetic shielding for AV applications. These speakers include removable grilles, gold-plated speaker terminals and optional mounting hardware. The rated impedance for both speakers is 6Ω.

800-733-7088; fax 650-588-3349

www.toaelectronics.com

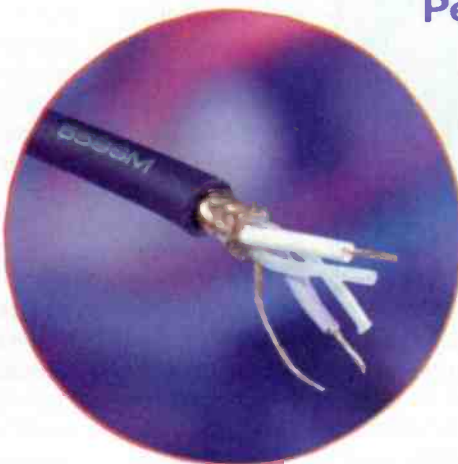
## Monitoring system ATC

SCM12 Pro: This two-way passive monitoring system is designed for near-field applications that can be shelf- or stand-mounted. Each monitor features a hand-built driver composed of a 3" midrange soft dome coupled onto a 6" cone for bass and midrange frequencies, as well as a 1" soft-domed tweeter with a neodymium magnet for high-end response.

fax 703-658-4919

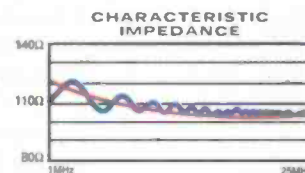
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more information: www.sinesystems.com

## Portable spectrum analyzer Anritsu

**MS2711D:** Covering the 100kHz to 3GHz frequency band, this spectrum analyzer features an input pre-amplifier (standard) and battery operation. Available options include transmission measurement for scalar analysis capability from 25MHz to 2.5GHz, a color display and a power meter. The unit weighs 4.9lbs. It includes a multilingual user interface, and can store 15 measurement test set-ups and 200 measurement traces with alphanumeric labeling and automatic time and date stamp.



Measurements include channel power, adjacent-channel power ratio and occupied bandwidth measurements that can confirm the distortion level or channel power level of a transmitter. The unit can conduct a series

of spurious measurements, while the field strength mode measures propagation and coverage, or pinpoints electromagnetic leakage in broadcast systems. Other features include trace averaging for more accurate noise measurements and a 50Ω interface that is adaptable to 75Ω. This unit includes data analysis software, soft carrying case, rechargeable/field-replaceable battery, ac/dc power supply and 12.5V automobile cigarette lighter adapter and a user's guide.

800-ANRITSU; fax 972-671-1877

www.us.anritsu.com; us-sales@anritsu.com

## Audio multiplexers Symetrix

Sufficient to handle all of the processing between the source gear (all inputs are line- or microphone-selectable) and the amplifiers. Express Cobra is available in four models: 12x4, 4x12, 8x8 and 4x4. Along with analog I/O, each includes an 8x8 Cobranet license, supporting Peak Audio's protocol for networked digital audio. Via Cobranet these units can interface with each other, Symnet Audio Matrix systems using Symetrix Cobralink hardware or third party manufacturers supporting the protocol. An onboard Ethernet interface allows the Express unit to be mounted on a computer network (LAN) and accessed in real time from a remote location. Symetrix provides for the connection of a redundant 24V power supply on all Express models.

## Digital audio generator

### Sencore Electronics

**DAG5161:** This handheld, multi-channel digital and analog audio generator provides stereo, Dolby 5.1 surround, DTS 6.1 surround and PCM digital audio via AES/EBU and S/PDIF coaxial and Toslink outputs. The unit performs eight automated tests, supports all digital and analog formats, captures performance data and provides test reports. The unit is battery-operated. Analog outputs include dual phono and stereo minijack. The unit measures 10-3/8"H x 6"W x 3-3/4"D and weighs about 3.5lbs. It operates on a 6V rechargeable battery. The LCD display measures 64 x 128 pixels.



800-SENSCORE; fax 605-339-0317

www.sencore.com

## Media production system Steinberg

**Nuendo 2.1:** Supporting a range of editing tools over a network, on projects, audio and MIDI, this system allows users to connect multiple Nuendo workstation computers via standard LAN network cards. Complete management of access rights and user groups makes it easy to collaborate on large-scale projects. The entire project, or just selected tracks, can be opened on multiple computers for other members of the network to access and edit. Also added are many musical features such as a time warp tool for creating complex tempo maps right from the project window or any editor, a freeze function for VST instruments to improve CPU performance and improved handling of multiple audio or MIDI parts within the editors.

