

# Radio

THE RADIO TECHNOLOGY LEADER

## A consolidation variation



#BXNPTHV\*\*\*\*\*AUTO\*\*3-DIGIT 857  
 #8705800160# ER 100 s 10618  
 BARRY MISHKIND s 311 928  
 OWNER  
 ARIZONA BROADCAST SERVICES PERIODICAL  
 2033 S AUGUSTA PL  
 TUCSON AZ 85710-7905

**Antennas**  
 Trends in Technology  
**Field Reports**  
 Prism Dscope & Klotz Aeon

A PRIMEDIA Publication



**OUT TEARING YOUR  
 HAIR OUT OVER  
 SHRINKING REVENUE!**  
 See Page 11

After you've closed the logs, RevenueSuite starts selling!

**RevenueSuite™** from dMarc

Toll Free:  
**888-438-7268**

Scott Studios' **Maestro**  
Serial Suites and Maestro are Private Labels of dMarc

**dMarc**  
INNOVATION  
THROUGH AUTOMATION

# THIS IS THE NEXT BIG THING:



## WHEATNET™ — FUTURE PROOF!

**WHEATNET LETS YOU ROUTE** THOUSANDS of bi-directional signals at ONCE in just 60 microseconds—all secure, virus-proof and in just 2 rackspace! WHEATNET leaps way ahead of conventional stacked router or IP-based designs, interconnecting up to 48 studios (each with its own independent mix engines and I/O resources) using just one CAT-5 wire per studio, plus providing systemwide X-Y control from one central location. You can even meter and monitor (in stereo) any signal systemwide.

**REDUNDANCY?** We've got that covered too: just add a second WHEATNET and CAT-5 link from each studio and have an AUTOMATIC standby interconnect for the ENTIRE system!

**WHEATSTONE has a proven track record for digital networking; benefit from our experience!**



48 CAT-5 PORTS with 128 audio channels  
(plus embedded control data) per port.  
**THAT'S 6144 TRAFFIC CHANNELS IN JUST  
TWO RACK SPACES!**



 **Wheatstone**

**GET THE POWER!**

tel 252-638-7000 / sales@wheatstone.com

World Radio History

copyright © 2005 by Wheatstone Corporation

# Together We Have The Power To Move Radio Forward.



At Harris, we're taking our leadership in the radio industry to an even higher level. Shaped by the feedback of customers and audiences across the market spectrum, the newly-formed Harris Radio Team is rich with the industry's most comprehensive products, services and expert resources. All with a focused team solely dedicated to moving our industry, and your business, forward. It's a spirit of innovation built on decades of pioneering solutions for radio. So get your business heading in the right direction, turn to the new leadership of Team Harris Radio.

To learn more about the new Harris Radio Team, call us at **800-622-0022** or visit us at [www.broadcast.harris.com](http://www.broadcast.harris.com).

T H E   N E W   H A R R I S   R A D I O   T E A M   I S   O N   T H E   A I R



AM/FM



AUDIO CONSOLES



DIGITAL RADIO



BROADCAST STUDIO



HIGH POWER AM



SYSTEMS & SERVICE

## Features

### 16 Trends in Technology: Antennas

by Doug Irwin

The final link in the transmission chain

### 27 Special: Insight to IBOC

The next installment of the DAB Answer Series

### 35 Facility Showcase: Federated Media

by Chriss Scherer

Really making LMAs and JSAs work.

### 50 Innovative Product Awards

The winner of the Acquisition category

### 52 Broadcasting on the Wire

by Paul Gathard

The details of streaming



16

## Departments

### Online 06

at www.beradio.com

### Field Report: Prism Dscope III 60

by Doug Irwin

### Field Report: Klotz Digital Aeon 62

by Gordon Carter

### New Products 64

by Kari Taylor

### Reader Feedback 66

### Classifieds 72

### Contributor Pro-File 73

Meet Don Danko

### Sign Off 74

by Kari Taylor

A tube solution for a modern fad

## Columns

### Viewpoint 08

by Chriss Scherer

HD what?

### Managing Technology 10

by Kevin McNamara

The data makes the difference.

### FCC Update 14

by Harry C. Martin

Easier FM allotments



60

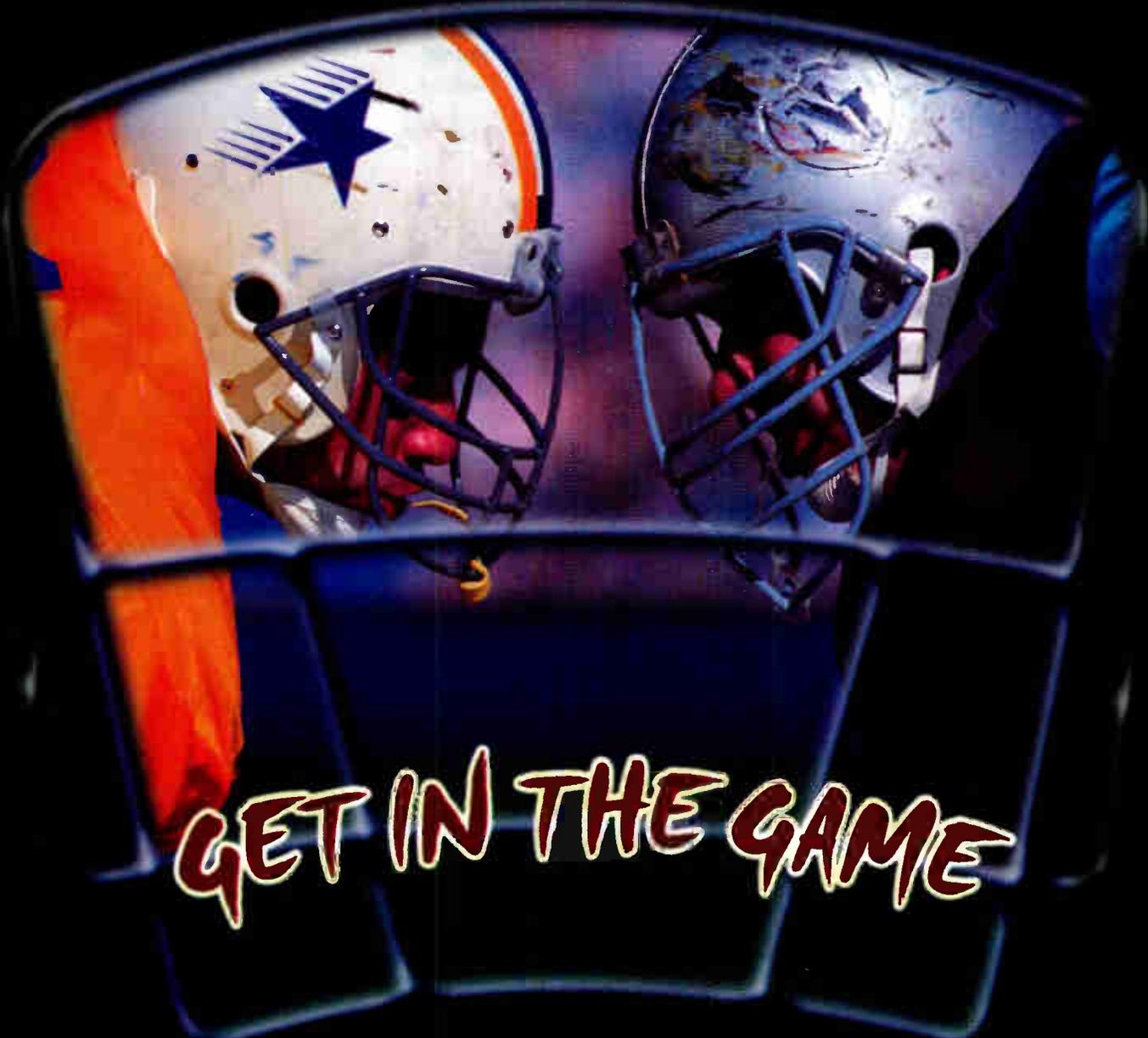


62



### ON THE COVER:

WRBR-FM The Bear is one of several stations in the Planet Radio facility near South Bend, IN. Cover design by Michael J. Knust.



# GET IN THE GAME

For football remotes that deliver every heart pounding, bone crunching moment, choose a codec that outperforms the competition. Only Tieline codec options connect over your choice of POTS, ISDN, GSM and soon IP\* with just one simple box. Get instant, rock solid connections, incredible wireless or wired audio quality and get your listeners into the game.

They're even compatible with Comrex<sup>1</sup> POTS codecs.

Order your free demo today.

**800-950-0750**



**Tieline** 

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

\*Audio over IP and wifi software module for all Tieline G3 codecs available late 2005.  
Compatible with <sup>1</sup>Comrex Matrix, Blue and Vector Codecs. <sup>1</sup>Comrex and associated trademarks are the property of Comrex Corporation.

## Currents Online

### Ibiquity Launches Online Resource for Radio Stations

The HD Radio Playbook website combines how-to information and success stories with updated content to provide information on the challenges stations face as they convert to IBOC.

### Broadcast Electronics Plans HD Radio Seminar in Philly

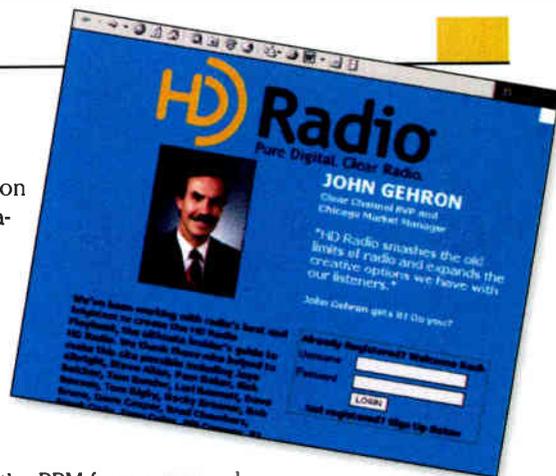
The event will be held Sept. 21 during the NAB Radio Show at the Philadelphia Marriott.

### RAB Releases PPM Analysis

The preliminary report analyzes the commercial viability of the PPM from a research perspective. A PPM Economic Impact Study is being released separately.

### NPR Releases KCSN Booster Test Data

The engineering test report details the results of using synchronous booster transmitters with hybrid IBOC digital FM transmission systems.



## Find the mic goes monthly!

Since 1998, *Radio* magazine has placed our mic icon on the cover of each issue. At the end of the year we have held a sweepstakes asking you to find all of them and enter to win prizes.

**To make it more fun, we're going monthly.**

Each month, tell us where you think the mic icon is placed on that issue's cover and you could win a prize courtesy of Transaudio Group.



This month, enter to win a Sabra Som SSM1 shockmount.



Enter by August 28.  
Send your entry to  
[radio@primediabusiness.com](mailto:radio@primediabusiness.com).

**TRANSAUDIO  
BROADCASTING**

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

No purchase necessary.  
For complete rules, go to [beradio.com](http://beradio.com).

## Museum of Broadcast Communications Breaks Ground

Construction has begun on the new \$21 million Museum of Broadcast Communications in downtown Chicago. The new MBC will open late summer 2006.

## Hilmer Swanson Dies

A Gates and Harris employee for 35 years, Swanson's first invention was an ultrasonic jewelry cleaner. He was 72.

## Site Features

### The DAB Answer Series is Online

Each quarter, Insight to IBOC covers a specific aspect of digital audio broadcasting. The latest installment is in this issue. The complete content of each issue is available online as well.

### Currents Online Weekly E-mail

Get the *Radio* magazine headlines delivered to your e-mail box every Monday morning. Subscribe today for the latest radio technology news and information.

### IBOC Update Twice a month

Stay up to date with the source of digital audio broadcasting news and information. The coverage extends to DRM, satellite radio and more. Subscribe today.

# AFFORDABLE STREAMING MEDIA TOOLS FOR THE RADIO INDUSTRY

## CONSIDERING STREAMING YOUR STATION ONLINE?

Liquid Compass is an industry leading company that provides streaming media tools developed specifically for the *Radio Industry*.

With Liquid Compass as your premier streaming provider, your station will receive superior audio and video hosting, unique cross-browser-compatible media players that are branded with your logo or creative concept, client acclaimed [24/7] tech support and detailed web reporting.

Most importantly, Liquid Compass will provide streaming media tools that will allow your station to *build a new source of revenue!*

## LIQUID COMPASS OFFERS:

- Live & On-Demand Streaming
- Custom Media Players
- Video Gateways Branded for Your Station or Advertiser
- Ad Replacement / Ad Scheduling Software
- Custom Side Channels
- Web-Based Reporting Tools
- Audio & Video Encoding Services
- Server Collocation
- Live Event Management
- 24/7 Tech Support
- **And More!**



To view a list or to listen to stations utilizing Liquid Compass' services, visit [www.liquidcompass.net](http://www.liquidcompass.net) or call (303) 839-9400 today!

## Digital radio? What's that?

**T**he initial comments on NRSC-5 are in the FCC's hands, and the reply comments are nearing their deadline. A few hundred stations are on the air with HD Radio, and many more have obtained Ibiqity licenses and notified the FCC. The interest in IBOC and HD Radio is as high as it has ever been in radio.

So now that the rollout has begun, it's time for consumers to begin purchasing the radios. Unfortunately, this still isn't possible.

We work in radio, and being close to the business sometimes makes it difficult to see the industry in the same way that a consumer sees it. I felt that it was time to act like a consumer to see what how HD Radio is perceived. I have done this before to see what information is available to the public, for IBOC and satellite radio. The last time was about a year ago.

I visited three stores in the Kansas City area to do this: Circuit City, Best Buy and Nebraska Furniture Mart. The information I received was not as promising as I had hoped. First, Circuit City never heard of HD Radio, so I tried other names including digital radio and the incorrect high-definition radio. When I asked for digital radio, I was shown an XM receiver. According to the salesperson, there is no such thing as terrestrial digital radio.

My next stop was Best Buy. The auto sound person had heard of HD Radio. He

showed me the Kenwood head units, but he did not carry the HD Radio tuner. He was not aware of any other manufacturers even though he carried Alpine and JVC (two manufacturers with HD Radio auto receivers).

It was suggested that if I wanted to buy one of the other units I would have to visit a high-end store. The home audio department knew nothing about HD Radio and was convinced that I meant XM or Sirius.

Nebraska Furniture Mart, despite the name, sells more than furniture. The Omaha-based company opened a Kansas City location about a year ago, and it has a huge inventory of consumer electronics. On the home side, I found the Boston Acoustics Receptor radio, but it was the model without HD Radio capability. The salesman did not know if NFM would ever get that model. On the auto side, two salesmen knew about HD Radio and showed me the Kenwood head units, but said that the HD Radio tuner was only available online. Both these salesmen said that in two years only two people had asked for it. I was the second.

This field work came at the same time that I was assembling a list of all the HD Radio receivers that were available. A list of what I found will be in next month's Product Source. There are 12 units available. However, given the obscurity in the public eye, this is not an unexpected number.

My next effort was to find a statistic on predicted sales of HD Radio receivers for the Insight to IBOC supplement that is included in this issue. Again, I was disappointed. Ibiqity did not have the information readily available. The Consumer Electronics Association does not track or forecast this information. The receiver manufacturers won't share any data they have. Ibiqity was later able to share a Deutsche Bank report with projections. This data shows a promising forecast, but I'm concerned that reality disagrees. This year alone the report forecasts that 100,000 HD Radio-capable receivers will be sold.

If it's this hard to get an HD Radio receiver, can you imagine trying to get a DRM, Cam-D or FM Extra receiver if those systems begin widespread deployment?

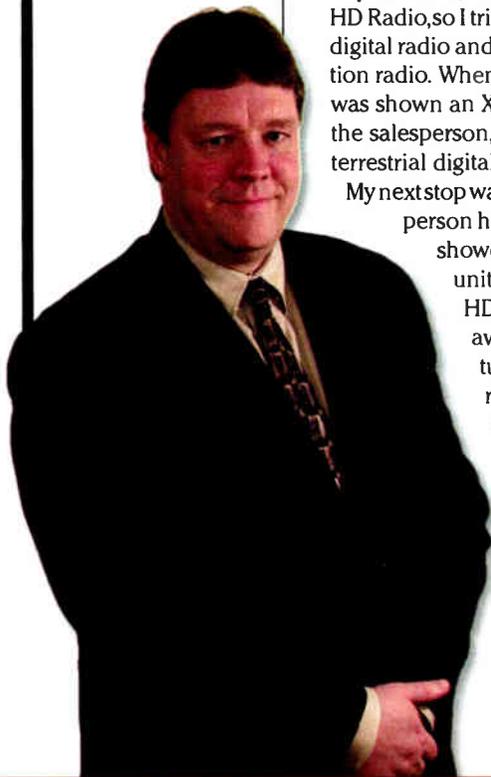
Radio has its work cut out for it. HD Radio is the best-kept secret. Ibiqity has launched HDRadioPlaybook.com to help stations with the transition, but who will take the lead on marketing the technology to consumers? Ibiqity? The NAB? The CEA? The stations?

To their credit, some stations have worked with local retailers to promote the technology, but it's inefficient to do this market-by-market and station-by-station. Unfortunately, it may need to start that way.



Chriss Scherer, editor  
cscherer@primediabusiness.com

**E-mail:** radio@primediabusiness.com  
**Fax:** 913-967-1905

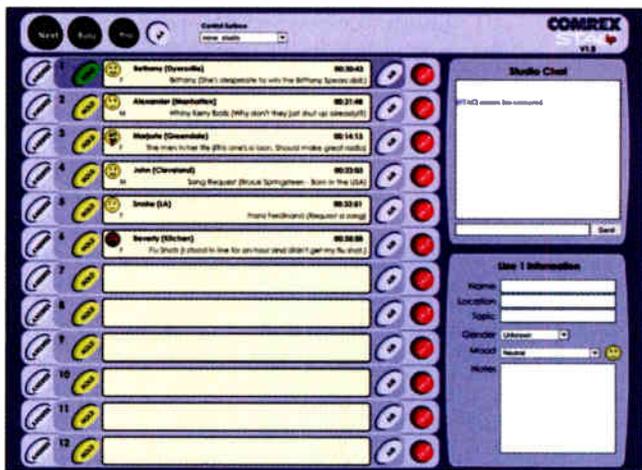


# GOT CALLERS? STAC 'EM!

No matter what they're talking about, STAC is the best way to manage your calls.

STAC (Studio Telephone Access Center) puts you in control of your talk shows, request/contest lines, call-ins and phoners with great sound, ease of operation and scalable configuration. Incorporating a pair of Comrex high-performance digital hybrids, STAC provides the most natural sounding telephone audio — even when conferencing up to four callers.

The STAC system is available in six (STAC 6) and twelve (STAC 12) line versions. Connect up to four control surfaces using standard CAT5 cable — no custom cabling required. Best of all, STAC is incredibly easy to use — anyone can master it in seconds.



## Use STAC any place there's a web browser!

If you have a computer, you've already got all the hardware and software you need. Just log onto the internet using a standard web browser — NO SPECIAL SOFTWARE TO INSTALL — go to your STAC IP address, and you are there! STAC 'EM from home, the studio or that great beach in Cancun!

### Cool features include:

- **STAC IP** allows call control from multiple networked computers.
- **Busy-All** makes starting contests a breeze.
- **Auto-Attendant** answers, plays your message and STACs callers on hold. Great stress relief for screeners and producers!



Got Calls? Put Comrex On The Line.

**STAC**  
STUDIO TELEPHONE ACCESS CENTER

Toll Free: 800-237-1776 • www.comrex.com • e-mail: info@comrex.com  
19 Pine Road, Devens, MA 01434 USA • Tel: 978-784-1776 • Fax: 978-784-1717

**COMREX**

# Managing Technology



## IBOC and data

By Kevin McNamara, CNE

www.beradio.com

In the April issue of *Radio* magazine, I wrote about the real return on investment of IBOC. While researching for that article, it became abundantly clear that the real return of migrating to IBOC comes down to the simple fact that it levels the playing field. How? By allowing the radio broadcast to position itself against the myriad of new digital-based program delivery technologies that are aching to gain a little share of the radio audience. There have been several well-known studies telling us that these new media, including webcasting, podcasting, cellcasting and yes, even satellite radio, will take an increasing piece of the revenues terrestrial broadcasters

have enjoyed. In my article, I theorized that the incorporation of an easily accessible universal data port in each receiver would be essential for broadcasters to take full advantage of any potential revenue opportunity from data streaming over their carriers.

### Protocols; a review

Having said this, we are all well aware of the bandwidth capabilities that IBOC will provide using the various data modes, hybrid, extended hybrid and all-digital, but ultimately it is the job of the protocol that defines its ability for data to work in the real world. Protocols contribute to the ultimate framework that efficiently gets the data from source to destination, with as few errors as possible. They define the rules that permit different devices to communicate.

In the world of data there are two basic categories of protocols: low- and high-level. Low-level protocols deal with the physical and electrical standards of interfacing the data to a device, i.e. the primary job of the network interface. High-level protocols address the data formatting, syntax and other aspects of the encoded message.

### First-generation data capabilities

The current data capabilities of IBOC are still somewhat limited in terms of what can be broadcast. This is not necessarily a limitation of the IBOC technology, but what, in my opinion, the receiver manufacturers feel are the critical features needed to sell radios and the lack of a standard in place to define the next generation of data services.

IBOC currently supports a standard called ID3V2, which is simply an implementation of tagging MP3 and other types of audio and video file formats, to provide specific information about the file. Tagging involves appending a frame of information, also called a chunk, at the beginning of the binary audio (or video) file. This is essentially the same as the Cart Chunk standard that was talked about for several years. In short, this is the method that IBOC uses to encode and decode textual program related information such as the song name, artist and about 40 additional fields of predefined information.

In the future, IBOC will support the Synchronized Multimedia Integration Language (SMIL), which is a method to deliver rich content-based multimedia programming using a variety of audio, video, text and other media.

Perhaps the most exciting proposal for IBOC is the Advanced Application Services (AAS) framework. AAS will provide specific Application Programming Interfaces (API), which would create a development platform to enable programmers to develop a wide range of future applications. A white paper by Thom Linden entitled *An Advanced Application Services Framework for Application and Service Developers using HD Radio Technology* (available on the Ibiquity website at [www.ibiquity.com](http://www.ibiquity.com)) discusses the proposal and gives some good applications. Of particular interest is an application where it would be possible to create a distributed network across multiple stations, where any one station could originate programming. In a past article I wrote about the possibility of combining (programming) multiple local facilities into a regional network using a common data stream.

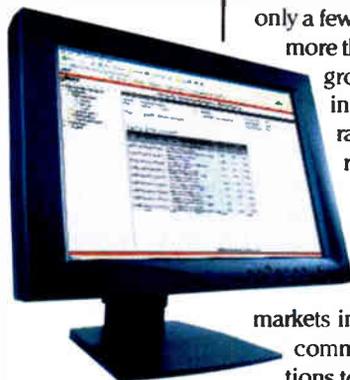
Consider a group of HD Radio-enabled stations that individually provide a usable signal from Washington, DC, to Boston. Also assume that a proper distribution network was created and available at each of these stations. Finally, we encode the digital program material with a chunk that identifies each station in the group as a common entity. In this example, it might be possible to program a user's radio to automatically switch frequency based on what they are currently tuned to as they travel throughout the area.

While it is somewhat similar to the RBDS function of following a particular format, the IBOC implementation would allow a listener to follow all stations owned by particular operators within that region, thus preserving the revenue stream.



# Shrinking Revenues?

**dMarc's new revenue solution gains momentum**



RevenueSuite's Online Control Console keeps you informed.

The chase for new revenues has exasperated radio execs for what seems like years, yet some are now starting to see light at the end of the tunnel. RevenueSuite, a newly launched revenue-on-demand program from dMarc is finding revenue streams where none existed before.

Offered exclusively to Scott Studios and Maestro customers, RevenueSuite has been on the market only a few months, yet it is already syndicated into more than 250 stations. That makes it the fastest growing new revenue solution in the industry. An additional several hundred radio stations are in various stages of review and/or pre-installation, according to dMarc management.

One of the early adopters is Nassau Broadcasting Partners, headquartered in Princeton, NJ, and serving multiple markets in the Northeastern U.S. Nassau recently committed all 55 of its market-leading stations to the RevenueSuite program.

"We give RevenueSuite a resounding thumbs up," said Nassau's Senior Vice President of Engineer Tony Gervasi. "It's performing exactly as

dMarc said it would. The best part about it is that we literally set it up, turned it on, and it operated seamlessly with our Scott Studios (SS32) systems, generating revenue. Prior to installing it group-wide, we put it through numerous performance tests. We found that RevenueSuite was easy to install, highly intuitive, hands-free and reliable. Now it's up and running, generating revenues across our network of stations."

Other managers report liking the fact that, once RevenueSuite is installed, it requires virtually no traffic management or operational maintenance. "After you close the logs for the day," said dMarc President Ryan Steelberg, "the RevenueSuite program begins to fill unsold and designated avails automatically without the need for station overhead or local trafficking. You can turn it on, and the system will run autonomously while providing real-time revenue reports and local control through a simple-to-use web-based interface. The RevenueSuite program is made available to any Scott Studios or Maestro enabled station." ■

For more information on RevenueSuite, check out the company's online site at [www.dmarc.net](http://www.dmarc.net).

**WHY RADIO EXECS GO BALD.**

**(And how dMarc can help you avoid it.)**

Worries over revenue are enough to, well, make you want to pull your hair out.

Before that happens, check out the new integrated digital systems and media solutions from dMarc. Through our pioneering Scott Studios and Maestro digital automation products, we've made station operations as simple as the touch of a finger on a screen or keyboard. With RevenueSuite, on-demand spot profitability is not just a goal, but a reality.

