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June 2004 • Volume 10, Number 6

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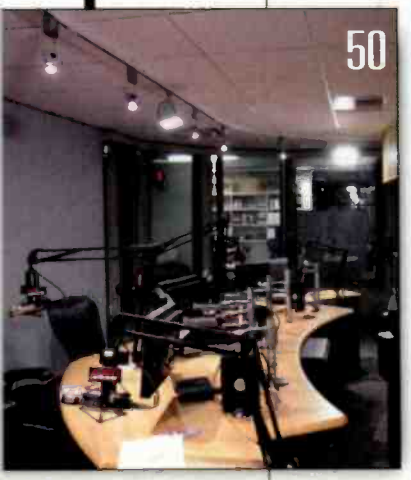

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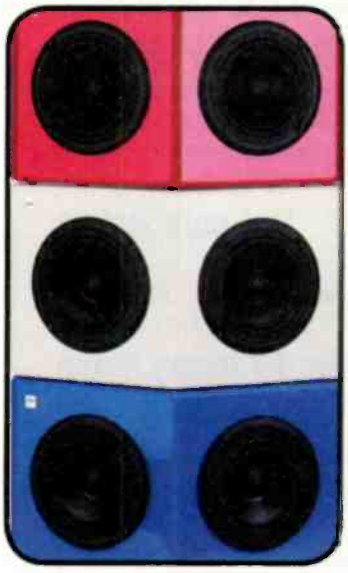

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Currents Online

Highlights of news items from the past month

Sirius Offered Through Dish Network

Premium package Dish Network satellite television customers receive it at no charge.

New EAS Event Codes Take Effect

Numerous new codes have been added.

Harris Installs 100th Vistamax

Bonneville's WWZZ-FM in Washington, DC, will have the honors.

RF Software Becomes Audemat-Aztec Dealer

RF Investigator 2.5 will include new features to import and display field measurement surveys from the Navigator 100 and Navigator 007.

Internet File Sharing on the Rise Again

This is according to a Pew Internet and American Life Project survey.

Site Features

Buyers Guide

The *Radio* magazine Buyers Guide is available online all year. Use it to source equipment manufacturers and service providers.

Web Enhanced Content

Certain articles in this issue have a *more online* note. Look to the *Radio* magazine website for extra features and information.

Currents Online

Updated daily, turn to the *Radio* magazine Currents Online for the latest radio technology news and information.

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When hi-fi meets Wi-Fi

The classic model of a radio station's operation considers the singular function of providing a source of audio entertainment to a listening audience. Programming is created in the studio and transmitted via the station's transmitter. While this model is still in use today, the singular function can be divided into two separate elements: creation and transmission.

These two functions are actually separate. We have seen this in a small way with Internet streaming. The program material is still created in the same way, but the program stream now feeds a transmitter for terrestrial transmission and a Web server for Internet distribution. With this in mind, single stations can function more like networks by creating the program stream regardless of the transmission scheme.

In time, I expect that radio stations will realize the disconnect between content creation and delivery. The programming will be delivered via alternate means in addition to wide-area coverage of the single transmitter. Cable systems, Internet providers and even cellular telephone networks are only some of the possibilities.

Internet radio has already proved itself as a means of reaching a mass audience. I listen to Internet radio stations quite often. And, like many online listeners, I do it while sitting at my PC. While it has seen some obstacles with content licensing issues, and it has yet to be shown as a viable method of revenue generation, several attempts have been made to market this delivery mechanism in a form that is familiar to radio listeners.

Remember Kerbango? This was an Internet appliance designed to emulate a traditional radio but used to listen to online stations. The product never came to fruition after floundering for a few years before being bought by 3Com and then being officially killed. The Kerbango never shipped. Other products, such as those from Sonicbox and Penguinradio, had similar functions, but they actually shipped to the market. To my knowledge, none of these were that successful. These were products ahead of their time.

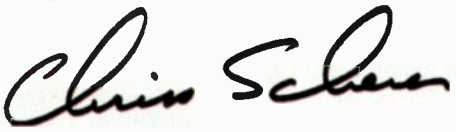
I believe that the main reason for these efforts not making radio history was due to the lack of broadband connectivity in homes. It was available, but not common and rather expensive. Today this has all changed.

With the increased use of home networking, and now wireless home networking, there is a renewed interest in streaming media delivery in the home, not to mention a better chance of it being widely accepted. New products are bypassing the radio-only thinking and moving to media control centers, which are something like boom boxes on steroids. Available and inexpensive broadband connectivity certainly helps, but newer technologies add more freedom and flexibility to the system: wireless networking in the home.

With Wi-Fi connectivity, attached devices are portable within the range of the network. A laptop can access anything stored on the network anywhere around the house. Depending on the configuration, even your neighbors can connect.

Home listeners have access to music stored on the PC or from Internet radio stations. With the concepts introduced by the Kerbango, other companies have introduced the function of a media player with the familiarity of a boom box. A few such systems have been unveiled from Linksys, Philips and Reciva. With downloaded (legally or otherwise) music, ripped music libraries and Internet streams, several listening options are available.

The timing on this comes as IBOC is reaching critical mass. Whether you like IBOC or hate it, the point is that consumer listening is moving ahead. Terrestrial radio needs to move ahead as well, and radio stations need to look ahead to supplemental transmission paths for the future. Digital transmission is the immediate step in that direction. IBOC may or may not be the perfect solution, but with every other form of audio entertainment media moving to enhanced features and capabilities, terrestrial radio runs the risk of being left behind.



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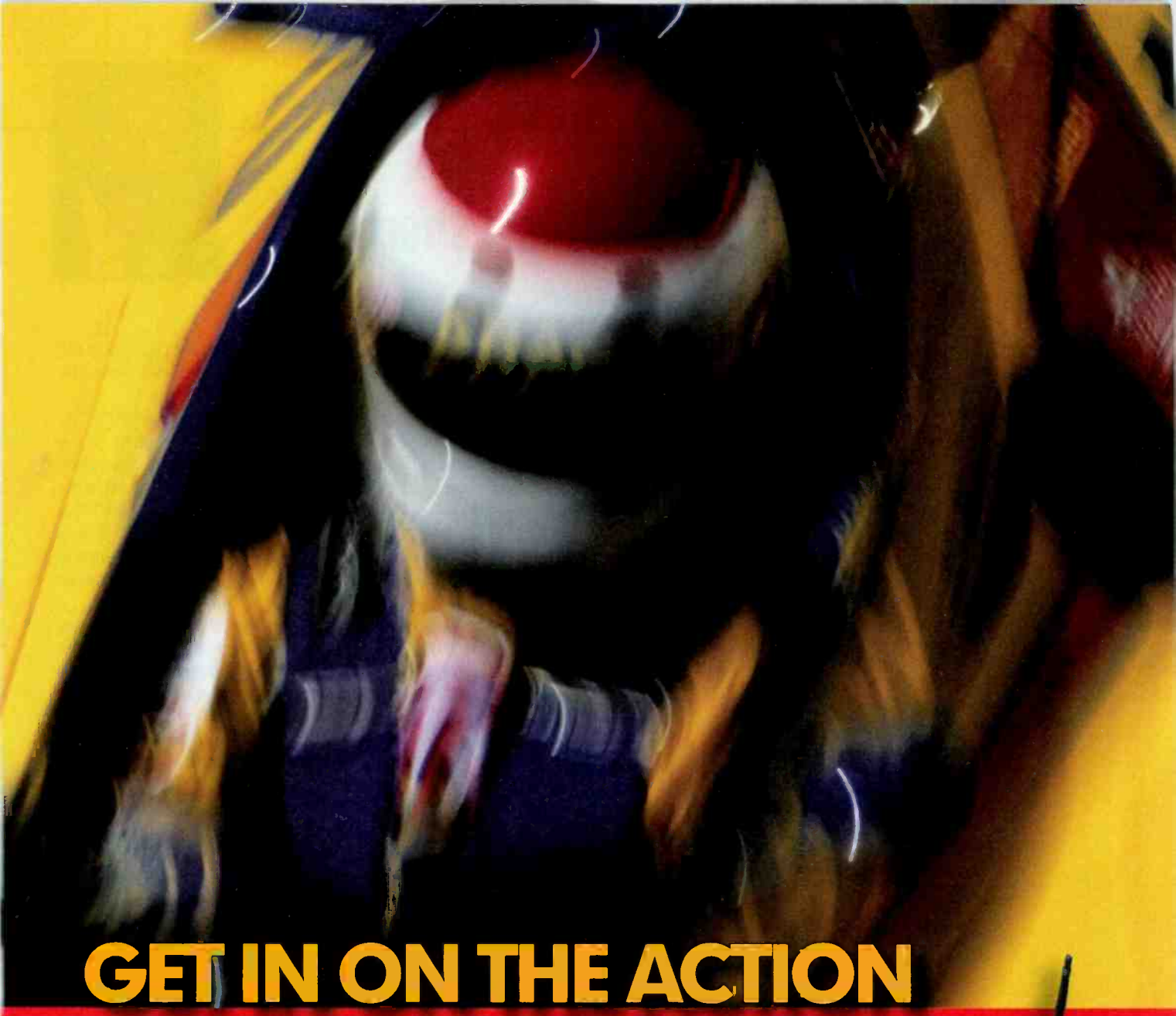

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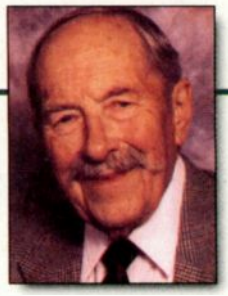
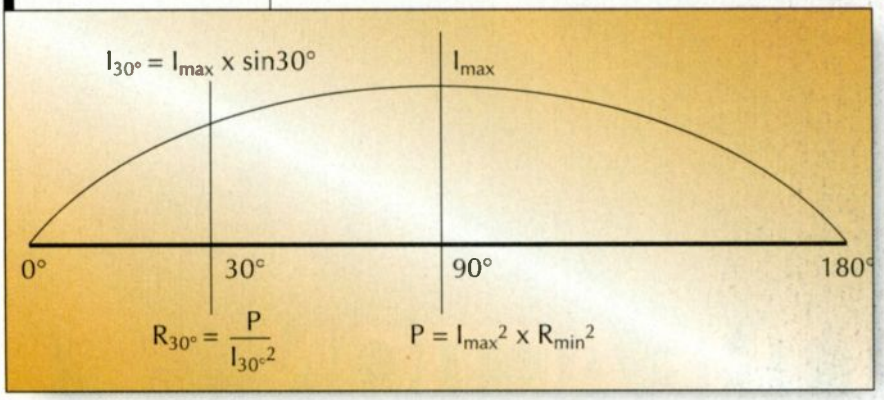


Antenna currents and field strength

By John Battison, P.E., technical editor, RF

Anything metallic can be made to carry RF current and to radiate some sort of RF signal. But what quality of signal will it be? It can depend on the construction and size of the tower, as well as the antenna tuning-unit circuits. RF currents induced in a nearby metallic structure can deform a nominally circular radiation pattern and affect coverage in positive or negative ways. While this is going on the RF antenna ammeter may indicate the licensed antenna current, but listeners may be hearing a distorted signal.

Engineers tend to talk glibly about RF current and field strength in millivolts per meter (mV/m) but sometimes we don't get the millivolts per meter that we expect from the power delivered to the antenna. We talk about the antenna resistance, but sometimes the antenna resistance and the radiation resistance are noticeably different. When we supply RF current to our antennas we expect to get a definite return for the power expended. If this doesn't happen it is sometimes difficult to find a reason, especially if it is a nondirectional station.



Halfwave antenna showing the relationship between current and resistance.

Clarity of thought

Sometimes we lose sight of the relationship between current in an antenna and the resulting field strength value. The level of our electric field is measured in terms of millivolts per meter, or volts per meter depending on the requirements. This term expresses the voltage that would be induced in a one meter long wire placed parallel to the lines of flux. This induced shortage results from the movement of the flux across the wire.

Two fields are developed around an antenna. The induction field exists in the immediate vicinity of the antenna, and consists of lines of flux that connect back into the antenna twice each cycle. This is not the field that the engineer generally wants. In fact, it is this induction field that often produces the unwanted effects of high currents or voltages in close by metallic objects. It is a reactive field in which the electric and magnetic fields are 90 degrees out of phase.

The radiation field consists of detached lines of flux that move out as an electromagnetic wave. This is the emission that is of greatest interest to the radio engineer. It is this field that contains the real power because the electric and magnetic fields are in phase with each other. The intensity of this field is inversely proportional to the distance from the antenna, and diminishes far less rapidly than the induction field; this is the radio signal.

If we want to compare developed field strengths we must compare them at the same distance. Originally, engineers used one mile as a convenient distance. This distance is sufficient to be well outside the induction field and provides a good solid measuring signal.

What's your sine?

We are all familiar with the normal sinusoidal distribution of current in an antenna. Although, under some circumstances, non-sinusoidal current distribution may have to be assumed because unusual antenna configurations such as top loading can affect current distribution.

The radio engineer is generally most interested in the impedance of an antenna and the real part of this term, which is the radiation resistance. This resistance multiplied by the square of the antenna current tells us the power developed in the antenna circuit.

Much of our broadcast work involves vertical radiators around 90 degrees to 120 degrees of electrical height. We try to measure the antenna current at the base of the tower. It is common practice to place an RF ammeter or other current-measuring device in the output leg of the base-matching network. We then measure the antenna base impedance at this point and use the resistance thus obtained to calculate the power into the antenna.

When we use a bridge to measure antenna impedance, what we actually measure is the antenna impedance (the R term), plus any resistance in the actual antenna connections and structure, and the ground connections and

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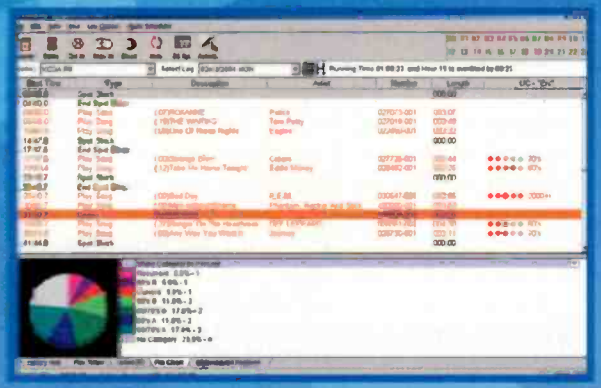

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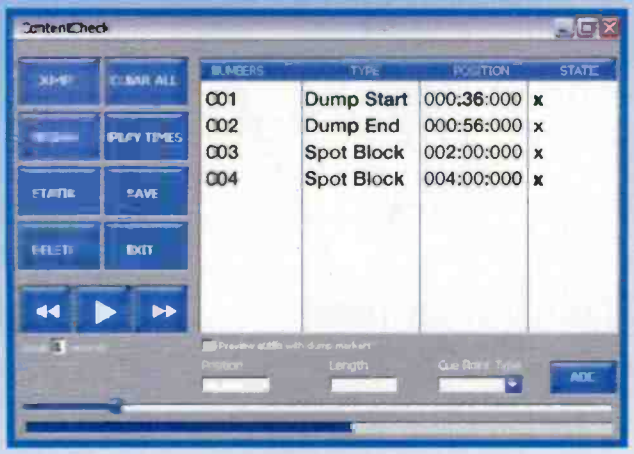

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system. Dirty and corroded connections, small-diameter cables and connections that have corroded to small conductors, rusted connections between tower sections and inadequate ground system with damaged ground screen and broken or missing radials will add to the I^2R losses. Power that should be radiated will be dissipated in heat. Therefore the value of R used as antenna radiation resistance actually consists of $R_{ant} + R_{misc}$. The FCC allows a certain amount of system loss to be included in directional antenna operations.

An antenna's measured impedance depends on exactly where along the antenna it is measured. The indicated current in the antenna varies with the measuring location.

Consider the radiation resistance of a half-wave antenna that is about 73.1Ω. This is the value that can be measured at the center of the antenna. However, this is the only position that will produce this resistance. All the other points on the antenna will exhibit a lower current and higher resistance. This can be calculated by multiplying the current measured at the center by the sine of the distance from the end of the antenna. However, you must specify the reference part of the antenna. This is called the point of maximum antenna current, but it is not always the same thing as the resistance of the driving point of the antenna, which is the point at which we place our impedance bridge.

Remember the textbook introduction to vertical radiators in which a quarter-wave radiator is shown above ground with an image below it? The total length of the real antenna and the image equals one-half wavelength. An antenna one-half wavelength long with one amp at the center will produce about 37.5mV per meter at a distance of one mile from the antenna. The radiation resistance of this antenna is around 73Ω.

If we take half of this antenna, i.e. a quarter-wavelength also with one amp at its base, we shall find about 37.4mV per meter at a distance of one mile. The radiation resistance (the R term in the antenna impedance) will be half of the ideal half-wave dipole, or about 36.6Ω. With 1A flowing the power will be 36.6W.

In terms of millivolts per meter with 1kW power at 1 mile:

$37.42 \times \sqrt{1000/36.6} = 196$ mV/m

If we increase the power to 10kW, we multiply the field strength at one mile by the square root of the power increase. Therefore,

$196 \times \sqrt{10} = 196 \times 3.16 = 619.36$mV/m

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290 FM channels on the auction block

By Harry Martin

The FM auction initially announced almost four years ago, but postponed four times, is now back on the calendar for Nov. 3, 2004. The auction is described in an April 15 public notice available on the Audio Division's Web page (under "Audio Headlines") on the FCC's website (www.fcc.gov).

The Commission will conduct the auction in consecutive rounds, with all channels being available to be bid on in all rounds. To bid on a particular channel, a bidder must have made an upfront payment large enough to ensure it has sufficient bidding units to cover the minimum opening bid for that channel. If a bidder wishes to bid on more than one channel in a given round, the bidder must have made an upfront payment sufficient to purchase enough bidding units to cover the to-be-bid-for channels. Here are some examples of how the system works.