+49 40 210 330; fax +49 40 211 598

www.steinberg.net; info@steinberg.net

**Symnet Express and Express Cobra:** The Express is available in three models, 12x4, 4x12 and 8x8, and is targeted at stand-alone applications where a single DSP unit is



425-787-3222; fax 425-787-3211

www.symetrixaudio.com; symetrix@symetrixaudio.com

## Surge suppressor Henry Engineering

**Powerclamp:** Powerclamp surge suppressors eliminate the ac spikes and surges that can cause equipment failures and system unreliability in broadcast facilities. These units are useful at transmitter sites and studio installations. Their automatic waveform tracking clamps voltage spikes to within a few volts of nominal ac voltage. AC surges are eliminated before they can cause any damage. Powerclamp units are available in various sizes to suit most installations.

626-355-3656; fax 626-355-0077; www.henryeng.com; info@henryeng.com



## Suppression processor DBX Professional Products

**AFS224:** With a DSP module, this processor provides control of fixed installations and live applications. Ten and 12 filter feedback elimination processors have become the de facto standard, but this dedicated feedback suppression processor offers 24 filters per channel with widths as narrow as 1/80 of an octave. The processor also offers



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801-568-7660; fax 801-568-7662

www.dbxpro.com; customer@dbxpro.com

## Digital monitor, switcher Broadcast Tools



**DMS-III:** This product accepts and automatically switches two AES signal sources when a digital error or analog silence are detected. Features include: automatic control function that switches to a backup source on failure of the main source; switch functions can be triggered by loss of clock, digital error flags, front panel transfer switch, external switch contact and the internal analog stereo silence sensor. Additional features: front panel error status and sample rate LED indicators; front panel headphone jack and level control; balanced stereo monitor output; remote control; removable screw terminals; plug and play installation; and dipswitch selection of precise time delay from two seconds to 85 minutes and restore timing delay from off to 10.2 minutes. The unit may sit on a desktop, mounted on a wall or up to three units mounted on the RA-1, Rack-Able mounting shelf.

877-250-5575; fax 360-854-9479

www.broadcasttools.com; bti@broadcasttools.com

## Acoustic series Firstcom Music

**EVO Unplugged:** EVO Unplugged features acoustic guitar performances from top musicians and unsigned bands. The discs in this series are all original recordings, created specifically for underscores. The initial releases in the series include EVO026 - Acoustic Chemistry and EVO036 - Acoustic Masters V1. Future EVO Unplugged series releases will feature guitarists Randall Bays, Alex DeGrassi, Doug Smith and Ray Russell. The EVO website offers users downloadable bonus tracks, additional versions not available on the CD and provides the opportunity for users to give creative input on the library's future releases.

800-858-8880; fax 972-242-6526; www.firstcom.com; info@firstcom.com

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## DHS alerts from NWR

In June 17, 2004, the U.S. Department of Homeland Security (DHS) signed an agreement with NOAA/NWS addressing the transmission of DHS-originated emergency messages over All-Hazards NOAA Weather Radio (NWR).

If the DHS becomes aware of a threat in a particular state or area of the country, after coordination with authorities in each involved state, the DHS will issue an alert to all NWS offices via a link in the Washington, DC, area. NWS offices with NWR coverage areas affected by the threat will broadcast the message on NWR, using the DHS-requested EAS/SAME Event Code. Currently, the alert will not be relayed in text form on NOAA Weather Wire Service (NWWS), EMWIN or any other NWS system.

Although many broadcasters have upgraded their EAS units to the new EAS Event Codes released in 2002, the second step is that the EAS units must be programmed to react to the new codes. If broadcasters want to relay these DHS alerts, they will need to know the Originator Code and Event Codes to program into their EAS unit filters. In reviewing NWS documents NWSI 10-1710 and NWSI 10-518, as well as information provided by Herb White, dissemination services manager at NWS headquarters, the following are the recommendations we felt appropriate at this time.

The Originator Code on all DHS alerts will be CIV (Civil Authorities). Even though the alerts are first broadcast on NWR, they are originated by civil authorities and thus will not carry the WXR (National Weather Service) Originator Code. These non-weather alerts will use the CIV Originator Code.