**Instead of pulling your hair, pull some profits. Call today.**

**1-888-438-7268**

[www.dmarc.net](http://www.dmarc.net)

**Maestro**  
*Scott Studios*

Scott Studios and Maestro are Product Lines of dMarc

**dMarc**  
INNOVATION  
THROUGH AUTOMATION

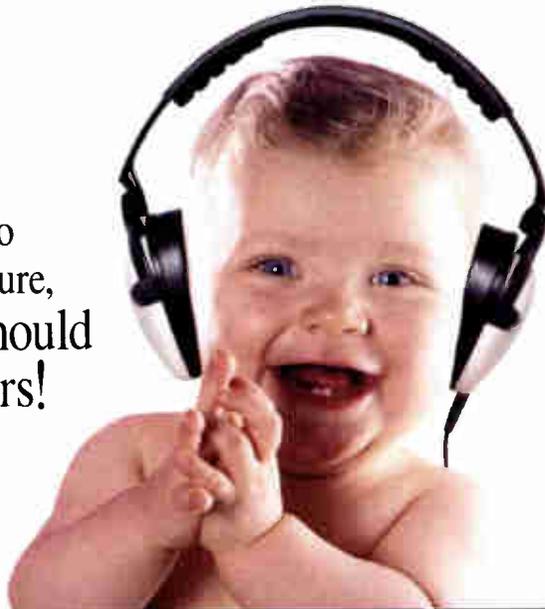
## What about the hardware?

The current generation of semiconductor technologies, aimed directly at the digital radio market, provide flexibility in their ability to handle existing and future data applications as a result of the use of programmable digital signal processors (DSP). These classes of semiconductors can provide virtually all of the RF/baseband



The Radiosphy Multistream includes a USB port to update the radio's firmware. Data ports on future HD Radio receivers may provide a baseband data output.

## Digital Radio Is In His Future, Belden Should Be In Yours!



Don't Trust Your Digital  
Conversion to Anything  
Other Than Belden —  
The Proven Leader in Broadcast  
And Data Cable Technology.

Belden is the leader in broadcast cable technology, offering the best quality and the broadest line of audio and video cables in the industry. In fact, Belden Brilliance® products are the important link in any number of radio broadcasts, network and cable TV broadcasts, and post-production recording and film studios. For radio, this includes hundreds of top-quality cables for instrumentation, microphone and line-level equipment applications — including AES/EBU-compliant digital cable designs.

Additionally Belden is the market leader in Unshielded Twisted Pair (UTP) data cable design, supplying extremely high quality cables for 10 Gigabit Ethernet performance, as well

as Category 6 and 5e. And, only Belden offers UTP cables with Bonded-Pairs. Belden Bonded-Pair cables ensure good attenuation characteristics over longer distance since the pair conductors are bonded together to maintain a consistent conductor-to-conductor spacing. Bonded-Pairs also mean Installable Performance® — that is, unlike other UTP designs, Bonded-Pair cables maintain their superior electrical performance even after the rigors of installation.

So, for a better link to the future, stay tuned to Belden.

For a FREE Digital Studio Cable Guide or a FREE cable sample, call: Belden CDT Electronics Division 1-800-BELDEN-4 Or, go to Belden's Web Site at: [www.belden.com/radio](http://www.belden.com/radio)



© 2005, Belden CDT Inc.

and signal processing capability within a single package and the firmware can be updated as necessary.

Recently, receiver manufacturer Radiosphy added a USB port on its programmable radio, however in this case the port was used to provide software upgrades via the Internet and permitted stations to program preset buttons with a logo into the radio. While it appears the port is not currently able to provide baseband IBOC data to external devices, it is a still unique application for the programmable DSP-based radio.

## Conclusion

As a medium, IBOC appears to be pulled in various directions: digital audio with data channels, supplemental audio channels (to provide multiple audio channels) and surround sound. Most of these discussions are still in process with no clear direction where the future of IBOC will go. However, what is certain is that stations are assigned a limited bandwidth and trade-offs will need to be made, most likely at the expense of potential ancillary data channels.

Recent press seems to indicate owners and operators have a growing interest in multiple audio channels, while it doesn't seem like there is a great deal of interest in exploiting opportunities using the ancillary data capacity. As much as I believe the utilization of the data channels would be essential to competing with other more widespread media outlets, I have to step back into reality and remember radio was only intended to be a local outlet and, realistically, who wouldn't want twice the quality programming and commercial content the local guy brings us instead of all that uninterrupted music we're getting with the real digital broadcasters? 🎧

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



# FM Transmitters

Reliable, cost effective  
FM stereo transmitters  
from 1 to 1000 watts



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

World Radio History



## FCC to streamline allotment process

By Harry Martin

www.beradio.com

In June the FCC issued a Notice of Proposed Rulemaking (NPRM) seeking comments on proposals that, if adopted, would have a significant impact on how the agency makes commercial FM channel allotments and community-of-license changes for AM and FM stations. Until the proposals are dealt with, the Commission has imposed a freeze on the filing of petitions for changes in the FM Table of Allotments, even those that do not involve city-of-license changes. In addition, the Commission has opened a limited window for the settlement of pending contested rulemaking proceedings, through Sept. 19, and has waived the cap on settlement amounts. Here is a summary of the proposals:

*Permitting Community of License Changes By Filing Minor Change Application.* The NPRM seeks comment on whether the Commission should permit a change of community of license of an AM or an FM station through the submission of a minor modification application. Under current procedures to effect a community change an FM licensee must file a petition for rule making. On the AM side, a change in community of license is sought through the filing on a "major change" application that can be filed only during rare auction windows.

*Getting Rid of the FM Table of Allotments.* The Commission suggests that the agency delete the FM Table of Allotments from its rules. Under this approach, the FCC would continue to maintain the table, but not as a formal rule. Rather, it would simply be a list, probably maintained and accessible on the FCC's CDBS Internet site. Removing the table from the rules would relieve the FCC from due process and other procedural burdens imposed by the Administrative Procedure Act.

*Requiring Filing Fee When Filing Petition for New Channels.* The Commission is proposing to require petitioners for new FM allotments to file, along with their allotment petitions, a construction permit application and filing fee (currently \$2,980). This proposal is intended to stem abuse by

parties who file allotment petitions only for the purpose of blocking legitimate proponents and forcing them into settlement arrangements.

*Limiting the Number of Allotments in a Petition.* The Commission is proposing to limit to five the number of allotments that can be proposed in a single petition to amend the table. Under present procedures elaborate proposals involving 10 or more voluntary changes are permitted. These complicated proceedings, which often include one or more multi-channel counterproposals, cannot be easily or speedily dealt with by the FCC's staff.

*Relocation of Sole Local Transmission Service.* While not likely to be approved ultimately, the Commission also seeks comment on how to deal with proposals that might involve removal of a community's only local transmission service. First Broadcasting proposed that the Commission adopt processing guidelines that would permit the removal of such a local service if (1) two or more other stations provide 70dBu service to that community; (2) the station-to-be-moved would serve its new community with its first local transmission service; (3) the station-to-be-moved would provide service to a greater population; and (4) the proposed service would not cause any short spacing.

These proposals are the first to be considered since the adoption of the current FM allocation rules in 1982. If adopted, abuses of the system would be curtailed and the process of changing a city of license (for AM or FM stations) would be significantly simplified and improved. With backlogs of contested petitions of three years or more in some cases, this would be a welcome relief. 

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

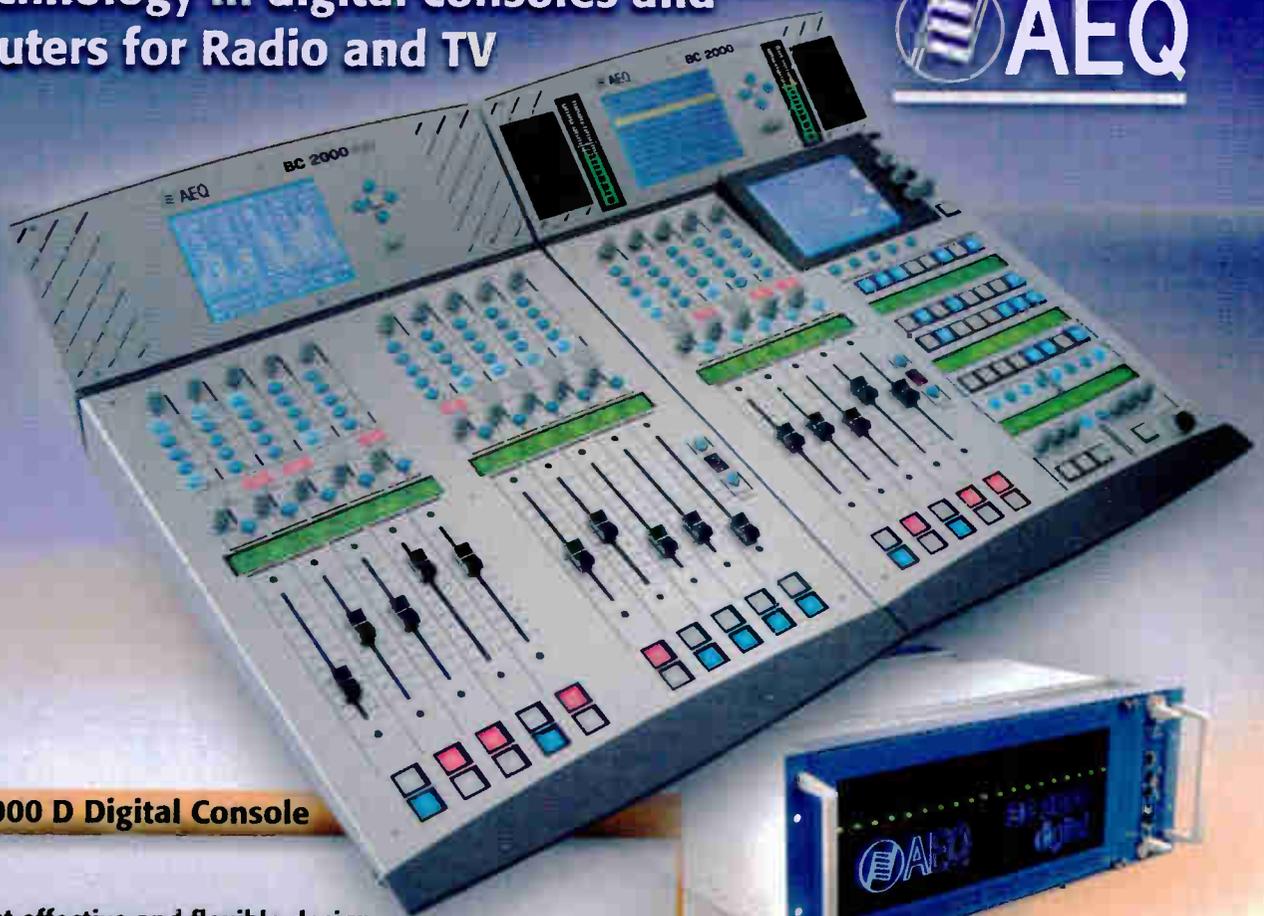
### Dateline:

Radio stations in Alaska, Hawaii, Oregon, Washington and the Pacific Islands must file their 2005 renewal applications, biennial ownership reports and EEO program reports, all electronically, by Oct. 1, 2005.

By Oct. 1, stations in Connecticut, Maine, New Hampshire, Vermont and Rhode Island must start their renewal pre-filing announcements in advance of their renewal application filing date of Dec. 1, 2005.

Also, by Oct. 1, stations in Florida, Puerto Rico and the Virgin Islands must electronically file their biennial ownership reports.

Ask us about the most advanced technology in digital consoles and routers for Radio and TV



**BC 2000 D Digital Console**

- Cost effective and flexible design.
- Flexible inputs and outputs allocated to faders.
- Design adaptable to digital and analog environments for a single studio or multi-studio installations.
- Enhanced interconnectivity between engines through MADI multi-channel links.
- Incorporating motorized faders with position memories enabling the allocation of up to 9 different channels per fader and with instant access.



**BC2000 D Router**

The same router used by the BC 2000D Console works as a stand-alone router, with thousands of inputs and outputs, summing and processing, with a scalable and modular architecture.

For more information and user references please visit us at [www.aeqbroadcast.com](http://www.aeqbroadcast.com)

**AEQ also offers excellent communication and audio equipment**

- Fixed and portable ISDN Audio Codecs and telephone hybrids.
- Advanced multi-channel talk show system.
- Multiplexers, analogue mixing consoles, AD Converters, monitors and digital commentary system for large sport events.
- Hand held digital audio recorders.

Phone: 866 817 9745 (US only) (954) 581 7999 Fax: (954) 581 7733 e-mail: [sales@aeqbroadcast.com](mailto:sales@aeqbroadcast.com)

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

# The Final

# Element

By Doug Irwin

## A critical part of the transmission system

**F**all is fast approaching, and with it for many engineers comes the chore of capital budgeting. You might be tasked with budgeting for an HD Radio installation next year. Last month I wrote about the trends in technology with respect to HD Radio-capable transmitters, but little was said about the antenna itself. This time we'll examine some ideas and items to look for in the budgeting and planning process as they apply to FM and AM antennas.

How you decide to implement IBOC depends on the circumstances of your current transmitter site. Let's take the example of a transmitter facility at which there is plenty of space on the tower that holds the current antenna. You could use a separate antenna for the planned HD Radio transmission. Keep in mind that the tower needs a space to support this additional antenna between 70 and 100 percent of the HAAT of the analog current antenna. The station also needs an STA from the FCC before the antenna is energized. The good news about the additional antenna, at least from a capital cost standpoint, is that the digital antenna can be a low-power type because the digital ERP will be 20dB below the analog ERP. The station can also use a smaller transmission line. Don't build it too small, however, because it could be licensed as an auxiliary antenna for the analog transmission and it's likely that you'll want to have as high an analog ERP for that use as possible. Likewise, remember that if it is using an auxiliary, and if it is too close to the main antenna, the RF field may prevent it from being used during maintenance to the main antenna.

The proximity of the analog and digital (or main and aux) is also a concern for other reasons. Two antennas with broad patterns in the vertical plane (i.e. low-gain types) will not provide as much isolation from one another, necessitating a considerable expense on an isolator for the output of the IBOC transmitter. The isolator will have to be rated for the amount of forward power being run through it in the forward direction, and the termination will need to handle the amount of power that is expected to come back from the IBOC antenna. At least three manufacturers make high-power isolators: AFT in Germany, Channel Microwave (used by Shively) and EMR. Even if an isolator is not needed, consider the proximity of the antennas of neighboring stations; too much RF from one of them could generate intermodulation products in the output of the IBOC transmitter. A low-power bandpass filter can be installed to prevent this. All the major antenna manufacturers make these as well. (Not to dwell on the auxiliary antenna aspect, but make sure the filter is sized to handle the amount of power that will go through it if the new antenna is used as an aux for the analog transmission.)

The big four antenna manufacturers all make low power versions of their FM-band antennas. ERI has the LPX, the lower-

*Photo courtesy of Dielectric Communications*

**aeon**

**breaking down barriers**



**DIGITAL RADIO ON-AIR CONSOLE**

- Full Audio Networking
- Any signal anywhere
- Complete format store, name and recall system
- Dynamic control matrix
- Dynamics and EQ control
- Powerful Mix-Minus capabilities

**aeon**

- + Level meters for all buses and selected inputs
- + Talkback
- + Macro programming
- + Voice processing presets
- + 16-character channel name displays
- + Ultra slim low profile design - only 1" thick!
- + Table-top mounting, no furniture cutouts required
- + Split or straight console options
- + GUI based Autoconfig Setup Tool



**Starting at \$10K!**

Including surface, audio engine and audio platform

**AEON - the latest innovation from the market leader**

actual height  
mm inch

25 1  
20  
15  
10  
5

For more information

visit [www.klotzdigital.com](http://www.klotzdigital.com) or call 678-966-9900

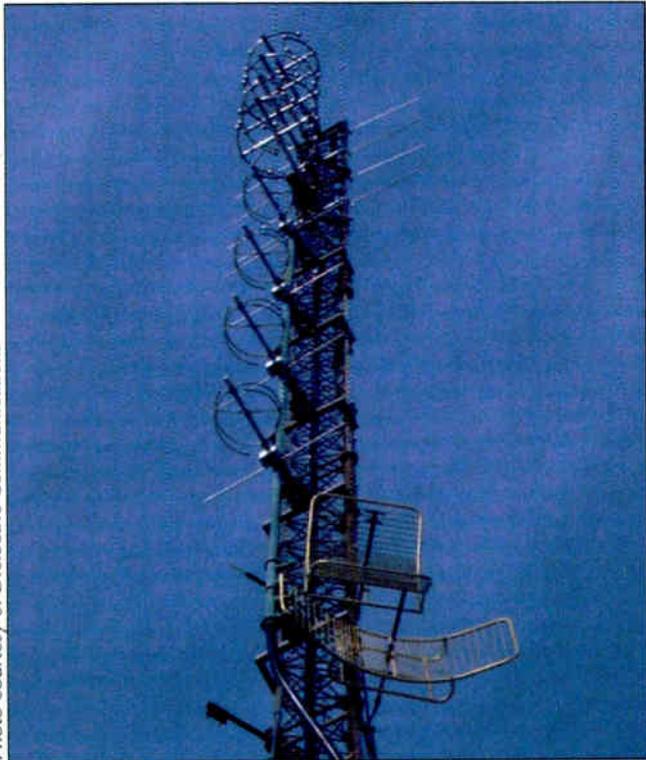
World Radio History



**DIGITAL**

# The Final Element

Photo courtesy of Dielectric Communications



WNNK, Harrisburg, PA, has an interleaved antenna system (upper antenna) mounted directly above a backup antenna.

power version of the rototiller. It also offers the 1105 series, which is for lower-power applications, and the 100 series made for LPFM. In most cases it will easily handle the input power needed for an IBOC project. Jampro offers the JLST for low-power applications and the JMPC (among others) for medium power. Shively makes the 6812 for lower-power applications and the 6813 for medium power. Dielectric makes the DCR-L for lower power applications and the DCR-H for medium power applications.

To the extent possible, you need to maintain the ratio of analog to digital at 20dB around the entire horizontal plane. So, if the current antenna is directional (or even optimized) you will likely want to match the digital antenna type with that of the analog antenna. Likewise, at least consider using the same gain in the digital antenna as is used in the analog antenna to keep the vertical plane pattern the same or at minimum similar.

## Something old? Something new!

Perhaps it is time to replace the old antenna, and HD Radio is just the catalyst that your station needs to buy one. If you plan to continue using the tower space you already have, there are several options available.

An IBOC antenna interleaved inside the pre-existing analog antenna is a technology used by at least three antenna manufacturers. An interleaved antenna is basically a system comprised of two completely separate antennas fed by separate transmission lines, with the radiating elements for the HD Radio antenna installed on the same support structure between the radiating elements for the analog antenna. The necessary degree of isolation between

## NEW X-MIXER DIGITAL CONSOLE



BSW is the sole domestic U.S. dealer for Arrakis X-mixer products

**BSW**

800.426.8434  
www.bswusa.com

- 10 AND 14 CHANNEL MODELS
- DIGITAL AND ANALOG IO
- TELEPHONE INTERFACE

STARTS UNDER \$5,495

970-461-0730 www.arrakis-systems.com



**Arrakis**

ON THE AIR

# SANITIZED FOR YOUR PROTECTION

SOME WORDS SHOULD BE OBSCENE AND NOT HEARD



Eventide Broadcast Delays are designed to keep profanity off your air, and angry listeners, embarrassed advertisers, and the FCC off your back. We invented the obscenity delay and have a solution for stations large and small that provides up to 80 seconds of the highest quality revenue and license-protecting delay.

Our new HD compatible BD600, 24-bit delay, comes standard with AES/EBU, and provides up to 80 seconds of memory — twice as much as other delays. There are fully adjustable Delay and Dump functions, and a Sneeze function which “edits” audio entering the delay, allowing the host to sneeze, cough, or make a short comment without being heard on air.

The BD600 offers two different methods of delay buildup and

reduction: Eventide’s catch-up and catch-down system, and an exclusive fast-entry-and-exit feature which allows starting a broadcast with the delay already built up to a safe amount and ending it with a rapid reduction of delay.

For HD, the BD600 offers MicroPrecision Delay™ mode which allows up to 10 seconds of delay to be adjusted in real time in 100 nanosecond increments. This is useful for synchronizing analog and digital signals while on-air, without audible artifacts, to maintain a seamless user experience.

Whatever your size, whatever your format, you can’t expect to protect the integrity of your air and the foundation of your business without an Eventide Broadcast Delay in your rack.

# Eventide®

HD COMPATIBLE

Eventide is a registered trademark and MicroPrecision Delay is a trademark of Eventide Inc. ©2005 Eventide Inc.

World Radio History

# The final Element

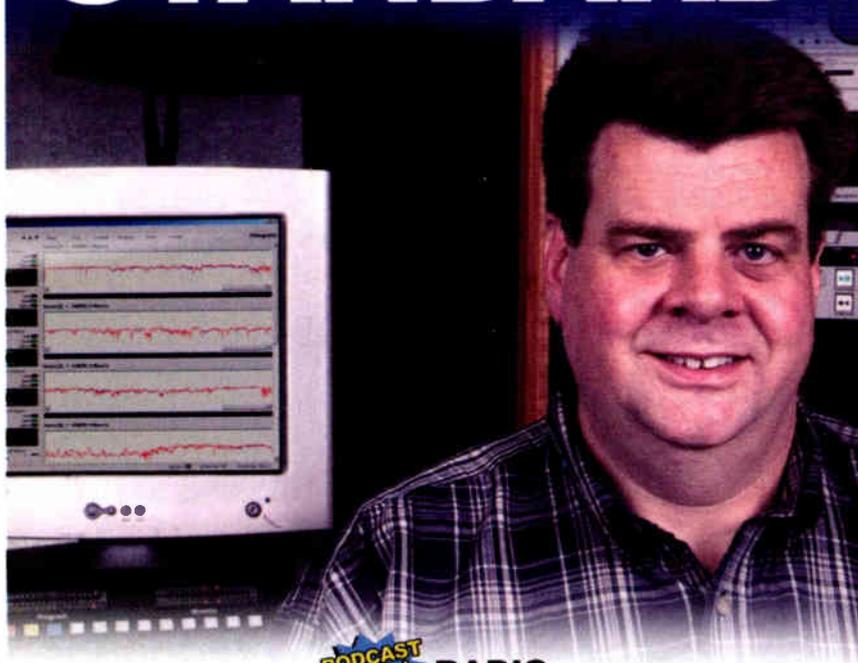
the two antennas is achieved by the use of opposite circularity. Even though the IBOC bays will ultimately handle less power, Shively, for example, prefers to use the same type of bays for the IBOC that are used for the analog system. In this way the horizontal plane pattern of the IBOC antenna matches that of the analog. The number of bays of the IBOC antenna does not have to match the number of the analog antenna. Shively has gone as high as seven bays for the IBOC antenna. Dielectric also offers an interleaved antenna system (the HDR

series). Dielectric says that it can use 14 bays on an interleaved system, and that it can retrofit an interleaved antenna with analog antennas made by other manufacturers. Jampro also offers interleaved systems, using the low-power version of the Penetrator as the IBOC elements.

ERI now offers the Lynx, a dual-input antenna. The analog and digital transmitters feed their own separate input on this system. With careful installation, more than 30dB of isolation between the analog and digital inputs can be achieved. The radiating elements are excited by the analog and digital

Looking for a Digital Audio Logger? Why not try the Industry

# STANDARD



**PODCAST Ready!**

## iMediaLogger

**Radio's #1 Selling Digital Logger**

Industry Standards - OMT has been setting them for over 35 years. Our iMediaLogger Digital Logger, and our iMediaTouch Broadcast Automation, are proof of this.

Introduced in 2000, iMediaLogger set the bar for all other Digital Loggers. Used in all of the top ten US markets with more features than any other competitor, iMediaLogger has easily become the most popular Digital Logger in Radio. It also helps your station easily record, package and transmit recordings for Podcasting.

With non-proprietary hardware, special Corporate Rates and the compatibility with the new ASI Tuner Card, there's no reason to look to any other software.

**omt technologies** The Original. The Standard. The Innovator.

**RADIO ONE 94.5KSOIL 97.9 THE GREAT**

"When we installed the iMediaLogger, we showed our PD what it could do for him. He responded by saying 'This is my newest favorite toy.' The ability to instantly listen to our stations or the competing stations 24 hours a day and preparing airchecks has greatly helped our Production and Sales Departments."

**Don Stevenson - Chief Engineer**  
Radio One Dallas - Dallas, TX

**iMediaLogger features:**

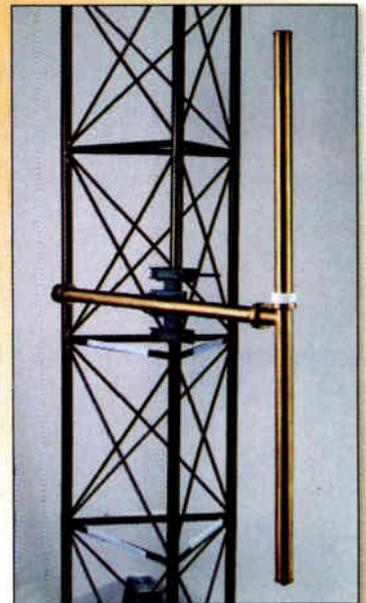
- This multi purpose tool can simultaneously perform 24/7 logging, Mic Skimming, Podcasting, Competition Monitoring and Back Ground Recording.
- On one record input, create four recordings (24/7 log, Mic Skim, Best of show and an internet stream). For example, The 8 Channel iMediaLogger = 8x4 for a total of 32 recordings!
- Station personnel can then access any of their recordings remotely via LAN/WAN with its built-in Web browser interface.

**THE NAB RADIO SHOW** Visit us at NAB Radio Show BOOTH #611

To find out more, call us Toll Free 888 665 0501 or visit [www.imediatouch.com](http://www.imediatouch.com)

## A backup alternative

While a fixed, permanent auxiliary antenna is the most ideal, there may be reasons why it's not practical for some stations. In addition, there may be times when a temporary backup is needed, particularly after a storm or when the location will be for a short term.



