Radio®
THE RADIO TECHNOLOGY LEADER

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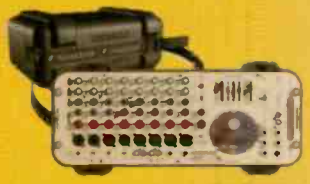

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THIS NEW RADIO CONSOLE from Audioarts combines the benefits of a ROUTER *and* an AUDIO CONSOLE into one COST-EFFECTIVE digital package, *letting you route any input to any fader or to any monitor feed,* with all sources clearly shown in bright LED dot matrix displays right above the faders and monitor level controls.

A COMPACT TABLETOP DESIGN, the D-16 has the features you need: both analog and digital PROGRAM and AUDITION stereo outputs, 2 MONO analog outputs, 14 input faders plus 2 caller faders, 4 mic preamps, control room and studio monitoring, built-in cue and headphone amps (with concealed headphone jack) —even four internally generated mix-minus outputs!

WITH 24-BIT A>D and D>A inputs and outputs and sample rate converters on every AES digital input, the *D-16 will work with virtually any digital source gear you have.* It can run your source machines too (up to eight of them) — all opto-isolated. Its DSP DIGITAL METERING simultaneously displays VU columns and peak hold fullscale digital so you can be assured of pristine performance. Its powerful caller tools generate mix-minuses automatically, and you can program any of its four MXM outputs to be pre or post fader.

And with Wheatstone's extensive digital background and reputation you can be assured that the D-16 is a *great* console!

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THE RADIO TECHNOLOGY LEADER
Radio Magazine
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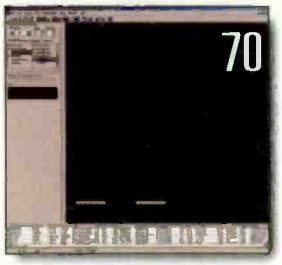