- In the Form 175 (auction qualification statement), you specify only one channel that you want to apply for, and the upfront payment for that channel is $10,000. You submit an upfront payment in that amount. When the auction starts, you can only bid on that one channel, because that is the only one you specified in the Form 175.
- A slight variation. In the Form 175, you specify two channels, each of which has an upfront payment of $10,000. If you submit an upfront payment of $20,000, you would be able to bid on both channels in each round of the auction. In fact, you would have to bid on both in each round, because your maximum eligibility would be 20,000 bidding units (based on your total upfront payment of $20,000), and the rules require that in each round you must be active (*i.e.*, either place a bid or be the standing high bidder from the preceding round) in markets whose upfront payments equal your maximum eligibility. Because you would be able to bid in only two markets (since those are the only ones listed in your Form 175), and because those two upfront payments for those two markets equal your maximum eligibility, you would have to bid in both markets during each round, or risk losing eligibility.
- Suppose in the Form 175 you specify a total of 15 channels, 10 of which have upfront payments of $10,000 each, four of which have upfront payments of $50,000 each, and one of which has an upfront payment of $200,000. You submit an upfront payment of only $200,000, which gives you maximum eligibility of 200,000 bidding units. During each round of the auction you would have to be active with respect to markets totaling in the aggregate $200,000. Thus, you could bid on the $200,000 channel. Or you could bid on all four of the $50,000 channels. As long as you are "active" in each round in markets having an aggregate upfront value of $200,000, you remain able to bid, in the next round, with respect to any of the channels you specified in your application.
- In the first two rounds you might elect to bid on the $200,000 channel alone. Because a bid in that market would exhaust your maximum eligibility, you would not be able to bid on any other markets during those rounds. But let's say that, by the end of round two, you feel that the $200,000 channel is being priced beyond your limits by other bidders. In rounds three–five, you might then decide to bid on the four $50,000 markets. Because such bids would again exhaust your 200,000 bidding units, you would not be able to bid on any of the other markets (*i.e.*, any of the $10,000 markets, or the $200,000 market) during that round. But let's then say that one of the $50,000 markets gets priced out of your league by other bidders. In round six, you could then continue to bid on the other three $50,000 markets, but also place bids in five of the $10,000 markets.
- By the time you get to round seven, you may have determined that the price for the $200,000 channel, which you stopped bidding on after round two, really isn't all that high. At that point, as long as you are not the high bidder in any other market you're bidding on, you could jump back in and bid on the $200,000 channel, even though you had not been active there since round two. But because the $200,000 value of that market would exhaust your maximum eligibility, you would not be able to bid in any other markets during that round.

Martin is an attorney with Fletcher, Heald & Hildreth, PLC., Arlington, VA. E-mail martin@fhhlaw.com.

Dateline:

Radio stations in Illinois and Wisconsin must file their renewal applications on or before Aug. 1. Their EEO program reports and ownership reports are due with the renewals. Also on Aug. 1, stations in Iowa and Missouri must begin their pre-filing renewal announcements.

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Project Engineer, Entravision Communications, Radio Division

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The Pick Hits of NAB2004

The best in show from the best at the show

Reported by Kari Taylor, associate editor

This year's Pick Hit Award winners have more to celebrate than ever before because 2004 marks the 20th year that the Pick Hit Awards have been presented. The Pick Hits are the original technology award from the convention and still the most respected.

The award winners' products, the rules, the judges' comments and a list of the judges are provided on the following pages. The Pick Hits are the only awards that disclose our rules and our judges' names. Note that there is one new addition to the Pick Hits Awards this year. The Pick Hits judges decided, during their selection meeting, that there were some emerging technologies that were implemented in various products that deserved recognition. While the Pick Hit Awards recognize specific product introductions, the panel also wanted to recognize three emerging technologies, which are called the Technology Honors, and recognize the achievements in applying new technology in a broad range of products.

So put on your party hat, eat two pieces of birthday cake and help these winners and *Radio* magazine celebrate the achievements of 2004

2004 PICK HIT

IBOC monitor
Belar

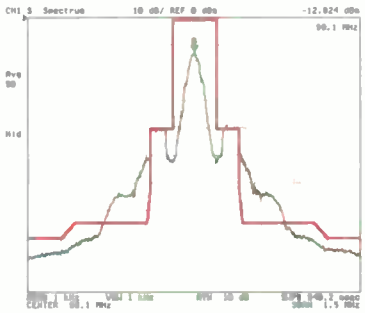
HD Radio Monitor: This 2RU monitor is designed to decode and analyze AM and FM IBOC signals. The frequency-agile front end can accept signals off the air or through a high-level input for use at the transmitter site. The graphic display provides measured results of the signal and includes basic spectrum analysis. Level metering is displayed as horizontal bargraphs in percent with a user-selectable dBFS level used as the reference. Capability to display SIS data, quality of service information, MPS data and bit-error data are standard. An RS-232 serial and RJ-45 Ethernet connection are included. Belar plans to include firmware update capability.

What the judges had to say:

"A long-awaited device for HD Radio stations"

"A must-have for any IBOC installation."

610-687-5550; fax 610-687-2686; www.belar.com; sales@belar.com



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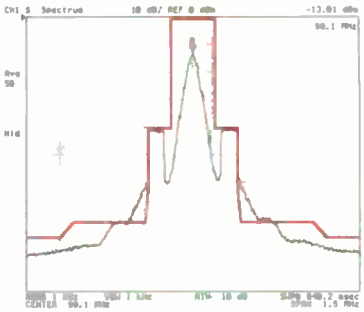

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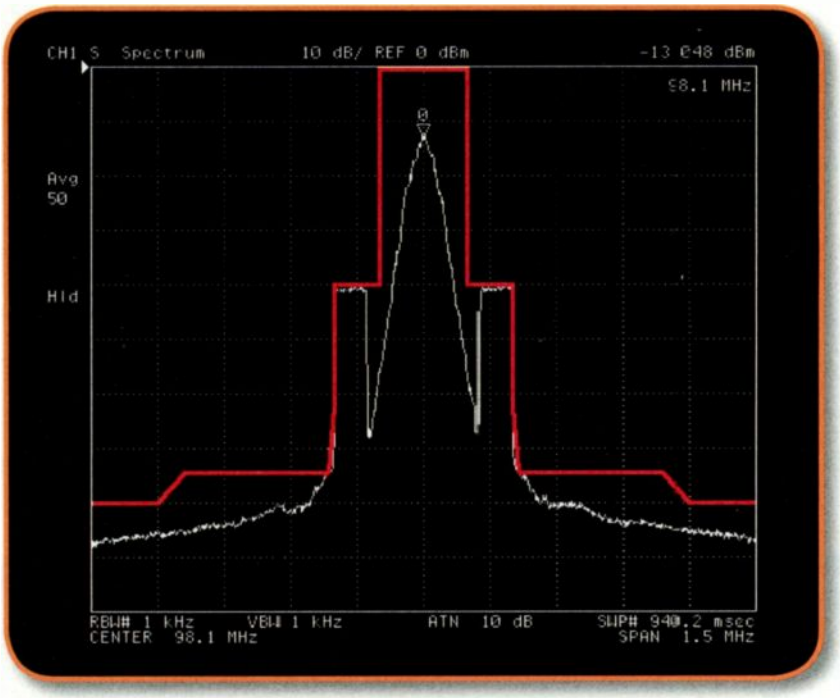
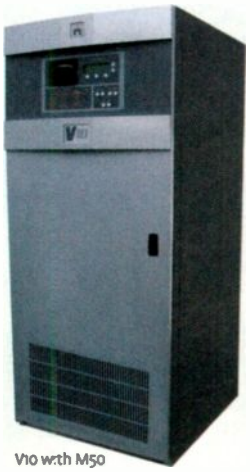


Gone.

Introducing Nautel's Newest Cutting Edge FM Technology – **Digital Adaptive Pre-Correction**



V10 with M50

Worried about not meeting the HD Radio™ mask requirements? After all, you wouldn't want to interfere with someone else's signal. Nautel's new M50 digital FM exciter samples the all-digital or hybrid HD Radio™ output of the V10, 10 kW FM transmitter and dynamically applies digital adaptive pre-correction. This means no expensive external bandpass filter and no additional tuning. Even better, because the M50 continuously monitors and adjusts the RF output, your performance is optimized regardless of environmental changes and your signal will always be within spectral limits.

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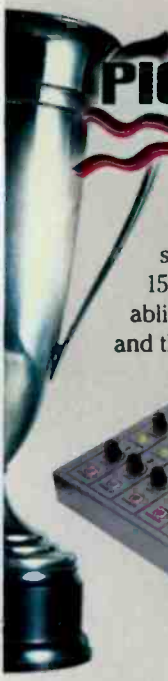

15kHz POTS stereo codec
Tieline America

I-mix G3: With the I-mix G3, left and right audio channels can be phase locked over two telephone lines to deliver 15kHz stereo programming. Also available is the provision for dual 15kHz mono transmission from a single POTS codec enabling the use of one 15kHz mono channel for program audio and the other 15kHz channel for a range of communications including production/engineering talkback, telephone coupler for live on-air callers and simultaneous 9.6kb/s control data and 7kHz voice. This third-generation design incorporates an expansion slot allowing broadcasters to select from a range of new hardware modules to suit individual remote applications. The modules include GSM to landline wireless, stereo/mono ISDN, stereo or dual-mono POTS plus new IFB and telephone talkback caller facilities.

What the judges had to say:
"The stereo capability is impressive."
"Its ability to communicate with other brands of POTS codecs adds to its versatility."

888-211-6584; fax 317-913-9615; www.tieline.com; sales@tieline.com

Rotating rack system
Middle Atlantic Products

WR series: This series consists of a detachable rack frame that is housed in its own protective host enclosure. Installers can roll the rack out and rotate it 60 degrees for easy access to rear equipment connections. Off-site integration and testing of A/V equipment in the detachable rack frame reduces labor and simplifies the installation. The roll out, rotating design of the series saves a minimum of six square feet of space per bay. In addition, the rack system is gangable, allowing installers to maximize room space. Ample laser knockouts on the side of the rack allow ganging of multiple racks and cable pass-through between each. Slots in the upper rack frame accommodate Velcro ties and the rack frame features pre-punched rackrail brackets for built-in cable management.

What the judges had to say:
"A perfect idea for tight installations."
"This could provide new-found rack space in an existing installation."

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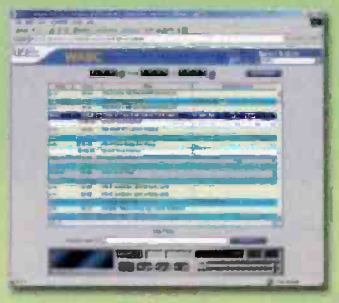

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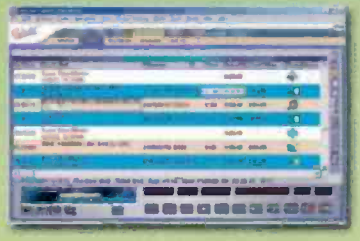

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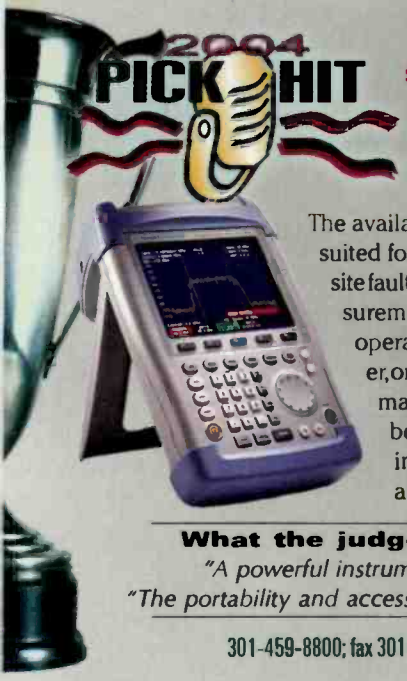


Spectrum analyzer
Rohde & Schwarz

FSH3: This spectrum analyzer provides signal measurements from 100kHz to 3GHz. The available measurement functions are suited for mobile radio base stations, on-site fault location in RF cables, IBOC measurements or lab applications. It can operate for four hours on battery power, or can operate on an ac supply. As many as 100 traces and setups can be stored in the unit. The analyzer includes software to store, review and compare data.

What the judges had to say:

"A powerful instrument in a small size."
"The portability and accessories make this stand out."

301-459-8800; fax 301-459-2810; www.rsd.de

Web-based remote control
Broadcast Tools

WRC-4: Providing remote control, this system offers a built-in Web server with non-volatile memory, 10/100baseT Ethernet port, four channels of 10-bit analog inputs with a large monitoring range, TTL-compatible digital inputs, SPST relays, open collector outputs, front-panel status indicators and a single front panel temperature sensor. The product is supplied with removable screw terminals for connections and loaded with a generic Web page that may be edited by the end user. The remote control works with dynamic or static IP addresses. Multiple units may be used with a user-provided Ethernet hub.

What the judges had to say:

"A new and convenient way to access a remote site."
"Another clever solution to a common need."

877-250-5575; fax 360-854-9479; www.broadcasttools.com; bti@broadcasttools.com

Ultra-compact mixer
Henry Engineering

Studiodrive: This stereo audio mixer fits in the drive bay area of any PC. It features six inputs (one mic and five line), and has on-air and sound card outputs. Sources can be mixed for a live broadcast or recorded and edited on the PC. There is also a built-in telephone coupler, a mix-minus output and provision for remote mic control. The monitor system features automatic muting when the mic is on, plus control of on-air warning lights.

What the judges had to say:

"A good set of mixer functions in a tiny space."
"The logic functions and phone coupler make it suitable for use even outside a PC case."

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

Technology Honor

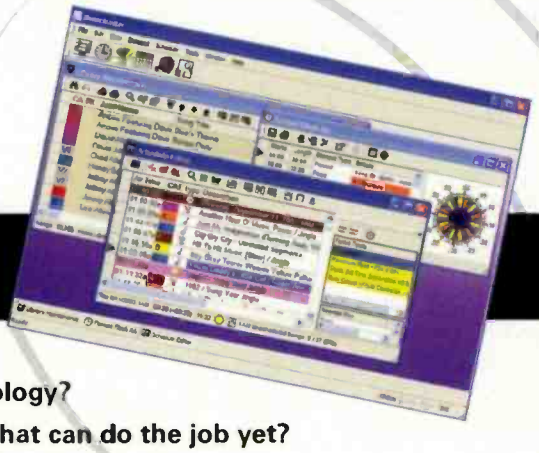
Multi-channel IBOC Audio

The continued search for the killer app of IBOC appears to be emerging. While there are audio improvements in the digital transmission over the analog system, it is still considered by many to be a replacement technology and not an enhancement. Multi-channel sound enhances the aural experience for the listener.

Three demonstrations of multi-channel audio for FM IBOC were displayed at the convention. Two were examples of 5.1 surround sound. Neural Audio and Harris showed one system in the Harris booth, while Omnia Audio provided demonstrations of a Fraunhofer encoder in a private suite. In addition, Harris demonstrated the Tomorrow Radio project, which was a partnered effort between Harris, NPR and Kenwood.

These technology applications show the potential flexibility that the IBOC data stream can provide and have been recognized for a Technology Honor from the *Radio* magazine Pick Hits judges.

Music Master
for Windows



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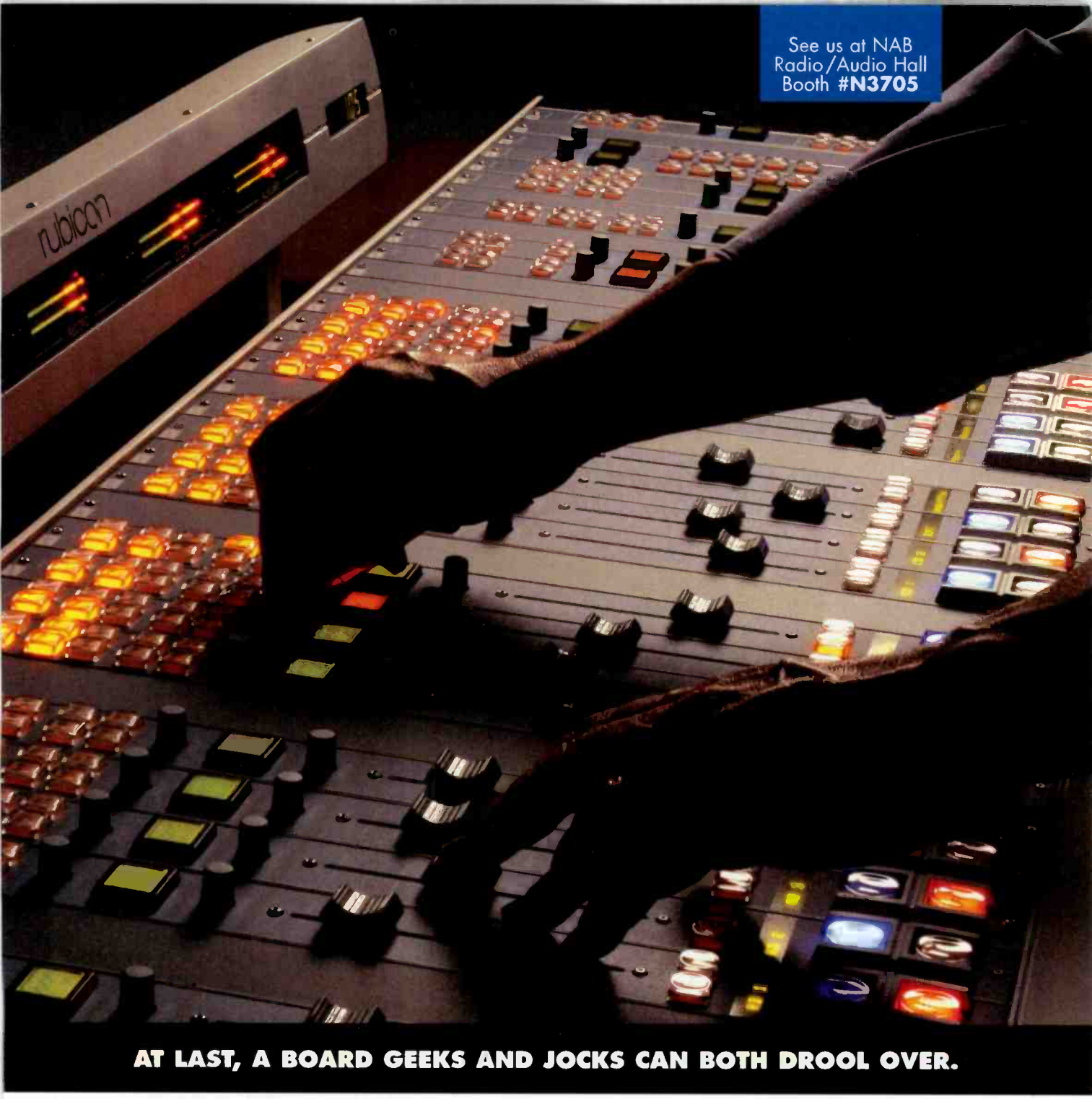

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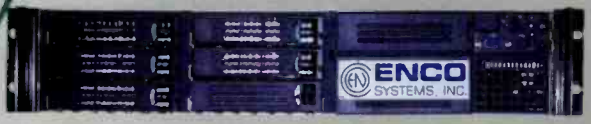
Automated profanity elimination

Enco Systems

Guardien: This automated profanity elimination and spoken word logging system for radio broadcasters is a two rack-unit device with stereo balanced analog and AES/EBU inputs and outputs. It features contact closures for control of external devices or alert mechanisms. The unit delays and monitors the air signal, looking for objectionable words, and when it finds them, mutes or bleeps them automatically. Then the Guardien logs the event, along with an audio clip, for future reference. The list of objectionable words can be edited and modified manually or through automatic means.