A single-bay backup antenna can be stored in a secure location and pressed into action when it is needed. This can be especially helpful to clusters in a region that can share the resource. It may be feasible to use a single bay from a retired antenna for this purpose.

If space or portability is a concern, Armstrong offers the FMA-2VBP portable antenna (shown above). This broadband antenna breaks apart for easy transport and sets up in moments. The antenna fits in a hard-shell shotgun case for shipping. Multiple-bay versions are also available.

# We're all talk.

# And all action, too.

All talk and no action? That certainly doesn't describe any radio station we've ever seen. With guest interviews, news and traffic feeds, live reports and listener calls to juggle, a talk studio is one of the most active places on the planet. Seconds count, and there's no room for mistakes.

That's why we created Status Symbols<sup>®</sup> for the Telos TWOx12 Talkshow System. Instead of flashing lights to decipher, there's easy-to-understand picture icons that give talk pros the information they need with just a glance. What caller's next? Who's screened, and who's just holding? With Status Symbols, you'll know instantly. And only Telos has them.

TWOx12 has lots more benefits. Like Digital Dynamic EQ, for uniform caller audio despite less-than-perfect lines. Twin DSP-powered hybrids for quick, no-hassle conferencing. A unique Dual Studio Mode that lets you use your 12-line phone system like dual six-line systems for extra flexibility. And TWOx12 is the world's only talk show system that can work with either POTS or ISDN lines to deliver exceptional caller clarity. Impressive? You'd expect no less from the company that *invented* the digital broadcast hybrid.

Is TWOx12 the perfect union of word and deed? Thousands of broadcasters worldwide think so. Why not see for yourself?

*Telos*  
AUDIO | NETWORKS



12 lines, two digital hybrids, and superior audio performance. Desktop Director controller features handset, speakerphone and headset jack. Drop-in controls available for popular consoles.



New Call Controller has Status Symbols, DTMF pad and recorder controls (like Desktop Director), but lets talent use their favorite wireless phone or any standard handset for call screening.



Status Symbols show exactly what's what. Intuitive icons show calls locked on-the-air, which hybrid they're on, who's next in queue and more. So much better than a panel of blinking LEDs.



Assistant Producer enables talk show production via LAN or WAN. Status Symbols, Caller ID support, instant messaging and caller database are just a few benefits. Supports touchscreens, too.

# The final Element

signals, thus ensuring the same horizontal and vertical plane patterns.

Stations that use a multiple-element panel antenna, either singly or several through a combiner, should contact the antenna manufacturer for the modifications necessary to the system so that the

panel antenna can also be driven with the IBOC RF signals.

If the tower holding the main antenna is crammed with other antennas and there is simply no possibility of adding a separate antenna, you may be compelled to stick with what you already have. That works fine, too. If you feed this single antenna with a high-level combined system, you will need an injector, which couples the IBOC carriers into the same transmission line that carries the analog RF to the antenna. Each of the big four can provide the injector. Dielectric makes several versions of its unit with power levels from 12kW to 70kW, and coupling factors of 10, 9 or 8dB. Custom coupling factors are also available. Shively makes five versions of its injector up to 40kW, with 10, 9, 8, 7 and 6dB of coupling. Jampro makes two versions of a 10dB coupler, a high-power one rated at 35kW analog and 10kW IBOC, and a medium-power one rated for 10kW analog and 3.5kW IBOC. ERI makes four versions of a 10dB coupler; 12kW max with a 1 5/8" connector and 30kW with 3 1/8" connectors. The higher-power version will handle up to 80kW of analog RF with a 6 1/8" connector.

## A shift in the band

Planning for an AM HD Radio system is potentially much more of a minefield than planning one for FM. A critical aspect of the performance of the antenna system is the impedance bandwidth of the antenna as seen by the transmitter. If the VSWR seen by the transmitter in the upper sideband region is too different than that in the lower sideband region, the net result will be higher



AM antenna systems require linear, broadband and balanced response, which are the same factors that applied to an AM stereo upgrade.



## RF Specialties® Group

*"I didn't know you guys sold that!"*

We hear that a lot. There's more to the name RF Specialties than meets the eye. We are not a run-of-the-mill "Box House." We offer many small items you use everyday in the operation of your station, including microphones, headphones, monitor speakers, tower lights, copper strap, audio cable, CD players, and hard drive systems.

Select from over 300 product lines.

Call the nearest office for more information on even the smallest items you might need. For your added convenience, check out the full line of products and detailed information on each manufacturer by going to [RF.Specialties.com](http://RF.Specialties.com).

*We Continue to Grow for Sound Reasons!*

**RF is Good for You!**  
**And the Rest of the World!**

Visa and Mastercard are welcome.  
Offices Independently Owned and Operated.

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



Sam Lane	Santa Barbara, CA	1-800-346-6434
Bill Newbrough	Las Vegas, NV	1-888-737-7321
Bob Trimble	Vancouver, WA	1-800-735-7051
Walt Lowery	Mukilteo, WA	1-425-210-9196
Don Jones	Amarillo, TX	1-800-537-1801
Wray Reed	Ft. Worth, TX	1-888-839-7373
Chris Kreger & John Sims	Kansas City, MO	1-800-467-7373
Rick Funk	Richmond, IN	1-888-966-1990
Ed Young	Monroeville, PA	1-866-412-7373
Dave Edmiston	Ebsenburg, PA	1-866-736-3736
Harry Larkin	Southamton, PA	1-888-260-9298
Bill Hoisington	Crestview, FL	1-800-476-8943
Ed Edmiston	RF Specialties of Asia (Manila, Philippines)	+63-2-412-4327

wherever. whenever.



Prime C-band satellite capacity, digital system design, and expert field engineers to assist you. To cover the U.S., Mexico, and the Caribbean. Faraway affiliates, distant stations, hard-to-reach areas are all within easy reach. With reliable, low-cost solutions, maximum flexibility, and engineering support 24/7. Wherever you want us, whenever you need us. Call NPRR Satellite Services at 202.513.2626, or visit [www.nprss.org/bo-radio](http://www.nprss.org/bo-radio).

npr  
satellite  
services

space segment | equipment | uplink services | system design | engineering support | 24x7 customer service

# The final Element

bit-error ratio (BER) at the receiver. The first step in the plan is to hire a consultant who is experienced with the characteristics of AM antenna systems, especially with respect to AM IBOC. He can evaluate the antenna system and subsequently make recommendations on its modifications should any be necessary. Several established companies, such as Kintronic Labs, LBA or Phasetek could then be used for the design and construction of new building blocks of the system such as the phasor in the event that the

antenna is directional and the antenna-tuning units.

Research and planning are the keys to accurate budgeting. Do your homework now, and get an early start so that there is plenty of time to mull your decisions before finalizing them. Your antenna is your final link in the broadcast chain between you and your listeners, and as such its importance cannot be overemphasized.

*Irwin is director of engineering for Clear Channel Radio Seattle.*

## Resource Guide

A list of some manufacturers and dealers of antennas and accessories

Isolators	Antennas
<p><b>AFT</b> 301-670-2833 www.aftgmbh.de</p> <p><b>Channel Microwave</b> 805-482-7280 www.channelmicrowave.com</p> <p><b>EMR Corporation</b> 623-581-2875 www.emrcorp.com</p>	<p><b>Antenna Specialists</b> 440-349-8400 www.antenna.com</p> <p><b>Armstrong Transmitter</b> 315-673-1269 www.armstrongtx.com</p> <p><b>Bext</b> 619-239-8462 www.bext.com</p> <p><b>Crossed Field Antennas</b> 860-676-0051</p> <p><b>Dielectric Communications</b> 800-341-9678 www.dielectric.com</p> <p><b>ERI-Electronics Research</b> 812-925-6000 www.ERLinc.com</p>

### Broadcast Sales:

#### Mid-South Sales

**Bob Mayben**  
> bobmayben@usa.net  
Voice (877) 391-2650

#### Central Sales

**Bernie O'Brien**  
> bernieob@earthlink.net  
Cell (731) 695-1714

#### West Coast Sales

**Doug Sharp**  
> dougt@scmsinc.com  
Sales (866) 673-9267

#### Mid-West Sales

**Mary Schnelle**  
> marys@scmsinc.com  
Sales (513) 899-3036

#### South-Atlantic Sales

**Art White**  
> whitearthur@bellsouth.net  
Sales (770) 632-1295

#### North-East Sales

**Jim Peck**  
> jpeck001@scmsinc.com  
Sales (315) 623-7655

#### South-West Sales

**Tyler Callis**  
> tylerc@scmsinc.com  
Office (877) 699-9151

### ProAudio & Commercial Sound:

#### Southeast Sales

**Ric Goldstein**  
> ricg@scmsinc.com  
Voice (877) 640-8205

# Sizzling Summer Specials!



**TASCAM**

**Tascam MD350 Mini Disc \***  
List-~~\$385~~ Sale Price-~~\$469~~  
with **free** freight, beach cooler,  
and drink Koozies!



**HHB 830 CD Recorder/Player \***  
List-~~\$649~~ Sale Price-~~\$549~~  
with **free** freight, beach cooler,  
and Koozies!

Ask for **BOB, MIKE,  
ERNIE or MATT**

Toll FREE 1-800-438-6040  
1-704-889-4508  
Fax 1-704-889-4540

**CORPORATE  
SALES OFFICE  
Pineville, N.C.**

www.scmsinc.com  
e-mail sales@scmsinc.com

\* While Supplies Last!



# Multiple Personalities Aren't Disorders Anymore.

In fact, they're a powerful way to build listenership.

Multicast-capable consumer receivers will be available soon. Broadcast additional, digital program channels now using BE's IDi 10 and IDi 20 HD Radio™ Data Importers and Encoders. Enhance listener loyalty by providing program information and station branding using broadcast data software and services from The Radio Experience. Only Broadcast Electronics delivers the tools you need for HD Radio today, tomorrow and the day after tomorrow without risk of rapid obsolescence or unexpected costs.



Broadcast Electronics, Inc. • 4100 North 24th Street, P.O. Box 3606, Quincy, Illinois 62305-3606 U.S.A.  
Telephone: (217) 224-9600 • Fax: (217) 224-9607 • E-Mail: [bdcast@bdcast.com](mailto:bdcast@bdcast.com)

Broadcast Electronics and the BE logo are registered trademarks of Broadcast Electronics, Inc. HD Radio is a registered trademark of iBiquity Digital Corporation.

## Resource Guide

A list of some manufacturers and dealers of antennas and accessories

### Antennas Cont'd.

#### Harris

800-622-0022  
www.broadcast.harris.com

#### Jampro Antennas

916-383-1177  
www.jampro.com

#### Kathrein, Scala Division

541-779-6500  
www.kathrein-scala.com

#### OMB America

800-662-4872  
www.omb.com

#### Propagation Systems

814-472-5540  
www.psibroadcast.com

#### RFS Broadcast

877-737 9675  
www.rfsworld.com

#### Shively Labs

888-SHIVELY  
www.shively.com

#### Superior Broadcast Products

800-279-3326  
www.superiorbroadcast.com

#### SWR

800-762-7743  
www.swr-rf.com

#### Valcom Limited

519-824-3220  
www.valcom-guelph.com

### AM Systems

#### Kintronic Labs

423-878-3141  
www.kintronic.com

#### LBA Technology

800-522-4464  
www.lbagroup.com

#### Phasetek

215-536-6648

## More online

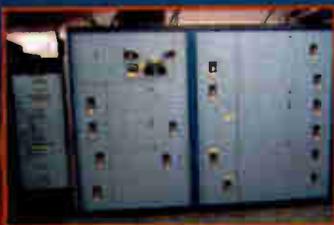
Access the complete  
Radio magazine  
Buyers Guide online  
at [beradio.com](http://beradio.com).



"There are sound reasons why Kintronic is on the label of every directional facility I am responsible to maintain."

After installing a new Kintronic Wide-Band Directional Antenna System, Gary Ellingson said:

"Military specifications, craftsmanship, conservative design, precision, geometrically balanced; these are just a few terms I would use to describe phasing equipment from Kintronic Laboratories."



With Kintronic on your DA team, a successful and maintainable system is a realistic goal."



Gary L. Ellingson, CPBE  
Director of Engineering  
Northwestern College Radio  
KNWC-AM/Sloux Falls, SD

Your Source  
For HD-Ready  
AM Antenna Systems!

423.878.3141 fax 423.878.4224  
Email: [ktl@kintronic.com](mailto:ktl@kintronic.com) [www.kintronic.com](http://www.kintronic.com)

## COAXIAL DYNAMICS

SPECIALISTS IN RF TEST EQUIPMENT & COMPONENTS



**COAXIAL DYNAMICS** has been a leading manufacturer of precision equipment for the measurement and termination of RF power for over 35 years. Our equipment is used by engineers and technicians in a wide variety of applications throughout the world.

Check out our website  
for more information!  
[www.coaxial.com](http://www.coaxial.com)

6800 Lake Abram Drive  
Middleburg Heights, OH 44130  
440-243-1100 • 800-COAXIAL  
Fax: 440-243-1101





# Working separately, **working together**

By Chriss Scherer, editor

## A cooperative effort to cover North Central Indiana

**A**ny facility construction project starts with establishing the needs of the stations that will use the facility. In most cases, it is a straight-forward process to identify the station's needs and temper them with the owner's goals. Joint sales agreements and local marketing agreements with a second licensee can be a factor in the plans, but what happens when you have four licensees and two distinct locations? The Federated Media stations in South Bend and Elkhart, IN, have figured it out.

With studios in two adjacent counties, the seven stations are split into two studio facilities. WAOR-FM (95.3, classic rock), WBYT-FM (100.7, country), WYPW-FM (95.7, CHR/urban), WNIL-AM (1290, news/talk), WRBR-FM (103.9, active rock) and WUBU-FM (106.3, smooth jazz) share a studio building in Mishawaka, a town near South Bend. WLEG-AM (102.7, adult contemporary) and WTRC-AM (1340, news/talk) share space in Elkhart. While all the stations serve a smaller market—Arbitron

Working separately  
working together



WAOR—one of two studios on the ground floor—is adjacent to the sales area, making them accessible to station visitors as a showcase view.

ranks South Bend as market 177—the studios are built as well as any major-market facility.

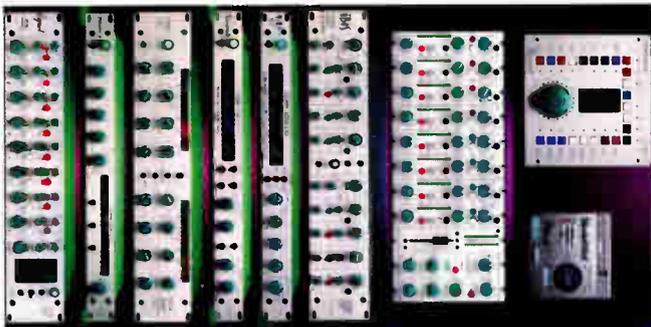
The interesting twist is that Federated Media is not the sole licensee of the stations in the South Bend facility. The five stations are licensed to four owners. Federated Media owns WBYT and WAOR. Second Wind Communications owns WRBR and has a joint sales agreement with Federated Media. Talking Stick Communications owns WYPW and operates under an LMA with Federated Media. Partnership Radio owns WUBU and contracts operations functions from Federated Media.

The South Bend stations all operate under the Planet Radio name, which serves to provide a unifying brand to the listeners, but still maintains the necessary separation of business elements between the licensees.

For all of this, there is a single engineering staff of two people: Chief Engineer Greg Trobridge and Assistant Engineer Jeff Snyder.



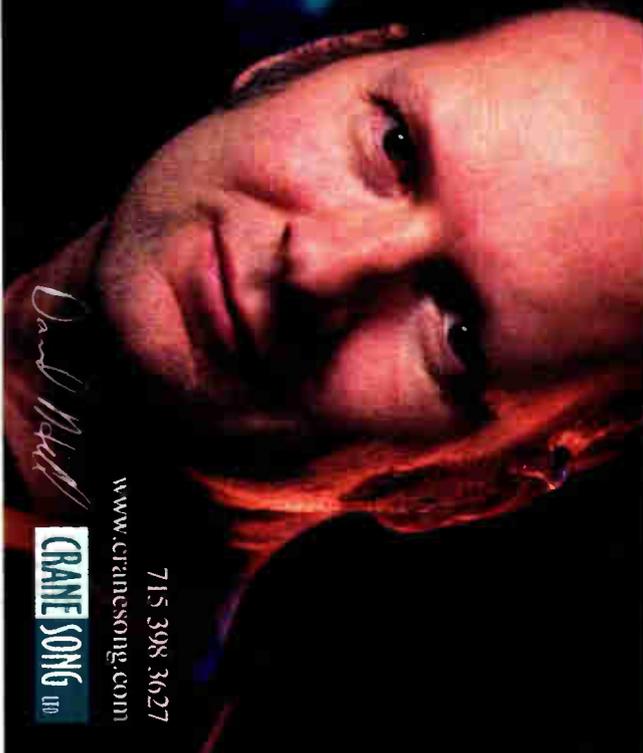
Lots of stations need lots of signals. The backyard is the site of several satellite antennas and an STL tower.



To celebrate a decade of innovation, Crane Song will give away the piece of electronics that started it all: the Crane Song STC-8 compressor/limiter.

WIN A CRANE SONG STC-8

go to [www.cranesong.com](http://www.cranesong.com) for all of the details.



David Hall

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

715 398 3627

CRANE SONG  
INC.

# How to build the perfect console.

Start with a flexible routing system that can accommodate all of your facility's audio distribution, along with intercom functions, EQ and dynamics processing, profanity delays, timers, and more. Next, select the right frame size for the router's control surface. Populate the frame with the number of faders you want, along with programmable pushbuttons, countup/countdown timer controls, and meter bridge with extra graphic displays. The result? Your console, exactly as you want it, with the functionality your talent craves and a sleek design that complements the studio perfectly.



*Introducing*

## Mosaic

Where art meets technology

- Multiple frame sizes allow configuration of systems ranging from 2 to 24 faders
- Support for 16-character source names, allowing you to precisely identify a source rather than guessing on unintelligible abbreviations
- Full color LCD screens on each module that provide source information, meters, clocks, timers, delay information, text messages and more
- Programmable backlight colors in ON/OFF buttons alert users to operational conditions or separate faders by source type
- Source selection, bus assigns and other controls with each fader module make operation easier and faster

Available now! Contact us today for more information.

**Logitek Electronic Systems, Inc.**

5622 Edgemoor • Houston, TX 77081 USA

713.664.4470

**1.800.231.5870**

© 2005 Logitek Electronic Systems, Inc.

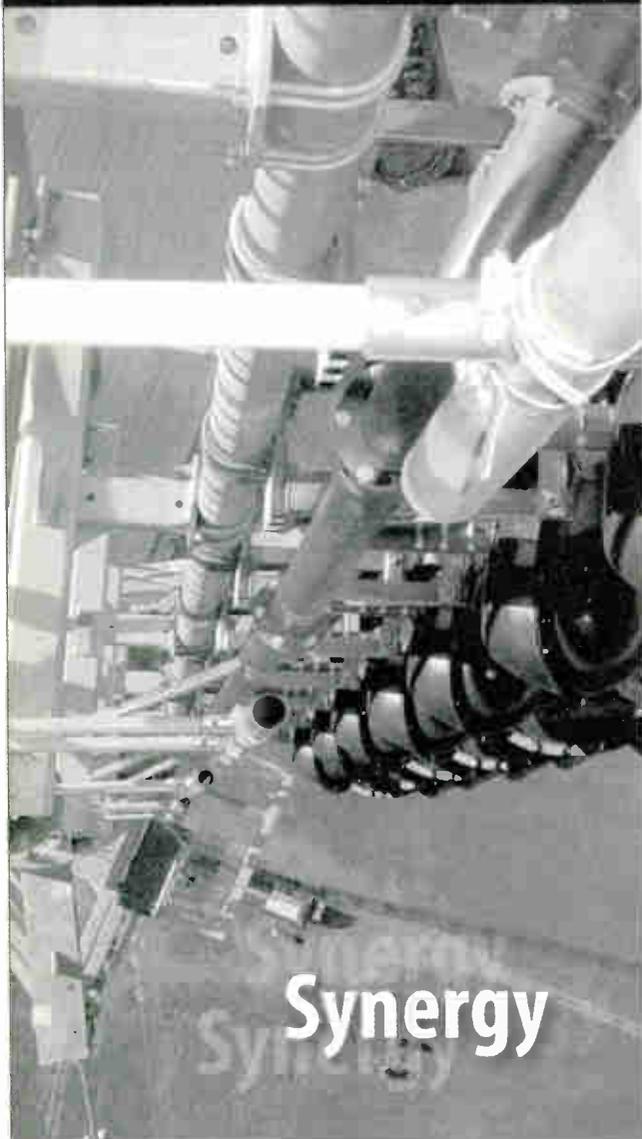
[www.logitekaudio.com](http://www.logitekaudio.com)

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



**Logitek**  
Console Router Systems

Choosing ERI with our dedication to **Quality** and **Innovation** coupled with the **Synergy** achieved through a complete ERI broadcast system gives you **The ERI Advantage**.



**Synergy**

- ERI designed and fabricated 2000 foot tower
- 16 bay ROTOTILLER® SHPX FM Antenna
- 2100 feet of Andrew HELIAX® Semiflexible Coaxial Cable
- ERI installation and project management

**ELECTRONICS RESEARCH, INC. ERI®**

*Your Single Source for Broadcast Solutions™*

Call Toll-free at 877 - ERI - LINE - Visit Online at [www.eriinc.com](http://www.eriinc.com)

**Working separately,  
working together**

They are employees of Federated Media, and through the licensee agreements they handle the technical needs of the other stations as contracted engineers. While the facility is fully integrated so that common resources are shared, there are times when Trobridge has to work with four general managers or program directors to see a project to completion.

### The plans for the Planet

The Planet Radio stations occupy a two-story facility that was remodeled at the end of 2004. Federated Media already occupied the second floor, so when the first-floor tenant moved out, it seized the opportunity to consolidate all the stations under one roof. Two studios (WBYT and WAOR) are on the ground floor. While all the studios are well designed and look good, these two are used as the showcase studios for visitors because of their easy access.

The first floor also houses the engineering shop, sales offices, business offices and programming offices for the first-floor stations. The second floor houses the remaining studios, programming staffs

### Partial Equipment List

360 Systems Shortcut  
 Adobe Audition 1.5  
 Air Tools 6000, 6100  
 Aircorp 500  
 AKG C3000B  
 Aphex Compellor  
 ART SLA2 and SLA1 power amps  
 Audemat-Aztec FMB-80  
 Audio-Technica AT4033  
 Auralex acoustic panels  
 Belden 1189A RG-6  
 Bogen TP30D tuners  
 Broadcast Electronics Audio Vault AV-100  
 Broadcast Tools SM II, SS16  
 Burk ARC-16, Autopilot  
 Circuitwerkes Telco-6  
 Comrex Matrix  
 Crown D-75  
 Denon TU-1500RD  
 Electro-Voice RE-20, Sentry 100A  
 ESE GPS master clock  
 Gepco audio and control cable  
 Harris Airwave Digital  
 Harris Quick-built II furniture  
 Henry Engineering Stereomixer, Superelay  
 HHB CDR-850  
 Homaco wiring racks  
 Inovonics 712  
 Marantz PMD-321  
 Moseley SL9003Q  
 O.C. White mic booms  
 Rane HC-6  
 Rolls RS79  
 SAS 16000 router  
 Shure SCM810, SM7B  
 Sine Systems MBC-1  
 Sony CDP-D11, MDS-E12, MDS-E56, MDS-E58  
 Symetrix 528E  
 Tascam 112 MKII  
 Woodline furniture  
 JBL Control One

**NEW Digilink Satellite Automation...**

**ONLY \$100 PER MONTH**

**now shipping !!!**

The 'Bridge' hardware ...

supplied by Arrakis contains the audio sound cards, routing switchers, and control logic so that the PC requires NO special hardware or setup. This means that the PC can be off-the-shelf, and unmodified so that it is easily serviced locally. The Xtreme 'Solutions' program is per workstation for complete redundancy and backup. Imagine an AM/FM combo with production room for only \$300 per month. With more than 15 years of automation experience and thousands of Arrakis automation systems in the field around the world, Arrakis can provide you with the solution that meets BOTH your business AND technology needs.



**Xtreme 'HARDWARE'**

a 16 x 3 stereo routing switcher, dual PC sound cards, & control logic



**Xtreme 'SOFTWARE'**  
powerful Windows PC software for live air, automation, scheduling, and production

- No down payment**
- Return at any time**
- Free Factory training**
- Free Hardware support**
- Free Telephone support**
- Free Software upgrades**
- Free Hardware upgrades**
- Free PC and Network setup**

**the XTREME 'Solutions' program**

Xtreme is a complete solution for live & automated On Air Radio systems. Pay one very low monthly fee, and we do the rest. We supply the audio hardware, software, and support, while all that you supply is the PC. Without a large initial equipment investment there is no financial risk or capital expense; the old automation system can be upgraded out of current operating costs. With free system configuration and training you receive the help you need to make a smooth transition to the new system. With free hardware replacement, ongoing repairs are worry free. Free telephone support helps train new staff, and free software upgrades means you have the latest product features at no cost. The only hardware that is not included is the PC computer and we can help you with that too... also for free.

**...the risk free automation system**  
**XTREME~digilink**



**970-461-0730** [www.arrakis-systems.com](http://www.arrakis-systems.com)

**now shipping !!!**

**Arrakis**

# Working separately working together

for those stations, the tech center and the station managers.

The heart of each station's operation is a Harris Airwave Digital console in all but one studio and a Broadcast Electronics Audiovault automation system. The first-floor studios are mirror images of each other because they were built at the same time. The remaining studios have similar layouts, but each is unique.



The B-100 studio is a mirror image of the WAOR studio next door.