One of three event codes will normally be used. CEM (Civil Emergency Message) or CDW (Civil Danger Warning) will be used to activate the alerts. ADR (Administrative Message) will be used to terminate the alerts. To be on the safe side, White advises stations to also program the following codes for possible DHS use: EVI, HMW, RHW, SPW, FRW, LAE and NUW. NOAA has requested

that the DHS use only the CEM code until the broadcast community adds the other codes into their EAS units. Broadcasters should program these new codes into their EAS unit filters as soon as possible.

In addition to the DHS alerts, a separate agreement between NOAA and the FEMA National Warning Center (NWC) exists for NWR to transmit warnings of nuclear attack as well as other non-weather alerts. Nuclear attack would use code CDW, and the other non-weather alerts could use any of the additional codes that White recommends adding. Using the guidelines above regarding programming for DHS alerts should then cover stations for NWC alerts as well. The NWC alerts are separate from any EAN messages issued by the White House.

### Local alerting

The NWS is taking the new All-Hazards Radio moniker to heart, and has made changes recently to make NWR more available to local civil authorities. As of June 30, 2004, all the new EAS Event codes were approved for use on NWR. On Sept. 8, 2004, NWS offices began using the new EAS-equivalent Product Codes in text messaging as well (via NWWS, EMWIN).

NWS has also published a helpful document, NWS Instruction 10-518, which aids local authorities in establishing a relationship with their local NWS Office for the purpose of sending local emergency alerts. Section 5 of the document, Civil Emergency Message, addresses local alerting. It deals with developing procedures, issuance criteria and sample scripts. Appendix C of this document is a landmark. Someone has finally defined the new specific EAS Event Codes. The definitions in Appendix C will be used as a guide for federal authorities in issuing alerts, and they can be useful to local authorities as well. State and local EAS plans should be updated at this time to not only include the relay of DHS alerts, but also to incorporate these new EAS Event Code definitions. This document is available at

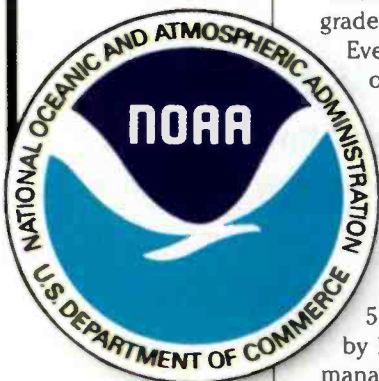
[www.nws.noaa.gov/directives/010/pd01005018c.pdf](http://www.nws.noaa.gov/directives/010/pd01005018c.pdf).

Looking to the future, NWS is currently working on a system called Haz Collect, which it expects to begin deploying in mid-2005. This would be a secure, centralized interface, with backups, that would be used to collect non-weather hazard messages from local, state and federal authorities and get them into the NWR system. NWS is really going the extra mile to work with local authorities, and it's great to see.

Contact Herb White at [Herbert.White@noaa.gov](mailto:Herbert.White@noaa.gov).

Gary Timm

broadcast engineer, Journal Broadcast Group  
broadcast chairman, Wisconsin EAS Committee  
Milwaukee



comments?

[radio@primediabusiness.com](mailto:radio@primediabusiness.com)

### Support to reduce to 5kHz

Without regard to AM IBOC operation (which may or may not be on the horizon for some or all of our numerous AM stations), we at Crawford Broadcasting Company have been experimenting with reduced audio bandwidth for some time now. Our experience mirrors that reported by Mr. Littlejohn. Except for what the very few listeners who use "wideband" receivers may observe, there is no observable penalty for reducing bandwidth to 5 or 6kHz. The gains are reduced interference, improved spectrum efficiency, loudness and clarity. As such, we have elected to join Clear Channel in reducing audio bandwidth on our talk format stations.

*Cris Alexander*  
director of engineering  
Crawford Broadcasting Company

### Appealing the 5kHz limit

Clear Channel has its own agenda when pushing a 5kHz bandwidth. We who are required to operate a stereo signal because we use the expanded band would be forced to go IBOC or sound like crap if limited to 5kHz. And we have many listeners who hear our stereo signal with receivers that hit the full 10kHz.