What the judges had to say:

"Its ability to update its own dictionary is amazing."

"A highly practical application with the current attention to indecency."

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2004 PICK HIT Radio

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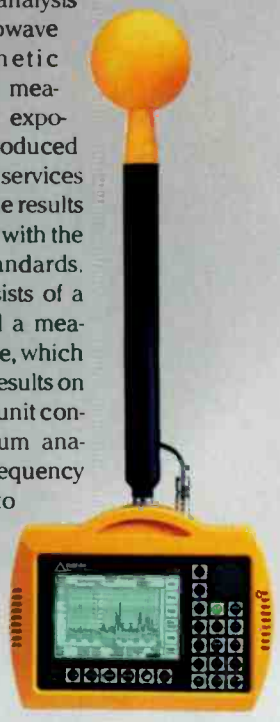

What the judges had to say:

"An affordable way to verify signal levels."

"The various functions enhance its usefulness."

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www.narda-sts.de; support@narda-sts.de

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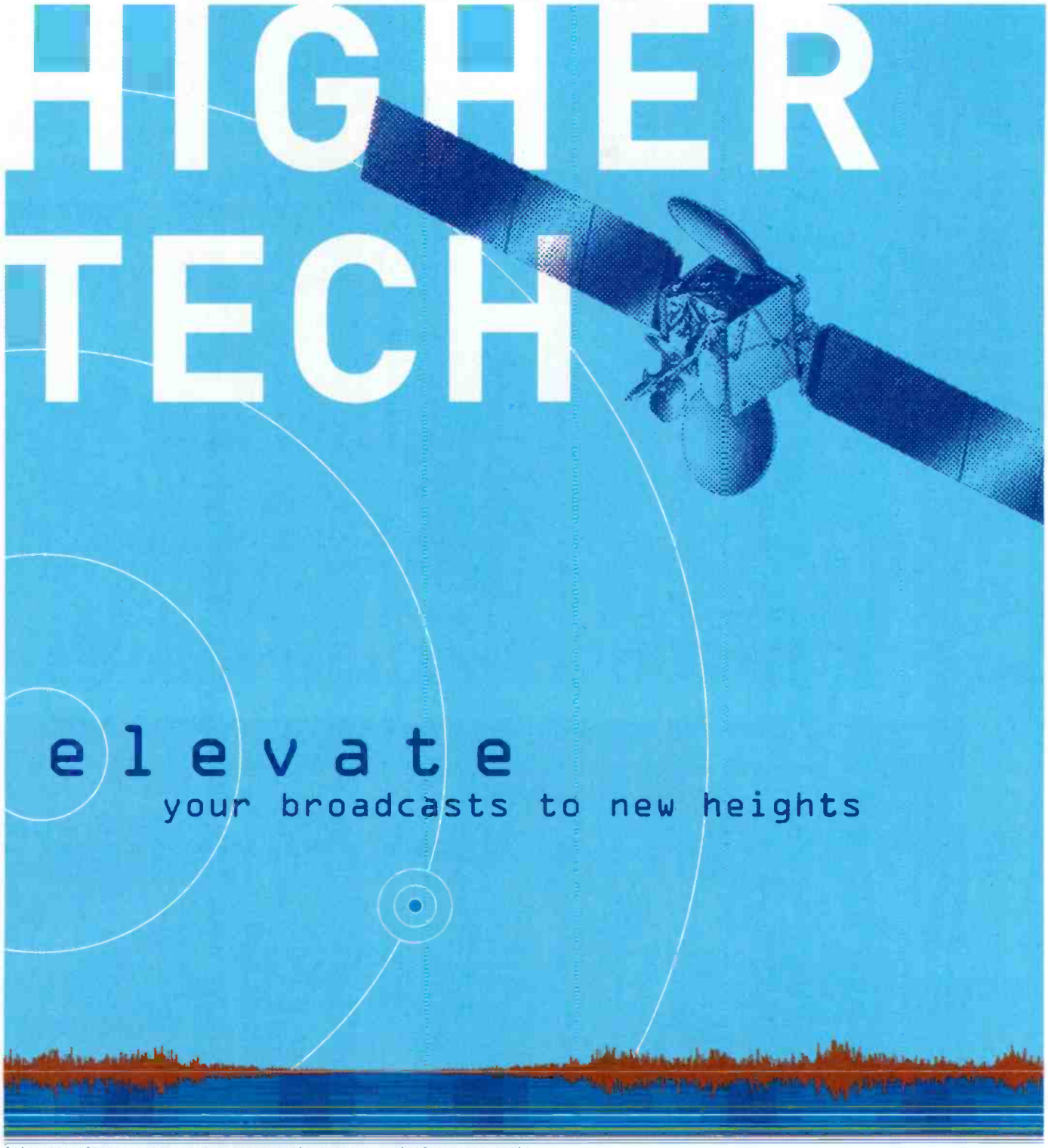

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ALWAYS ON.

2004 PICK HIT

Digital broadcast monitor

Dovetail Sciences

DBM-300: All setup and local operation of this monitor is performed using the LCD display with an integrated touch screen. The unit is tuned to the desired center frequency and displays the spectrum at the selected frequency span. Audio demodulation of the center frequency is also provided. Spectrum capture of a single channel bandwidth or a wider frequency span to include adjacent signals. The detected audio can also be saved in digital format. Spectral and audio captures may be programmed at user-defined start, stop and interval times. Data is stored in a large internal memory, providing for long periods of unattended operation. The unit also features the ability to display captured data.

What the judges had to say:

"A digital replacement of the traditional analog meter and more."

"The added capabilities greatly enhance its usefulness."

610-264-0180; fax 6102648901; www.dovetailsci.com

Digital STL transmitter/receiver

TFT

460/467: A new addition to the STL product family, this unit offers six uncompressed program channels and a data channel to meet the requirements of consolidated operations. The digital STL consists of a transmitter and receiver pair that accommodates as many as three AES/EBU inputs or as many as six discrete audio channels. The transmitter provides a 2W output and delivers them uncompressed in a configurable digital method to the receiver. Sample rates of 32-, 44.1- and 48kHz are supported. The RF system is frequency agile and set by software in the transmitter and receiver. The transmitter and receiver can be remotely controlled over an Internet or LAN connection. The 460 transmitter features six channels uncompressed, analog I/Os and 3.125kHz step size. The receiver offers a threshold sensitivity of 84dBm for 256 QAM, analog output levels at -10 to +8dBm and analog audio outputs at 600Ω balanced.

What the judges had to say:

"This makes sense with shared studio and transmitter facilities."

"Six uncompressed channels is a great way to go."

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Bill Gould 978-373-6303

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www.moseleysb.com

2004 PICK HIT

On-air phone system

Comrex

STAC6 and STAC12: These Studio Telephone Access Centers (STAC) for listener lines, talk shows and call-in segments incorporate two digital hybrids handling up to four callers. It is offered in six and 12 phone line versions with the ability to upgrade in the field. The control surface supports unique producer and screener configurations. IP-based call screening and control is embedded, enabling operation from virtually anywhere. It includes an auto-attendant with message, built-in call screener hosting and support of as many as four control surfaces.

What the judges had to say:

"The built-in screener ability makes this stand out."
"Easy to learn to operate, with obvious attention to the end-user's needs."

800-237-1776; fax 978-784-1717; www.comrex.com; info@comrex.com

Digital STL

Broadcast Electronics

Big Pipe: This scalable, bidirectional studio-to-transmitter link can transport up to 45Mb/s of data as analog and digital audio, HD Radio data, Ethernet, serial data and telephony. Data formats can be interchanged via a wireless or wireline path. Key product features include hot-pluggable modules for upgrades or repair; 45Mb/s bidirectional point-to-point radios for wireless applications and network access units available in DS3, OC-3C or OC-12C.

What the judges had to say:

"This is one heck of a piece of equipment."
"It costs less than other systems for the same functions."

217-224-9600; fax 217-224-9607; www.bdcast.com; bdcast@bdcast.com

FM broadcast analyzer

Microgen Systems

TS9000: This analyzer provides broadcast measurements through a USB interface that allows for on-site and mobile monitoring. The unit samples the multiplex signal at 240kHz at 12-bit precision, with all measurements and calculations performed by Windows software. Modulation power is calculated with 32-bit floating-point precision. It covers the FM band from 87.5MHz to 108MHz in 10kHz steps. The unit includes a baseband FFT spectrum analyzer covering 10Hz to 100kHz. With a dynamic range of 90dB and a resolution of 10Hz, the unit can analyze the multiplex signal or be used as a stand-alone audio analyzer using the external BNC input.

What the judges had to say:

"A ton of features and capabilities in a tiny package."
"The versatile measurements really make this unique."

+44 208 5409992; fax +44 208 5489994
www.broadcastwarehouse.com; info@broadcastwarehouse.com

Technology Honor

Dual-feed IBOC Antennas

Long-term operating efficiency along with iceal compatibility performance is the reason the Pick Hits judges honored this new technology. Ideal compatibility within a receiver (digital signal back into a stations' own analog signal) is achieved when both signals have identical radiation patterns from the transmitter site. Dual-feed FM antennas, like those from ERI, Dielectric and Shively, bring an opportunity for efficient digital operation while ensuring matched coverage between a stations' existing analog and the digital addition. An additional, separate low-power digital feed excites the same or interwoven bays of a dual-feed antenna without the large power losses of high-level combining. While the cost of the new antenna may offset the initial capital savings for a much smaller digital transmitter, the cost of operation will be greatly reduced when compared to the high-level method. Dual-feed antennas have the disadvantage of additional wind load, so stations must apply the technology judiciously.

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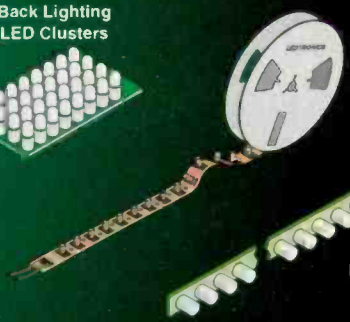
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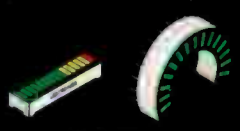
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2004 PICK HIT

Signal generator
Broadcast Electronics

XPI 10: This HD Radio signal generator is installed at the studio, rather than the transmitter, to reduce STL bandwidth and repurpose more of the existing equipment when implementing HD Radio. Key product features include integrated Ethernet connectivity; an integrated GPS receiver; graphical touch-screen interface; interface connections for main program audio, secondary audio, program-associated data for main and secondary channels and advanced data application; and integrated audio synchronization and automated bypass functions.

What the judges had to say:

"Creating the IBOC signal at the studio simplifies the path to accommodate audio audio processing, PAD and other features."
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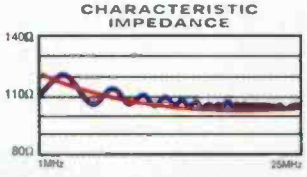

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NAB2004 Pick Hits Rules

1. Products must be new and not shown at a previous NAB Spring Convention. In some cases, distinguishing a new product from a modified older one is difficult. For "Pick Hits" purposes, a new product is one with a new model number or designation.
2. Products must have some positive effect on the intended user's everyday work. Judges search for equipment intended for use on a regular basis. Products should provide new solutions to common problems.
3. Products must offer substantial improvement over previous technology. Unique circuit architecture need not be included, but some new approach or application must be involved in the product's design.
4. The price of the product must be within reach of its intended users. The judges seek products appropriate to a wide range of facilities.
5. The products must be available for purchase within the 2004 calendar year. Equipment must be on display on the show floor, currently (or imminently) in production, and some type of product literature *must* be available. Judges take the exhibitor's word on availability dates. Products demonstrated in private showings do not qualify.
6. The Pick Hits Judges operate independently from one another and remain anonymous to everyone including other judges until the selection meeting. This ensures that the products chosen are truly representative of the industry, that the judges were not persuaded in any way, and that the entire selection process is as fair as possible. The judge's identities are published in the June 2004 issue.
7. The editorial staff of *Radio* magazine serves only as a moderator during the final selection process and has no influence or decision in determining the winners. ■

RBDS Applications

Technology Honor

A class of products that serve a purpose almost forgotten in radio, the re-emergence of RDS/RBDS products has been gratifying to those in the industry who believed in its potential and toiled to make the technology viable since its U.S. introduction in 1994. Admittedly, satellite radio's recent promotion of an artist and title display was an instigating force. There are new potential applications that are now driving the further deployment and development of this existing data broadcasting technology. One factor that has consistently hampered RBDS was the small number manufacturers of equipment and the dearth of experts who knew how to implement it. New companies, such as Broadcast Warehouse, are releasing RBDS products (the RDS2), and companies that never stopped producing RDS equipment have released new and exciting RBDS products: the Audemat/Aztec FMX480 and 410, the Inovonics Model 510 and 712 encoders for example. Dedicated leaders at companies like The New Radio Experience, Stratos Audio and others have been promoting the exciting and potentially revenue-generating uses and are offering expertise and guidance in the use of this data. It is through teaching the industry how to maximize this relatively slow data stream that the Pick Hits judges have awarded this Technology Honor to these efforts. The experiences gained here will help develop applications for the higher-speed data services available with IBOC.

NAB2004 Pick Hits Judges

Bud Aiello, CBNT
Director of Engineering Technology
NPR
Washington, DC

Mike Cooney, CBRE
Director of Engineering/IT
Entercom Kansas City
Kansas City

Bill Croghan, CPBE
Chief Engineer
Lotus Broadcasting Las Vegas
Las Vegas

Steve Fluker
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Cox Orlando
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Mark Humphrey, CPBE CBNT
Chief Engineer
Radio One Philadelphia
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Gary Kline, CSRE CBNT
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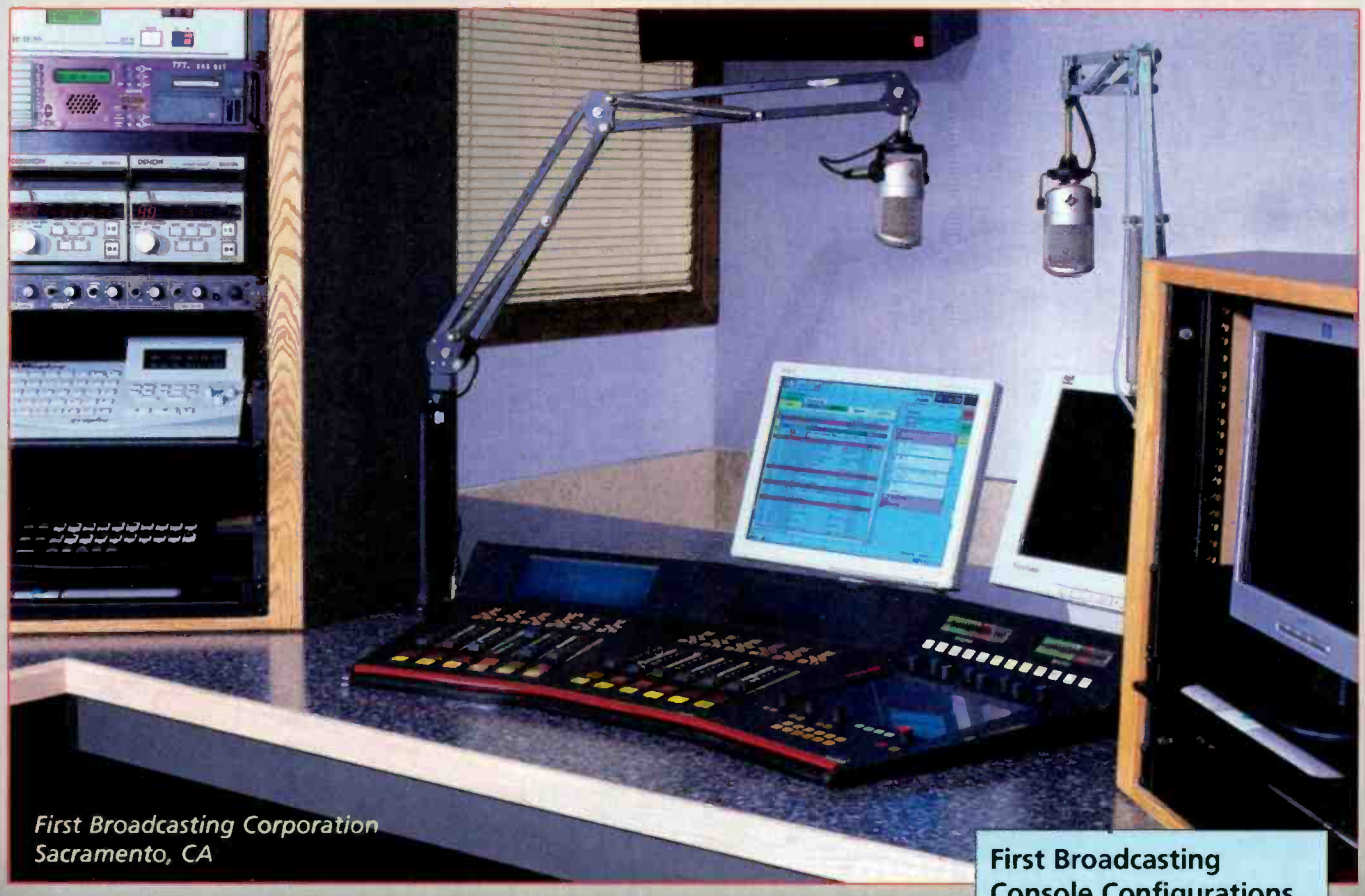
NAB2004 in review

It's a four-day convention, but the events, meetings and sessions spill over into an entire week of activities.