## Managing the data

All the stations run RBDS and are ready to provide PSD when they begin transmitting IBOC. When RBDS was implemented a few years ago, Trobridge was not satisfied with the performance of the available data management systems and interfaces, which were unable to provide the flexibility that the stations wanted, or required an ongoing licensing fee that the stations were not willing to pay.

Instead, Trobridge built the system that he wanted. A custom-written application takes the PSD information from the station automation systems to feed the RBDS encoders. The software allows the station program director to update text fields and provide additional information that can be displayed.

The software provides station promotional messages when commercials are played so that song information is not showing when commercials are playing. The promotional messages are day-part scheduled on a programmed clock.

It provides data to feed the now playing portion of the stations' websites. The software is written to feed Audemat-Aztec, Inovonics and Terion RBDS encoders, and it can provide scrolling PS if it is wanted. In addition, it can display warning messages that are manually entered or triggered by EAS.

The software also has an adjustable delay that accounts for the nine-second profanity delay that is used on all the stations. ■

# New! StudioDrive-USB!

Use StudioDrive's new **USB MicroSound** option for a quick and easy connection to your PC or laptop. You'll get superb digital audio...and no soundcard is needed. Just load your editing or automation software, plug in the USB cable, and go!

## StudioDrive with USB is perfect for

- Newsroom
- Desktop automation
- Production suite
- Self-contained remotes
- Emergency studio

Now in stock at all Henry Engineering dealers



**We Build Solutions**

626-355-3656

henryeng.com

StudioDrive shown with optional Desk-Mount Kit.

USB  
easy!

# The routing switcher gets a new twist.

(About five twists per inch, actually.)

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

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



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

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

An expensive proprietary router isn't practical for smaller facilities. In fact, it doesn't scale all that well for larger ones. Here's where an expandable network really shines.

Connect eight Axia 8x8 Audio Nodes using Cat-6 cable and an Ethernet switch, and you've got a 64x64 routing switcher. And you can easily add more I/O whenever and wherever you need it. Build a 128x128 system... or 1024x1024... use a Gigabit fiber backbone and the sky's the limit.

### Are you still using PC sound cards?

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



*There's a better way to get audio out of your PC. No more consumer grade '6" connectors — with Axia your digital audio stays clean and pristine.*



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

### Put your preamps where your mics are.

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

### Put your snake on a diet.

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



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



*Scott Studios*



*AKA TV*

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

### With a little help from our friends.

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

### Would you like some control with that?

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



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



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



© 2004 TLS Corp. All rights reserved. Axia, the Axia logo, Livewire, the Livewire logo, Telos, and the Telos logo are trademarks or registered trademarks of TLS Corp. All other trademarks and likenesses are property of their respective owners.

# The new Radio Millennium Digital has many pluses + even more mi

## Pluses (+)

Mic/Line/or Digital  
on **any** input with  
full simultaneous  
analog and digital outputs

## Minuses (-)

10 **fully** configurable  
analog and digital  
mix-minus outputs



# Systems al Console S — nuses...

Contact (!)

**Radio Systems, Inc.**

601 Heron Drive Logan Township, NJ 08085

phone: 856-467-8000 fax: 856-467-3044

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

or any Radio Systems dealer

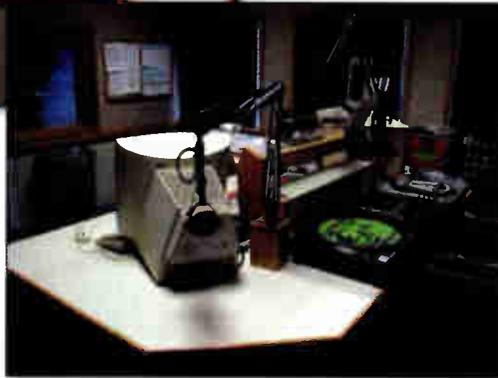


Working separately  
working together



WYPW is automated most of the day, so an Audiotronics console was used in the studio. A DJ setup is used for a daily mix show (inset).

Some common design elements can be seen in the studio photos. These include a truss mounted along the ceiling to support the speakers and the LED signs. Driven by Sine Systems



MBC-1 sign controllers, each air studio displays two LED signs, while the production studios have one. Each studio has one sign for general information such as ringing phones and after-hour visitors. The second sign in the air studios displays EAS information and notifies the operators when a station is off the air.

The air studios also have a KVM switch for the second computer to switch the monitor between the Audiovault system and the general use (Internet) computer. This allows the cohost to view the on-screen program log. While the video switches, the cohost does not have mouse or keyboard control of the on-air system to avoid confusion.

Every studio can be used to create voice tracking for the station. To reduce the possibility of errors by switching the console, a Henry Engineering Stereo Mixer was installed to mix audio for the automation system for the song ending, the song starting and the mic. This removes the console from the voice-track

Snap, Crackle, Pop?  
Dropouts?  
Intermittents?



Solve Digital Audio Problems



Digi Pro  
Digital Audio Analyzer

**SENCORE**  
3200 Sencore Drive • Sioux Falls, SD 57107 USA

sales@sencore.com www.sencore.com 1-800-736-2673 or 1.605.339.0100

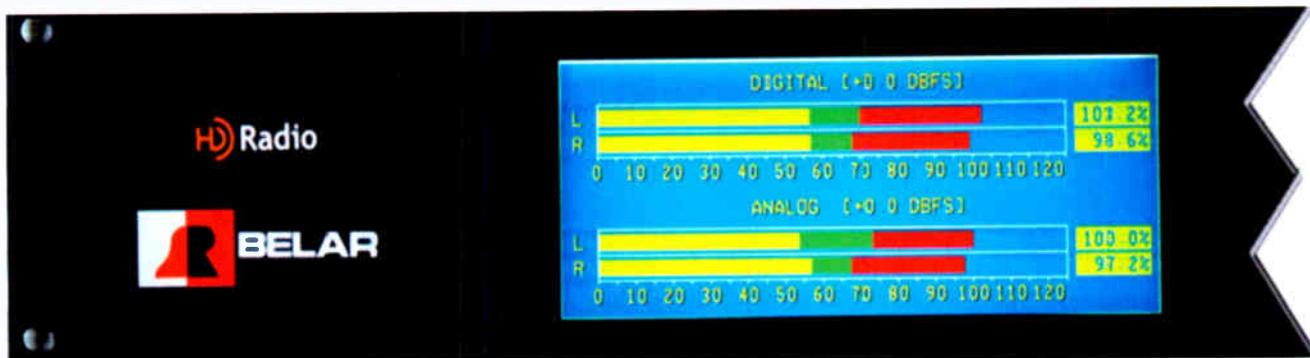
Coming Soon from the leading name in Radio Monitoring Equipment



# BELAR

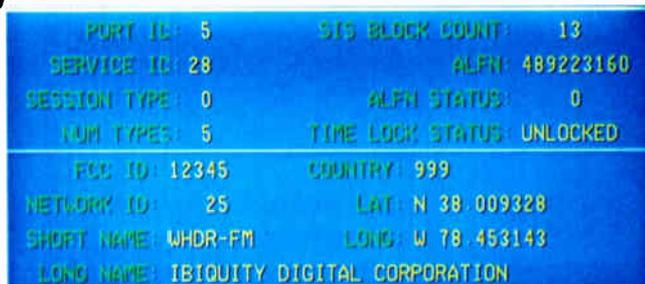
"When accuracy counts, count on Belar."

# FMHD-1



- Frequency Agile High and Low level inputs
- High Resolution Graphical Color Display
- HD Status, Station Info, and Program Info
- 8 Assignable Analog Audio Outputs (L/R Analog, L/R HD, L/R Tomorrow Radio, 5.1 Surround, etc)
- Analog to HD Audio Delay Measurement
- HD and Analog Program Audio Metering
- RJ 45 Ethernet Interface
- FFT Spectrum Analysis

*Here are some sneak preview screen shots!*



For updates and more information on the

**BELAR FMHD-1** and **AMHD-1** go to

[www.belar.com/hdradio.htm](http://www.belar.com/hdradio.htm)

Belar Electronics Laboratory, Inc.  
119 Lancaster Avenue  
P.O. Box 76  
Devon, Pennsylvania 19333 USA

Telephone: (610) 687-5550  
FAX: (610) 687-2686  
E-mail: [sales@belar.com](mailto:sales@belar.com)  
Website [www.belar.com](http://www.belar.com)

# Surround

## Decisions, decisions

So if your station decides to carry surround-sound audio, which system is the one to choose? This is a decision that the station will have to make on its own, but that decision can be tempered by weighing the various aspects of the systems.

The matrix and watermark systems work with existing stereo facilities. Audio encoded in this way can be mixed and edited with little or no effect on the encoding. However, surround aficionados may notice that the surround audio may not be exactly like the original. In addition, there is concern that the encoding process may introduce unwanted artifacts, such as excessive stereo difference information.

Meanwhile, the discrete systems maintain the stereo quality and accurately replicate the surround field. The drawback is that existing stereo facilities are probably not yet able to route and mix the encoded audio. The matrix/watermark systems have the advantage that they are easier to implement, and can be done so gradually.

The ability to transmit surround-sound programming adds a sparkle to IBOC's consumer acceptance, and it provides another element to keep terrestrial radio in step with other forms of digital entertainment. While the specific format used widely has yet to be determined, stations should plan now for a possible surround-sound future. ▲

## Case Study: Installing multicast

*continued from page 3*

the air with second channel audio. After further investigation I found that a handful of public radio stations nationwide along with some Clear Channel stations (and I'm sure other broadcasters) are implementing second channel audio. Now that encoders are shipping (at a price of around \$5,500) I expect it to spread fast.

I believe that multicast audio may be the killer application needed to give HD Radio a boost and propel the technology. The next generation may provide even more channels. Currently, there are tests being conducted for three channels of audio each at 32kb/s.

PSD will be an important feature of HD Radio, but the availability of a viable second channel of programming is something that will have every station program director and sales manager salivating, and it will only provide the radio listener with more options and a better experience. It is precisely this kind of experience terrestrial broadcasting needs to secure listener loyalty and prevent them from signing up with satellite radio or listening to that six-disc CD changer mounted in their trunks. ▲

*Danko is VP of engineering and operations for WGUC-FM, Cincinnati.*

**All about IBOC. Twice a month by e-mail.**



## Slow and steady

*by Chriss Scherer, editor*

As the HD Radio rollout continues, many stations ponder the chicken-and-the-egg situation that exists: some stations won't install IBOC equipment until there are sufficient receivers in consumer use, but consumers won't buy the receivers if there aren't any HD Radio stations to receive. Many consumers believe that satellite radio is the only form of digital radio, which further hinders the acceptance of HD Radio.

The transition to a completely digital transmission system will take several years. During this time, more stations will commence IBOC transmissions, and more radio receivers will become available. The balancing act will continue, but the two will fuel each other. The data in Figure 1 shows that consumers will increase their investment in HD Radio-capable receivers over the next decade.

These figures show that it will take five years for more than one-quarter of all radio receivers to be sold with HD Radio capability, and nine years before half the receivers sold have HD Radio capability. ▲

*Source: Audio Signals, Deutsche Bank newsletter, June 1, 2005, from Ibiqity and Deutsche Bank estimates*

### Radio Receiver Sales

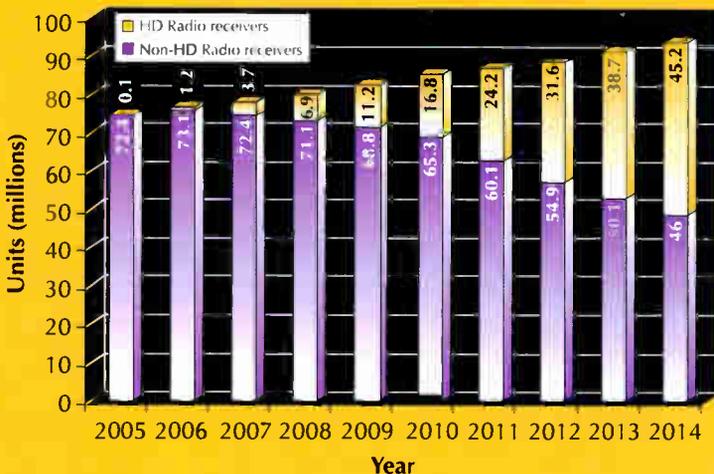


Figure 1. Projected sales of radio receivers with and without HD Radio.

# Insight to IBOC

August 2005

Part of the *Radio* magazine DAB Answer Series

## Practicalities of surround

by Chriss Scherer, editor

Now that the FCC is soliciting comments on NRSC-5, there has been renewed interest in the IBOC rollout. While the standard defines the basic operation of the transmission system, the enhanced functions of data, surround sound and multicast operation have yet to be fully defined. Several stations now transmit multicast programming, and multicast receivers are becoming available to consumers.

Surround sound for IBOC is not yet mature. While some of the surround technologies are established, there's no easy way for consumers to decode the signals. This is advantageous for broadcasters, because few stations have the capability to provide a significant amount of programming anyway. This could change soon.

Surround sound has potential for success with IBOC.

While most radio listening is casual, which lends itself to the additional program offerings of multicast, surround

sound will likely find its initial niche as a special feature medium. Concerts and special programs are

an obvious possibility. Some classical stations may consider surround for more regular use.

### Searching for standards

There are currently five surround systems that have been demonstrated for use with HD Radio, so there is no single standard. Three of them, SRS Circle Surround, Neural Audio's surround system and Dolby Pro Logic II have been approved by Ibiqity as compatible with HD Radio. The other two systems—from Fraunhofer and Coding Technologies—operate differently and have not yet received the Ibiqity stamp, although they have been shown to work with the HD Radio system.

As it is, there are few receivers available to decode a surround signal, so there is not much incentive for stations to begin regular broadcasts. SRS Circle Surround or Dolby Pro Logic II can be found in several models of home media systems, and Kenwood announced that it will release a mobile receiver for many formats, including HD Radio and Circle Surround.

### Case Study: Installing multicast

By Don Danko,  
CBRE CBNT

Broadcasters have sought the killer application for FM HD Radio, and at first glance it looked like program-service data (PSD) was going to be it. More recently, the attention has turned to supplemental audio.

Three years ago, National Public Radio spearheaded a project called Tomorrow Radio. This technology, now referred to as multicast, provides a second channel of audio that is transmitted with a station's main program stream. The overall HD Radio data stream is set at 96kb/s. Streaming a second signal involves lowering the bit rate on the main channel and giving those saved bits to the second channel.

WGUC has tested its system with the main channel at 64kb/s and the second channel at 32kb/s. We also tested at 48kb/s for both channels. The main concern for any engineer is that when bit rates are lowered, more artifacts will be evident along with other audio quality issues. As an engineer of a classical music station I was concerned about our audio purist listeners. Lowering our main channel bit rate was a big concern.

After testing the main channel at 96, 64 and 48kb/s most of my fears and concerns vanished. The classical music proved to be more resilient than expected. It's

*continued on page 3*

### Inside

Top Picks in Surround..... 4  
Expected Sales of Radios... 6

A special supplement to

**Radio**  
THE RADIO TECHNOLOGY LEADER

## New Nautel FM Digital Equipment



# Ready for Digital. Ready for Anything.



### Virtuoso V10

3 kW Digital, 7.7 kW Hybrid, 11 kW Analog Transmitter

#### More Versatility

- Frequency agile: N+1
- Programmable frequency & power
- Better than 62% overall efficiency
- Compact, light weight rack (32" W x 72.5" H x 35" D) is ideal for tight spaces

#### More Redundancy

- Hot-pluggable RF modules
- Hot-pluggable PS modules
- Parallel rectifiers
- Redundant ventilation fans

#### More Duplication

- Dual digital exciters
- Dual IPA
- Dual IPA power supply
- Dual low voltage power supply

### Maestro M50

Direct-to Channel Digital FM Exciter

- Plug-and-play integration with Nautel's NE IBOC FM signal generator for digital or hybrid transmission
- Built-in programmable analog modulation time delay is ideal for HD Radio or FM synchronous applications
- Links with Nautel FM transmitters to provide digital adaptive pre-correction
- Six programmable pre-selections for frequency, power and audio source
- Instantaneous remote or local selection of digital, hybrid or analog transmission modes
- Diagnostic 128 event time stamped log
- Built-in DSP stereo generator interpolates AES/EBU digital data or L&R analog audio to produce digital stereo composite
- Built-in SCA generators and RBDS/RDS coder
- Universal AC supply: 90 V to 264 V



## Contact Nautel for details.

Phone: (207) 947.8200 Fax: (207) 947.3693  
info@nautel.com www.nautel.com

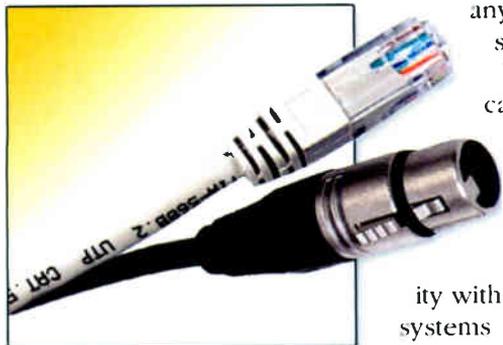
HD Radio is a trademark of iBiquity Digital Corp. All rights reserved.



# Surround

The five systems can be divided into two distinct types. Circle Surround, Pro Logic and the Neural system all encode a surround source into a stereo audio path, while the Fraunhofer and Coding Technologies systems create a stereo channel and an associated data channel that is used to create the surround image.

Because the first three encode the surround information into a stereo signal, it is easy to understand how these systems can work with HD Radio. In reality, they could work with any stereo audio path. As long as the appropriate decoder is installed in the receiver,



The surround sound formats have different needs for transmission.

any or all of these systems could be used. Because the surround audio is encoded into a stereo path, compatibility with non-surround systems is maintained by not decoding the imbedded signals. The SRS and Dolby systems

are matrix processes, and the Neural system is a watermarking process.

The last two are different because they split the data path of the FM signal into two portions. Instead of using 96kb/s for the entire stereo audio path, Fraunhofer and Coding Technologies use a large portion of the path—about 80kb/s or more—for a stereo signal, and up to 16kb/s for the surround data. The surround data is created in the encoding process by comparing the surround mix to the stereo mix. The stereo portion is left intact for systems without a surround decoder. For simplicity, I'll refer to these as discrete systems.

The HD Radio signal is a data path, and with the development of multicast, this path can be allocated with different bit-rates for different uses. Again, more than one surround system could be implemented and the receiver could detect which process was used for the encoding.

Fraunhofer's system is touted as being compatible with MP3, AAC, AAC Plus and other codecs. Coding Technologies uses the HDC coder, which it built for Ibiqity.

## Surround around the station

Before a surround signal can be transmitted, stations must be able to work with surround content. There are several points along the signal where surround sound can be implemented, but we'll start at the beginning of the audio air chain and move forward.

Creating surround content will likely be the most challenging for any station. While music may be

## Case Study: Installing multicast

*continued from page 1*

important to note that those tests happened almost five months ago, before any supplemental audio equipment was available. I did this so that when Harris shipped the supplemental audio equipment—a Flexstar—I could concentrate on the second channel. The one unresolved question is listener fatigue at lower bit rates. I feel confident with the quality of the 64, 48 and 32kb/s audio stream for a variety of music formats.

The Flexstar is simply a streaming audio encoder. We push the stream to our Dexstar exciter via a LAN connection through an E1 fiber optic Intraplex link. The Dexstar accepts the stream, merges it to the main HD Radio stream, and then sends it as one big data stream. The signal coverage is identical to the main HD Radio program signal.

## Room for improvement

There are three important details to be identified. Unlike the main channel audio, when the second channel drops out because of a lack of signal strength there is no analog audio to switch to. This is simply a limitation of the system that can't be improved on. The second issue is the lack of being able to switch bit rates or turn the second channel on and off at will without restarting the exciter. This issue is expected to be fixed in a future Ibiqity software release. The last issue deals with surround sound broadcasting. WGUC has been testing multiple surround technologies and has been involved with the NRSC subcommittee dealing with surround. When broadcasting surround it will be important to maintain the highest bit rate possible. Depending on the system used it will be necessary to use either 64kb/s or 96kb/s to broadcast surround on the HD Radio signal. This is where switching bit rates without restarting the exciter becomes an important issue.

Available multicast receivers are still limited. Kenwood, JVC and Panasonic have the only aftermarket automobile receivers available. Boston Acoustics, Polk Audio and Radiosophy are scheduled to ship tabletop receivers by fall. All of these receivers are now forward compatible and can decode second channel audio. Kenwood has offered to upgrade its older non-compatible HR-100 HD Radio receivers for a nominal fee.

On the Kenwood system, when users tune to a station that has a second channel the display will indicate the second channel by displaying a call sign then HD1 for the main signal and with a push of a button it will say HD2. When the second channel signal is lost the receiver will mute and wait for the signal to return or for the user to change the channel. Using the HD Radio receiver in my car I soon realized that a Clear Channel station in town was on

*continued on page 6*

The *DAB Answer Series* is an ongoing series of supplements that covers the technology of digital audio broadcasting.

*Insight to IBOC - a supplement to Radio magazine*, August 2005, ©2005 Primedia Business Magazines & Media. All rights reserved.

## Open Mic

Every radio engineer has his favorite songs that he uses to adjust a station's processing or to evaluate an audio system's performance. Surround Sound is a newer format, and it can take time to find the works that demonstrate a system's performance.



### What are your top picks for outstanding surround sound productions?

**David P. Reaves, III,**  
*co-owner,*  
*Translantech Sound*

#### **Gacho - Steely Dan**

The clarity of the instrumentation is simply amazing. Singers and instruments seem to leap out of thin air from any direction, then disappear just as magically.

#### **The Beatles Anthology - five DVD set**

I loved them first on AM radio, stereo LP, CD and now in surround on DVD. As each new technology reveals previously unheard layers, the original quality never becomes workaday and flaws never seem to surface.

#### **Band on the Run - McCartney & Wings**

I suspect the 5.1 surround mix is basically the original quad master tapes with a bit of work, but whatever the history, the surround engineering is superb. "Band on the Run" immerses the listener in a sonic fantasyland.



**Frank Foti**  
*Founder and President*  
*Omnia Audio*

#### **Tommy - The Who**

Pete Townshend created a full-blown 5.1 surround mix from the original eight-track masters to add detail and dimension in surround that should not be missed.

#### **Brothers In Arms - Dire Straits**

This masterpiece has been given the Mark Knopfler touch in an astounding 5.1 mix. Using the surround placement augments the subtleties on this recording.

#### **Goodbye Yellow Brick Road - Elton John**

Here's an example where surround stands out. Using the surrounds to place harmony vocals really shows off not only what a great performer Elton John is, but what great production was added to this album. Candle In The Wind offers chills. ♣

## Surround

provided to the station in a surround format, live concerts or other station productions will need surround capabilities. In addition, if any program elements are delivered in surround, station imaging would sound better in surround too, or it will sound flat compared to the program.

The audio production needs for a surround sound studio can be handled by many audio systems today, although some are not broadcast specific. Still, radio console manufacturers are answering this call, as was demonstrated at NAB2005. The router-based broadcast console manufacturers have shown that they are ready to meet this need.

If surround content is delivered to a station, it will need to be encoded into the transmission format being used. All the systems have encoders and decoders to do this. Each audio entry point will need an encoder, as will each audio monitoring point need a decoder.

To encode and decode audio with the matrix and watermark systems, Neural offers the 5225 Upmix decoder and 5225 Downmix encoder; SRS has the CSE-07D and CSE-07 hardware encoders, and CSD-07D and CSD-07 hardware decoders, as well as VST and TDM software plug-ins; and Dolby provides the DP563 encoder and DP564 decoder. Fraunhofer and Coding Technologies do not have commercially available encoders and decoders at this time.

Creating the stereo mixdown from the surround source can be a source of heated debate. The matrix and watermark systems perform this function automatically. The discrete systems can take advantage of using a manual mixdown for the stereo version. While a manual mixdown could maintain some artistic control, the amount of material being encoded may make this step impractical. A compromise will have to be made between the expended effort and the desired result.

Once audio is encoded into the surround format, it must be stored for later playback. The matrix and watermark systems encode to stereo files, so nothing needs to be done to handle the files. The discrete systems create two elements for the audio file. Computerized audio storage systems can easily store and deliver these files. Enco and Broadcast Electronics demonstrated their systems' abilities to deliver discrete surround-encoded audio at NAB2005.

The final step is routing and delivery of the surround content. Again, the matrix/watermark systems are ready to go because of the existing stereo infrastructure. The ability to transmit one of the discrete systems will depend on the facility itself. An analog infrastructure will need to be upgraded.

The discrete-encoded audio is transmitted as a bitstream, but this is not a traditional digital audio stream. Some of the router-based audio systems have demonstrated their ability to carry these signals.

# We're Reshaping The Future Of Radio From A Solid Foundation Of Leadership.



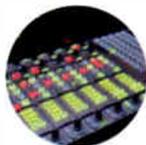
The newest force in radio was forged from a rich heritage of leadership that is decades strong. We're bringing a breath of fresh air and a re-energized spirit to an industry we helped to build. At Team Harris Radio, we've brought together the industry's largest and most comprehensive range of products, services and people dedicated to advancing radio. All working together in perfect harmony and focused on the success of your business. From our innovative products to our forward-looking services, management tools and expert support teams, we're dedicated to our mutual future of pioneering and growth. So whether your audience is around the corner or around the world, Harris Radio is on the air with the resources you need to succeed.

To learn more about the new Harris Radio Team, call us at **800-622-0022** or visit us at [www.broadcast.harris.com](http://www.broadcast.harris.com).

T H E N E W H A R R I S R A D I O T E A M I S O N T H E A I R



AM/FM



AUDIO CONSOLES



DIGITAL RADIO



BROADCAST STUDIO



HIGH POWER AM



SYSTEMS & SERVICE

# Solutions for All of Your IBOC Needs from **ERI**<sup>®</sup>

From the beginning, ERI has been a leader in the research and development of IBOC FM technologies. Join us as we continue to work toward developing new products for this exciting technology.