*Steve Soboroff*  
owner, 1630 KCJJ  
Iowa City, IA

When I read that Clear Channel will reduce the AM audio bandwidth of all its stations, and that Jeff Littlejohn proposes the change to the NRSC for all AMs, I know that more investigation by our engineering community is needed. Why does this degradation appear to be a smokescreen for IBOC quality issues? In my opinion, by degrading analog AM to 5kHz mono, it will make IBOC seem like a huge improvement, whereas analog stereo out to 10.2kHz is equal to or better sounding than IBOC in some instances.

Are they perhaps saying: "Let's make analog AM sound so bad now that IBOC will seem like a good investment"? Is this why Clear Channel just this week killed the spectacular

stereo music from KABL—to downgrade its decent-sounding stations to telephone audio in advance of IBOC?

To those who say there are no decent bandwidth AM radios, look no farther than your local Wal-Mart and Dollar General stores. They both have a portable \$5 AM/FM radio with wide AM bandwidth beyond 5kHz. There is also a "one-chip" AM tuner that typically uses a "barn door" ceramic filter and even Ford has an AMAX (7.5kHz) bandwidth radio in its 2005 models.

I just don't buy this AM analog audio downgrade as an engineering improvement. Clear Channel can do what it wants to with the audio quality of its stations, but its business decisions should not be mandated to the rest of the AM broadcasters via an NRSC mandate.

*John Pavlica*  
Toledo, OH

Jeff Littlejohn's contention that AM receivers have less than 5kHz frequency response ignores the multitude of people listening on AM stereo radios, AM wideband radios, and older AM radios that had great frequency response. Clear Channel's motives are suspect and should be taken with "a box of salt!"

*David Creel*  
chief engineer  
Far East Broadcasting Company  
Saipan

Bear with my oversimplified math here but isn't having 50kW signals running IBOC sidebands at night the equivalent of having a 5kW jammer on adjacent frequencies? How will any signal on an adjacent frequency be

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able to be heard (or, better, why would anyone want to listen to it) over the noise that will be generated?

By way of example, my station's 54W night signal covers its target area well while it does little to interfere with anyone else's reception save anyone trying to DX 660kHz in our immediate area. In fact, there would be little to hear most of the time. And, in fact, it wouldn't have been licensed if it would put any kind of interfering signal into the dominant station's protected area. However, there are closer class As on 650 and 670 that sometimes put in "peeling the paint off the wall" signals into our service area. If these stations are running IBOC sidebands—and let's call them what they are: they're not carriers, they're sidebands on the already existing carrier just like the analog sidebands that create "monkey chatter" now—how will my 54W signal be able to compete with 5kW jammers right on my frequency?

On the other hand, how will my station's effectively 5.4W digital signal (sidebands off to either side of 660) be able to compete with the 50kW analog carriers booming in on 650 and 670?

If this argument needs any more fuel, the recent objective to reduce the analog bandwidth announced by Jeff Littlejohn and Clear Channel just proves my point. If the present 10kHz analog sidebands can produce interference—and we all know they do but only on a part time basis because they are analog—how much worse will 100 percent duty cycle digital sidebands produce similar interference or worse and won't the character of that interference and high average power of that new interference render more adjacent signals unusable? To quote Jeff's own statement, albeit out of context, "Whether it's analog or digital doesn't matter."

I still believe IBOC on AM is a solution looking for a problem. It is not optimum usage of this band of frequencies and its characteristics. A new band should have been (and should still be) chosen. Then those who wished to ride the old band down to the end could have done so in peace. Either way, the consumer needs a new radio, but with a new band, old radios wouldn't have been made obsolete until there was nobody transmitting anything to hear rather than having signals fighting for their lives against what amounts to legalized jamming. Who knows how long the old band would hang on if the pro-

gramming is worth listening to and can indeed be heard?

The FCC says it wants to bolster "local" radio. Seems like the deck is stacked against local radio (again). It was the class A operators who didn't want to move to a new band and give up skywave service they can't even sell that in part gave us this IBOC cle we now face, which will effectively jam out local service in many areas. As I've said before, this has nothing to do with audio quality to the consumer; it's a spectrum grab plain and simple.

It's also short-sighted. With today's technology (not tomorrow's pie-BOC in the sky) those operators who objected to losing coverage area could have been compensated in a new band with additional allocations which they could have programmed centrally at little, if any, additional recurring cost.