After several years of declining attendance, the NAB Convention is making a comeback. Overall, opinions of the convention are positive. With radio ad sales forecasts looking good, several new technologies showing actual progress and an increase in attendance, exhibitors and attendees agreed that it was a successful convention. Our NAB Convention review includes several sections, which cover the various aspects of the convention, from the sessions to the exhibit floor to the talk in the aisles.

16 The *Radio* magazine Pick Hits
32 Convention overview
34 Overview of IBOC
36 Inside the PREC
40 NAB Jackpot

"Logitek gives me the capabilities I want."



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NAB2004 *in review*

NAB2004 overview

By Chriss Scherer, editor

Spirits were high, attendance was up and the industry seems to be on an upswing.

At 4:01 p.m. on April 22, I walked through the convention floor to see smiles all around. After a few years of dwindling attendance and shrinking exhibit space, the positive tone at the end of the convention was a welcome sight. NAB2004 will be remembered as a successful convention.

While the happy feelings are a good sign for the future, the attendees' practical side regarding the convention looks to the prominent technology that was shown. With this in mind, there were a few areas of technology that garnered much of the attention.

The big item, plain and simple, was IBOC. Like it or hate it, there were plenty of exhibits that had some tie to IBOC. Transmitters, antennas and STLs are the obvious part, but IBOC has ties from the studio and data side as well. (And John Battison looks into elsewhere in this convention review.)

For digital audio, the integration of the console and facility router appears to be complete. There are more systems than ever before, and many of the manufacturers have several models, options and configurations from which to choose. This shows that it is a mature technology. Even the stand-alone console manufacturers were exhibiting new digital implementations.

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On the automation side, the ability to store, manipulate and deliver program-associated data saw a heightened interest. Some of this is because of the enhanced service capability of IBOC, but it is also due to the renewed interest in RBDS. While some of the RBDS discussion focused on scrolling PS information, the general interest—largely due to the large station owners implementing RBDS—is high. Consumer radios were quietly introduced to the market, and now that owners and general managers see the data on a competing station, everyone must have it.

In addition to RBDS, another form of radio data made a showing. The ability to for a station interact with listeners has always held an attraction, but it has long eluded stations. With the proliferation of mobile phones and especially the ability to send text messages, radio may have found the portable return path to match the portable transmission medium. One example of this is RCS Mobile from RCS. By connecting listeners with the station, an increased awareness of radio may serve both sides well.

Watch your language

The most prominent topic anywhere at the convention had to be indecency. While politicians ranted about indecency, stations were on their best behavior and tread lightly while the watchful eyes were present.

So while indecency was the buzz word, the attention turned to profanity delays as the solution. While final decisions are made about how to define indecent material, manufacturers seized the opportunity to update existing technology.

A profanity delay in its basic form is nothing new. But with the faster pace of station programming, the ability to handle a faster and more plentiful barrage of verbal offenses has a new importance. The traditional seven seconds of delay is no longer enough. The new minimum is 20 seconds with the ability dump the unwanted material several times in that window.

Delay hardware still makes the mark in addressing this. Air Tools, a relative newcomer to the delay game, showed the 6000 and 6100 delays. Building on the increased attention, Eventide's familiar BD500 is now available with up to 40 seconds of delay time. MDO displayed the Arse, a software program that offers up to 30 seconds of delay time. But the time doesn't stop there. Several new devices were shown to handle longer delay times.

By combining the recording time of a logger and adding on-the-fly editing capabilities, the next wave of profanity delays removes the potential time constraint. With this in mind, Prophet Systems showed the Content Check, and OMT Technologies reintroduced Mdelay.

Finally, if the human element of catching all the potential on-air blunders is too risky, Enco Systems pooled its technology to create Guardien, which can automatically remove words from speech in near real time. Personally, I found it amusing to openly discuss profanity and test the software by uttering words that would embarrass even the most open-minded individuals. ■

XPi 10:
Hey, where's the signal generator?

2004 PICK HIT Radio

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NAB2004 *in review*

IBOC at NAB2004

By John Battison

It would not be correct to say that IBOC was on everybody's lips at NAB, but there was considerable interest in it. There seems to be a hurry-up-and-wait attitude for many stations at this point.

Transmitter manufacturers were on the ball and most of them had floor models to show or planned to produce IBOC transmitters shortly. Some of the equipment on the convention floor is already second generation, showing that there are some strong commitments to IBOC.

Broadcast Electronics showed the FSI 10, IBOC signal generator. It provides correct delay for matching of analog and IBOC paths and encoding of the IBOC digital signal. It can be used with the FXI 60/250 series digital FM exciter and the IBOC plug-in card. Depending on the user's requirements it will produce an FM plus IBOC output for low level combining systems, or IBOC only, for use in high-level combined operation. In addition, Broadcast Electronics unveiled the XPI10, which splits the IBOC generator from the exciter, allowing the IBOC signals to be generated at the studio. See more on this in the Pick Hits article on page 16. Broadcast Electronics also showed the ASI 10 AM IBOC signal generator.

Harris demonstrated its two projects with multichannel IBOC audio. One demonstration showed the Tomorrow Radio system that has been developed by Harris, Kenwood and NPR. I detailed this system in the March issue of *Radio* magazine. While Tomorrow Radio allows for two separate audio streams to be transmitted, another demonstration with Neural Audio showed a 5.1-channel surround sound application using a Kenwood radio installed in a Hummer. While only some of the program material played was in full surround, this demonstration showed that it is possible to provide more than just a stereo audio signal with IBOC.

A third multichannel demonstration was shown in private sessions by Omnia Audio. Omnia demonstrated technology from Fraunhaofer in a suite in the Hilton. Those who attended the demonstration were impressed by it.

On the hardware side, Harris unveiled the MinHD transmitter, which covers power ranges from 10W to 600W.

Nautel has unveiled several IBOC offerings. The Jazz J1000 is a 1kW AM transmitter in a 19-inch rack mount package. It uses direct digital synthesis (DDS) to produce logic-level RF drive and modulation encoding. The J1000 has provision for six pre-set RF power levels.

The Virtuoso 10 (V10) is a 10kW FM IBOC transmitter that uses a linear, adjustable bias, broadband design. It is capable of

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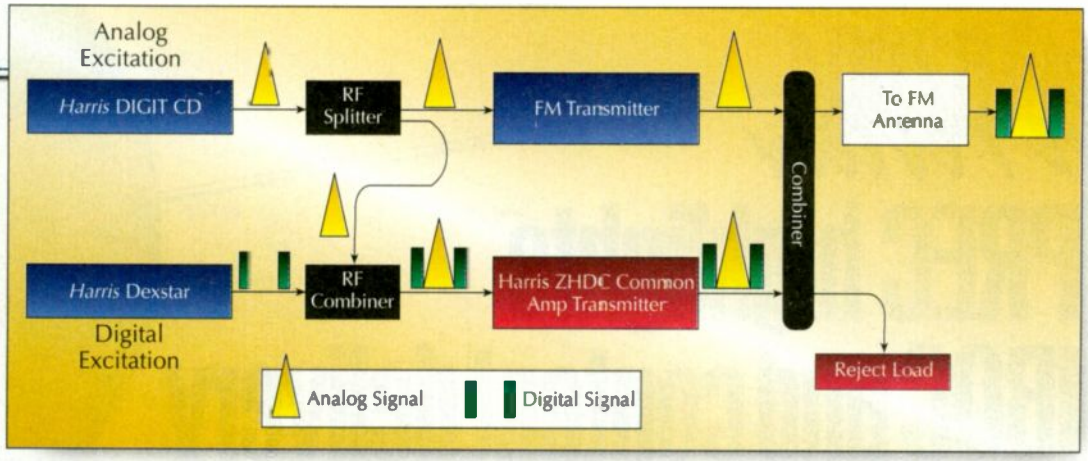


System diagram of split-level combining.

as much as 3.2kW digital, 7.7kW hybrid or 11kW analog operation.

The Maestro M50 is a 50W direct-to-digital exciter for FM and IBOC. DSP and field-programmable gate array (FPGA) technology enable direct conversion of the audio source to the low-level FM signal. The exciter accepts data from Nautel's NE IBOC generator to produce either a hybrid or all-digital HD Radio signal.

Continental Electronics, having recently experienced a change in identity to DRS Broadcast Technology, unveiled a new solid-state FM transmitter, the 815D5 and 815HD5. In addition, Continental provided a demonstration of an AM transmitter producing DRM digital transmissions.

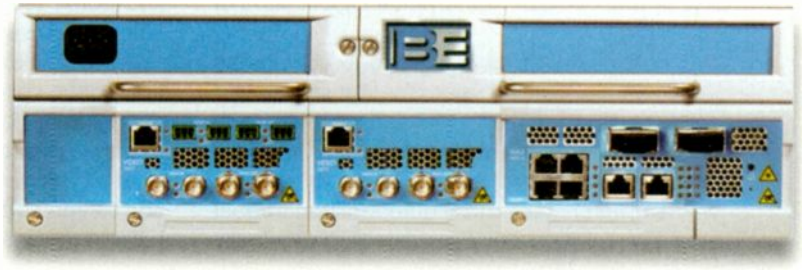
Not just transmitters

The IBOC attention was not limited to transmitters. Developments in antenna technology were also shown. The *Radio* magazine Pick Hits judges even recognized the current work in dual-feed antennas. This work shows that IBOC is a serious issue with tremendous resources devoted to making it succeed.

STLs were also being shown to provide IBOC applications. The Broadcast Electronics Big Pipe and multichannel offerings from TFT and Moseley were unveiled. These address the added need for audio and data capacity from the studio to the transmitter.

And finally, one new development in the transmission chain was shown. A last-minute addition to the Harris booth was a discussion of a hybrid combining system called mid-level or split-level combining. While specific details were not revealed because of pending patents, the system looks to be a practical means to implement IBOC for many stations. It uses two transmitters to feed a single antenna. One transmitter is an analog-only transmitter with half the needed analog power. The other transmitter operates in a low-level combined mode to provide all the digital power and half the analog power. This system reduces the wasted power present in a high-level combined system.

Radio magazine is currently arranging an article that will fully describe this system.



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2004 Pick Hit Radio

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NAB2004 *in review*

PREC highlights IBOC and content delivery

By Gordon Carter, CPBE

The annual Public Radio Engineering Conference (PREC) was held on April 16 and 17. The two main topics for the two days were National Public Radio's rollout of the Content Depot and Tomorrow Radio, an advanced application of HD Radio.

All of the sessions on Friday had to do with the rollout of the Content Depot. The first session was conducted by a number of NPR staff members, each concentrating on their own area of expertise. Speakers gave an overview of the Content Depot, from the process of submitting and acquiring material about programs, to the receiving technology and finally interfacing the system to existing station automation systems. Recommendations were given regarding program timelines, program clocks and the differences between live programs and stored programs. Some time was also spent explaining the differences between the present DACS system and the Content Depot.

After a short break, the sessions moved to more detailed information on the system. An explanation of the concepts of program segments and cueing, file format standards and naming conventions was presented. Examples were given for integrating the Content Depot receivers with various types of computer networks and station audio systems.

The day's sessions concluded with a panel discussing various

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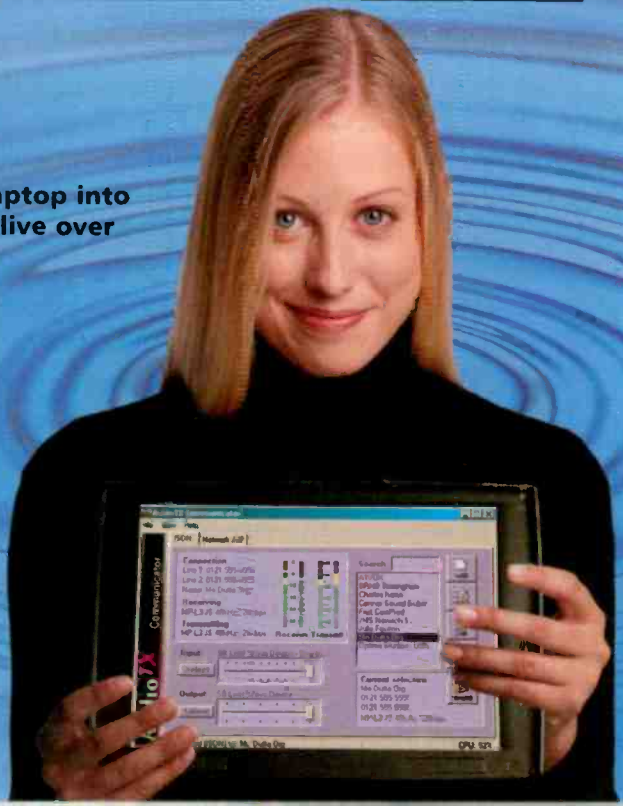

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ways to take advantage of the features and capabilities of the Content Depot on the programming side of things. Ideas were presented for using content beyond audio, content localization and improving workflow.

The Saturday sessions began with a presentation of alternate methods of combining the analog and digital broadcast signals. Harris announced that it had completed a successful on-air test of split-level combining.

Further sessions presented the results of on-air coverage and audio testing of Tomorrow Radio. The HD Radio chipset and possible strategies for marketing advanced features was presented, as were funding options for public radio stations to implement HD Radio, and some strategies for programming of Tomorrow Radio.

The afternoon sessions were a bit less unified in theme. During lunch Jeffrey Dvorkin, NPR Ombudsman, gave a presentation entitled *Ethics in the Digital Age*. Other afternoon sessions included a panel discussion on crisis event management, business implications of new technologies and some interesting new facility projects.

The regular sessions ended with a panel discussion entitled *Things We've Discovered about HD Radio*. This included two presentations on the results of Tomorrow Radio testing, a panel discussion on technical problems and experiences encountered while implementing HD Radio, and finally a discussion of low power HD testing in Los Angeles.

The conference ended with a special Night-Owl session entitled *An Audio Expedition*. Bill McQuay, NPR's Surround Sound and Radio Expeditions Technical Director, played a selection of some of the best on-location surround recordings from his collection. Attendees were invited to bring their own recordings to hear Tomorrow Radio first-hand. ■

Carter is chief engineer of WFMT, Chicago.

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NAB2004 in review

NAB Jackpot

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Sound card
Digigram

Mixart 8ES: The newest member of the Ethersound family, this multichannel sound card features eight Ethersound inputs and outputs and eight analog inputs and outputs, including four microphone preamps with phantom power. The system supports simultaneous recording and playback as well as audio effects, metering, mixing, routing and real-time processing. Options for MPEG encoding/decoding on the card, sample rate conversion and delay are available. This system offers as many as 64 channels of 24-bit digital audio at 48kHz, plus bi-directional control information may be transported to more than 60,000 networked audio devices. The point-to-point transmission time between an audio input and an audio output in an Ethersound network is six samples (125µs at 48kHz). Latency is independent of the number of channels transmitted.

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

Audio leveler
Ward-Beck

Alfa: A card-based system that works with the company's rack-frame system, this audio leveler offers as many as eight AES channels of control in a 1RU frame and 20 channels of control in a 2RU frame. Control can be preset for automatic level adjustment of predetermined levels or dynamic adjustment via a physical control panel. Unlike a compressor/expander, this audio leveler responds slowly to minimize the potential to change the dynamics of the signal. Adjustments are made to the long-term average level of the audio signal. All parameters of the processor are adjustable.

800-771-2556; fax 416-335-5202
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What clients are saying about Zephyr Xport and Zephyr Xstream:

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Vic Jester, Market DoE, Radio One, Atlanta

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Alex Lakey, Chief Engineer, Virgin Radio

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

Michael Black, GM, WEOS, Geneva, New York

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

James Turvaville, Chief Engineer, WAY-FM Media Group

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

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NAB2004 in review

Chassis connector
Neutrik

XLR Switch: These five-pole XLR receptacles can be used for audio, lighting and industrial purposes and are offered with vertical PC contacts. Because the switch is activated when the plug is inserted, it is possible to indicate, monitor and control mated connections. The switch provides open and closed contact, with a current rating of 100mA and a voltage of 12Vdc. The A series comes equipped with plastic housing while the B series has a metal ring for additional RF protection.

732-901-9488; fax 732-901-9608; www.neutrik.com; info@neutrikusa.com

RF station monitor
Coaxial Dynamics

81095: This microprocessor-controlled, rack-mounted Watchman monitor/alarm measures and displays forward and reflected power simultaneously in 50Ω transmission systems. Using LCD displays it also provides direct readings of VSWR. It is compatible with the company's series of 7/8" to 6 1/8" line sections and will accept elements from less than 5W to 100kW full scale from 2MHz to 2.3GHz. Installation consists of the Watchman, a dual-socket line section and two elements for monitoring forward and reflected power. The Watchman is supplied with two 25' dc cable assemblies for connection to the line section and a 6' ac power cord. An audible single tone alarm will indicate a system/transmitter malfunction. Relay contacts are provided for remote alarm and reset switching.

800-COAXIAL; fax 216-267-3142; www.coaxial.com; sales@coaxial.com

Solid state amplifier
Energy-Onix

SSA-100C, 150C, 330C and 500C: This compact amplifier occupies 5 1/4" of 19" rack space. The unit's full metering front panel indicates voltages and currents of all pallets, as well as forward and reflected power outputs. Protected against VSWR, high temperature and overdrive-foldback circuitry automatically reduces RF drive when VSWR exceeds 1.5:1. Protection circuits turn the amplifier off if VSWR exceeds 2:1, or RF drive exceeds preset level, or if thermostats within equipment operate. Thermostats are located on each of the two pallets and combiner reject load. Both amplifiers use 350W sections that incorporate two pallets. Insensitive to line voltage variations, the amplifier contains independent switching power supply that work at line voltages of 100 to 250Vac.