**NEW**

## LYNX™ Dual Input Side Mount FM Antenna for IBOC Operations

The Electronics Research LYNX™ Dual Input Side Mount FM Antenna is designed specifically for FM IBOC applications. This new antenna is capable of transmitting both the analog and digital FM signals without requiring a high loss hybrid combiner and maintains high isolation between the digital and analog transmitters. The design meets the current Federal Communications Commission requirement for informal notification of IBOC implementation.



## MASK-960 IBOC Spectral Compliance Filter



ERI has developed a compact arrangement of our famous FM 970 band pass filter cavities to address the specific needs of FM IBOC broadcasting. ERI's mask filter configuration can provide the right response for any requirement.

**iBOX**  
High Power Systems

## Low/Medium/ High Power Hybrid Combiners

The quality and reliability of ERI's standard quarter wave hybrids have been adapted for use as an IBOC Hybrid Combiner. The iBOX™ 10 dB Hybrid Combiner is available in two versions:

- Low/medium power version for analog FM power levels up to 30 kW
- High power version which is rated to handle up to 80 kW of analog FM power.



Your Single Source for Broadcast Solutions™

**ELECTRONICS RESEARCH, INC. ERI**<sup>®</sup>

Call Toll-free at 877 - ERI - LINE • Visit Online at [www.eriinc.com](http://www.eriinc.com)

World Radio History



# HD RADIO? I'M GOING WITH MOSELEY.

My challenge is to make the right STL choice for today, as well as for tomorrow.

With Moseley, it's no problem.

Check out their **Starlink SL9003Q-2SLAN**, the first STL to provide AES digital audio and Ethernet data over the traditional 950 MHz band.

Or add a bi-directional Ethernet LAN extension and serial data link to a new or existing STL with the license-free 900 MHz **Lanlink 900D**.

For T1 lines or license-free 5.8 GHz links, the **Starlink SL9003T1** STL/TSL transports bi-directional AES digital audio, Ethernet LAN extension, remote control, and telephones.

Your best connection to the future is a smart STL choice today. Take it from me, Moseley will insure that your station is ready for HD Radio and the new digital services of tomorrow.

Give the digital STL experts at Moseley a call for more details.



## Moseley

Dave Chancey .... 805 968 9621

Bill Gould ..... 978 373 6303

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

# Working separately working together



The two production studios serve as back-up air studios.

chain, and it sets a fixed level on the music. This prevents the voice tracking person from adjusting the audio level in his headphones, a change that will not be made on the air later.

The Audiovault keyboard and mouse are wireless units, which eliminates cord tangles. Because the

keyboard is not needed often, this has proven to be a smart choice because the keyboard is usually needed when a problem arises, which is exactly when the cord is likely to be wrapped around something.

The audio and control trunk cables are terminated on Homaco wiring racks on each end. These hold the punch blocks on one frame that is easier to mount than individual block mounts.

## Moving up

The second floor houses the remaining studios. While the first floor was completely remodeled when the previous tenant left, this space did not see the same construction, but the spaces were updated as needed.

The production studios are similar to the first-floor studios because they were built about the same time. WUBU is automated and can use the production studios to go live.

The WYPW studio is in one of the existing studios from before the rebuild. This station is also automated most of the time, and when it is live, the programming is usually a music mix show. A club DJ setup is installed on the backside of the on-air console. Because the on-air console does not see much use, an Audiotronics 210 was refurbished and put into use.

The last studio built was for WRBR. While the other rebuilt studios use Harris Quick-built furniture, this studio has furniture from

## Design » Build » Installation Radio and Television Studios

Ram Broadcast Systems builds studios for most of North America's major networks, group stations, and news organizations.

Ram offers comprehensive studio design, fabrication, systems integration, and components. Put Ram's 35 years of experience to work for you:

- Studio Design & Fabrication
- Pre-Wired Systems
- Broadcast Furniture
- Switchers
- Metering
- Amplifiers
- Wire & Cable
- Racks
- Accessories
- Used Equipment
- And More!



RAM Broadcast Systems  
[www.ramsyscom.com](http://www.ramsyscom.com)  
**800.779.7575**



Greg Trobridge checks the processing in the rack room, which is a showcase in itself with its clean layout and aesthetic lighting.

Woodline Furniture, a manufacturer based in Michigan. The furniture was designed to look similar to the Quick-built furniture.

The second floor also houses the tech center for the facility. The 10 racks hold all the behind-the-scenes equipment, but this space is far from being simply a practical space. The racks are lit with an overhead spotlight system that makes for an impressive view. Unfortunately, space did not allow for the rack room to be

showcased through a glass wall. The station is located next to a power substation, so commercial power reliability is not normally a problem. When it does fail, the proximity to the substation means that the station's power is restored quickly. As a backup, the broadcast operations have a UPS to power everything needed to remain on the air as well as the office telephone system and computer network. Office PCs have their own UPS systems as they are needed.

### Down the street

The two stations in Elkhart have strong ties to the community. Talk station WTRC particularly wanted to reinforce its importance to the listeners, so a corner showcase studio on the street was designed when its

studios were rebuilt. This studio has several TV monitors to display various news channels, which fits with the station's news/talk format.

This studio is set up with three uses in mind. The console position, at the center of the furniture, is at stand-up height and looks into the corner of the studio toward the street. To the right of this

## 12000 SERIES ... ANALOG CONSOLE

- MODULAR CONSOLE
- 8, 18, & 28 CH MAINFRAMES
- ONLY... \$4,695



12K18-12  
\$4,695 MSRP

WHY PAY MORE  
AND GET LESS ?

970.461.0730

[www.arrakis-systems.com](http://www.arrakis-systems.com)



**Arrakis**

# Working separately working together

position is a cohost position, which is a few steps from the studio door. This allows the cohost, who is usually a news reporter, to quickly enter the studio and deliver his newscast.

The area to the left of the operator is set up for sit-down interviews. This allows the host to be in

a comfortable position with his guests and still have a clear view to the operator and to the outside windows.

The furniture, custom-made by Harris, was designed with open space below to keep the open feel and to eliminate a hard furniture barrier between the station air staff and the listeners watching on the street. The studio also has a high ceiling—about 11 feet—which adds to the open feel.

A talk show with multiple guests requires many mics, and if all the mics are open at once, acoustic problems are likely to occur. In addition, the console has a limited number of inputs. Because of this, an automatic mic mixer, the Shure SCM810, is used. This system automatically mutes mics that are not being used, which improves the audio quality.

It's through this effective use of the available technology that the engineering staff is able to serve the needs of the stations and the separate owners. Because of this cooperation, these Northern Indiana stations have found a way to serve their collective audiences better.



The showcase studio in Elkhart faces the street corner from the ground floor, which gives the stations a close tie to the community.



## Powerful Automation from BSI

Series  
110  
\$9,999



Purchase a system from BSI with the confidence that you're buying years of research into what makes an automation and hard-disk play out system reliable, powerful and versatile. Dell Computers with 3-year on-site warranty, professional AudioScience multi-output sound cards and BSI software make a great combination.

Our team of broadcast professionals installs and configures your system so that everything is ready to run out of the box. We include telephone training to help you get started, and the Series 110 comes with a full year of standard telephone support and software upgrades. For added peace of mind, software mirroring synchronizes your machines, so that changes made on one computer are reflected on the other.

BSI systems are used in stations across the US and around the world.

**Thousands of users have discovered how easy and versatile BSI software really is. Test and try before you buy.**

Broadcast Software International 1925 Bailey Hill Road, Suite A, Eugene, OR 97405  
www.bsiusa.com 888-BSI-USA1 (888-274-8721) info@bsiusa.com

Para el español, llámeda Felipe Chavez, Distribuidor de los E.E.U.U.  
(916) 368-6332 fchavez@ommedianet.com



# Facility Focus

## the technology behind Federated Media

### Inovonics RBDS Encoders



Inovonics offers a range of RBDS encoding products, from the simple Model 702 Mini Encoder to a new Model 713 with TCP/IP network connectivity.

Models 712 and 713 are interactive encoders, connecting directly with station automation to send song title and artist information, station promos and advertising. Dynamic messaging can be scrolled across the receiver faceplate either as scrolling PS and/or as radio text; these independent functions are available simultaneously.

Inovonics has addressed automobile safety with the option of a unique Safe Scrolling mode, which displays text in a less distracting manner, albeit at a slower rate.

[www.inovon.com](http://www.inovon.com)  
831-458-0552

### Comrex Matrix



The Comrex Matrix offers the ultimate in flexibility for remote broadcasts. Whether on regular telephone (POTS) service, ISDN lines or GSM wireless networks, the Matrix can send high-quality remote audio to the studio from virtually anywhere. As a 15kHz POTS codec, the Matrix can connect with all Comrex POTS codecs, and with the optional ISDN module, the Matrix is compatible with most ISDN standards. When the remote site has no phone line, the optional GSM module allows the Matrix to transmit 7kHz audio with an internal GSM wireless phone. Along with the full line of Comrex codecs and telephone hybrids, the Matrix will help your station broadcast great-sounding audio from anywhere.

[www.comrex.com](http://www.comrex.com)  
800-237-1776

### Moseley SL9003Q



Taking advantage of the Starlink's modular platform, Federated Media uses 950MHz STL carriers to convey three FM composite signals sampled at 128kHz. A fourth system is used to feed an AES 44.1kHz sampled AES stereo pair to its transmitter sites. Moseley engineering concentrated on the low-end audio frequency response for both configurations resulting in an STL that allows Federated Media to adjust its digital audio processors for maximum effect. If the station decides to go with HD Radio, the composite audio cards can be exchanged for the AES versions.

[www.moseleysb.com](http://www.moseleysb.com)  
805-968-9621

### Sine Systems MBC-1

The Sine Systems MBC-1 replaces all the various strobe lights and colored beacons that are a part of almost every broadcast



studio. It has 15 inputs for relay contact closures or logic level sources and a single serial output that connects to an electronic message display—typically an inexpensive Beta-Brite display. Each input can trigger a unique message on the display including text and graphics. Multiple message boards can be connected to a single MBC-1. Messages are stored in the display so a single input can trigger different messages on different displays. A factory setup feature can initialize the display with a list of starter messages. The display is fully programmable with a hand-held remote that is included with the Beta-Brite display.

[www.sinesystems.com](http://www.sinesystems.com)  
615-228-3500

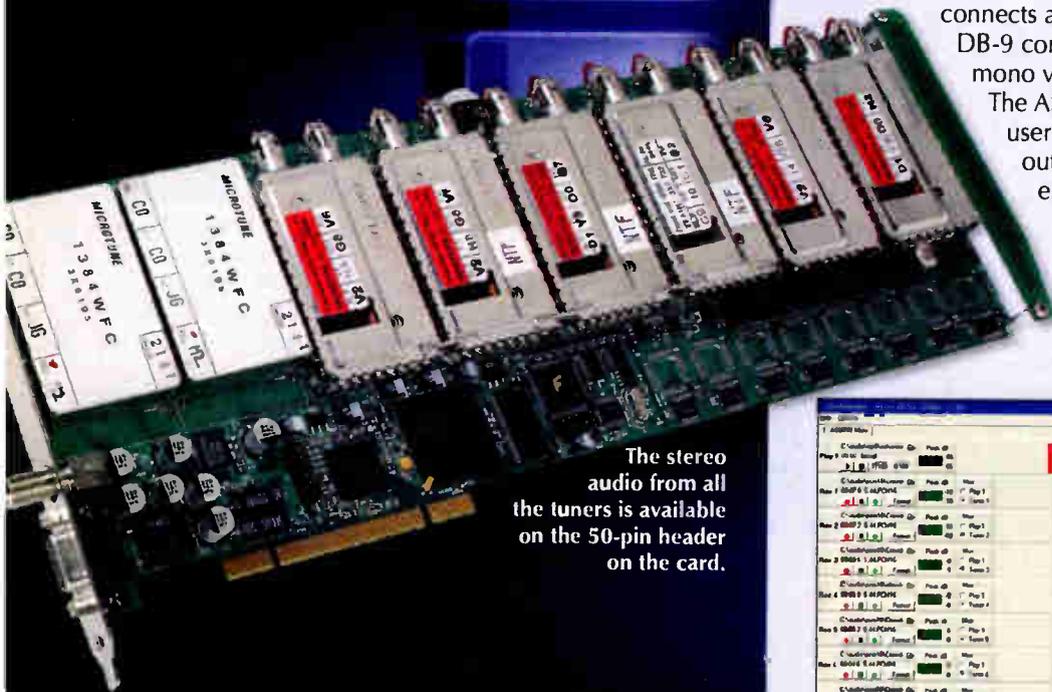
# The 1st annual

## 2004 **Radio**

### Innovative Product

Reader's Choice **AWARD**

# WINNER



The stereo audio from all the tuners is available on the 50-pin header on the card.

Introduced in 2004, the *Radio* magazine Innovative Product Awards were developed to honor excellence in new product development in the radio industry. The awards demonstrate the talent and commitment of the people in every aspect of development at each company, from concept through sales. The entrants were listed in the 2005 *Radio* magazine Buyers Guide that was included in the December 2004 issue.

Manufacturers submitted products in several categories, and the winners were selected through an online form by you, the *Radio* magazine reader. The results were tallied at the end of February, and the winners were presented with their awards at NAB2005. Over the next few months, we will profile each of these winning products.

The 2005 Innovative Product Award entries will be listed in the *Radio* magazine 2006 Buyers Guide, which will be released in December.

# Acquisition

## Audio Science ASI8702

A PCI card with eight AM/FM tuners, the Audio Science ASI8702 receives radio signals and creates a mono or stereo stream from each tuner to the PCI bus. As many as eight cards can be installed in a system. The audio can be sampled at rates from 8kHz to 48kHz.

The AM portion of each tuner covers a range from 520kHz to 1,750kHz. The FM portion covers a range of 76MHz to 109MHz. The stereo decoder is software controlled.

A 75Ω F connector on the card bracket connects an antenna to all the tuners. A DB-9 connector supplies a line-level mono version of each tuner signal.

The ASI Mixer software allows the user to select which tuner feeds output one. Tuners two through eight have dedicated line outputs on the connector. The full stereo signal is available from a 50-pin header on the card. Drivers are available for Windows 2000, Windows XP and Linux.



The tuners are controlled through a software interface.

The tuners are controlled with the ASI Mixer software. This sets the band, frequency and attenuation for each tuner section. The RF input level is also displayed for reference. The display also indicates when the tuner PLL is locked and if there is an FM stereo pilot.

Applications for the ASI8702 include broadcast monitoring and logging, advertising verification and content identification. Other models in the series include the ASI8703 (eight FM/NTSC-TV tuners), ASI8705 (four AM/FM and four FM/NTSC-TV tuners), ASI8712 (four AM/FM tuners) and the ASI8713 (four FM/NTSC-TV tuners). Custom tuner configurations are also available.

# Selector<sup>®</sup>

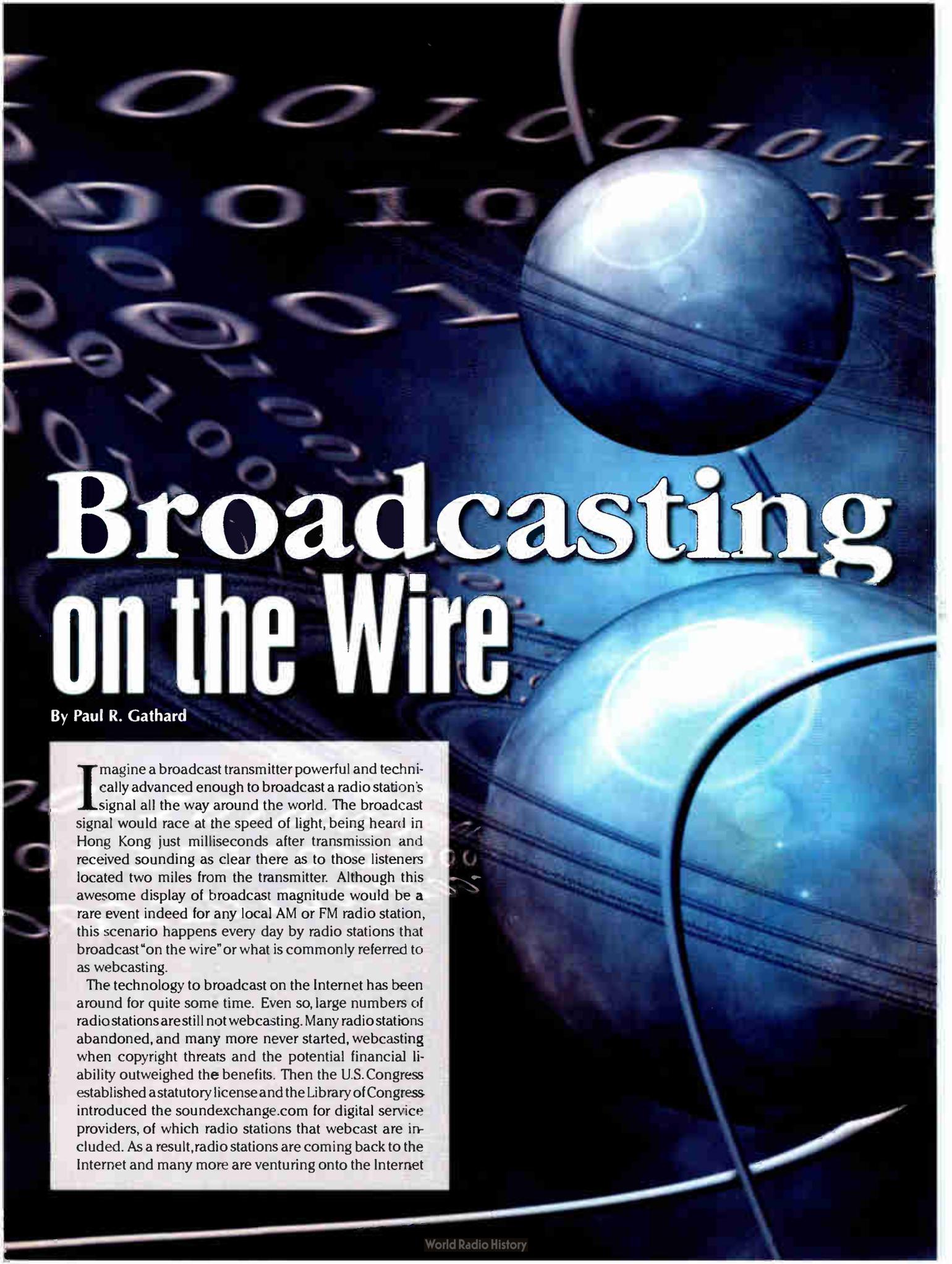
Music Scheduling

The best  
use the  
best.™

"I could not do my job without Selector. Music is the heart of every station I consult and Selector is by far the most reliable, consistent music scheduler available. Plus, RCS Support is the best, bar-none. I've called them in the middle of the night and received instant help."

**Gary Berkowitz**, Consultant  
Berkowitz Broadcast Consulting

**RCS**<sup>®</sup>  
Sound Software<sup>™</sup>  
[www.rcsworks.com](http://www.rcsworks.com)



# Broadcasting on the Wire

By Paul R. Gathard

**I**magine a broadcast transmitter powerful and technically advanced enough to broadcast a radio station's signal all the way around the world. The broadcast signal would race at the speed of light, being heard in Hong Kong just milliseconds after transmission and received sounding as clear there as to those listeners located two miles from the transmitter. Although this awesome display of broadcast magnitude would be a rare event indeed for any local AM or FM radio station, this scenario happens every day by radio stations that broadcast "on the wire" or what is commonly referred to as webcasting.

The technology to broadcast on the Internet has been around for quite some time. Even so, large numbers of radiostations are still not webcasting. Many radio stations abandoned, and many more never started, webcasting when copyright threats and the potential financial liability outweighed the benefits. Then the U.S. Congress established a statutory license and the Library of Congress introduced the [soundexchange.com](http://soundexchange.com) for digital service providers, of which radio stations that webcast are included. As a result, radio stations are coming back to the Internet and many more are venturing onto the Internet

# The Infinite Stream

By Gary Eskow

The Internet has been easy to embrace, and obviously helpful in many ways. But how do Google searches and iTunes translate into advertising revenue? What are the business models?

Infinity, one of the largest radio broadcasters in the country, avoided streaming for years; now it's in the fold. Why? Are there lessons in Infinity's migration to the Internet that others can draw lessons from? Matt Timothy, Infinity's vice president of streaming media provides some answers about these issues.

"Why is Infinity, which has avoided streaming for so long, embracing it now? I don't know the answer, other than to say, why not now?" asks Timothy. "We have a tremendous collection of local brands, and Infinity wants to unlock that value, to extend it to platforms and places where everyone can access it.

"Attracting advertisers targeting localized markets is one strong advantage of streaming broadcasts," said Timothy. "Advertisers are on board, without a doubt. Our initial streaming launch consisted of 12 news stations, and the response from advertisers has been great. Fundamentally, streaming allows us to expand the sales conversations we have with potential advertisers in two ways: we can talk to individuals and companies who haven't been able to afford our services in the past, and we can now offer them a suite of tools that were not available in the past. For example, banners and online spots give advertisers more choices, and more entry points into the markets we provide them with."

When asked if streaming helps Infinity compete with satellite radio, Timothy says, "Let's say that it allows our brands to be heard in more places. Reaching people while they are at work is important, and streaming gives us more shelf space for our brands. We have an aggressive, nimble sales force on the ground, and streaming gives them even more to sell."

Negotiating with AFTRA and other talent unions has been a sticking point for many would-be advertisers on a budget. What is Infinity's position on this ticklish issue? "In any new initiative there are obstacles and challenges to overcome. The potential for this business is big enough that we're addressing the issue you just brought up every single day."

Yes, but there must be a way to provide one layer of spot production for entry level clients, and another that uses top union talent, for national clients with larger budgets, right? "We can accommodate Home Depot, for example, and its desire to appear on our sites, as well as the most local, community based businesses. The conversation we have with talent unions and others is on-going. The cement is still wet on the policies we're developing in this area."

## Technology approach

Ray Miklius, vice president of studio systems for Broadcast Electronics, said that his company has expanded into datacasting products and services. For example, BE provides Sonixstream, an application to allow Internet listeners see the title of a song and information on the artist. The system also provides real-time data for other playback devices, including car radios and table-top units.

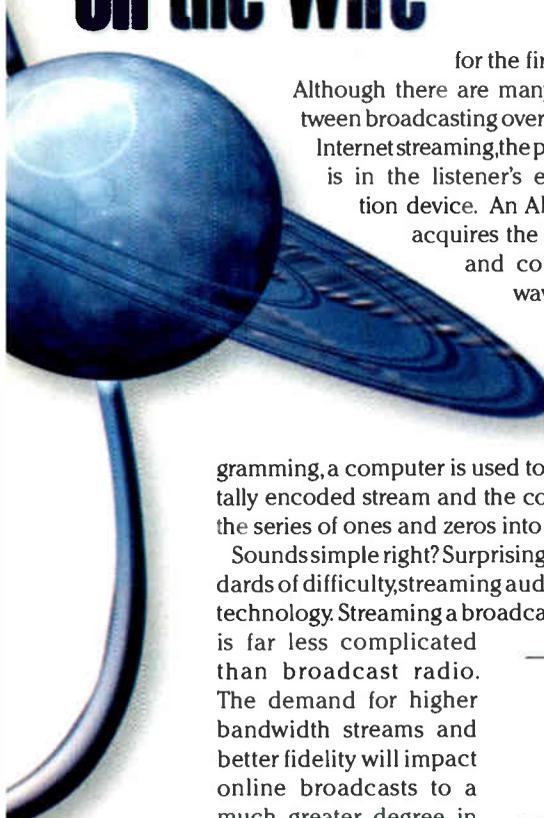
"After the Internet advertising crash of 2001, companies realized



Web tuners, like this one for Infinity's WINS, provide more visual information than radio has previously been able to provide.

Continued on page 59

# Broadcasting on the Wire



for the first time.

Although there are many similarities between broadcasting over the airwaves and Internet streaming, the primary difference is in the listener's electronic reception device. An AM or FM receiver acquires the broadcast signal and converts the radio waves into audio output. When the listener uses the Internet to acquire radio programming, a computer is used to capture the digitally encoded stream and the computer decodes the series of ones and zeros into audio output.

Sounds simple right? Surprisingly, by today's standards of difficulty, streaming audio is fairly simple technology. Streaming a broadcast on the Internet is far less complicated than broadcast radio.

The demand for higher bandwidth streams and better fidelity will impact online broadcasts to a much greater degree in the future, but today the state-of-the-art is still rudimentary in nature. Taking a rather robust broadcast-quality signal and compressing it down to a 16kb/s or 20kb/s stream might make an audio engineer cry. On the other hand, producing a great sounding Internet experience in spite of the signal compression is where a master of the airwaves can really shine.

In any event, the decision to webcast may have already been made or will be made in the near future. So how do you manage the implementation of this wired broadcast technology and integrate streaming into your already demanding responsibilities?

## Getting started

First, you assemble the equipment and software required. You will need a personal computer, an audio capture card and an uninterruptible power supply (UPS). Download the free Microsoft Windows Media Encoder to the webcast personal computer.

You will also need unobstructed access to the Internet with an always-on Internet provider that offers a T-1, DSL, ISDN or cable modem connection.

You will need a static IP address or if you have a dynamic IP connection, you will require the services of a free IP address forwarding service. This is the short list of equipment and software required, but as easy as it sounds the devil is definitely in the detail.

While I focus on the Windows Media Systems technology, other operating systems can be used, such as Real Media, which are similar and may use various algorithms to code and decode the audio. Each codec system has its own strengths and weaknesses.

The subject of which technology is better has caused many an argument among knowledgeable streaming media gurus. We

have chosen the Windows Media System because of the widespread distribution of the Windows Media Player and the non-scientific observa-

---

***Streaming a broadcast on the Internet is far less complicated than broadcast radio.***

---

tion that webcasting in this technology appears to come with a lower overall cost of content delivery (COCD).