I don't expect the steamroller will be stopped, but if I had my druthers, I would rather not be able to say, "I told you so."

As far as Littlejohn's proposal is concerned, I am opposed to it. Clear Channel can do what it wants, but where does the company get off proposing that all should be made to do the same? While I agree with the idea that, mathematically, limiting audio bandwidth to 5kHz would make the AM signal fit the channel allocations, it really isn't necessary for one thing (except to permit IBOC sidebands), and for another the missing octave of audio really will make a difference even on narrow bandwidth radios. I happen to think that difference will serve to make AM radio sound even more inferior to most ears.

Mike Shane  
operations manager, KCRO-AM 660  
Omaha, NE

## Digital pioneer

I remember the Technics SV-P-100 digital recorder featured in the August Sign Off. I was lent one of these machines with a pre-recorded tape of Earl Klugh (*Finger Paintings*) and played it on the then KLSI 93.3 on Oct. 8, 1982, making us the first station in the Kansas City market to play anything from a digital source on the air. KLSI also played the very first CD on the air a few months later on Feb. 11, 1983.



Ben Weiss, CPBE  
engineering director  
KMXV and KSRC/Infinity Broadcasting  
Kansas City

## How long, big brother?

I read Chriss' editorial [*Shades of Big Brother*] in the August 2004 issue with some concern.

Perhaps there are additional rules proposed that also limit the length of time that a broadcaster is required to maintain these copies of the programming. I could see one year as a possibility, which results in stacks of boxes of slow-speed tapes for the radio broadcasters (or CDs, etc.), but how about the television broadcasters? One would think



such a rule would affect them as well, and recording video for long-term storage is a bit more cumbersome. And what if the save duration wasn't given; does the broadcaster then have to look at saving its radio and TV programming "forever"?

And what if a broadcaster decided to junk the recordings from so many years ago, and someone decided to request an older log? What's the mechanism to determine if the station willfully acted against the law?

This really sounds like a rule that has no reason for being.

Dave Felt  
Pasadena, CA



ham band. Seems to me we are going backwards and a lot of money will be wasted on transmission modes that are "better than FM" for just the few who know the difference. By the way, I am not a silver-speaker-wire, \$200-patch-cord audio nut, but I have heard MP3 played on a good system and it don't impress!

Charles DiLuglio  
legal counsel  
Rhode Island

## The new low-fi

The MP3 explosion is going to create a whole generation of "music lovers" who think good sound is audio run through a blender and stuffed into a RAM chip or replayed through a \$100 home theater system with a 5.25" speaker in a ported plastic box. Home theater is apparently exempt from IHF standards.

Don Imus loves his MP3 player and wears two hearing aids. I've heard better audio in the AM window on the 75m

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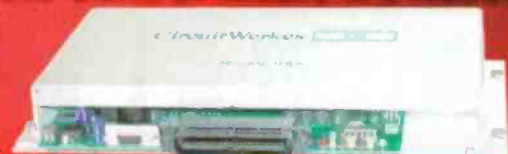
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- ▶ The REX features a 50-pin telco (RJ-21) type connector that interfaces directly with prewired telco punchblocks. Type 66 telco punchblocks & cables are optionally available.