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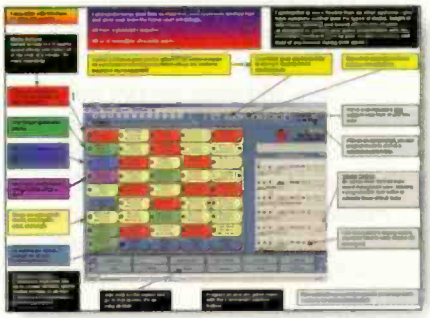
Action Sports Media

Game OPS Commander: Media buttons provide CD-quality sound effects and music in a variety of file formats. Navigation buttons keep sounds organized into as many as 12 user-defined screens. An automatic queue feature permits users to load music on the fly for unattended play-



back. On-screen mixer controls make sound management easy, including a programmable fade button to automate difficult fades. Cross-fade automatically fades between two selections. The minimum system requirements for Game Ops Commander Version 3.0 software are a Pentium 300 processor, a sound card, 32MB of RAM, 50MB of free hard disk space, a 800 x 600 display, and Windows 98, 2000, ME or XP.

503-963-3809; fax 503-963-3815
www.actionsportsmedia.com

Reverb plug-in
Trillium Lane Labs

TL Space: By combining the sampled acoustics of real reverb spaces with advanced DSP algorithms, this plug-in offers full control of reverb parameters in mono, stereo and surround formats. The technology features a Pro Tools plug-in to harness as many as eight Pro Tools HD DSP engines in parallel to deliver smooth, low latency convolution processing. Internally, the plug-in uses 32-bit block floating point processing for sonic fidelity. When used with Pro Tools HD Accel systems, it provides zero latency processing. The plug-in includes a library of high quality sampled reverb spaces and effects ideal for music and post applications.

fax 206-855-4658; www.tllabs.com; info@tllabs.com

Field recorder
Fostex

FR-2: This recorder includes a 10-second pre-record buffer, battery power, on-board limiter and phantom-powered balanced mic inputs. The system can record up to 24-bit 192kHz and an optional time code card, which has a full-featured time-code reader/generator and external word/video references. The system records to PCMCIA 1.8" hard disk drives and Type II Compact Flash and is stereo/mono selectable. The unit uses AA-size NiMH batteries for about two hours of field operation (Compact Flash) and files can be transferred to PC/Mac via PCMCIA, CF adapter or standard onboard USB connection.

800-7-FOSTEX; fax 562-802-1964; www.fostex.com; sales@fostex.com

NAB2004 in review

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MGE UPS Systems

EPS8000: This uninterruptible power system provides online backup at power ratings up to 800kVA with engine generator compatibility to ensure smooth operation for transmitters, while providing protection from crowbar events. High efficiency operation reduces operating costs, while its graphic interface eases operation.

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

Remote control and access
Adder Technology

Adderlink IP: By allowing multiple computers in different locations can be controlled securely and remotely via the Internet, dial-up link or a corporate network, this unit enables users to take remote control of computers, make updates and even re-boot from anywhere in the world. This ability offers a practical means to remotely manage computer installations. Developed in cooperation with Real VNC, the Adderlink IP is compatible with Virtual Network Computing remote control software. This enables total control of a remote PC irrespective of the operating system or hardware deployed by using a Java application that does not place a software or processor burden on the remote machine.

888-932-3337; fax 888-275-1117
www.addertec.com; enquiry@addertec.com

CD player
American Audio

CDI 500: This single-disc CD player features Power Touch, a touch-sensitive, interactive jog wheel; digital scratching 2.0; digital scratch mode and beat juggle scratch mode; tempo lock; instant start; nine on-board effects (scratch, filter, echo, trans, skid, phase, flanger, pan, bop); time and ratio (wet/dry) adjustment for digital effects; effect layering; and digital B.P.M. counter that keeps digital effects in sync with music. Other features of this unit include a 10-second anti-shock buffer, seamless loop, recall memory of Q-start and samples and a S/PDIF digital output.

323-582-2650; fax 323-582-2610; www.adjaudio.com; info@americanaudio.us

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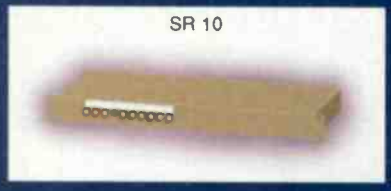
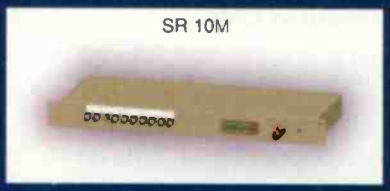
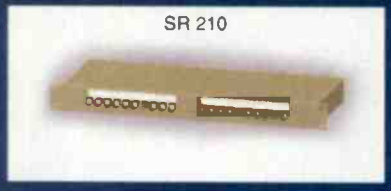


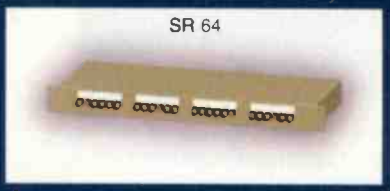
10 x 1 STEREO SWITCHER



10 x 1 STEREO SWITCHER WITH METERING AND MONITORING



10 x 2 STEREO SWITCHER



6 x 4 STEREO SWITCHER

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6 x 1 STEREO SWITCHER WITH METERING AND MONITORING

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NAB2004 in review

CD recorder
Tascam

CD-RW750: This recorder offers 24-bit digital converters, CD-R and CD-RW support, S/PDIF digital I/O, CD text, A-B repeat and single playback features in a 2RU package. The unbalanced I/O and S/PDIF digital I/O are provided in optical and coax formats. It has a RAM buffer for skip-free playback, 24-bit A/D and D/A converters and a digital fade in and fade out that is adjustable from three to 30 seconds. Its monitor section allows it to be used as a stand-alone A/D converter or sample rate converter without the need to place a blank disc in the tray.

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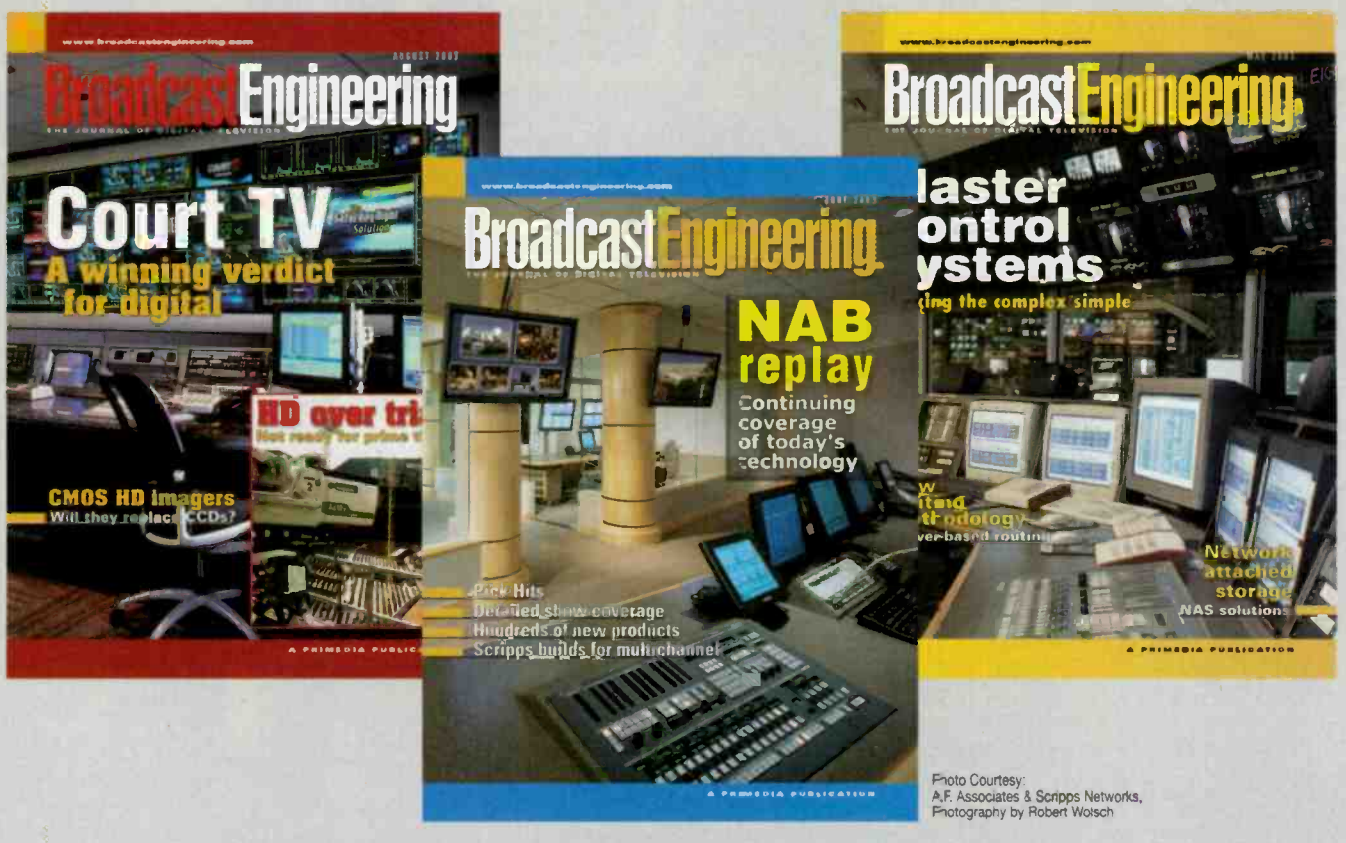

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ESPN

This facility upgrade is described as moving from the Flintstones to the Jetsons.

The old studios of ESPN Radio were long overdue for an upgrade.

by Allen J. Singer

Radio enters the digital age

"Jiminy Christmas, is this place big!"

Ron Dibble isn't exaggerating. The co-host of the *Dan Patrick Show* on ESPN Radio was accustomed to broadcasting from a room the size of a closet. That has all changed since the sports network recently finished updating its cramped and out-of-date facility. Dibble and the rest of the ESPN Radio on-air staff now enjoy more spacious studios and modern broadcasting technology as they deliver more than 9,000 hours of annual talk and event content to more than 700 affiliates nationwide.

ESPN Radio launched in 1992. In the beginning studio size wasn't an issue. Sports fans across the country tuned into their 170 local affiliates carrying the new

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ESPN Radio

sports network broadcasting from the ESPN Campus in Bristol, CT, home to 60,000 residents and one of the largest bell factories in the United States. ESPN's analog studios were deemed modern for 1992, but the next decade brought many changes to the sports network: more programming, more staff, more affiliates and less available room in their facility. By the turn of the new century, it was past time for ESPN to grow.

By 2000, the digital age had arrived. As hundreds of stations across the country upgraded their facilities, ESPN Radio decided their time had also come. In the early part of 2000, management and engineering considered their decade-old analog-based studios and began formulating the plans for a new state-of-the-art facility. With this major capital project, ESPN Radio would be able to provide crisp, clear audio for its affiliates with an all-digital path using modern cutting-edge equipment.

The air studio has an improved look and feel. Here we see Dan Patrick at the mic.

Growing pains

Any broadcaster who has spent a decade in one facility can understand the needs of this major sports network. As ESPN's popularity grew, new shows were added to the roster nearly every year, continuously increasing the size of the staff, and decreasing the physical space for announcers. For instance, Sports Center anchors had to physically

enter the main talk booth every 20 minutes to deliver their updates. These studios could only comfortably house three people; any more and they would be trampling on each other. Improvements to these awkward and cramped working conditions factored heavily into the new studio designs.

On the production side, the studios housed a hodgepodge of analog and digital equipment: BMX III and Yamaha 02R consoles, Minidisc decks, cart machines, CD players, 360 Systems editors, Orban DSE7000s and a Datatek 2400 router. A studio upgrade promised to bring up-to-date audio editing equipment and a new overall sound to ESPN Radio. This new sound would better serve the affiliates, listeners and most importantly the advertisers.

After the decision was made to build the new facility, the engineering crew, led by chief engineer Tom Evans, moved ESPN Radio from Building 2 to Building 5. ESPN Radio broadcast from the temporary, windowless quarters in Building 5 for the next two years. Ironically, this location offered a substantial space improvement to the old facility. Two studios, three control rooms and the equipment room occupied about 1,000 square feet, with an additional 3,000 square feet available for office space. The engineers moved all of the equipment (except for the core routing system and patch bays) to the temporary building, one room at a time, to allow for uninterrupted on-air operations.

ESPN commissioned Tecton Architects of Hartford to design the new facility in Building 2. This firm had previously designed the adjacent ESPNews studio, and the sports network wanted the continuity of style to carry into ESPN Radio. Tecton's greatest challenge in Building 2 was space limitation, in spite of the 5,000 square feet available on the first and second floors. Of this space, 2,800 square feet were allocated for the office space, and Tecton had to maximize the functionality of what was left for four live studios, four control rooms, an isolated production room and three equipment rooms.

All of the rooms occupy a compact area of only 2,200 square feet, making ESPN Radio a modern exercise in space efficiency. Windows were installed to provide sight lines between all rooms. Each room contains cameras to further enhance visual contact, and the images are transmitted within all the studios via a closed-circuit CATV system.

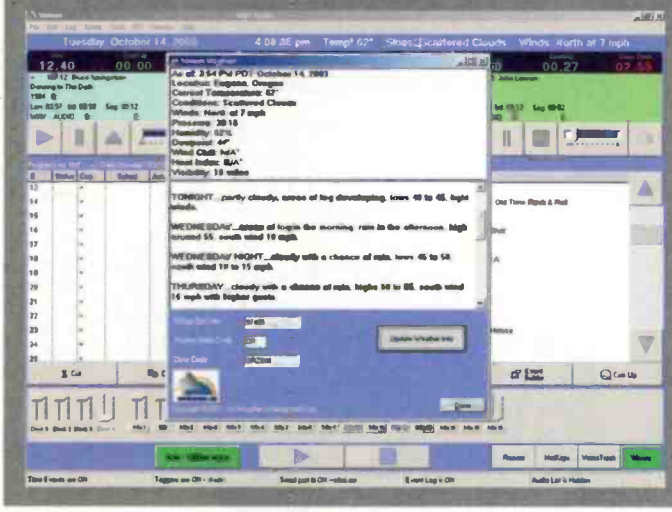
ESPN Radio uses the latest in acoustic technology

New Simian 1.6

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

The new Simian also includes sophisticated new Voice-Tracking functionality allowing Voice-Tracking days in advance, even from remote studios, and an improved ability to verify logs before air play.

Simian is still the most feature-rich automation system in the industry and provides powerful, reliable broadcast automation for stations in the US and around the world.



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ESPN Radio

for the entire facility. Tecton contracted University of Hartford Acoustics to optimize the sound performance of the new studios. The design called for high-performance doors, walls, ceilings and windows to acoustically isolate each studio. A specially designed HVAC system provides quiet ventilation, and a computer floor installed throughout the facility limits penetration between rooms (and eliminates the need for ugly wire trays). Absorption and diffusion fixtures manufactured by RPG regulate the acoustic reflections on the studio walls, and no electronic equipment in the studios and control rooms contain fans.

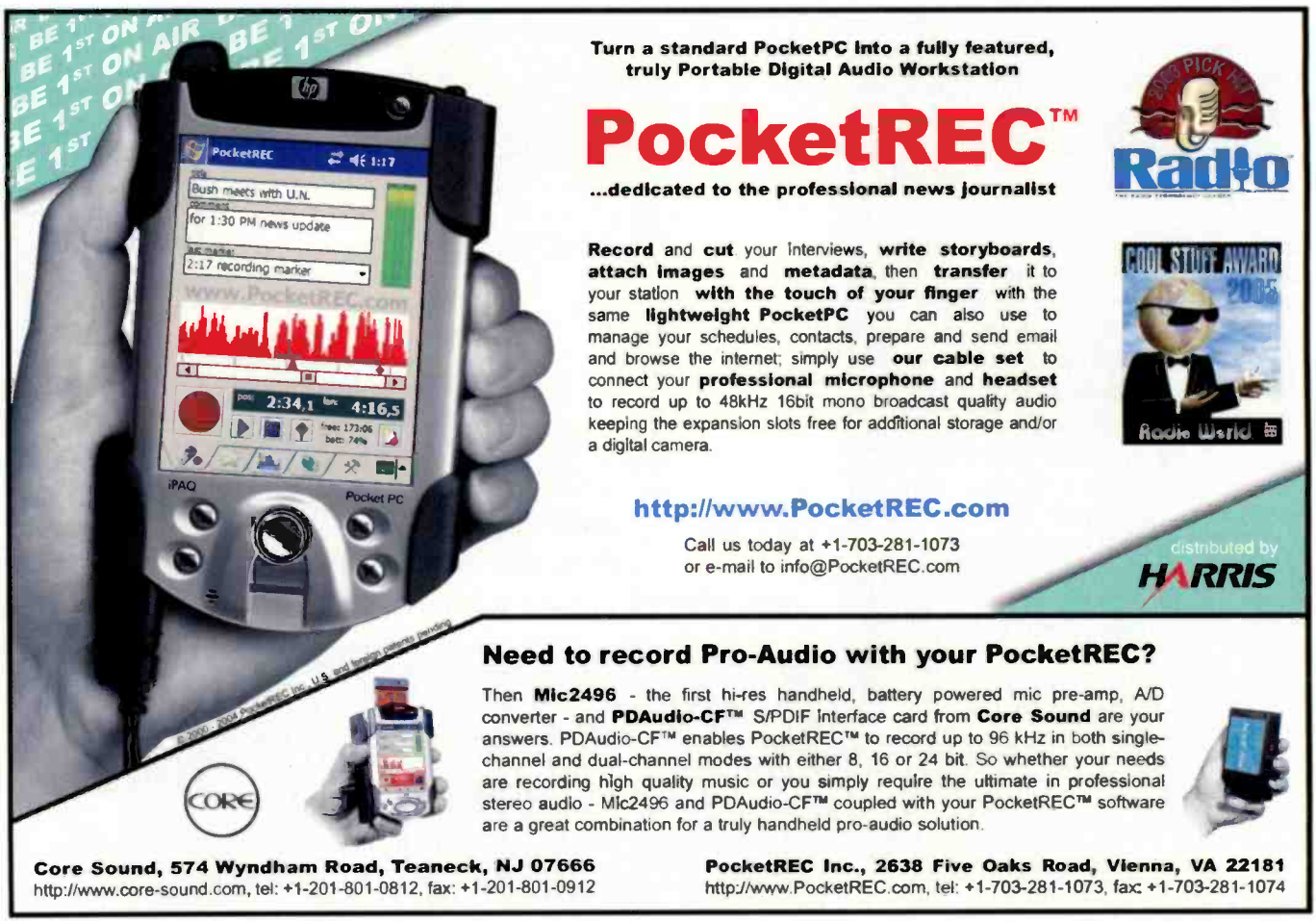
Late call

One challenge the engineers were forced to cope with was unexpected delays in delivery of software and hardware components required for the new studios. Some of these devices were so new that they were actually still in development when they were ordered. New items would trickle in over the months of construction, and engineers were left wringing their hands, wondering when the next one might show up.