Webcasting a live radio program is all about processing speed. The faster the central processing unit (CPU), the better the overall digital output quality and the less likely other applications or running multiple streams will have a degenerating effect on the audio output. A CPU speed of 333MHz should be considered the bare

**Audemat-Aztec**  
Broadcasting Innovation

## A NEW WAY TO THINK ABOUT MONITORING

**HD Radio**  
Pure Digital. Clear Radio.

**GOLDENEAGLE HD Radio Monitors**

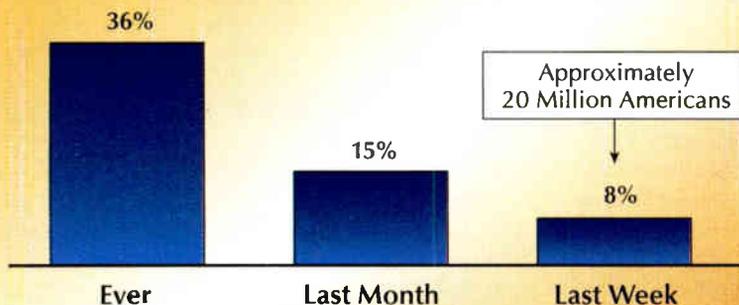
- Continuous monitoring of multiple stations
- Automatic detection and notification of out of tolerance conditions
- Built-in FFT spectrum analyzer as an option
- Analog and digital signal monitoring
- PAD and RBDS data monitoring
- TCP/IP connectivity

More information and demo online at [www.goldeneagle-hd.com](http://www.goldeneagle-hd.com)

HD/AM/FM Mobile metering - RDS Encoding - Remote Control

[www.audemat-aztec.com](http://www.audemat-aztec.com) Miami, FL USA - [ussales@audemat-aztec.com](mailto:ussales@audemat-aztec.com)

## Percentage of Americans who have listened to Internet radio



Source: Arbitron Internet and Multimedia 2005

### Internet radio has an established presence.

minimum requirement for even a single 16kb/s bit-rate stream. I personally recommend a 2GHz or faster processor or even dual processors. I don't think there is such a thing as too fast.

Many stations provide multiple streams to allow dial-up and broadband listeners equal access to the most usable bandwidth. Using higher bandwidth streams and sending multiple streams to the media server may force you to increase the CPU processing speed. I don't recommend taxing the processor at more than a 50 percent usage on a continuous basis. Although other applications and processes will most likely be subordinate to the Windows Media

Encoder output, continuously pushing a processor into 80 or 90 percent utilization is not worth risking the computer locking up and the webcast ending abruptly. Remember, faster is better. The Windows Media Encoder control panel indicates the continuous CPU utilization percentage in real time.

The sound card is the next most important item of equipment in the Internet streaming media configuration. Think of it this way: the transmitter simply pushes a carrier wave loaded with an amplitude-modulated or frequency-modulated signal. The quality of the broadcast audio signal started with the pre-transmission audio electronic equipment long before the signal was loaded onto the carrier wave. The hosted media server is equivalent to an Internet transmitter that distributes the Internet stream to listeners and in this way is similar to a broadcast transmitter. The media server simply takes the signal presented by the WMS encoder and faithfully redistributes the digitally produced output to hundreds or even thousands of online listeners.

If the audio source is clean and a high-quality audio capture card is used, theoretically, the low-bandwidth Internet stream will sound equally great no matter the listener's location on the planet.

I recommend a 24-bit sound card, but you may have to experiment with different brands to find the best integration with the

PC's motherboard configuration. Broadcast automation systems frequently process more than one audio source simultaneously by incorporating multiple processor chips. Likewise, you can stream more than one audio source through the same computer. You may have two separate radio station broadcasts, one station broadcast and an Internet-only side-channel or other multiple-stream requirements.

### Reliable service

One single-processor sound card can encode different bandwidths of the same audio source if you

run Windows XP. Using another Windows operating system, such as Windows 98 or Windows 2000, may require multiple sound cards even if the audio source is the same.

Computer sound cards come in many brands, but for low-bandwidth streaming, high-tech sound cards may mean a much more complex job of system integration and configuration. Some more costly sound cards will not stream at less than 32kb/s.

# High Voltage Rectifiers

## Nobody Knows Them Better Than We Do

Don't pay ridiculous prices to OEMs for replacement rectifiers when we can provide an economical retrofit package that will more than do the job. The Model 51014 package shown is a single-phase, full wave bridge to retrofit all AM and FM transmitters to greater than 15 kilowatts, depending upon modulation method. Rectifier cards are rated at 24 KV per leg at a maximum forward current of 6 amps, suitable for plate supply voltages to 12 KV. Additionally, each diode is protected by both an MOV and a resistor.

**WE HAVE CCA RECTIFIERS**

Quick, Cost-Effective & Expert Solutions



www.rectifiers.com  
800-649-6370



# Broadcasting on the Wire

Microsoft maintains a list of WMS-supported sound cards on its website.

Remember that user statistics still show that just under half of all Internet listeners still use a dial-up Internet service provider. Most dial-up providers, although advertising a 56kb/s bandwidth downlink, rarely connect their customers at more than 19kb/s

to 26kb/s. Consequently, a 32kb/s stream would be unusable by most dial-up listeners. The player would constantly drop out and be overpowered.

If you use a backup power supply to make sure the broadcast stays on the air, connect the Internet modem, router, firewall and Internet streaming computer to the same backup source. You may prefer to install a separate uninterruptible power supply (UPS) for just the webcasting equipment.

The free, downloadable Windows Media Encoder

provides a stream setup wizard that is fairly intuitive and easy to use, but there are a few non-intuitive things to know to get the encoded source stream to a media server for distribution to the world. For example, the multiple bit-rate (MBR) setting will not work for live streaming one-pass radio broadcasts. You will select the continuous bit-rate (CBR) setting and only select one bit-rate stream from the bit-rate pick list.

If you do not use a router or firewall, the Windows Media Encoder will provide the IP address of the encoder installed on the PC. If a firewall or router is used, the encoder will only indicate the IP address of the network or protective device. Consequently, a couple of things must be done to have the Media Server hosting service pull the stream from the webcast PC. Although some hosting

---

***Just under half of all Internet listeners still use a dial-up Internet service provider.***

---

services allow the stream to be pushed to the Media Server, it is a more efficient use of bandwidth to have the hosting service pull the stream. If a router or firewall is used, open the HTTP port to allow the Media Server access to the webcast PC located on the station's network. Read the router or firewall device instructions as to how to open the port.

## Plug and play. Really.



It's not hype—you really can stream audio over 100 Mbps Ethernet with AudioScience's ASI 6416 professional PC sound card with CobraNet. Connecting is as easy as plugging in an Ethernet cable. Since CobraNet is non-proprietary, you'll be able to plug and play with any CobraNet-equipped device. And our ASIroute software allows you to make routing connections on the network without ever touching a wire. For information, call us at 4E-302-724-5221 or go to [www.audioscience.com](http://www.audioscience.com).

- 32 channels of CobraNet I/O
- 8 stereo streams of record and play
- PCM, MP3, Layer 2, MP3 and Dolby AC3 formats
- 99.999% mean time between failures
- Up to 4 cards in one system
- Windows 2000, XP and Linux drivers

**CobraNet**  
The standard of Ethernet

**AUDIOSCIENCE**  
SOUND ENGINEERING  
Since 1982

## THE CHOICE IS CLEAR

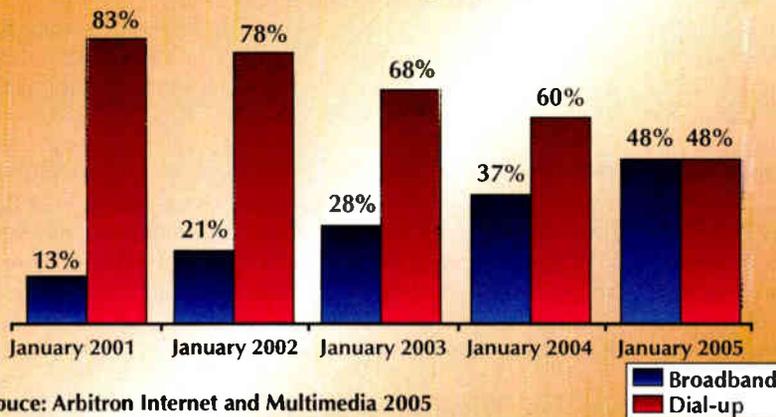
Real-time 3-D mapping, integrated FCC searches, FCC filings and unlimited technical support are just a few of the reasons why thousands of customers around the world trust RadioSoft for their frequency mapping, management and maintenance solutions.

To find out more about RadioSoft products and services, contact us today at **1-888-RADIO9E**.

**RADIO  
SOFT**

THE CLEAR CHOICE FOR SPECTRUM MANAGEMENT.

## Distribution of consumer broadband and dial-up use



While broadband use is increasing, dial-up is still common.

Use the broadcast security provided by the WME software. This will prevent denial of service attacks and keep unwanted intruders from redistributing the signal directly from the encoder.

Once the sound card is installed, the Windows Media Encoder is downloaded and it is possible for a Windows Media Server to access the webcasting PC, you are port ready. Port refers to the HTTP port that is opened to allow the Media Server to pull the signal. The HTTP port default value is 8080, but you can designate your own port numbering strategy just as easily.

### Quality counts

My number one rule of streaming on the Internet is if you don't care what the stream sounds like, don't bother. No one listens to a poor sounding Internet stream unless there is a disaster in his home community and that poor-sounding stream is the only way he can hear what's happening to loved ones or his own property. Strive for listener enjoyment and don't rush to the Internet just to be able to say that a webcast is on the Internet. Some listeners will stay with a station when they are driving on the fringe of a broadcast area, but there is no fringe area on the Internet. Low-fidelity laptop and desktop systems already have a strike against them. Don't let the streaming webcast quality drive listeners away from the station entirely.

Internet Service Providers come in various sizes and quality of service. There is a noticeable difference in the bandwidth and stability of connections so don't think one is just as good as the other. Going cheap is not prudent when it comes to the stream to the Windows Media Server. The station's connection to the server needs to be 5x5. You cannot control how the listener connects to the webcast, but you should make every effort to make the best decision when it comes to the station's only path to the Internet. If the stream to the media server goes down, everyone listening to the

webcast goes down with it. Fast and stable are the two words I use to describe the most important aspects of an ISP. Of course, cost is another important element in the decision. It might be hard to justify a \$300-per-month T-1 line vs. \$26.95 per month for a DSL Internet connection.

If a telephone modem is unacceptable for streaming, then a decision to use DSL to stream the station's webcast should be weighed with great care. DSL providers often don't connect at the fully advertised upload throughput unless the customer complains that something doesn't work correctly. DSL connections are historically less stable than residential broadband hookups.

ISDN and T-1 lines are more stable, but also more expensive. Choose wisely.

Finally, the desired type of IP address is static as opposed to dynamic. A static IP address never changes, but with a dynamic IP address, the Internet service provider recycles its connections when the PC or modem is rebooted, changing the IP address. When this happens the streaming media host will

# Acoustics First<sup>®</sup>

Materials to Control Sound and Eliminate Noise<sup>™</sup>

Sonora<sup>™</sup> Panels

Sonora<sup>™</sup> acoustical panels  
look as good as they sound.

Toll Free

1-888-765-2900

<http://www.acousticsfirst.com>

# Broadcasting on the Wire

lose its connection with the webcast computer and require manual intervention to re-establish the stream.

The way to make a dynamic IP address a quasi-static IP address is with the use of a free IP forwarding service like No-IP.com. These free services provide a host name that the Media Server uses instead of an IP address.

The IP forwarding service tracks any IP address changes and automatically switches the connection for you. Simply request a static IP address from your Internet service provider; however the ISP may have an extra monthly charge for the unchanging static IP address.

Here is a radical means of broadcasting on the wire: go through the air first. If you do not have the extra budget for a webcast PC but you still want to broadcast on the wire, there is a work-around.

Use the PC and Internet connection of someone in the broadcast area who can receive a solid signal from the transmitter. A remote AM or FM receiver can feed the streaming encoder. This is not the ideal method, but it can work.

Wired broadcasting is in its early years and the more you learn about the technology of streaming media the better you will be able to take full advantage of its revenue-generating possibilities. Don't give away potential advertising revenue for the promise of low or no streaming costs. Take control of your Internet presence and run your own streaming media show. Broadcasting on the wire is easy, its local and the Internet webcast is your property. Take control and stream on.

*Gathard is president of Barnabas Road Media Hosting, RC24x7.com, Indianapolis.*

The headlines delivered weekly by e-mail  
Subscribe today at [beradio.com](http://beradio.com)

## Radio Currents

NEW  
FlipJack



**FJ-700**  
Cell Phone  
Interface

Perfect for ball games and  
remote talk shows

**Features:**

- 4 Mic/Line Inputs
- 4 Headphone Jacks
- Connect To Cell Phone
- Connect To Telephone
- Balanced In/Out
- Operates On 3 'AA' Batteries Or Ext Pwr

**More Info:**  
[www.conex-electro.com](http://www.conex-electro.com)



360-734-4323  
800-645-1061

## Custom Broadcast Furniture

Facility Specific Design  
& Fabrication



**High Quality Construction & Materials**  
Laminates - Natural & Exotic Woods - Solid Surface

"Balsys Gets The Jobs That Others Can't Handle" Satisfied Customer

**Affordable Cost**

BALSYS

WOOD ARTS, INC.

Complete Pre-Wiring, Testing,  
& Turnkey Services  
Optionally Available

**Balsys Wood Arts, Inc.**  
930 Carter Road #228 - 234  
Winter Garden, FL 34787  
Tel: 407-656-3719  
Fax: 407-656-5474  
[furniture@balsys.com](mailto:furniture@balsys.com)

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

Continued from page 53

that the level of advertising they received from streaming couldn't support the initiatives that had been undertaken on the Internet, in part because the valuations coming from Internet companies were inflated. Royalty uncertainty was also an issue, and radio seemed ready to disappear from the Internet, from a streaming standpoint," said Miklius.

"The CARP and AFTRA negotiations didn't make things easier for clients. AFTRA, for example, wanted a lot more money for a spot played on the Internet than via terrestrial broadcast, but that just didn't make sense for advertisers. A major push to replace ads came to be. Stations needed to get the union spots off the Internet because they could not afford them."

Miklius added, "To be fair, an important point was reached when customers realized that local transmission at affordable rates brought additional assets into the picture. At that point, new models for monetizing the Internet stream came into being that were more focused, and in some cases, targeted to a quite specific market.

"Everyone's looking for revenue growth, and streaming is definitely more economical than it was four years ago. Bandwidth rates, for example, have dropped significantly. It's great for a listener to have a DSL line for \$40 a month, but when you need lots of bandwidth price becomes an important factor. Not long ago a megabyte of bandwidth cost about \$500 a month. The price has dropped significantly. And now that the fiber has been laid and the infrastructure is in place, rates have dropped by a factor of 10 to 1 over the last three years," said Miklius.

"Traditional radio streams will continue to be viable for many years with Internet streaming simply adding value for advertisers," said Miklius. "Graphics, for example, are obviously not possible with radio, but they can be incorporated into streaming audio in a number of creative ways that will help listeners remember information. Album artwork can be displayed while a song is playing. The Web address of an advertiser, a coupon code or a number of other pieces of information can be displayed as well. A new level of interactivity has been added for the listener. Stations have to sell the value to their advertising base. That's how these services will get properly monetized."

Additional interactivity allows listeners to purchase music online. Likewise, a listener can click to an

advertiser's website if he hears something he likes.

Clearly, the day has arrived when creative ways to use the Internet will result in effective new revenue streams for advertisers at all entry points. Taking this message to mom and pop stores and all the way up to the most visible national advertisers is the next important step for broadcasters looking to profit from Internet streaming. ■

*Eskow is a freelance technology writer in New Jersey, and contributing editor to Radio magazine's sister publication Mix magazine.*

## Product Showcase



### Model DAI-2 Dialup Audio Interface

- perform unattended remote broadcasts
- DTMF operated controller with relay outputs
- fully programmable output on any key press
- momentary and/or maintained relay outputs
- four logic inputs with programmable output
- balanced audio input and output with ALC

# Innovative solutions

 Sine Systems, inc.

615.228.3500

more information: [www.sinesystems.com](http://www.sinesystems.com)

## Expect MORE From Your AM Transmitter



### Armstrong Transmitter X-1000B

Made in USA

1KW HD Radio® ready AM Transmitter for under \$10K

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

Best of all, our customers tell us that the money they save running the X-1000B pays for itself with

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

But, don't take our word for it. Talk to our customers already on-the-air with the X-1000B. Call or email for a users list and decide for yourself why owning this transmitter is a no-brainer.



Tel 315-673-1269 / [sales@armstrongtx.com](mailto:sales@armstrongtx.com) / [www.armstrongtx.com](http://www.armstrongtx.com)

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



## Prism Sound Dscope III

By Doug Irwin

The Prism Sound Dscope III is an easy-to-learn and use analog and digital test set that works in conjunction with a user-supplied PC. The unit itself is 9" deep and 12" wide and therefore can easily have a laptop computer sitting directly on top of it. The Dscope and the computer communicate via a USB cable. All its inputs and outputs reside on front of the unit.

If you are familiar with the Windows operating system (I used XP for this evaluation) then learning how to use the Dscope will be no problem. A series of icons along the top of the display window lead quickly to the controls and test functions.

The "Quick Tour" icon takes the user through the basic functions of the unit. After studying the tour I was able to make use of the equipment's basic functions in about 30 minutes.

The Trace Window is a display that is essentially like that of an oscilloscope,

tests, such as THD vs. frequency and THD vs. level.

This product features an analog and a digital signal generator (AES format) that operate simultaneously. The output signal type includes everything from sine wave to square wave, ramp, burst, white noise, pink noise, simultaneous multiple frequencies and user-defined waveforms. Output levels on the analog generator can be referenced to dBfs or more conventional units such as dBu or dBm. Different signals can be generated in the A output vs. the B output. While the digital output follows the analog in terms of the type of waveform, the user can change the sample rate and word-length independently. As part of the suite of digital tests, the user can also add deviation to the sample frequency (up to  $\pm 1,500$  ppm) and errors and noise to the digital carrier output itself, such as variations in the actual output level, the rise time, jitter, common-mode interference and differential interference. These parameters allow the user to test the effects of lossy cable (for example) on a device's ability to receive and decode an AES data stream.

The signal analyzer side is versatile. With mouse control, the user can switch back and forth between the analog input and the digital input. The most basic analyzer window displays the received level (displayed in dBfs or more conventional units such as dBu), frequency and inter-channel phase. The Dscope includes a Continuous Time Analyzer, which is more like the traditional distortion analyzer. It can display distortion measured in the received signal in terms of dB or a percent. The CTA window also allows the user to add a high-pass and low-pass filter, and band-pass or band-reject filters in the distortion measurement process. In addition to the CTA is the FFT analyzer. The FFT analyzer can perform more complex functions than the CTA, including user-defined measurements from Visual Basic scripts. It can calculate 40 two-channel measurements at once. The CTA window and the FFT window can be displayed at the same time, and look similar. Graphical results of swept measurements using either or both of the CTA and FFT are displayed on the trace window.

The unit also provides a set of monitor outputs that allow the user to monitor the signal being generated or the signal being analyzed. The unit included a headphone output, and four BNC connectors that correspond to the A and B outputs and the A and B inputs.

### Testing, testing

I first used the Dscope to align the analog vs. digital levels of a Moseley digital receiver located at our transmitter site on Cougar Mountain. Because this receiver has two sets of outputs that need to match, the Dscope's ability to quickly switch between the analog and digital inputs, along with the dBfs reference, made the level setting that much



### Performance at a glance

- Uses Windows as the GUI
- Simultaneous digital (AES-3) and analog outputs
- User-selectable digital and analog signal analyzer
- Continuous Time Analyzer akin to standard distortion analyzer
- FFT analyzer performs complex array of tests, including user-defined

but better. The user can look at the scope trace (time domain vs. amplitude) while at the same time looking at an FFT trace (frequency domain vs. amplitude). See Figure 1. This enables the user to study individual distortion products in real-time. The trace window is also used to display the outputs of other swept measurement

easier. This was done as part of an HD Radio installation, and even with the distraction of that project I was able to plug-and-play and to get the Dscope going in about five minutes. Strong RF fields seemed to have no detrimental effect on its operation.

For purposes of this evaluation, I decided to do something just a bit more complicated. The device under test (DUT) in this case was a pair of transmit and receive PT353 and PR353 cards for an Intraplex multiplexer. The PT353 card has digital and analog inputs, and the PR353 has digital and analog outputs. I attached the units back-to-back on

the test bench, and quickly matched the analog and digital output levels. Using the AES ins and outs, I was able to measure THD vs. amplitude sweep followed by a THD vs.

## Prism Sound

<b>P</b>	973-983-9577
<b>F</b>	973-983-9588
<b>W</b>	www.prismsound.com
<b>E</b>	sales@prismsound.com

**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.

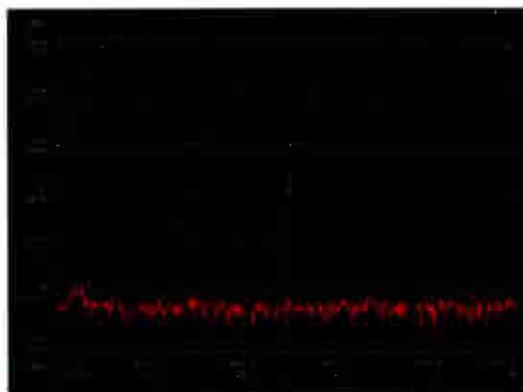
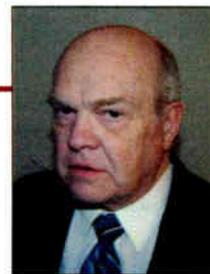


Figure 1. Screen traces can be captured and stored as image files. This is the Trace Window, which looks much like the screen of an oscilloscope.

frequency sweep at -3dBfs. The results are turned out fast and they look good; I was comfortable with the results.

Irwin is director of engineering for Clear Channel Radio in Seattle.

www.beradio.com



## Klotz Digital Aeon

by Gordon S. Carter, CPBE

Have you ever been at a trade show and come up to a booth where you see a sign, "Put your card in the box for a chance to win"? So, you pull out your card, put it in the box and figure that's the end of that. After all, I never win anything.

Well, that is what happened to me at NAB2004. I put my card in the box at the Klotz Digital booth thinking that the grand prize was just too good to really win. Guess what? I won! The grand prize was a

complete Aeon digital audio console.

The console arrived in December, just a week before Christmas. The timing was good because we needed a

### Installation

The console consists of three major components: the control surface, an electronics frame and a power supply. In addition, a USB keyboard and mouse, and a cable to connect the control surface to the electronics module were in the package. All documentation is on a CD-ROM. The power supply is a 2RU cage with what appears to be a conventional computer power supply inside. It has a captive cable that connects to the electronics card cage.

The electronics frame is the heart of the system. Our unit came configured with one eight-input analog card, one eight-input digital card, one eight-output digital card and two eight-output analog cards. In addition, two DSP cards were included that are required for operation of the unit. The unit has connectors for a VGA output, PS2 keyboard and mouse, USB connectors, RJ-45 and several other connectors normally associated with a computer. All analog and digital audio input and output connections are on 15-pin DB connectors. Some of the connectors on the unit are noted in the manual as not being used. A 36-pin DB connector is also included for GPI input and output connections.

The control surface connects to the electronics frame with a 15-pin DB cable. The control surface in our configuration consisted of three four-fader channel modules and a master/monitor module. The system will support two to five channel modules. The modules may be separated for more flexible control room layouts. The control surface has a clean, low profile, high-tech look. The only thing we had to add to the system was a monitor. We chose a 17" black, flat screen monitor to complement the look of the control surface.

I began by planning the installation. While the total number of inputs and outputs was no problem for our small control room, it did take some thought to make sure we had enough analog inputs for those devices that require it. For instance, DAT machines with AES outputs were no problem, but we needed to reserve space for our remote inputs, cassette machines and analog tape. (Yes, we still sometimes need to play those through our system.) I used a spreadsheet to help outline the inputs and outputs. Once I had this figured out the next step was to set up the software of the console.

The software was intuitive and easy to use once I had gone through the procedure in the setup manual. The software allows you to assign labels to the various inputs and outputs. The input labels show up on the control surface as the inputs are assigned to the channels. Once the keyboard and mouse are removed (you can also perform the setup with a computer connected to the RJ-45 connector) users cannot change the setup. Each output can be assigned to one of the seven buses in the console

new console in a small production room. The early music production digital console no longer fit our needs. We needed more output channels than the old console could provide. In particular, we needed to create a mix-minus, which was difficult to do in a way that semi-skilled operators could understand.

### Performance at a glance

- Dynamics and EQ control for each channel
- Extensive mix-minus capabilities
- Level meters for all busses and selected inputs
- Cost effective, router based system
- 16-character channel name displays
- Low-profile (1") design
- Table-top mounting
- Split or straight console options
- GUI-based setup



(two of them are mono for mix-minus uses) or one of the four monitor channels.

Users have the ability to change which input is assigned to which fader channel, as well as the more typical user functions on an audio console. However, the real power of this console appears when you press the select button for any channel. The EQ and dynamics control window pops up on the monitor display. The EQ has a high and low frequency shelf function, as well as two full parametric sections. The dynamics section has a compressor and expander with full control including an "over-easy" option. The

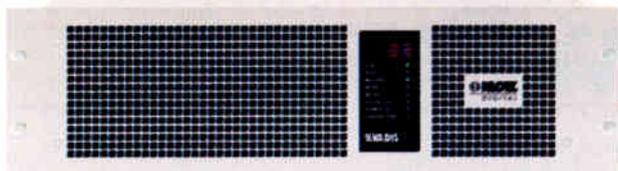
## Klotz Digital

<b>P</b>	678-966-9900
<b>F</b>	678-966-9903
<b>W</b>	www.klotzdigital.com
<b>E</b>	sales@klotzdigital.com

**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.



The Vadis frame handles all the audio functions of the console.

monitor section can independently control the four monitor channels for source selection and volume. An auto-cue function can be activated to allow instant monitoring of channels put in cue without playing with the monitor controls. Two of the monitor channels can be ganged so one follows the other. This is useful when you want one to feed monitor speakers and the other to feed headphones.