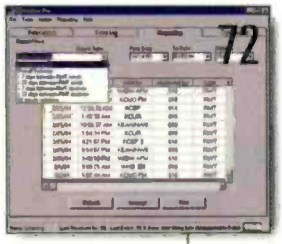

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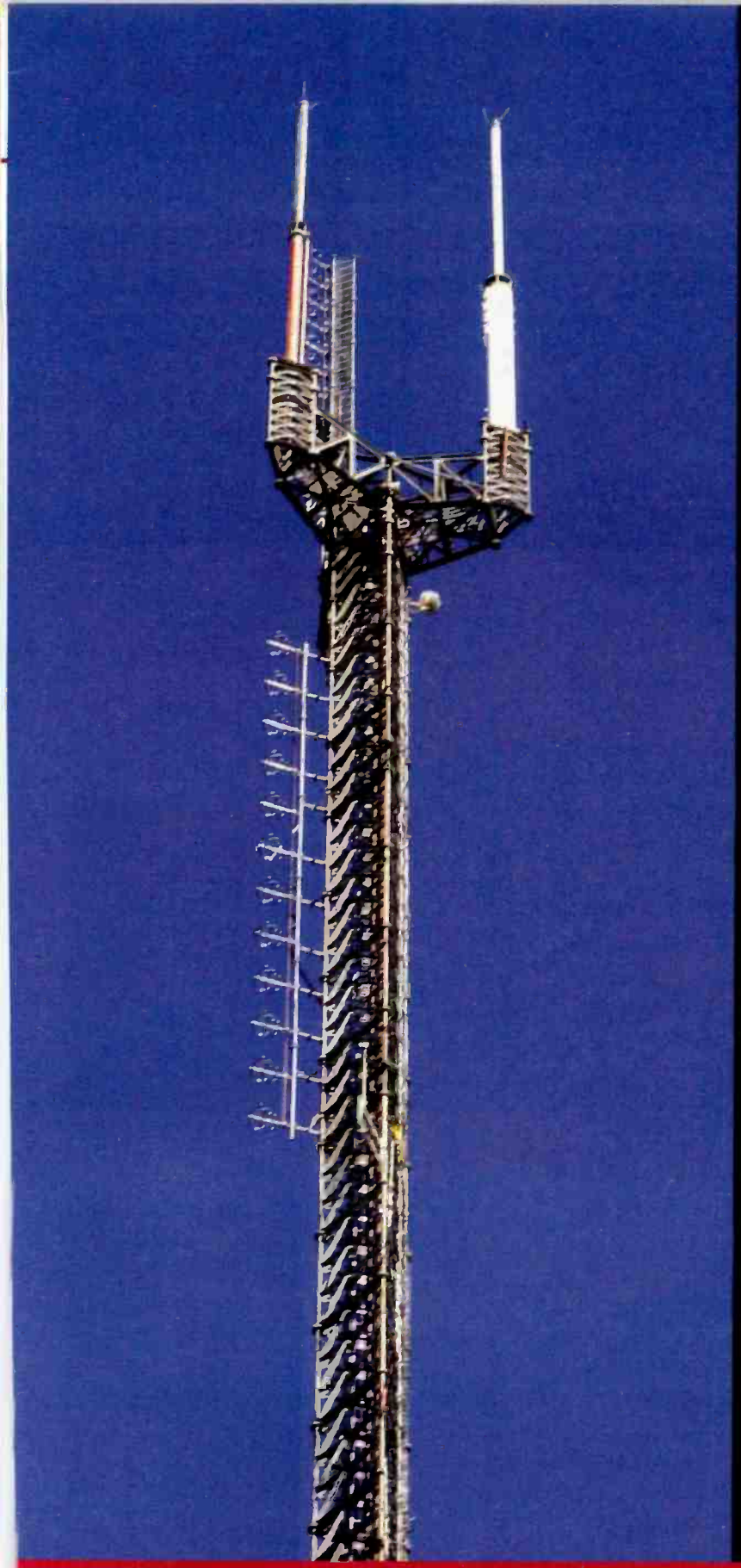
Telephone codecs make easy work of point-to-point audio distribution, and they're smarter than ever before. Cover design by Michael J. Knust.



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"From base to beacon" – that's the scope of products and services we provide at Dielectric. It's also the primary reason why we are the world leader in Digital Broadcast Technology.

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KLINE TOWERS

Currents Online

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

FCC Okays Use of Separate Antennas for IBOC

FM stations may file for an STA to commence IBOC operations using dual-antenna systems that meet the NAB-recommended criteria.

Orban Announces Spring MBL Tour Dates

Orban/CRL has announced the dates and cities for its Mobile Broadcast Laboratory USA Tour for the second quarter of 2004.

New EAS Event Codes Take Effect in June

The FCC has adopted new civil emergency, weather and natural disaster event codes. View the complete list of the codes.

Sam Donaldson, Michael Powell Face Off at NAB2004

Sam Donaldson will interview FCC Chairman Michael Powell for the FCC Chairman's Breakfast on Tuesday April 20.

Arbitron Inks Deal with Mediaguide

Arbitron will use Mediaguide's broadcast monitoring technology to verify whether radio commercials were broadcast as indicated.

Clear Channel Imposes Indecency Standards

Clear Channel has announced that it is undertaking a new Responsible Broadcasting Initiative.

NAB Crystal Awards Finalists Announced

The winners will be announced at a luncheon on April 20 at NAB2004.

Download the *Radio* magazine **FASTtrack and Exhibits Directory** for NAB2004 to your PDA.

Follow the link at www.beradio.com

Site Features

Demo Room

Step into the Demo Room for online demonstrations of the newest products for radio.

IBOC Update E-newsletter

This twice-monthly e-mail newsletter follows the latest news and technology developments for HD Radio. Subscribe today.

NAB Insider E-newsletter

Get ready for NAB2004 with our exclusive e-newsletter full of product introductions, session previews and news from the convention.