But once the construction of all the rooms was complete, the wiring and equipment they did have could be installed. Harris was contracted to build out the facility, while ESPN staff took care of the support systems for the new studios. Three equipment rooms house the Enco workstations, servers and main audio storage. Thirteen racks hold the studio phone system, ISDN codecs, the router and patch panels. Three more racks facing into the adjacent ingest/screening room are fitted with dubbing equipment. The old-fashioned way of running big audio snake cables to the rooms was modernized by running the more compact CAT-5 multicables through 110 punch blocks, patchable 110 blocks and RJ45 panels. Also, fiber-optic lines carry signals from building to building, as well as some server to storage connections. Video and CATV are run on traditional coax.

Enco servers and storage devices are located in several buildings, providing a physical diversity of backup systems. ESPN Radio uses a virtual TOC still in development by ESPN and Enco Systems. The virtual TOC is a modern system of monitoring and control, with a schedule-based monitoring system that is being developed and deployed as new programming requirements arise. Scheduling of program paths will also be handled by the virtual TOC. Transmission and commercial insertion operations at ABC Radio in Manhattan is part of this virtual system, allowing even more flexibility to ESPN Radio's programming techniques.

The studios resemble something one might see in a science fiction movie. In all, the broadcast areas contain more than 100 video monitors. The second floor alone has 26 mic locations. The staff at



ESPN Radio uses the many monitors for computer displays, inter-room visual communications and to view multiple sporting events. Monitors also appear at audio workstations and office computers throughout the facility.

In addition to the vast array of video monitors, the studios contain all-new equipment except for the 360 Systems Digicart 3, a cart machine (still have to have this old standby) and two Telos Zephyr Xstreams—all carryovers from the old facility. Harris Pacific BMX digital consoles were installed in the new studios partially due to the resemblance to the BMX III, helping ease the transition into the new environment. In spite of their larger size, the new consoles provide an immediacy of button-per-function design similar to the previous BMX III consoles.

The digital signal path ultimately makes its way to the Harris Intraplex, where it joins a data stream and is sent to ABC Radio on a T1 line. Backups to the audio and data are available on diverse DSOs and KU feeds.

Producer Phil Ceppeglia in an ESPN Radio control room. The multitude of monitors provides a great deal of information to the producers.

The all-digital environment has greatly improved ESPN's flexibility and versatility and overall sound; and most importantly an improved efficiency on the job. The staff loves the new router system with more than 2000 crosspoints, with which they can pull any source into any studio, to instantly send programming across the hall among the four studios.

ESPN Radio

In an ESPN Radio news studio, Doug Brown prepares a story while monitoring television and Internet feeds. The air studio can be seen in the monitor next to the clock.

Formerly cumbersome multiple remote broadcasts are now a snap due to the way the increased numbers of ISDN connections are handled in the studio upgrade. These upgrades better serve the specific needs of their affiliates. The new equipment also helped ESPN launch its new ESPN Audio Cut service. Audio Cut is broadcast twice a day, and features the most timely, poignant news bytes from the world of sports.

ESPN Radio is now fully immersed in the 21st century. The new studios in Building 2 at the ESPN Campus are found just south of the main ESPN News room and north of the television studios. The current staff of 70 sports-minded people deliver more than 24 hours of live—never automated—programming to its 700-plus affiliates and 17 million weekly listeners across the country, including those in key markets such as Cincinnati, Chicago, Los Angeles, Pittsburgh, Dallas, Hartford, CT, New York, Phoenix, Norfolk, VA, and Louisville, KY.

Needless to say, the employees think they've died and gone to digital heaven. Following the requisite initial apprehension of moving into the new office, staff members quickly embraced the unfamiliar gear, observing noticeable time-savings on all their projects. The new equipment even challenged the staff to find better methods to perform their tasks more productively.

And whether the station personnel like it or not, the temporary facility in Building 5 is going to stay there

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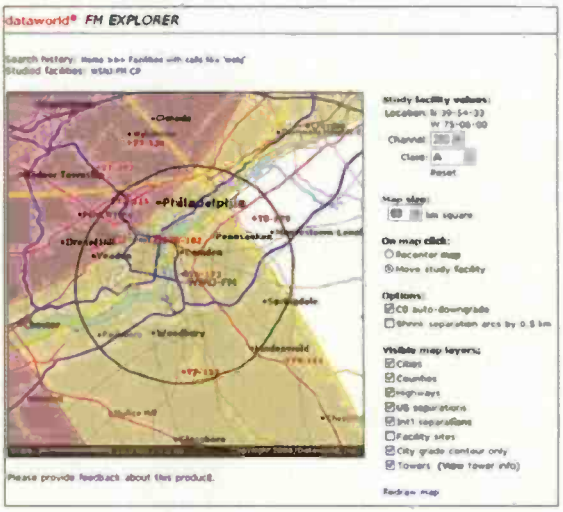

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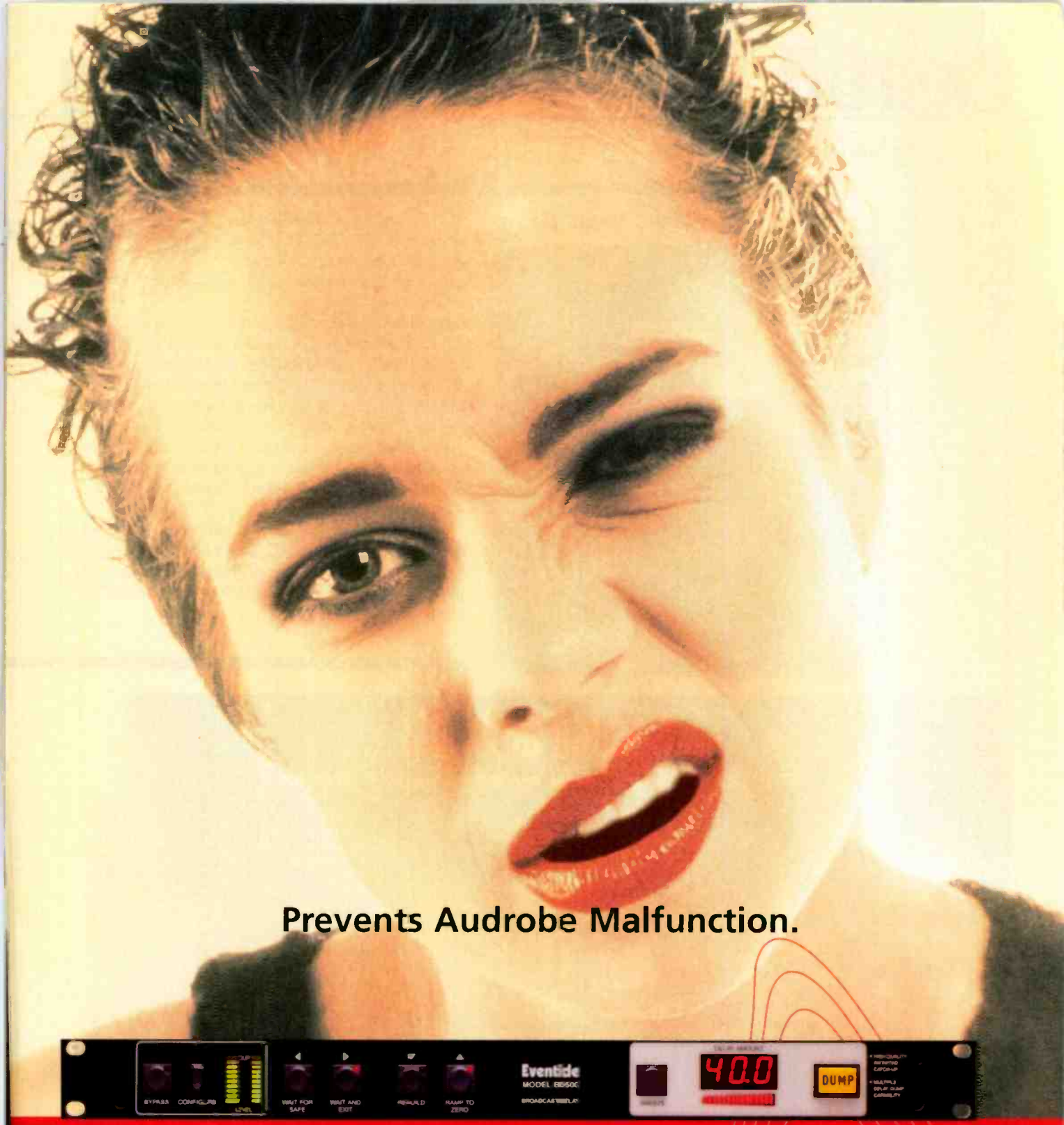

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Sign Off

By Kari Taylor, associate editor

www.beradio.com

That was then

This is the on-air studio of WFMT Chicago in 1983. WFMT was, and still is, a classic music station with cable distribution of its programming throughout the United States.

The reel-to-reel tape recorders in the foreground are Revox PR99s; those in the background are Studer A80RCs. The turntables are Technics SP-15s with Audio-Technica tone arms. The console was custom built by the chief engineer at that time, Al Antlitz. The cassette recorder is to the right of the console.

The panel below the cassette recorder and the displays above are for audio routing switcher control, designed and built by Gordon Carter, the current chief engineer at WFMT.

There were also Apt Holman phono pre-amps not seen in the picture. The CD player (behind the word update) was manufactured by Philips/Magnavox, and the microphone is an AKG D-202. Steve Reeder, a WFMT announcer, is at the controls.

Sample and Hold

Top 25 Radio Owners by Revenue per Station

Radio magazine 2003 rank	Owner	Avg. Revenue per station (Radio Magazine) ($000)	2003 BIA Total Revenue Rank	Radio magazine 2002 rank	2003 BIA Estimated Revenue-Owner ($000)	Owner # Stations Present	Owner# Markets
1	Infinity Broadcasting	12,199	2	2	2,269,025	186	42
2	Emmis Communications	11,528	10	1	311,250	27	8
3	Greater Media	9,125	13	4	173,375	19	6
4	Jefferson-Pilot Communications	8,197	16	5	147,550	18	5
5	Susquehanna Radio	7,571	11	6	257,400	34	10
6	Bonneville International	6,593	12	3	230,750	35	6
7	Cox Broadcasting	6,237	3	10	474,000	76	18
8	Spanish Broadcasting System	6,180	15	9	154,500	25	7
9	ABC/Disney	6,093	5	7	444,800	73	44
10	Sandusky Radio	5,930	25	8	59,300	10	2
11	Radio One	5,665	7	12	368,250	65	22
12	Univision Communications	4,592	8	*	330,650	72	23
13	Entercom	4,370	4	13	454,475	104	19
14	Inner City Broadcasting	3,412	24	14	64,825	19	8
15	Clear Channel Communications	2,914	1	16	3,535,060	1,213	189
16	Beasley Broadcast Group	2,871	17	15	120,600	42	10
17	Journal Communications	2,042	21	17	77,600	38	8
18	Citadel Broadcasting	1,893	6	21	399,438	211	46
19	Salem Communications	1,807	14	20	168,050	93	35
20	Entravision Holdings	1,718	19	22	89,350	52	21
21	Multicultural Radio Broadcasting	1,632	22	*	76,705	47	22
22	Saga Communications	1,524	18	19	120,375	79	14
23	NextMedia Group	1,206	23	25	72,377	60	11
24	Regent Communications	1,180	20	23	88,515	75	14
25	Cumulus Broadcasting	1,036	9	24	311,780	301	60

BIA ranks owners by total revenue. *Radio* magazine has taken this data and then divided it by the number of stations owned, to provide a ranking based on individual station average performance, which shows the revenue efficiency of each owner.
For comparison, we have included the BIA ranking, the owner's 2002 *Radio* magazine ranking and the average revenue per station.

* - Not ranked in 2002.
Source: Data from BIAfn's Media Access Pro

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What is the Facility Focus?

The Facility Focus provides an up-close look at the technology in use at the facilities featured in *Radio* magazine Facility Showcase articles. The highlighted manufacturers are are leaders in the industry, and the Facility Focus allows them to showcase their products and services.

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Musicam USA Netstar 500

By Bob Anderson

WLIU had been using Musicam USA's CDQ Prima 220s to send programming to our sister station, WCWP, via fractional T1. This setup had been functioning reliably for the past five years with few outages. However, in January of this year the Long Island University's IT department informed us that the T1 was being replaced by an OC48 metropolitan area network link and we would have to replace the Prima's with equipment that would work over Ethernet. The university has had success with a VoIP telephone system, so I started looking at various music over IP codecs on the market. One unit that stood out was the Netstar 500 by Musicam USA. Because we had good results with the Primas, I decided to try the Netstars.

Performance at a glance

- IP or ISDN-capable codec
- Voice mode
- Analog or AES-3 inputs
- Easy-to-use menus

Once they arrived, I set them up in the shop with a back-to-back connection using a crossover cable. The units came preprogrammed with IP addresses for testing. After several minutes of getting used to the menus on the front panel, I was able to connect. I set the compression algorithms to none and used linear PCM with a 44.1kHz sample rate. The audio sounded exactly like the source. Using the menus, it was easy to try out the different compression schemes that were included with the Netstar - MPEG Layer 2 and 3, MPEG 2 AAC, MPEG 4 AAC-LD, G.711 and G.722.

The built-in Web browser made setup a snap. At a glance you can see the status of the current connection and what configuration you have on the near end and also the far end. And you can change the settings on the far end if needed. This can save a lot of time by not having to walk people through the configuration changes if any problems should arise.

The basics

The Netstar features analog in/outs along with AES in/out ports. These are selectable from the front panel or the browser. There is a front-panel headphone jack that is selectable for sending or receiving audio, or both simultaneously. The reference level and peak hold times for the VU meters are selectable.

The encoder can be set to match the incoming signal, therefore you can change the near end and the far end will automatically follow when reconnecting.

On the down side, the VU meters do not show up on the Web browser. Although a value can be accessed via telnet, this is only useful for assessing steady tone levels.

In addition, the Netstar is a full ISDN codec and has a built-in terminal adapter. The U interface is standard but an S interface can be activated by an internal cable change. More than 200 numbers can be stored as user profiles with various settings stored for each number. These can also be used to store IP addresses and settings for Internet connections. These user profiles can then be dialed or connected to with two clicks on the browser. The algorithms available for ISDN are Layer 2, Layer 3, AAC, AAC-LD, G.711 and G.722. Making ISDN calls was as easy as using IP and once the settings matched the Zephyr that we have, the call went through each time.

The Netstar Web interface provides access to the unit's functions and settings.

Besides using the Netstar on the university's network, I tried it on the cable modem that we have. After enabling the DHCP mode and rebooting the modem and the Netstar, I was able to connect to Musicam USA's IP address over the public Internet using MPEG Layer 2 at 128kb/s. Although the audio sounded fine, the connection did not hold any longer than three minutes at a time. Cablevision noted that the signal to the modem was weak and causing packet loss. This was probably causing the disconnects.

Construction of the unit was first rate with a substantial front panel. The keypad is a membrane click type and looks like it will survive for years, unlike the Prima's spongy pushbuttons, which had no tactile feedback. Inside, the Netstar has an Intel D845 micro ATX motherboard with a solid drive memory module installed in the IDE slot. Power is supplied by a standard slim-line PC Power and Cooling supply. The proprietary Musicam cards were horizontally installed on a vertical riser on one of the PCI slots on the motherboard. The motherboard and the riser card had metal bracing to the chassis, which ensures that nothing will work loose over time.

We have been using the Netstar 500 as an STL on the university's network for the last 90 days without any dropouts or connection problems. Because the audio is uncompressed, the quality of the sound on WCWP has improved considerably over the Prima's 128k we had been using. We have also used the return feed to send live music broadcasts from the Tilles Center at the CW Post Campus to WLIU and back again to WCWP with no noticeable audio degredation.

Anderson is chief engineer for Long Island University's WLIU Southampton, NY, and WCWP Brookville, NY.

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Digigram Ethersound ES8in/ES8out

By Ed Ruzumna

It is often said that Cartersville, GA, is 45 miles north and 100 years away from the hustle and bustle of Atlanta. So it is understandable that a community that has been cited as one of the 100 Best Small Towns in America would want to protect the appearances of its historical area.

Because of this, the not-for-profit station WBHF-AM (1450) was faced with some challenges when it moved its studio in 2003 from a corporate location outside of town to the bucolic historical district. The community fathers were all for a station that is big on the prep sports scene and local news, but they weren't too keen about the prospect of multiple four-foot-high satellite dishes being placed on top of the studio's building.

A combination of Digigram's off-the-shelf Ethersound audio bridges ES8in/ES8out and existing Ethernet that runs the four miles between the old facility and the new studio allowed the radio station to keep its dishes in place and keep the historical-minded community happy. Plus, the station saved costs by not installing the satellite dishes at the new site.

A tricky situation

We investigated several methods to carry the audio from the old location to the new studios, but each either required a higher ongoing cost or did not provide the reliability that we wanted. Because we had fiber running between the corporate building and the new station, we were able to install Digigram's Ethersound ES8in and ES8out using the existing Ethernet. We set up a virtual LAN, which dedicated 100Mb/s of bandwidth on the network. The five satellite dishes at the corporate office travel as streams through the system and break out on the studio end.

Ethersound ES8in injects eight analog balanced audio signals into an Ethersound network, while the Ethersound ES8out extracts eight analog audio signals out of an Ethersound network. The network set-up is as easy as plugging in an Ethernet cable. System set-up, control and re-configuration are operated remotely via straightforward PC software. No specific IT expertise is required. Applications include synchronous high-quality audio distribution in broadcast facilities, fixed installations and live sound.

One hitch I encountered is that Ethersound requires a dedicated network with the same bandwidth at all times. The Ethersound devices' identity is indicated by their MAC address, and a dedicated control software (EScontrol) is used to address, manage and control them. In our installation, we placed the terminals in an isolated portion of our network by creating a VLAN.