While the console can save several snapshots of the controls, there appears to be no way to lock them so a user cannot change them inadvertently.

The console has several other features that would be useful in an on-air situation that we are not using, such as the ability to control other devices from the console controls.

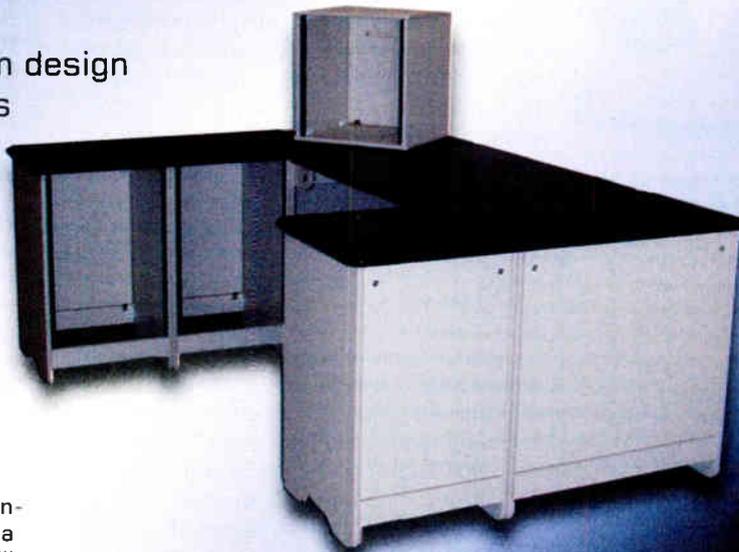
This is a flexible system that would be at home in most radio stations.

Carter is chief engineer of WFMT, Chicago.

www.beradio.com

## RADIUS-XP STUDIO FURNITURE

- plastic surface & trim design
- highest quality materials
- modular for flexibility
- precision crafted
- professional features
- many options available



**T**his studio furniture line is engineered for studio decors where non-wood trims are a design goal. Available in a wide variety of colors, this furniture will complement any size market application. The modular design enables the furniture to be ordered in almost any configuration that can be imagined.

970-461-0730 www.arrakis-systems.com

only \$2,995



Arrakis

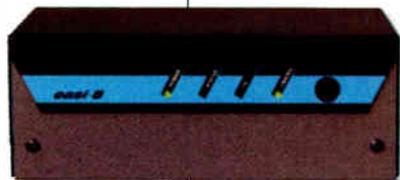
# New Products

By Kari Taylor, associate editor

www.beradio.com

## Remote monitoring WIT

Easi-8: By connecting this Ethernet-based remote monitoring and control system to a LAN hub, concentrator or Ethernet switch, the system can be accessed from almost anywhere in the world. A unit will monitor eight inputs and each input can be individually set as metering (voltage monitoring) or status (binary).



Multiple units can be tied together via the software control panel. The unit can make ac or dc measurements of zero to 160V with auto-ranging or user defined scales at 1, 4, 16, 64 or 256V. It can also measure an ac frequency range of 20 to 400Hz.

801-326-1300; [www.witinc.net](http://www.witinc.net); [info@witinc.net](mailto:info@witinc.net)

## Cordless, rechargeable headphone AKG



K206: This wireless UHF stereo headphone system uses a PLL-synthesized radio section that delivers a signal as far as 150 feet away, penetrating walls and floors. The transmitter operates in the 914 to 916MHz range. Three selectable channels enable it to side-step interference. The head-set receiver offers an auto-tune feature. The product's three-in-one transmitter integrates the storage cradle and battery charger. The system comes with high-current rechargeable batteries that will deliver about 15 hours of operation when fully charged. The transmitter can be used with several headphones.

615-620-3800; fax 615-620-3875; [www.akgusa.com](http://www.akgusa.com); [akgusa@harman.com](mailto:akgusa@harman.com)

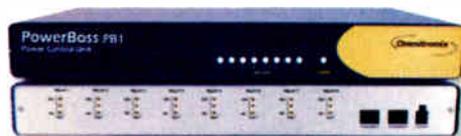
## GPS time Broadcast Tools

Time Sync Plus: The equipment provides four GPS time referenced outputs. The first is a SPST relay, which pulses at 54:30 each hour and is user programmable for any minute and second each hour. The second output is an active high driver with a 100ms pulse every second, while the third output is a 4,800 baud, RS-232 serial port. The fourth output will provide an active high driver in two serial time code formats. Indicator LEDs are provided to display power/valid GPS data, programming mode and time sync relay operation.

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

[www.broadcasttools.com](http://www.broadcasttools.com); [btu@broadcasttools.com](mailto:btu@broadcasttools.com)

## Remote power controller Omnitronix



Power Boss PB1: The first in a new line of power-management products, the PB1 control unit allows the individual power-cycling of eight pieces of equipment—such as routers, servers, transceivers, amplifiers and air conditioners—at the mixed voltages commonly found in remote and local sites. Control sites via its mechanical relays that handle ac or dc current to 10A at 60Vdc or 277Vac. The controller is available in rack mountable form, weighing 5.5 pounds and measuring 14.25" x 1.75" x 7.8". Power requirements are 24Vdc to 60Vdc, with an operating temperature range of zero to 40° C.

206-624-4985; fax 206-624-5610

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

## On-air processor Orban



Optimod-FM 5300: This processor provides five-band and two-band Optimod processing in a 1RU package. The processor's built-in stereo encoder, AES/EBU digital inputs and outputs and analog I/O provide connectivity. Tight band limiting to 15kHz allows uncompressed digital STL to pass processed audio from studio to transmitter. The processor features three remote control ports: GPI contact closures, RS-232 serial and built-in Ethernet for TCP/IP networks. Built-in clock-based automation allows for automatic daypart processing.

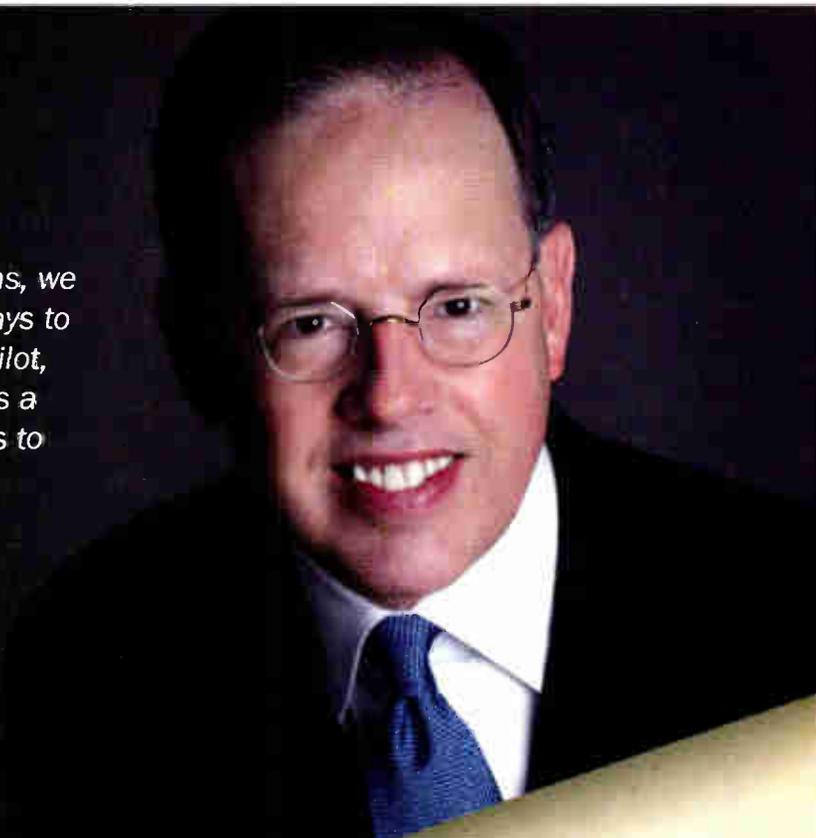
510-351-3500; fax 510-351-0500; [www.orban.com](http://www.orban.com); [custserv@orban.com](mailto:custserv@orban.com)

## Upgrades and Updates

Orban has released Opticodec-PC Streaming Encoder Version 2.0. This version features a new mid-cost SE (standard edition) and adds several features to the existing PE (professional) and LE (light) editions. ([www.orban.com](http://www.orban.com))... **Scheduall** has released version 4.46 of its scheduling and resource management software suite, including Scheduall, Schedulink and Newsplan. ([www.scheduall.com](http://www.scheduall.com))... The **Axia Smartsurface** version 2.5 software has been released. The primary update to the software adds compression, de-essing and a noise gate to mic channels. ([www.axiaaudio.com](http://www.axiaaudio.com))... **Radiosophy** has added a USB port to its Multistream HD Radio receiver. This inbound-only service port will eliminate the need to return the unit to the manufacturer for software updates. ([www.radiosophy.com](http://www.radiosophy.com))... The **A-Ware Software** has released version 2.0 of its Musicmaster for Windows music scheduling software, which adds a real-time studio editor, a trivia editor, manual-assist scheduling, a custom separation wizard, external library synchronization, segue preview and new schedule editor tools. ([www.a-ware.com](http://www.a-ware.com))... The **Henry Engineering** Studiodrive is now available with a USB interface, which allows it to be used with any computer without a sound card. ([www.henryeng.com](http://www.henryeng.com))

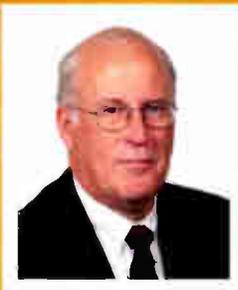
"While we all have to operate our stations, we also need to budget time for learning ways to evolve and improve them. At Jefferson-Pilot, our people use The NAB Radio Show® as a break from the regular, day-to-day issues to spend time on the future. The Show's convergence of great minds and the latest technologies — all in one place — affords our teams the opportunity to network, see and learn new things, and invest in upgrading and advancing our business. The Show is also a great reminder of just how exciting and powerful our medium is."

**Don Benson**  
 President, Radio Division  
 Jefferson-Pilot Communications  
 Atlanta, GA



Rally  
 Around Radio!

Listen. Learn. Profit.



**Radio Luncheon**  
 Friday, September 23  
**John F. Dille III**  
 President and Chief Executive Officer  
 Federated Media  
 NAB National Radio Award Recipient

Luncheon Sponsored by  The Advantage of ASCAP



**NAB Marconi Radio Awards**  
 Reception, Dinner & Show  
 Thursday, September 22  
**Delbert McClinton**  
 BMI singer/songwriter

Co-sponsored by 

**SEPTEMBER 21-23, 2005**  
**PENNSYLVANIA CONVENTION CENTER**  
**PHILADELPHIA**

**THE NAB**  
**RADIO**  
**SHOW®**

 **2-FOR-1**  
**REGISTRATION**

Special offer for  
 NAB Members Only!

Register and Book Your Hotel Rooms Online Today!  
[www.nab.org/conventions/radioshow](http://www.nab.org/conventions/radioshow)

# Reader Feedback

www.beradio.com

## Notes on NRSC-5 and IBOC

**W**hen the FCC asked for comments on NRSC-5, we asked readers to share some of their thoughts with us. The response was overwhelming. Like the comments received by the FCC, there are mixed feelings about the technology and the standard.

I filed a brief comment to the FCC saying that the extended hybrid FM option should allow use of the S2 sidebands (69–101kHz) if the station would give up use of its analog SCAs. I estimate that this would extend the data budget in the hybrid mode by about 48kb/s to an option of 192kb/s. If interference with the main analog FM signal is a concern then a guard band between the analog and digital carriers could be established by slightly reducing analog modulation. This gives broadcasters the tradeoff similar to what happens with analog SCAs: a slight reduction in loudness for more service options.

Am I right to think that many broadcasters would take the trade, especially if a successful business model can be established for use of this option? As a public broadcaster it might mean, for example, that we could offer the enticement of special services (two or three multicast channels instead of just one) offered by subscription on this extended bandwidth in return for a premium level of pledge. Many other options are possible (such as more extensive audio on demand) which do not fit into the 144kb/s budget of the extended hybrid mode as it is now proposed but would be possible at 192kb/s. Those options would not have to be put off into a distant all-digital-mode future if digital bandwidth was increased in the extended hybrid mode. Let's call this option super-extended mode. A station would then have options of 96, 144, 192 or 288kb/s (all digital) and could move in more appropriate and achievable stages toward the all-digital mode. In fact, I think the rules should give us as much flexibility as possible in choosing between analog and digital bandwidth. If a station was willing to downgrade its analog signal even more, let us say go to a 12kHz mono and

reduce its analog modulation 6dB to get another 48kb/s of digital bandwidth, then the rules should be flexible enough to accommodate that possibility too. I would like to see a graduated transition where as the digital bandwidth becomes more used and generates more services and revenues, the analog signal gracefully degrades and finally disappears. What's wrong with that vision?

*Tom Ammons  
broadcast technician  
WQED-FM  
Pittsburgh*

This is a technology that will financially ruin small town stations such as mine. We are unable to pay the \$5,000 licensing per station now, much less the higher fees later. Then we are faced with the upgrade in equipment to broadcast IBOC. Again the financials do not work.

Overall, we estimate that if we licensed today that the cost would be in the range of \$125,000. In a market that barely breaks even, how could we possibly handle this financially?

I posed this question to the IBOC people at NAB. The ultimate answer was, "we do not expect the small market to make this move." What then do we tell listeners who have ordered cars with IBOC radio and want to listen to IBOC? The simple answer is, "we lose!" No more listener.

Then there is the engineering and maintenance issue. How do we perform these functions when there are no qualified engineers available?

These are legitimate concerns for small operators. The entire IBOC thing appears to be driven by the large multi-station groups.

*Tommie Dodd  
president/GM  
KQIK-AM/FM  
Lakeview, OR*

If you go back in broadcast history to the days of yesteryear, TV and FM stereo were technologies that were not proprietary. I believe the inventor of TV wanted to patent the technology but never before IBOC has that been allowed to happen.

So here comes Ibiqity with IBOC. According to the trades if you signed on last year it was \$5,000 but if you wait a couple of years it will be \$25,000. Then they said you would have to pay a license fee just like your ASCAP and BMI at the prevailing rate to "reup" or whatever you want to call it. The trades said Ibiqity gave Clear Channel unnamed incentives and the head engineer at Clear Channel is on the NRSC board. I don't know all the details

**comments?**

radio@primediabusiness.com

but this doesn't pass the smell test. As my grandmother would say, "There's something rotten in Denmark."

So Clear Channel is pushing for 6kHz music audio to diminish sidebands but I personally can hear IBOC hash when I tune my car radio to 1380 in Columbia, SC, which is five or six miles away from Clear Channel's WCOS-AM 1400. Why 1380? Because I own a simple country station doing live radio with real people (imagine that) not that far away broadcasting on 1380 AM in Bishopville, SC.

So the technicals look doubtful, and the money trail? It will make your head spin. Is this pathetic drama going to have the same sad conclusion as Braveheart? Mel Gibson playing William Wallace got pulled apart on the rack in the end. Are you with me? We've got to stop this evil thing.

*James D. Jenkins  
owner/GM  
WAGS Radio  
Bishopville, SC*

## Find the mic winner June issue

Congratulations to

### William Sullivan

of Mega Communications of Altamonte Springs, FL. His name was drawn from the correct entries for the June issue. He won the Pauly Superscreen pop filter from Transaudio Group.



The mic icon was above the 0 in "NAB2005 in review."

**TRANSAUDIO  
BROADCASTING**

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

No purchase necessary.  
For complete rules, go to [beradio.com](http://beradio.com).

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

# Remote Broadcast Solutions!!!



## MicTel - Mic/Line to Telephone Interface

- Outputs & Inputs for telephone handset, cellular phone or balanced line level at up to +10dBm.
- Operates up to 36+ hours on two 9V alkaline batteries.
- High quality, user-switchable, internal limiter prevents clipping.
- External power input with silent, auto-switching battery backup.
- Individual gain controls for send, receive and headphones levels.

**CircuitWerkes, Inc.**  
352-335-6555  
2805 NW 6th Street,  
Gainesville, Florida 32609, USA



## TelTap - Pocket-Sized Manual Telephone Coupler

- Can be used as a phone tap or a passive manual telephone coupler.
- Send or receive telephone audio.
- Mute Switch disconnects all audio to or from the phone line, but leaves the TelTap connected.
- Compact size & low cost makes the TelTap a great remote kit addition for main or backup capabilities.

**Get info on these & other  
great remote products at  
[www.circuitwerkes.com](http://www.circuitwerkes.com)**

Buy simplicity,  
reliability and service.

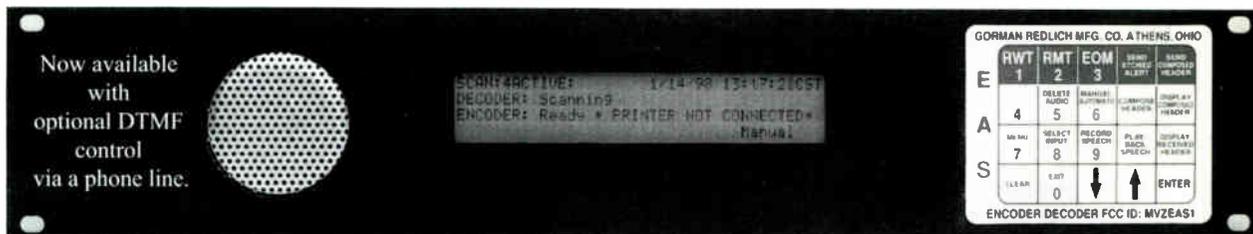
**EAS**  
Price \$1750.00

Equipment in-stock  
for immediate delivery.

Phone 740-593-3150

**GORMAN-REDLICH MFG. CO.**  
257 W. Union St. Athens, Ohio 45701

FAX 740-592-3898



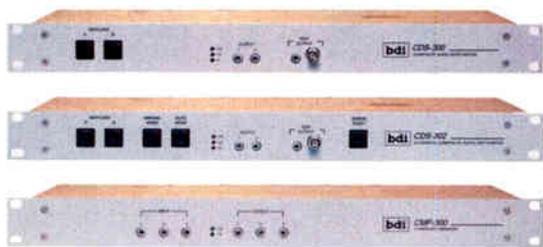
- 5 two-way RS inputs/outputs for computer, remote signboard & character generator
- 6 audio inputs on standard models. All audio inputs & outputs are transformer isolated from encoder-decoder board
- Automatic interruption of program audio for unattended operation
- 4 line 40 character LCD display with LED backlighting
- 20 key keypad to program unit, set modulation level, set input levels
- Now available with optional built in character generator which can crawl alert messages and station ID on the hour
- Will handshake with automation equipment
- 2 year warranty
- 2 minutes of digital audio storage
- 25 pin parallel printer port for external printer
- 52 terminals on the rear to interface with other equipment by removable plugs
- BNC fitting with 600 OHM balanced audio cut for second transmitter

Web Site: [www.gorman-redlich.com](http://www.gorman-redlich.com) • E-mail: [jimg@gorman-redlich.com](mailto:jimg@gorman-redlich.com)

• Also available: weather radios, antennas for weather radios, crystal controlled synthesized FM digitally tuned radios, remote signboards, cables for interconnection, Character generators.

## Broadcast Devices, Inc.

### Got composite, need AES?



Our solutions to composite distribution include the **CDS series composite audio switchers** and the **CMP-300 Composite Audio Mixer/DA**. Use your existing composite STL or stereo generator to drive AES input exciters with our new optional CTD-1 plug in module for the CDS series switchers! **Don't buy an external silence sensor either!** We put one in the CDS-302 for you already. **We have the total solution for your distribution needs!** We provided an RBDS loop through for application of RBDS to two exciters with one generator!

### The Total Digital Solution...



Today's digital broadcasting environment calls for a **digital solution**. The AES-302 features a two input digital switcher with automatic switching upon silence or digital errors. Digital radio means you need more outputs than ever. That's why we incorporated a four output digital DA in the AES-302. We didn't forget about analog either. There is a high quality analog output of the selected input available too. Many solutions in one package make the AES-302 indispensable for your transmitter or studio switching.



**Broadcast Devices**  
(P) 914.737.5032  
(F) 914.736.6916  
[www.Broadcast-Devices.com](http://www.Broadcast-Devices.com)

# Transcom Corporation

## AM & FM Transmitters

Fine Used AM & FM Transmitters

Authorized Representatives for all major equipment manufacturers

### USED FM TRANSMITTERS

2.5 KW	1984	Continental 814R
3.5 KW	1992	Harris HT 3.5
5 KW	1982	Harris FM 5K
6 KW	1995	Henry 6000D
10 KW	1980	CCA 12,000E
10 KW	1988	Harris HT-10
10 KW	2001	Henry 10,000D-95
20 KW	1978	Collins 831G2
20 KW	1991	Harris HT-20
25 KW	1980	CSI T-25-FA (Amp)
25 KW	1982	Harris FM25K
30 KW	1986	BEFM30A
50 KW	1982	Harris Combiner

w/auto exciter- transmitter switcher

### USED AM TRANSMITTERS

1 KW	1983	Harris MW1A <b>solid state</b>
1 KW	1986	Harris SX1A <b>solid state</b>
5 KW	1985	Continental 315R-1
5 KW	1996	Harris Gates 5 <b>solid state</b>
5 KW	1982	Harris MW5A
12 KW	2000	Nautel XL 12 <b>solid state</b>
50 KW	1985	Continental 317C2

### EXCITERS

Used Continental 802B  
 \*New\* 20 and 30 W synthesized exciters

Please go to our web site for updated listings  
[www.fmamtv.com](http://www.fmamtv.com)

Retuning & Testing Available  
**CALL US FOR A QUOTE !**

800-441-8454    215-938-7304    Fax 215-938-7361

### NEW TV TRANSMITTERS

**Special Discount Pricing On:**  
 VHF and UHF TV Antennas  
 (10w to 10kW)  
 TV STL

### USED TV TRANSMITTERS

10kW VHF NEC PCN 1213  
 30kW UHF RCA TTU-30A

### USED MISC. EQUIPMENT

Bird Test Load, 25 KW  
 Termaline, 50S  
 Bird RF ThruLine Wattmeter, 50S  
 Denon 720R Cassette Player  
 Orban Optimod FM 8200 Digital  
 Audio Processor  
 Potomac Phase Monitor AM19  
 w/sampler  
 Potomac Phase Monitor  
 1901 Digital 2-tower  
 Sola Voltage Regulator 60hz  
 1KVA s-phase



## Simply Simple.

Call or visit us online



New Products  
 New Technologies  
 New Suppliers  
 New Catalog Every 90 Days!



a company

(800) 346-6873    [www.mouser.com](http://www.mouser.com)

Mouser® and Mouser Electronics® are trademarks of Mouser Electronics, Inc.

Gallery Radio

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



Our client list continues to grow.  
 We would like to Thank-You  
 for your confidence and your  
 purchases.

We now have in stock, SHURE, SM-5B, wind screens.  
 These are from the OEM vendor and are priced at  
 \$60.00 per set. Make the best voice over microphone,  
 new again!

We recondition Pacific Recorders BMX I-II-III, AMX,  
 ABX and RMX mixing consoles. Let us re-work your  
 console's modules. Obtain that added value from a  
 proven winner. Quality built products last and last and  
 last!

Check our WEB site for great buys on pre-owned  
 broadcast gear. All equipment is repaired, tested and  
 shipped with the manual.

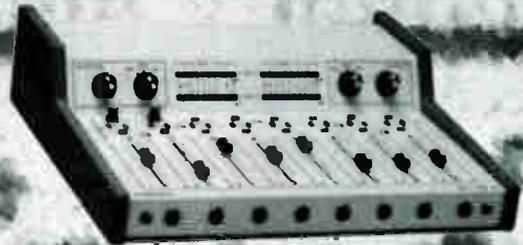
Stretch your broadcast \$\$\$ on quality, pre-owned  
 equipment... sold with a warranty.

TEL 800-300-0733 • FAX 231-924-7812  
[WWW.MOORETRONIX.COM](http://WWW.MOORETRONIX.COM)

# Mini Mix 8A

## Proven...Affordable...

# Reliable.



# AUT@GRAM

## 800.327.6901

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

# Nexus Broadcast

Quality Equipment, Low Price

**NEW FOR 2005!**

**950 Mhz  
Composite STL**

**Digitally Tuned**

**Composite &  
Mono Input**

30 W FM Exciter	\$ 999
150 W FM Exciter	\$ 1999
150 W FM Amp.	\$ 1099
300 W FM Exciter	\$ 2499
300 W FM Amp.	\$ 1999
500 W FM Amp.	\$ 3999
1KW FM Amp.	\$ 6499
2KW FM Amp.	\$11999
950 Mhz STL sys.	\$ 2995

NexusBroadcast.com

**800-219-7461**

**All Exciters  
FCC Certified!**

**Dealers Needed!**

**IN STOCK!**

**FCC Certified  
FM Stereo Transmitter**



**GET ON-THE AIR. STAY ON-THE-AIR!**

- ✓ 50W RF output, continuous duty!
- ✓ Auto protect with auto soft fail & auto restore!
- ✓ Automatic battery backup!
- ✓ Digital display of all parameters
- ✓ Perfect for LPFM and Translators, as well as stand-alone exciters

What's the bottom line? To stay on-the-air! The PX50 was designed with that in mind! Auto monitoring of all parameters, with automatic power reduction and restore on VSWR and temperature errors! No more down time, AND no more trips to the tower site! Plus the PX50 is FCC Certified under parts 2, 73, & 74 (ID: PF3PX50) and Industry Canada approved (IC: 4318A-PX50) so you will never have to worry about non-compliance! **Get on the air QUICK...and STAY on the air, with the PX50!**

Save \$200  
**\$1795**  
New Year Sale  
Ends 3/1/05



RAMSEY ELECTRONICS, INC.  
190 Park Station Drive • Roseton, NY 14564  
800-4-A-RAMSEY • 561-924-6660  
www.ramseyelectronics.com

Providing Value And Performance For Over 30 Years!