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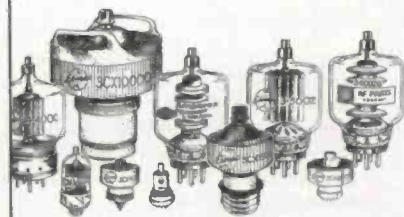
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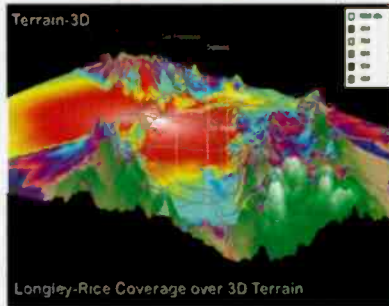
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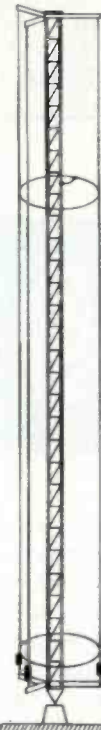
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20kW	1978	Collins 831G2
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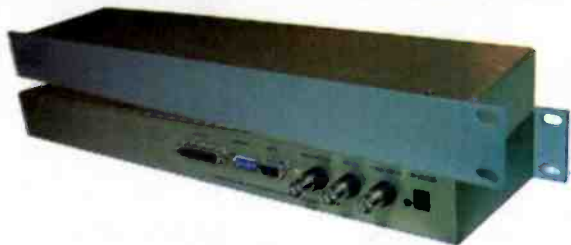
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	Average No. Copies Each Issue During Preceding 12 Months	No. Copies of Single Issue Published Nearest to Filing Date
a. Total Number of Copies (Net press run)	<b>12,998</b>	<b>13,917</b>
b. Paid and/or Requested Circulation (Sum of 1 and 2)	<b>9,216</b>	<b>9,462</b>
1 Paid and/or Requested Circulation Outside the United States	<b>0</b>	<b>0</b>
2 Paid and/or Requested Circulation in the United States (Sum of 10, 11, 12, 13, 14, and 15)	<b>9,497</b>	<b>9,784</b>
c. Free Distribution by Mail (Sum of 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100)	<b>0</b>	<b>0</b>
10 Outside the United States	<b>0</b>	<b>0</b>
11 In the United States (Sum of 12 through 15)	<b>2,745</b>	<b>2,806</b>
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15 Total Paid and/or Requested Circulation (Sum of 10, 11, 12, 13, 14, 15)	<b>2,993</b>	<b>3,806</b>
d. Total (Sum of 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100)	<b>12,489</b>	<b>13,570</b>
e. Copies not Distributed (Sum of 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100)	<b>548</b>	<b>347</b>
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g. Paid and/or Requested Circulation Outside the United States (Sum of 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 42, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 62, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 82, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99, 100)	<b>76.3%</b>	<b>72.0%</b>

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## Contributor Pro-file

Meet the professionals who write for *Radio* magazine.  
This month: Field Report, page 50.



**John Kennedy**  
Director of Engineering  
Entercom Boston

Kennedy has worked in and around radio since 1977 at Providence College. He started in Providence, RI, working for WLKW-

AM/FM and WPRO-AM/FM. He spent the mid-80's in New Haven, CT, working for Noble Broadcast Group at WKCI and WAVZ. In 1987 he moved to Boston to work for Noble's WSSH-AM/FM then and Granum Communications' WBOS. He worked for American Tower Corporation in the 90's.



Written by radio professionals  
Written for radio professionals

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# Sign Off

By Kari Taylor, associate editor



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## Do you remember?



The Producer from Gates Radio Company, then a division of Harris Intertype, was a four-channel recording mixer designed for production. The transistorized Producer contained 12 inputs in two microphones and two high-level channels, a self-contained monitor amplifier and speaker and cueing facilities.

A 1964 advertisement for this unit claimed that the Producer "fills a long existing void between multi-function audio consoles and standard commercial sound equipment."

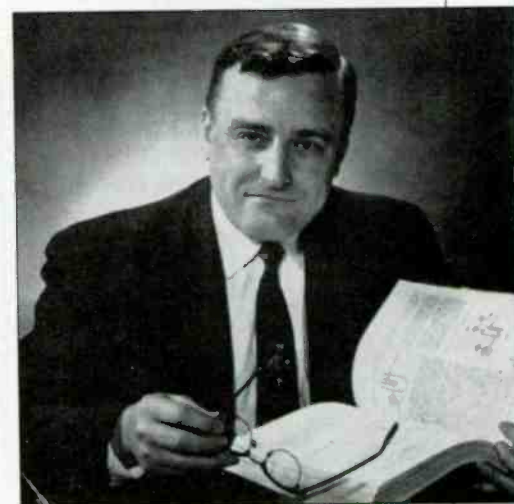
## Sample and Hold It comes with experience

What is the average age of  
radio industry professionals?



Source: 2004 Radio magazine Salary Survey.

## That was then



In 1934, Carl Smith established the Smith Practical Radio Institute, which later became the Cleveland Institute of Electronics.

In a 1965 ad for the school in *Broadcast Engineering*, Smith (above) said, "There is no substitute for knowledge. Even if a friend or relative can get you a good job, you'll fail mighty fast if you can't produce results. The first good emergency will separate the men from the boys."

Turning 70 this year, the institute is now a privately owned co-educational technical college. The institute's mission is to educate individuals in technical skills through independent study methods. The CIE prepares its students to become skilled technicians and engineering technologists who can solve electronic engineering and computer technology problems.



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