Performance at a glance

- High-quality audio distribution
- Integrates into existing Ethernet infrastructure
- Low latency: 125µsec at 48kHz sampling rate
- 24-bit, 48kHz audio performance
- Reduces cabling needs
- Easy configuration

The way it is configured now, the system occupies 100Mb/s at all times, regardless of actual usage. It would be ideal if the system would dynamically occupy bandwidth as it is needed instead of holding a continuous chunk of the network. The advantages of the current method are the extremely low latency and that the bandwitdh is always available to Ethersound. There is no danger of the network being too busy to accomodate the audio demand when it arises.

And as WBHF AM-1450 found out, using Ethersound ES8in/ES8out and existing Ethernet kept our architecturally-minded neighbors pleased as well.

Ruzumna is chief engineer of WBHF.

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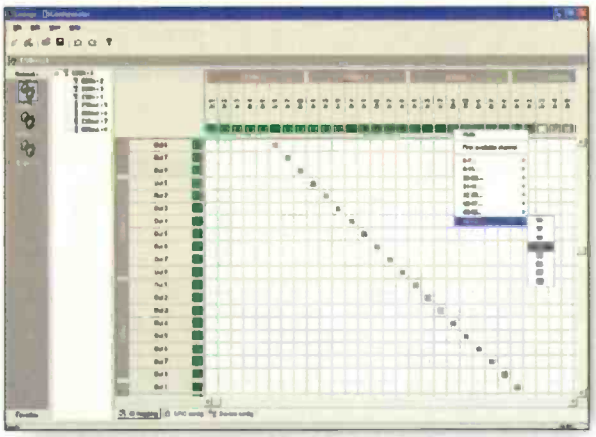
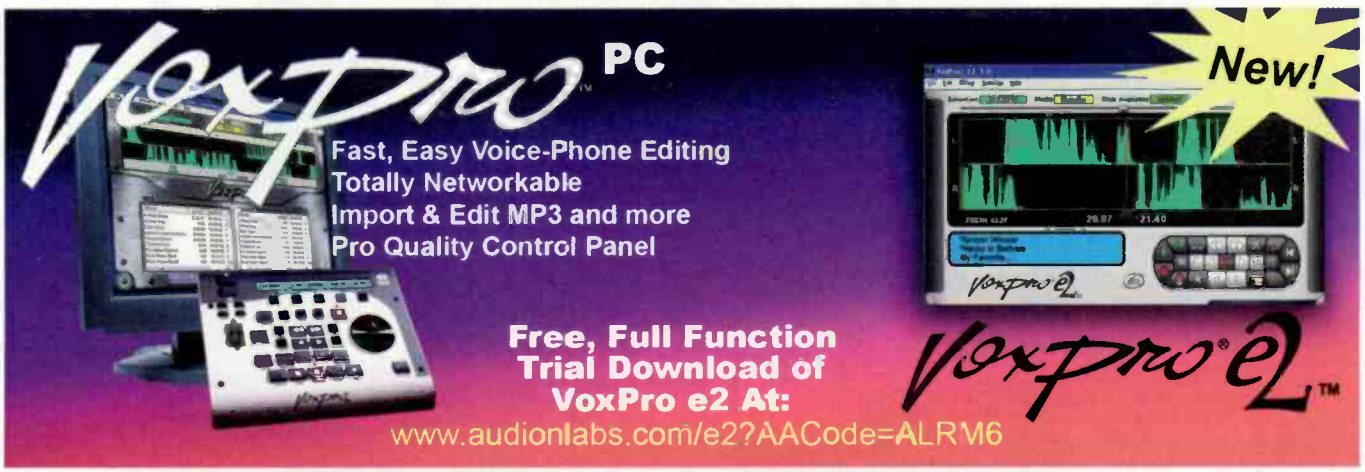


The system can be setup with the EScontrol management software, which can also access the system via an IP connection.



Ring of Fire

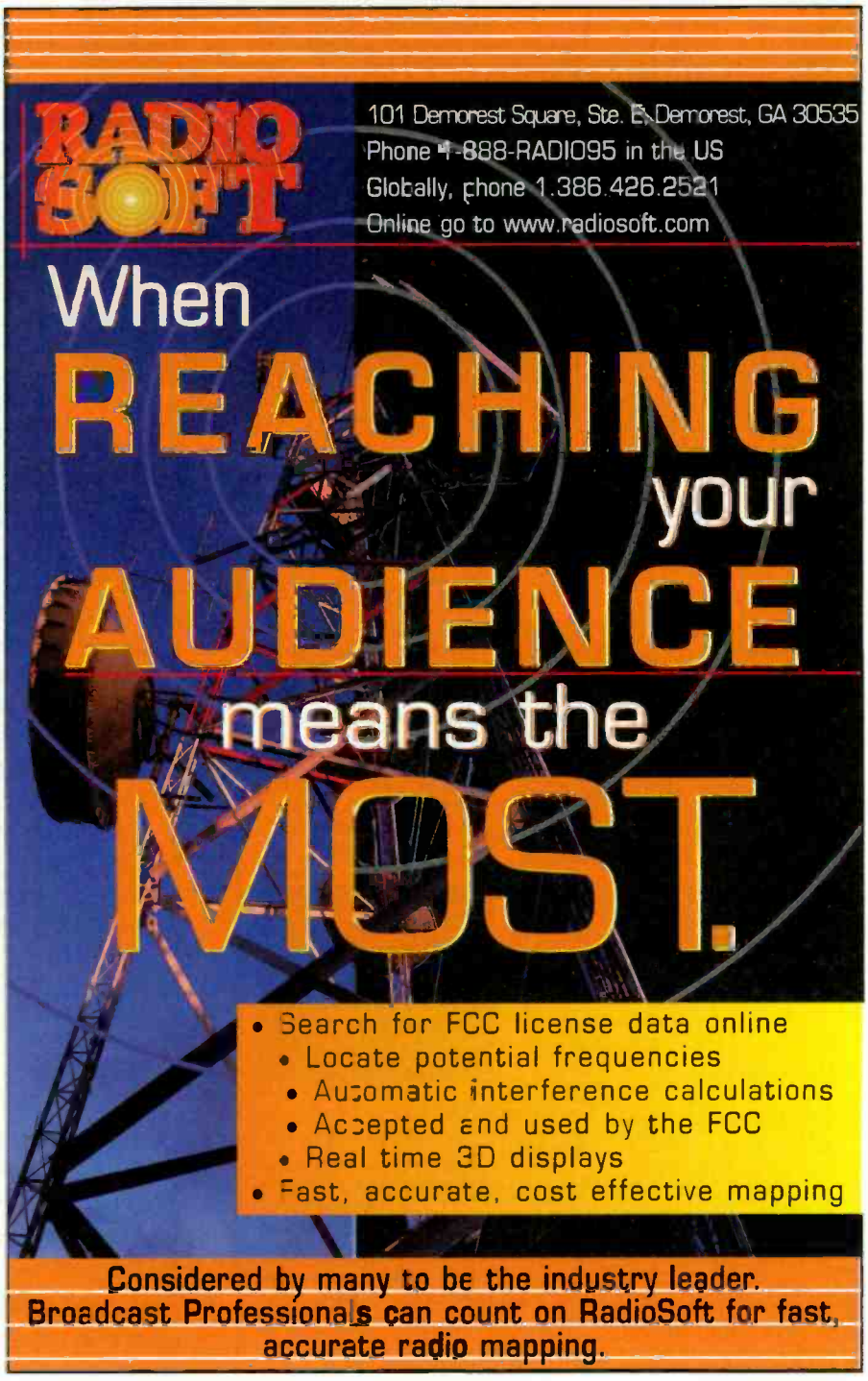
By Bobby Likis

Debuts New Talk Facility

The battle of the radio talk shows continues as new liberal-oriented hosts go on-air to combat the well-established conservative personalities. One show, *Ring of Fire*, co-hosted by Mike Papantonio and Bobby Kennedy Jr. and carried by the Air America Radio Network, will be produced in Pensacola, FL. Mike Papantonio is an attorney and senior partner at Levin, Papantonio, Thomas, Mitchell, Echsner, and Proctor, P.A. who has tried some of the most significant civil damage cases in North America and is the author or co-author of several best-selling books, including *In Search of Atticus Finch*. Bobby Kennedy Jr. has earned the reputation as one of America's most eminent and tenacious environmental, social and political advocates.

The venue for production of *Ring of Fire* did not exist when the idea for the show was conceived almost six months ago, but in late December, Papantonio allocated space for the studio within the building that houses his law offices. Because Papantonio and his staff are novices to the details of broadcasting, they sought outside expertise to create the new studio, and that's when I came in. *Bobby Likis Car Clinic*, which now airs from the studio I built inside my 15,000-square-foot automotive service facility, has been running for more than 17 years. Car Clinic programming is currently syndicated on 296 radio stations nationwide, the Internet, Sirius Satellite Radio, the American Forces Radio Network and television. This blend of national-quality experience and local availability made me the go-to guy for talk-show

Constructed from Lyptus hardwood, a hybrid hardwood species, the talk studio furniture maintains low sight lines for a clean layout.



Ring of Fire

facilities. In early January, Papantonio retained me to design and contract construction of the studio, as well as to equip it with state-of-the-art broadcast technology.

The finished product substantially evolved from the original concept because I felt it was essential that Papantonio and Kennedy had whatever facility they might need to produce their current program and to poise them for the future.

The control room oversees the talk studio, and was designed to maximize its flexibility in a limited area.

My goal was to build a studio that all would be proud to claim. The crews were encouraged daily to listen and provide feedback as to how to finish the project as fast as possible—and with all the specifics desired. Personally, I wanted the studio to impress the media. I believe this was accomplished.

My first call was to Rudy Agus, a broadcast engineer with whom I have collaborated with on several past projects. Agus specified and arranged for the purchase of all the necessary equipment, but when it came to furniture, we were temporarily stymied. Personalities of the stature of *Ring of Fire's* hosts demand and deserve a more sophisticated level of atmosphere and ambience than standard off-the-shelf offerings from most broadcast furniture manufacturers. Agus suggested that I speak with Balsys Wood Arts, a relative newcomer in the broadcast furniture field, but owned by people with a long and successful history in broadcasting as well as in the design and construction of fine wood cabinetry. The unique marriage of broadcast experience and master craftsmanship proved to be a superb combination.

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The Host Desk has been renamed Buddha because everyone rubs it when first entering the room.

Car owners think tune-ups can fix anything because they don't understand how sophisticated today's vehicles are, and certainly don't know the right questions to ask. This project began by asking myself, "What if I were building a replacement studio for myself?" I used this criterion throughout the project.

The first challenge was to create a radio, TV and Internet streaming facility for two attorneys who only wanted to produce a one-hour taped weekly radio show, which can be done with practically no equipment and little room. It's well known that there are a few radio talk hosts who work out of their homes.

The second challenge was turning a small office and adjacent hallway into a studio and a control room. Rocky Barnes, the firm's investigator, provided whatever support was needed to complete the job, including knocking out walls, adding dedicated HVAC systems, electrical boxes, wiring, doors, divider glass and a host of other building modifications. All the while, Barnes had to be sure he didn't take too much of the firm's office space.

While the project progressed, there were law-office personnel working four feet away from the construction areas from day one. No doubt they were happy to see the project finally come to an end.

Richard Christine of Acousti Engineering Company of Florida was the building contractor. He scheduled his crews to work when business hours were over whenever noise might be involved. This was a huge challenge, but necessary because the studio is adjacent to an accounting firm.

Christine consistently under promised and over delivered, but it was his carpenter, Rick Sibley, who could do anything with wood that was responsible for building the working model of my third challenge.

The third hurdle and most challenging environ-

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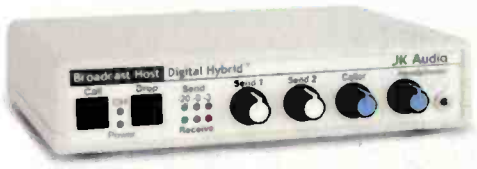

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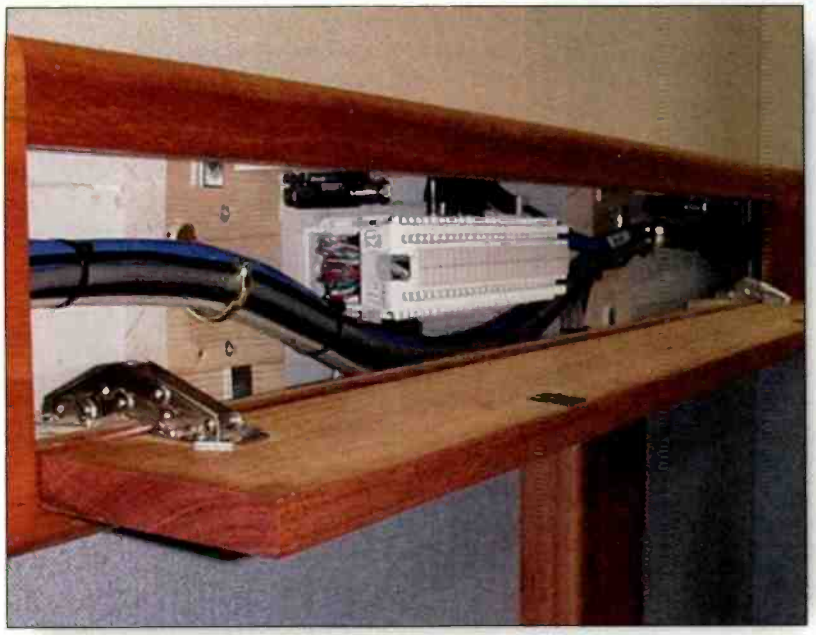
Ring of Fire

mental issue to deal with was a way to conceal all the wires in the studio. Remembering that this is a fifth-floor clerical office with concrete floors and drop ceilings.

Because the existing site had no provisions or clearance for conduits, I designed and had built a novel concept for wire management between rooms. On the right wall of the studio, we installed a hollow chair rail with drop-down doors for 25 pair CAT-5 house cables and other wiring. On the left, we completed the perimeter of the room by balancing the look with corresponding standard rail. The wood for both these rails also came from Balsys, ensuring that all hardwoods within the room would match in color, grain and finish. This feature not only simplified the installation, but also accommodates future upgrades and expansion.



The chair rail is actually a drop-down door that conceals the cable routing trough.

From the initial call to Balsys, which launched an incredible exchange of concepts and an education on the pros and cons of various materials, to the ultimate evolution into a remarkable collaboration, the professionals at Balsys were a joy. Larry and Eric Lamoray, each an artisan in different facets of the business, soon became more than just vendors; they transformed our preliminary look-and-feel requirements into spectacular, functional designs that would fit into limited spaces and at the same time would have dynamite visual appeal.

The host desk itself was the result of several conversations and design reviews. Initially, I wanted to place twin 17" LCD screens on the host's desk, but someone suggested that they should be hidden.

The remote kit sees regular use when the show takes to the road.

After some discussions, we decided that placing the monitors behind a glass panel would be too much to ask. Instead, I designed a hood, which was later named the dashboard.

Because there was the need for the director to be inside the studio, a desk with two screens, a computer and a headphone jack was installed. The host has equal access and controllability of the director's computer.

Balsys delivered and set up the furniture, complete with all internal prewiring mounted and tested to streamline Agus' task of installing the equipment. (It was fortunate that Balsys had requested precise measurements of each door and hallway from building entrance to studio locations, as the last doorway offered only ¼" clearance.) Each piece of furniture was assembled, leveled and polished, and then both studio rooms entirely cleaned prior to the official unveiling. The smile on Papantonio's face was worth all of the work and extra hours spent attending to the finer details that many may overlook on such projects.

In addition to the studio installation, a remote rack was assembled to allow co-host Bobby Kennedy to join Papantonio via POTS or ISDN using Tieline Communicators. A Zephyr Xstream is used to send the program audio to New York. The final step is an Airtools profanity delay.

The result is a showcase facility that we can be justifiably proud of and that is a testament to the quality of workmanship of all of the companies that cooperated in the construction.

Likis is the president of the Car Clinic Network (CarClinicNetwork.com), Pensacola, FL.

Equipment List

- 360 Systems Instant Replay
- 360 Systems Shortcut Editor
- APC SUA700RM2U UPS
- Audioarts R55
- Balsys Technology Group Custom headphone/mic panels
- Balsys Wood Arts custom furniture
- Belden 1864A
- Comrex TS-612
- Comrex TSCS
- Conex LFG1000-1
- ElectroVoice RE-20
- Fostex 6301BEAV
- Gepco D6-801EZGF
- Henry Super Relay
- HHB CDR-830+ CD
- Krone punch blocks with RJ-21
- Neutrik XLR connectors
- OCWhite mic booms
- Prolite AV on-air lights
- Quabbin 5200
- Rare HC4
- Rare HC6
- Sennheiser Countryman E60W6LSO
- Sennheiser EW-112C
- Sennheiser HMD280
- Shure P2TRE2
- Sony 7506
- Sony DCR-VX2100 minidisc
- Sony MDR7506
- Symetrix 422
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By Kari Taylor, associate editor

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800-333-2137; fax 650-842-7999
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Acoustica

Mixcraft: Mixcraft is a Windows program that allows multitrack recording into a PC. Multiple tracks of audio can be edited with cut and paste, and effects such as reverb and EQ can be added. Productions can be burned to a CD. Mixcraft's 32-bit sound engine supports recordings at CD quality and above. Each track has its own pan, volume and effects, including reverb, delay/echo, EQ, compression, flanger and chorus. The maximum number of tracks is only limited by the processing power of the computer. The software also offers looping tools and can use loops from existing loop libraries.

559-692-2224; fax 559-692-2214; www.acoustica.com

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Hollywood Edge

E49: A remote variable-pattern tube mic, this product uses Soundelux's KK47 large diaphragm capsule. The output transformer provides a correct impedance match to any mic preamp input and offers lower intermodulation distortion and improved frequency linearity in the low and middle frequencies. The mic features a double shock mounting system that includes a capsule-to-electronics shock assembly and a separate capsule and electronics package shock mount. The included universal outboard power supply has a continuous variable polar pattern control that adjusts from figure-of-eight to cardioid and then to full omni-directional.

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207-671-9110
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Heil Wire: This specialized cable is specifically for use in interfacing balanced audio lines from a professional audio mixer into the transmitter input. The cable can also carry the dc control lines from a push-to-talk circuit or a computer keying system. This wire can reduce the capacitive coupling between these two signals and shield the audio lines from the outside RF environment to reduce interference that the transmitter may create. This product contains two 18-gauge audio leads residing in a silver-braided shield. Along the side of this shield is another pair of 18-gauge control wires that can carry the push-to-talk circuits and keep the dc components away from the ac audio signals. The outer jacket is a PVC jacket that fits into the cable clamp system of the eight-pin Foster plug.