**Your #1 Source  
For Quality  
Used Radio  
Broadcast  
Equipment.**

View our latest list of equipment online at:

<http://www.baycountry.com>

or call and we will fax it to you.

All equipment sold with a 15 day return guarantee.

7117 Olivia Rd. • Baltimore, MD 21220 • Ph: 877-722-1031 • Fax: 443-596-0212  
<http://www.baycountry.com> • e-mail: [sales@baycountry.com](mailto:sales@baycountry.com)

For more information on how to advertise in *Radio* magazine's Gallery section, contact a salesperson today!

**Angie Connley**

p: 913.967.7221

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

**Scott Slocum**

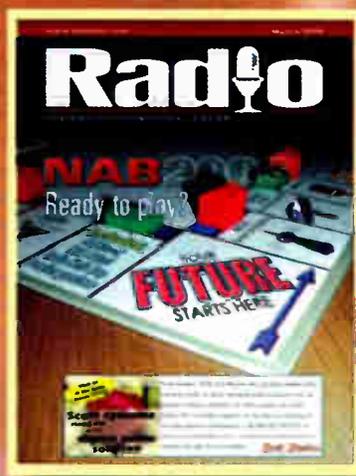
p: 913.967.1358

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

## Get your own copy!

Each month, the *Radio Technology Leader* brings you the latest must-read information about radio broadcasting:

- FCC Update
- Field Reports
- Managing Technology
- New Products
- Trends in Technology
- RF Engineering
- Facility Showcases



THE RADIO TECHNOLOGY LEADER

A PRIMEDIA Publication

**To start your own FREE  
subscription, go to  
[er.pbsub.com/nn5012](http://er.pbsub.com/nn5012)  
and complete the on-line  
application form TODAY!**

**PTK**  
1995 - 2005  
10 Years  
of Service

FM Broadcast  
Solid State  
Power Amplifier &  
Transmitters  
www.ptekpower.com  
1814 Schooldale Drive  
San Jose CA 95124  
408 448 3342  
FAX 408 549 9991

# Erickson Broadcast Sales

35 Years of Broadcast Experience and Support

Buying a new transmitter, console or other broadcast equipment?

**TALK TO US**  
before you write the check!

FM Broadcast Exciters Starting At \$999!

**Erickson Broadcast Sales**  
US Toll Free 1-888-830-8223  
www.ebsradio.com

**MILLIWATTS to KILOWATTS**

Transmitting & Audio Tubes  
Semiconductors

Taylor Motorola  
Eimac Immediate Shipment from Stock Toshiba  
Amperex Thompson  
MA/Com Mitsubishi

• Se Habla Español • We Export

760-744-0700 • 800-737-2787  
Fax: 760-744-1943  
www.rfparts.com

E-mail: rfp@rfparts.com

**RF PARTS COMPANY**

## Broadcast Engineering Propagation Software

Terrain 3D  
Longley-Rice Coverage over 3D Terrain

Professional software packages for FCC applications and predicting coverage.

- Create stunning "real-world" coverage maps and interference studies using Longley-Rice, PTP, Okamura/Hata and FCC with Probe 3™
- Search FM channels under spacings and contour protection using FMCommander™
- Prepare AM skywave and groundwave allocations studies and map FCC contour coverage using AM-Pro™
- Plot STL paths and coverage over 3D terrain with Terrain-3D™

**VSoft COMMUNICATIONS**  
R.F. Communications Software and Engineering Consulting

The leader in broadcast engineering consulting software.

www.v-soft.com 800 743-3684

## OMNIRAX BROADCAST FURNITURE

Custom Image Room Furniture

Force 36 MF

Why Omnirax?

- Excellent collaborative custom design ability, so you get exactly what you want
- Unique combination of style, functionality and ergonomics
- Financial attention to detail
- 15 years of experience
- 100% satisfaction guaranteed

P.O. Box 1792 Sausalito, CA 94966  
800.332.3393 415.332.3392 FAX 415.332.2607  
www.omnirax.com info@omnirax.com

## Chapters

Who you know can make all the difference...  
**Get connected to an SBE Chapter**  
 www.sbe.org • (317) 846-9000

## For Sale

**AcousticsFirst™**  
 Toll-Free Number: **888-765-2900**  
 Full product line for sound control and noise elimination.  
 Web: <http://www.acousticsfirst.com>

## Help Wanted

**Electronics Engineer**  
 NPR seeks an Electronics Engineer for Culver City, CA office to design, construct, install, test, maintain, repair technical equipment, and assist in determining Engineering's purchasing requirements. Two years college/technical school, including analog and digital electronics courses. SBE certification preferred. Three years broadcast and/or recording studio equipment maintenance; ability to troubleshoot to component level; knowledge of drawing and MS Office applications; ability to work independently or on team; work efficiently with tight deadlines; available for rotating shifts; able lifting up to 75 pounds; valid driver's license with good driving record a must.  
**To apply, visit [www.npr.org/about/jobs](http://www.npr.org/about/jobs)**  
 EOE

## Help Wanted

**Logitek**  
 Check out the new Logitek website at [www.logitekaudio.com](http://www.logitekaudio.com)

**Assistant Chief Engineer**  
 Newsweb Radio Group is seeking an Assistant Chief Engineer for its 9 Station Chicago cluster. You need to have a high degree of knowledge with windows 2003 server/XP networked computer operations and olog or other automation as well as be familiar with all facets of AM/FM Broadcast Technical Operations. Candidate should have three years experience in Broadcast Engineering with an IT background and/or certified Microsoft MSCE for 2003/XP.  
 Send resume and salary history to:  
**Michael McCarthy**  
**NEWSWEB RADIO GROUP**  
**6012 S. Pulaski Road**  
**Chicago, IL 60629**  
**No phone calls please.**  
 NEWSWEB RADIO GROUP is an equal opportunity employer.

## Services

**Tennessee Tower Service**  
 AM-FM • Broadcast • Cellular  
 Tower Installation • Antenna  
 Line Installation • Complete Civil Work  
 Blasting • Tower Painting  
 DICK BAIN, Owner M: 1-423-526-9041  
 111 Allen Dr. Ph: 1-423-626-5453  
 Tazewell, TN 37879 Fax: 1-423-626-0552  
 Email: [tn towerservice@yahoo.com](mailto:tn towerservice@yahoo.com)  
**Call about our 2005 tower painting specials.**

## Professional Services

**Structural Analysis**  
**ERI**  
 Electronics Research, Inc.  
 7777 Gardner Road  
 Chandler, IN 47610  
 (812) 925-6000  
[www.ERInc.com](http://www.ERInc.com)  
 REGISTERED PROFESSIONAL ENGINEERS  
 STRUCTURAL ANALYSIS  
 ERI Incorporated 1943  
 TOWER REINFORCING

**Applied Wireless, Inc.**  
 ... providing options.  
 PO Box 926  
 New Market, MD 21774  
 tel.: 301.865.1011  
 fax.: 301.865.4422  
 email: [kevinmc@appliedwirelessinc.com](mailto:kevinmc@appliedwirelessinc.com)  
[www.appliedwirelessinc.com](http://www.appliedwirelessinc.com)  
**AW**  
 Applied Wireless  
 Kevin McNamara  
 President & CEO



A PRIMEDIA Publication

[www.beradio.com](http://www.beradio.com)  
[radio@primediabusiness.com](mailto:radio@primediabusiness.com)

Editor - Chris Scherer, CSRE CBNT, [cscherer@primediabusiness.com](mailto:cscherer@primediabusiness.com)  
 Technical Editor, RF - John Battison, PE., [batcom@bright.net](mailto:batcom@bright.net)  
 Associate Editor - Kari Taylor, [ktaylor@primediabusiness.com](mailto:ktaylor@primediabusiness.com)  
 Senior Art Director - Michael J. Knust, [mknust@primediabusiness.com](mailto:mknust@primediabusiness.com)  
 Art Director - Robin (Morsbach) Metheny, [rmetheny@primediabusiness.com](mailto:rmetheny@primediabusiness.com)

Technical Consultants - Harry C. Martin, Legal  
 Kevin McNamara, CNE, Computers and Networks  
 Mark Krieger, CBT, IBOC, Contract Engineering  
 Russ Berger, Broadcast Acoustics  
 Donald L. Markley, PE., Transmission Facilities

Senior Vice President - Peter L. May, [pmay@primediabusiness.com](mailto:pmay@primediabusiness.com)  
 Publisher - Dennis Triola, [dtriola@primediabusiness.com](mailto:dtriola@primediabusiness.com)  
 Marketing Director - Kirby Asplund, [kasplund@primediabusiness.com](mailto:kasplund@primediabusiness.com)  
 Vice President of Production - Lisa Parks, [lparks@primediabusiness.com](mailto:lparks@primediabusiness.com)  
 Senior Director of Production - Curt Pordes, [cpordes@primediabusiness.com](mailto:cpordes@primediabusiness.com)  
 Group Production Mgr. - Julie Gilpin, [jgilpin@primediabusiness.com](mailto:jgilpin@primediabusiness.com)  
 Production Coordinator - Dana Honn, [dhonn@primediabusiness.com](mailto:dhonn@primediabusiness.com)  
 Classified Ad Coordinator - Mary Corcoran, [mcorcoran@primediabusiness.com](mailto:mcorcoran@primediabusiness.com)  
 VP Audience Marketing - Jerry Okabe, [jokabe@primediabusiness.com](mailto:jokabe@primediabusiness.com)  
 Audience Marketing Dir. - Barbara Kummer, [bkummer@primediabusiness.com](mailto:bkummer@primediabusiness.com)  
 Audience Marketing Mgr. - Sonja Rader, [srader@primediabusiness.com](mailto:srader@primediabusiness.com)

### MEMBER ORGANIZATIONS

Sustaining Member of:  
 • Acoustical Society of America  
 • Audio Engineering Society  
 • Society of Broadcast Engineers  
 Member, American Business Media, The Missouri Association of Publishers



missouri association of publishers

### PRIMEDIA

Business Magazines & Media  
 President - John French, [jfrench@primediabusiness.com](mailto:jfrench@primediabusiness.com)  
 COO - Andrea Goldschlager, [agoldschlager@primediabusiness.com](mailto:agoldschlager@primediabusiness.com)

### PRIMEDIA Inc.

745 Fifth Ave., NY, NY 10151  
 Chairman - Dean Nelson, [dean.nelson@primedia.com](mailto:dean.nelson@primedia.com)  
 President & CEO - Kelly Conlin, [kelly.conlin@primedia.com](mailto:kelly.conlin@primedia.com)  
 Vice Chairman & General Counsel - Beverly Chell, [beverly.chell@primedia.com](mailto:beverly.chell@primedia.com)

SUBSCRIPTIONS: Free and controlled circulation to qualified subscribers. Non-qualified persons may subscribe at the following rates (prices subject to change): USA and Canada, 1 year, \$50.00, 2 years, \$95.00, 3 year, \$140.00. Outside the USA and Canada, 1 year, \$65.00, 2 years, \$125.00, 3 years, \$185.00 surface mail (1 year, \$105.00, 2 years, \$205.00, 3 years, \$305.00 airmail delivery). For subscriber services or to order single copies, write to Radio, 2104 Harvell Circle, Bellevue, NE 68005 USA; call 866-505-7173 or 402-505-7173; or visit [beradio.com](http://beradio.com).

POSTMASTER: Send address changes to Radio, P.O. Box 2100, Skokie, IL 60076-7800 USA.  
 ARCHIVES & MICROFORM: This magazine is available for research and retrieval of selected archived articles from leading electronic databases and online search services, including Factiva, LexisNexis, and Proquest. For microform availability, contact ProQuest at 800-521-0600 or 734-761-4700, or search the Serials in Microform listings at [proquest.com](http://proquest.com).

REPRINTS: Contact FosteReprints to purchase quality custom reprints or e-prints of articles appearing in this publication at 866-436-8366 (219-879-8366 outside the U.S. and Canada). Instant reprints and permissions may be purchased directly from our website; look for the RSiCopyright tag appended to the end of each article.

PHOTOCOPIES: Authorization to photocopy articles for internal corporate, personal, or instructional use may be obtained from the Copyright Clearance Center (CCC) at 978-750-8400. Obtain further information at [copyright.com](http://copyright.com).

PRIVACY POLICY: Your privacy is a priority to us. For a detailed policy statement about privacy and information dissemination practices related to Primedia Business Magazines and Media products, please visit our website at [primediabusiness.com](http://primediabusiness.com).

EDITORIAL, BUSINESS and CORPORATE OFFICE: Primedia Business Magazines & Media, 9800 Metcalf, Overland Park, KS, 66212; 913-341-1300; [beradio.com](http://beradio.com), [primediabusiness.com](http://primediabusiness.com).

Copyright 2004, PRIMEDIA Business Magazines & Media Inc. All Rights Reserved.

### LIST RENTAL SERVICES

**Mario Briganti**  
 Walter Karl  
 Phone: (845) 732-7054  
 Fax: (203) 778-4839  
[mario.briganti@walterkarl.infousa.com](mailto:mario.briganti@walterkarl.infousa.com)

### EDITORIAL REPRINTS

**FosteReprints**  
 Phone: (866) 436-8366  
 (219) 879-8366

# Sales Offices

## Regional Sales Manager East

**Angie Connley**

Phone: 913-967-7221 Fax: 913-514-6852

E-mail: aconnley@primediabusiness.com

## Regional Sales Manger West

**Scott Slocum**

Phone: 913-967-1358 Fax: 913-514-3789

E-mail: sslocum@primediabusiness.com

## Europe/UK

**Richard Woolley**

Phone: +44 1295 278 407

Fax: +44 1295 278 408

E-mail: richardwoolley@btclick.com

## Classified Advertising

**Joyce Nolan**

Phone: 610-701-9993

Fax: 610-701-0580

E-mail: jnolan@primediabusiness.com

## Online Sales & Marketing

**Samantha Kahn**

Phone: 212-462-3401 Fax: 913-514-7006

E-mail: skahn@primediabusiness.com



# Contributor Pro-file

Meet the professionals who write  
for Radio magazine.

This month: Multicasting, Insight to IBOC.



**Don Danko,**  
**CBRE, CBNT**  
**VP of Engineering**  
**& Operations**  
**Cincinnati Public**  
**Radio**  
**(WGUC, WVXU,**  
**WVXA, WVXM,**  
**WVXH, WVXR,**  
**WVXC & WVXW)**

Danko joined WGUC in 1997, and the station began building its IBOC plans shortly thereafter. The station's IBOC strategic plan was developed in 1999. On July 26, 2003, WGUC commenced HD Radio transmissions. WGUC began multicasting on June 20, 2005.



**Written by radio professionals**  
**Written for radio professionals**

Radio, Volume 11, Number 8, ISSN 1542-0620 is published monthly and mailed free to qualified recipients by PRIMEDIA Business Magazines & Media Inc. 9800 Metcalf, Overland Park, KS 66212-2216 (primediabusiness.com). Periodicals postage paid at Shawnee Mission, KS, and additional mailing offices. Canadian Post Publications Mail Agreement No. 40597023. Canada return address: DHL Global Mail, 7496 Barh Road, Unit 2, Mississauga, ON L74 1L2. Additional resources, including subscription request forms and an editorial calendar are available online at beradio.com. To order single copies call 866-505-7173 or 402-505-7173.

POSTMASTER: Send address changes to Radio, P.O. Box 2100, Skokie, IL 60076-7800 USA.

# Advertiser Index

	Page Number	Advertiser Hotline	Advertiser Website
Acoustics First	57	888-765-2900	www.acousticsfirst.com
AEQ	15	954-581-7999	www.aeqbroadcast.com
Armstrong Transmitters	59	315-673-1269	www.armstrongtx.com
Arrakis Systems	18, 39, 47, 63	970-224-2248	www.arrakis-systems.com
Audemat-Aztec	54	305-249-3110	www.audemat-aztec.com
AudioScience	56	302-324-5333	www.audioscience.com
Autogram	69	800-327-6901	www.autogramcorp.com
Balsys Technology Group	58	407-656-3719	www.balsys.com
Bay Country Broadcast Equipment	70	877-722-1031	www.baycountry.com
Belar Electronics	61	610-687-5550	www.belar.com
Belden	12	800-BELDEN-4	www.belden.com
Broadcast Devices Inc.	68	914-737-5032	www.broadcast-devices.com
Broadcast Electronics	25	217-224-9600	www.bdcast.com
Broadcast Software International	48	888-BSIUSA1	www.bsiusa.com
Broadcast Warehouse	13	+44-208-540-9992	www.broadcastwarehouse.com
Circuitwerkes	67	352-335-6555	www.circuitwerkes.com
CKE/HVCA	55	800-649-6370	www.rectifiers.com
Coaxial Dynamics	26	440-243-1100	www.coaxial.com
Comrex	9, 49	978-784-1717	www.comrex.com
Conex Electro-Systems	58	800-645-1061	www.conex-electro.com
Crane Song Limited	36	715-398-3627	www.cranesong.com
Erickson Broadcast	71	888-830-8223	www.ebsradio.com
ERI-Electronics Research	38	812-925-6000	www.ERLinc.com
Eventide	19	201-641-1200	www.eventide.com
Gorman-Redlich Mfg. Co.	68	740-593-3150	www.gorman-redlich.com
Harris Corp. Broadcast Div.	3	800-622-0022	www.broadcast.harris.com
Henry Engineering	40	626-355-3656	www.henryeng.com
Inovonics	49	831-458-0552	www.inovon.com
Kintronic Labs	26	423-878-3141	www.kintronic.com
Klotz Digital Audio Systems	17	678-966-9900	www.klotzdigital.com
Liquid Compass	7	303-839-9400	www.liquidcompass.net
Logitek	37	800-231-5870	www.logitekaudio.com
Mediatouch	20	888-665-0501	www.omt.net
Mooretronix	69	800-300-0733	www.mooretronix.com
Moseley Associates	45, 49	805-968-9621	www.moseleysb.com
Mouser Electronics	69	800-346-6873	www.mouser.com
NAB	65	202-429-5336	www.nab.org
Nexus Broadcast	70	800-219-7461	www.nexusbroadcast.com
NPR Satellite Services	23	202-513-2626	www.nprss.org/be
Omnirax	71	415-332-3392	www.omnirax.com
PTEK	71	408-448-3342	www.ptekpower.com
Radio Computing Services	51	914-428-4600	www.rcsworks.com
Radio Soft	56	888-RADIO95	www.radiosoftware.com
Radio Systems	42-43	856-467-8000	www.radiosystems.com
RAM Broadcast Systems	46	847-487-7575	www.ramsyscom.com
Ramsey Electronics	70	800-446-2295	www.ramseyelectronics.com
RF Parts	71	800-737-2787	www.rfparts.com
RF Specialties	22		www.rfspec.com
SCMS, Inc.	24	800-438-6040	www.scmsinc.com
Scott Studios	1, 11	888-GET-SCOTT	www.scottstudios.com
Sencore	44	800-736-2673	www.sencore.com
Sine Systems	49, 59	615-228-3500	www.sinesystems.com
Telos Systems	21, 41	216-241-7225	www.telos-systems.com
TieLine Technology	5	888-211-6989	www.tieline.com
Transcom Corp.	69	800-441-8454	www.fmamtv.com
V-Soft Communications	71	800-743-3684	www.v-soft.com
Wheatstone	2, 75, 76	252-638-7000	www.wheatstone.com

This index is a service to readers. Every effort is made to ensure accuracy, but Radio magazine cannot assume responsibility for errors or omissions.

www.beradio.com

# Sign Off

By Kari Taylor, associate editor



www.beradio.com

## Do you remember?

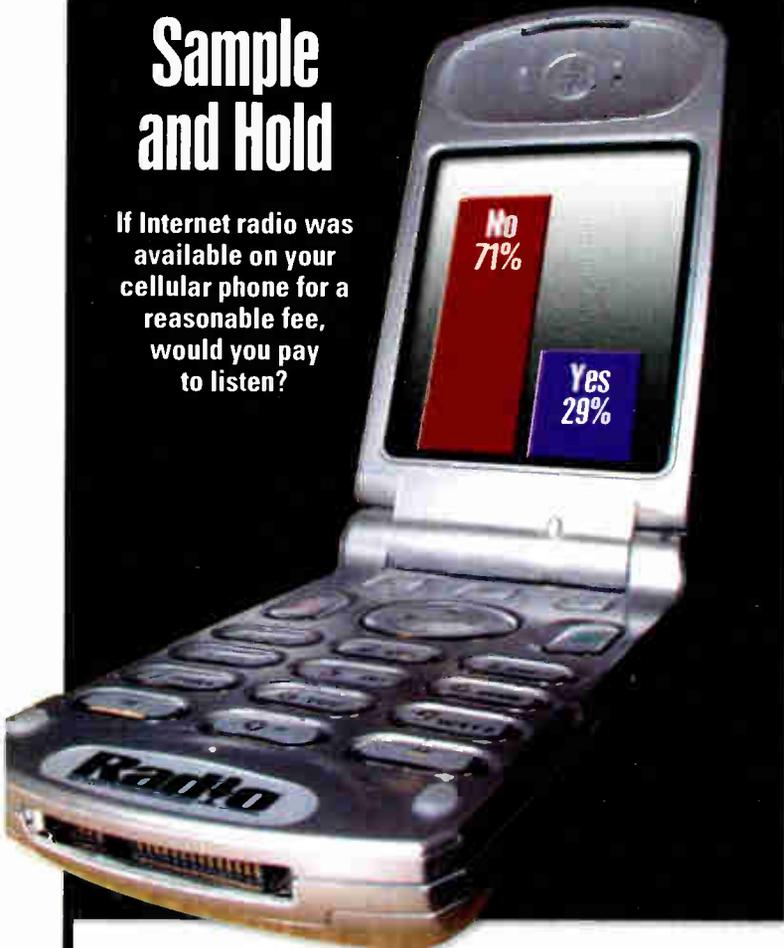
The TCM-6, manufactured by Terracom about 30 years ago, was a portable microwave



radio that provided performance for up to 1,200 frequency division multiplexing (FDM) voice channels or high bit-rate digital data transmission. The unit offered 0.005 percent frequency stability across its 1.7 to 15GHz range. Other features included continuous frequency tuning, automatic fault indication, a solid-state modular design and internal subcarrier program channels. The system was available for simplex, duplex, hot standby and diversity operation. Convertible mounting configurations allowed rack installation, stacking or vehicular mounting. The RF unit plug-in modules could be remote controlled from hundreds of feet away in weatherproof enclosures at the antenna, eliminating waveguide.

## Sample and Hold

If Internet radio was available on your cellular phone for a reasonable fee, would you pay to listen?



Source: RRadio Network, Survey 29 Music, Cell phone, the Future, 2005.

## That was then

Manufactured around 1954 in Indianapolis, the Regency TR-1G was one of the first consumer transistor radios. The radio received AM broad-



casts only, as FM was not yet an option. Using transistors instead of tubes allowed portable audio entertainment to become a common part of everyday life.

## This is now



Today portable audio devices are not limited to radios. CD players, Minidisc players and now media file players such as the Apple Ipod provide consumers with access to more audio choices than ever before. As portable as the first transistor radios, modern media players add extensive battery life and vast amounts of storage space to hold hours of audio material.

The distance consumer technology has traveled from the transistor radio to the Ipod has come full circle with the emergence of N&S Valveworks' tube-based amplifier. This vacuum-tube amplifier allows the portable Ipod to be used as a table-top set in a way that appeals to audiophile interests while making something of an homage to the humble transistor radio's ancestry.



## How Would You Like Your *SOUND*?

**HOW DO YOU WANT IT** in MIAMI? How about NEW YORK? Should Chicago be the same as Houston? What about Boulder versus LA?

**YOU GET THE POINT:** today's market sound is dynamic; formats and personalities can change on a dime. Keeping up with what the competition's doing can be a fulltime job.

Our VORSIS™ AP3 processor incorporates multi-band compression, parametric EQ, high/low pass and notch filters, expansion, de-esser, AGC and a host of

system and output settings that let it perform as a dual-channel mic processor OR a stereo signal processor—perfect for in-house rack use or that final HD radio signature sound shaper.

And you don't have to fly from city to city (or room to room) to stay on top—VORSIS™ ethernet protocol lets you control all settings right from your laptop—anywhere there's an internet connection.

**VORSIS™— Get the POWER!**





## Shouldn't Require a LEAP OF FAITH

# JUMP! We have the NET you can TRUST

**YOUR ENTIRE COMPLEX** depends on the reliability and longterm support of the digital network. WHEATSTONE has the hardware, the software, the GUI, the op manuals, and most important, the support TEAM. We'll get you up and running on time—without budget surprises.



**OUR NETWORK SYSTEM:** It's not just a product; it's an **entire line**—CONTROL SURFACES: we've got eleven to choose from; CARD CAGES: three different sizes to optimize your budget and still allow for future expansion.

**DIGITAL AUDIO ISN'T EASY**, and reliable networks are much more challenging. Trust the company with EXPERIENCE, RESOURCES and STAYING POWER: **WHEATSTONE!**



- *Proven designs—hundreds installed!*
- *64 bi-directional signals on CAT-5 or optical*
- *Bi-directional machine control embedded with audio*
- *Routable mixes*
- *Extremely low latency (audio and logic) not system size dependent*
- *Scheduling software*
- *Automation control interface*
- *Desktop X-Y control plug-in*
- *Audio over Ethernet portal to automation*
- *Virtual soundcard software*
- *Embedded router control*
- *Realtime operating system*
- *Ethernet controllers*
- *Redundant DSP option*
- *Redundant WHEATNET™ option*

 **Wheatstone**

**AUDIO is what we do BEST!**