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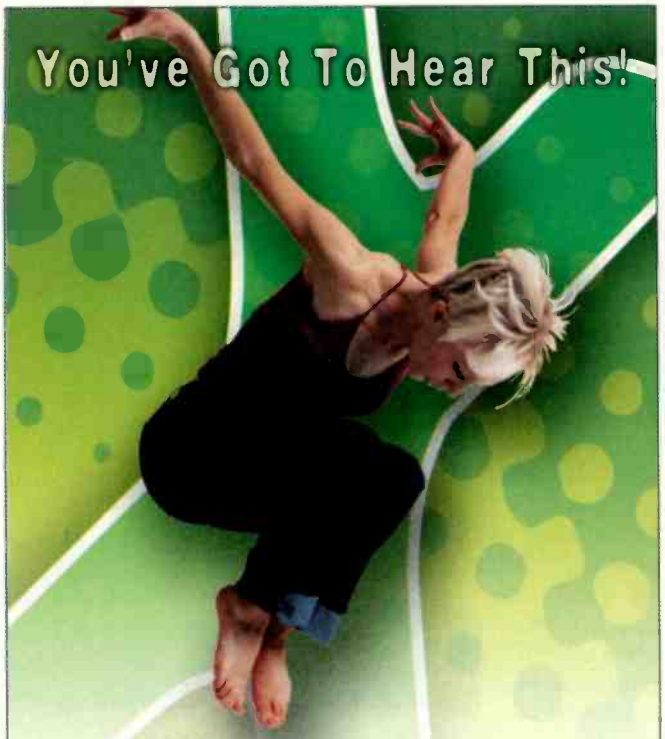

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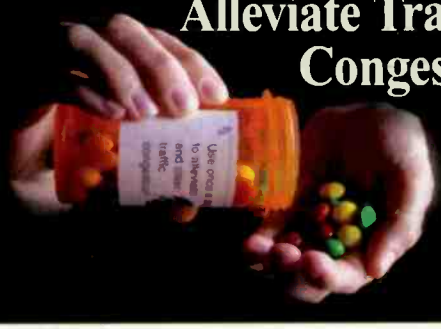

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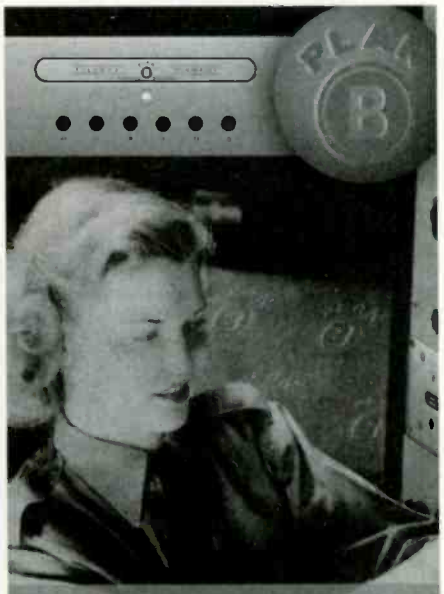

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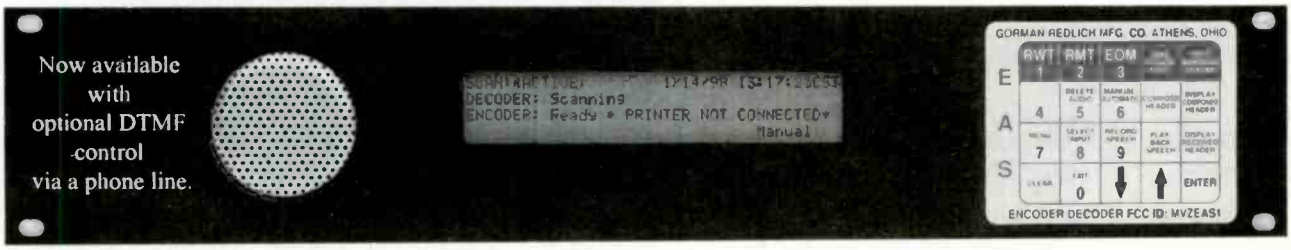

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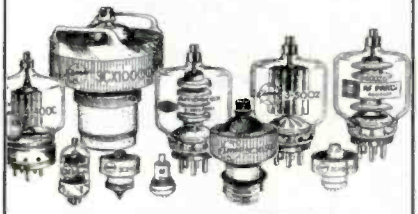

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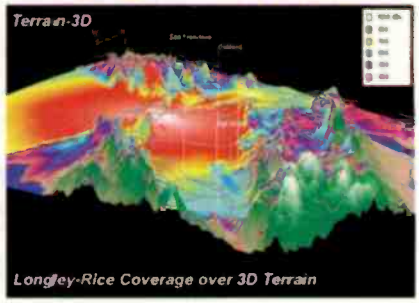

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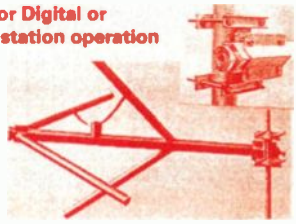

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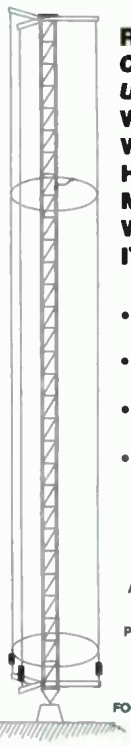

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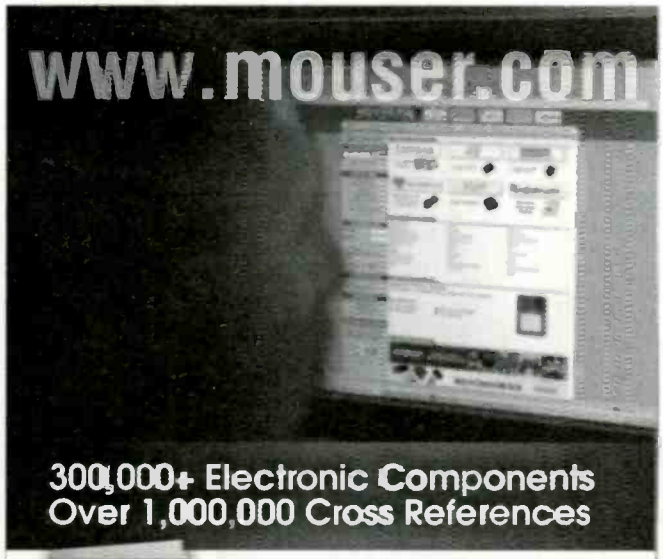

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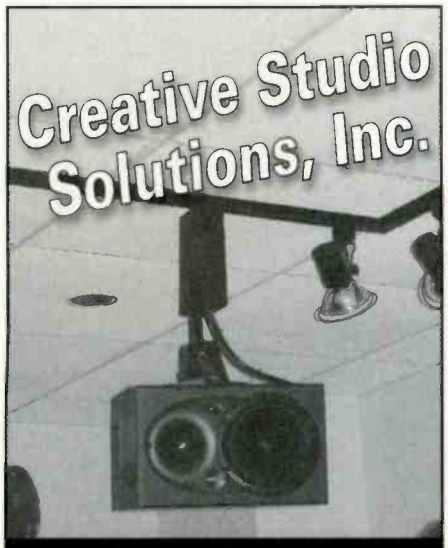

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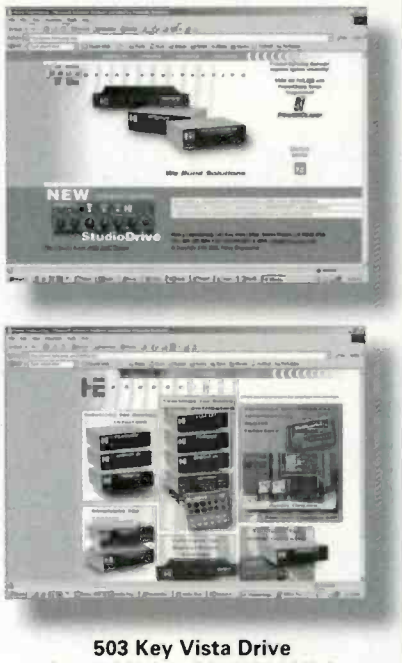

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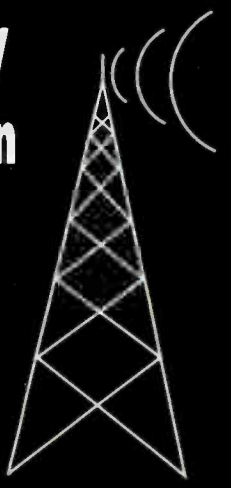

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Contributor Pro-file

Meet the professionals who write for *Radio*. This month: ESPN Radio, page 50.

Allen Singer
Allen's Edge
Cincinnati, OH

In the late 1990s and early 2000s, Singer pursued a career as an installation and broadcast engineer. After graduating from college in 1996, he worked for Harris as an installation technician. Following that, he worked for WRRM/WMOJ in Cincinnati as an assistant engineer. After getting let go after 4½ years as an engineer, Singer worked for an A/V installation company in Cincinnati for nine months. After that, Singer decided to pursue freelance writing as a career because his book, *The Cincinnati Subway*, was selling so well.

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Sign Off

By Kari Taylor, associate editor

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That was then

This is the on-air studio of WFMT Chicago in 1983. WFMT was, and still is, a classic music station with cable distribution of its programming throughout the United States.

The reel-to-reel tape recorders in the foreground are Revox PR99s; those in the background are Studer A80RCs. The turntables are Technics SP-15s with Audio-Technica tone arms. The console was custom built by the chief engineer at that time, Al Antlitz. The cassette recorder is to the right of the console.

The panel below the cassette recorder and the displays above are for audio routing switcher control, designed and built by Gordon Carter, the current chief engineer at WFMT.

There were also Apt Holman phono pre-amps not seen in the picture. The CD player (behind the word update) was manufactured by Philips/Magnavox, and the microphone is an AKG D-202. Steve Reeder, a WFMT announcer, is at the controls.

Sample and Hold

Top 25 Radio Owners by Revenue per Station

Radio magazine 2003 rank	Owner	Avg. Revenue per station (Radio Magazine) ($000)	2003 BIA Total Revenue Rank	Radio magazine 2002 rank	2003 BIA Estimated Revenue-Owner ($000)	Owner # Stations Present	Owner# Markets
1	Infinity Broadcasting	12,199	2	2	2,269,025	186	42
2	Emmis Communications	11,528	10	1	311,250	27	8
3	Greater Media	9,125	13	4	173,375	19	6
4	Jefferson-Pilot Communications	8,197	16	5	147,550	18	5
5	Susquehanna Radio	7,571	11	6	257,400	34	10
6	Bonneville International	6,593	12	3	230,750	35	6
7	Cox Broadcasting	6,237	3	10	474,000	76	18
8	Spanish Broadcasting System	6,180	15	9	154,500	25	7
9	ABC/Disney	6,093	5	7	444,800	73	44
10	Sandusky Radio	5,930	25	8	59,300	10	2
11	Radio One	5,665	7	12	368,250	65	22
12	Univision Communications	4,592	8	*	330,650	72	23
13	Entercom	4,370	4	13	454,475	104	19
14	Inner City Broadcasting	3,412	24	14	64,825	19	8
15	Clear Channel Communications	2,914	1	16	3,535,060	1,213	189
16	Beasley Broadcast Group	2,871	17	15	120,600	42	10
17	Journal Communications	2,042	21	17	77,600	38	8
18	Citadel Broadcasting	1,893	6	21	399,438	211	46
19	Salem Communications	1,807	14	20	168,050	93	35
20	Entravision Holdings	1,718	19	22	89,350	52	21
21	Multicultural Radio Broadcasting	1,632	22	*	76,705	47	22
22	Saga Communications	1,524	18	19	120,375	79	14
23	NextMedia Group	1,206	23	25	72,377	60	11
24	Regent Communications	1,180	20	23	88,515	75	14
25	Cumulus Broadcasting	1,036	9	24	311,780	301	60

BIA ranks owners by total revenue. *Radio* magazine has taken this data and then divided it by the number of stations owned, to provide a ranking based on individual station average performance, which shows the revenue efficiency of each owner.
For comparison, we have included the BIA ranking, the owner's 2002 *Radio* magazine ranking and the average revenue per station.

* - Not ranked in 2002.
Source: Data from BIAfn's Media Access Pro

Wheatstone Corporation

D-8000

Digital Radio Console

ADVANCED TECHNOLOGY! WHEATSTONE'S fourth generation digital console has what you need: dual-domain input modules that accept both analog and digital sources; built-in router integration with 8-character displays; a choice of features like auxiliary sends, equalization, dynamics control and event memory/recall—all without the aid of an external computer. *The D-8000 is an all-modular design with no active components mounted inside.* And best of all, it uses Wheatstone's exclusive VDIP® setup software, letting you easily configure individual console modules, logic modes and automatic functions. ***Contact Wheatstone—the digital audio people!***

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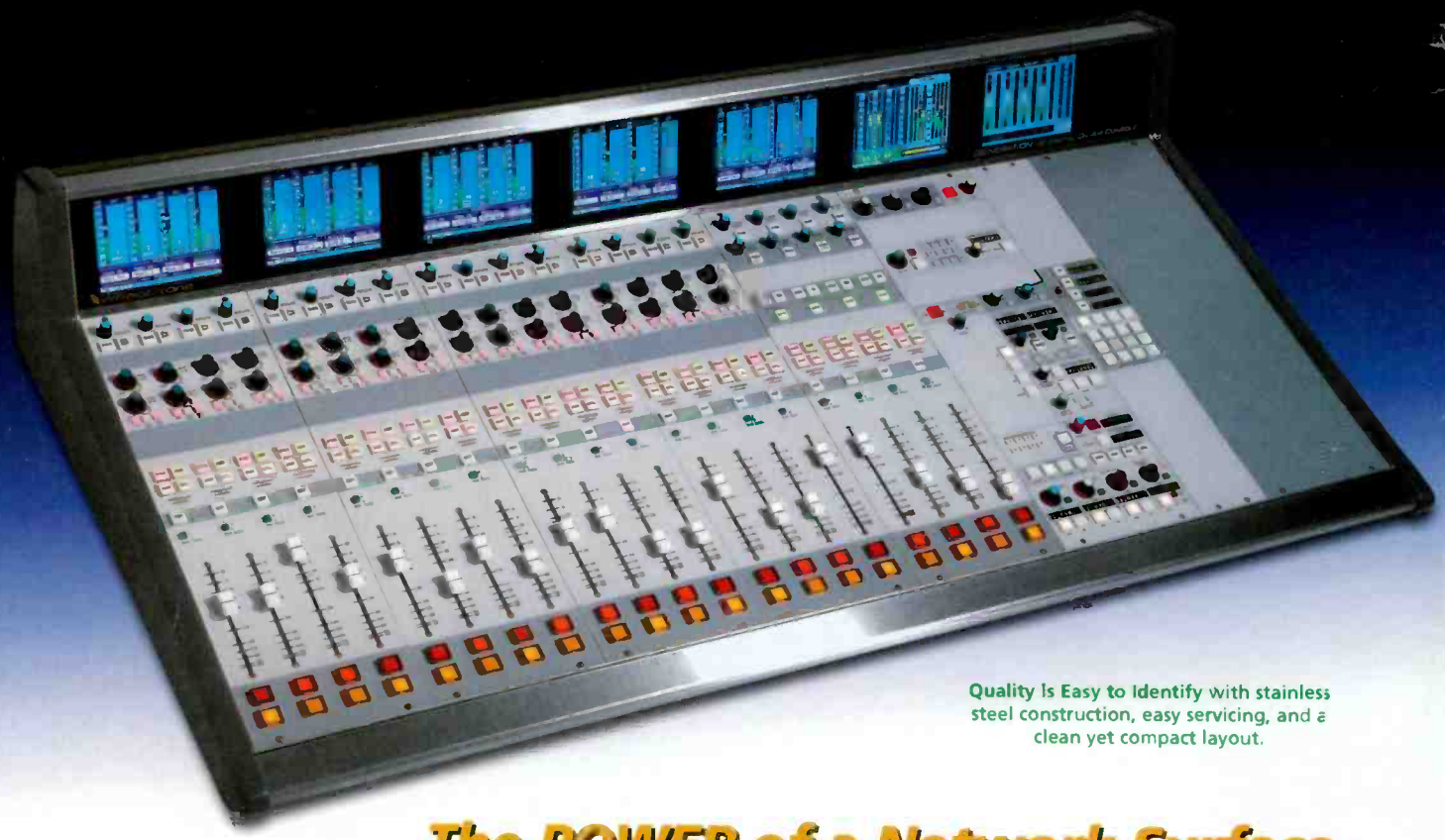
GENERATION-8: The On-Air Control Surface for High-Traffic Studios



Quality Is Easy to Identify with stainless steel construction, easy servicing, and a clean yet compact layout.

The POWER of a Network Surface with the FEEL of a Traditional Console!

ONE CAT-5 WIRE conveys all the control from this surface to Wheatstone's Bridge System. You can bring any system source (inputs or mixes) to any console fader or monitor pot (source visibility software controlled). You can set destinations for mixes, aux sends and MXMs to anywhere in your facility. For example, you could allow (or software disallow) your news console to go to your on-air chain, or feed any mix desired to a talent or remote position.

THIS MAJOR MARKET CONSOLE can handle all the call-ins and remotes you'll encounter. Four faders dedicated specifically to phone segments provide errorfree interface to four callers or remotes, each with independent caller and fader feeds, user selectable talkback communication and adjacent channel linking. A dedicated LCD display screen keeps the operator informed and in control.

YOU CAN STORE AND NAME switch and fader settings for each operator's task and recall them by simply spinning an encoder and hitting a TAKE button. And like our larger G-9, the G-8 has 12 user programmable switches for salvos and intercoms plus additional programmable TALK buttons for IFB functions. And with full color LCD display screens the operator will know for certain that his signal is clean, his sources correct, and his preset signal is ready and waiting. *The G-8 has the layout and features to let your operators work fast and accurately!*

Wheatstone the digital audio leaders

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