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STEREO POTS
AUDIO CODEC

Introducing the all new iMix G3

iMix G3 features a brand new super charged DSP platform that combines studio mixing power and new POTS/ISDN,GSM and data codec capabilities never before offered in a 16 x 9" sized remote mixer at such a low price.

The world's first 15kHz stereo POTS audio codec can deliver live stereo remotes or stereo studio links over dual POTS lines. A new Dual Mono feature also enables the use of one 15kHz POTS channel for main program and the second 15khz POTS channel for a range of on-board IFB including production/engineering talkback and live on-air callers. You can even send your broadcast program to two locations.

A miniature expansion slot accepts a range of new hardware modules to suit individual remote applications such as GSM to landline for wireless remotes, Stereo/Mono ISDN, Stereo or Dual Mono POTS plus new IFB and front panel controlled live on-air caller facilities.

The on-board six input digital mixer can be easily configured for non-technical users or as a fully featured studio mixer including on-off channel buttons, cue, intercom, telephone caller control, LAN/RS232 interfaces and one button control of local and remote control relay inputs "and" ouputs. You can even adjust your remote talent's audio input levels from the studio to ensure their levels are always perfect.

An optional Digital Router software kit will allow any of the six audio inputs to be routed to any audio output, giving you the tools to create a powerful and fexible studio environment in the field. iMix G3 will also connect to your existing Comrex* or Musicam* POTS codecs

Call Tieline or your favorite dealer for a free demonstration.

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*Compatible with Comrex Matrix, Blue, Vector and Musicam Liberty POTS Codecs
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One bad apple

On the eve of NAB2004, I am making the final preparations for my week-long stay in Las Vegas to focus on our industry's biggest event. For the staff of *Radio* magazine, the work involved in preparing for a four-day convention starts in January. We devote space in the March and April issues to the convention. We compile a weekly e-mail newsletter for several weeks leading up to the convention. The NAB convention fills our days as we review new product announcements, exhibitor news and session highlights.

But once the April issue is sent to the printer, we're still not finished. Our pre-convention work is done, but now we have to focus on our activities during the convention and make plans for the convention review after it's all done. This is a lot of effort for four days of the year.

So, now I look ahead to what this year's convention will bring. In preparation, I try to determine what the big item of discussion on the convention floor will be.

Will it be IBOC? Perhaps. The FCC is allowing the use of separate antennas with an STA. Several manufacturers have provided peeks into their new products. Several sessions are devoted to the technology. It doesn't take any special insight to know that IBOC will once again be an important topic. However, this is a familiar topic and I don't expect a great deal of new discussion.

Will it be RBDS? Also a strong candidate. The recent explosion of RBDS installations is generating interest in the 10-year-old technology. RBDS provides information that satellite radio listeners have learned to expect. Meanwhile, some consumers are confused by the technology, thinking that it is digital radio. Regardless, transmitting RBDS today is an analog step that can be adapted for IBOC tomorrow, so it will also be heard regularly in discussions.

Unfortunately for us, the big topics this year will likely not focus directly on technology. Consolidation will return as a frequent topic for aisle banter, but it won't be the star.

The big topic this year will be indecency, thanks to the FCC and the consumer media that keep feeding this monster. It's amazing how a little skin during a primetime broadcast can become a point of obsession for so many bureaucrats. Is this by any chance an election year? Because decency is tempered by opinion, there is no easy answer here, which is why the debate will rage on and on.

I am pleased that Congress plans to increase the fines for airing indecent material. Not only will the licensees have to pay more, the performers will also be held financially responsible. AFTRA opposes this action, stating that it will limit free speech. AFTRA also states that on-air personalities are forced into airing indecent material because of programming decisions. Sorry, I don't buy that. No one writes the script that forces a show host to say certain words. In the end, an individual's own sense of decency should take over before airing a potentially offensive bit. Likewise, we shouldn't expect to hear children's programming on an adult-oriented morning show.

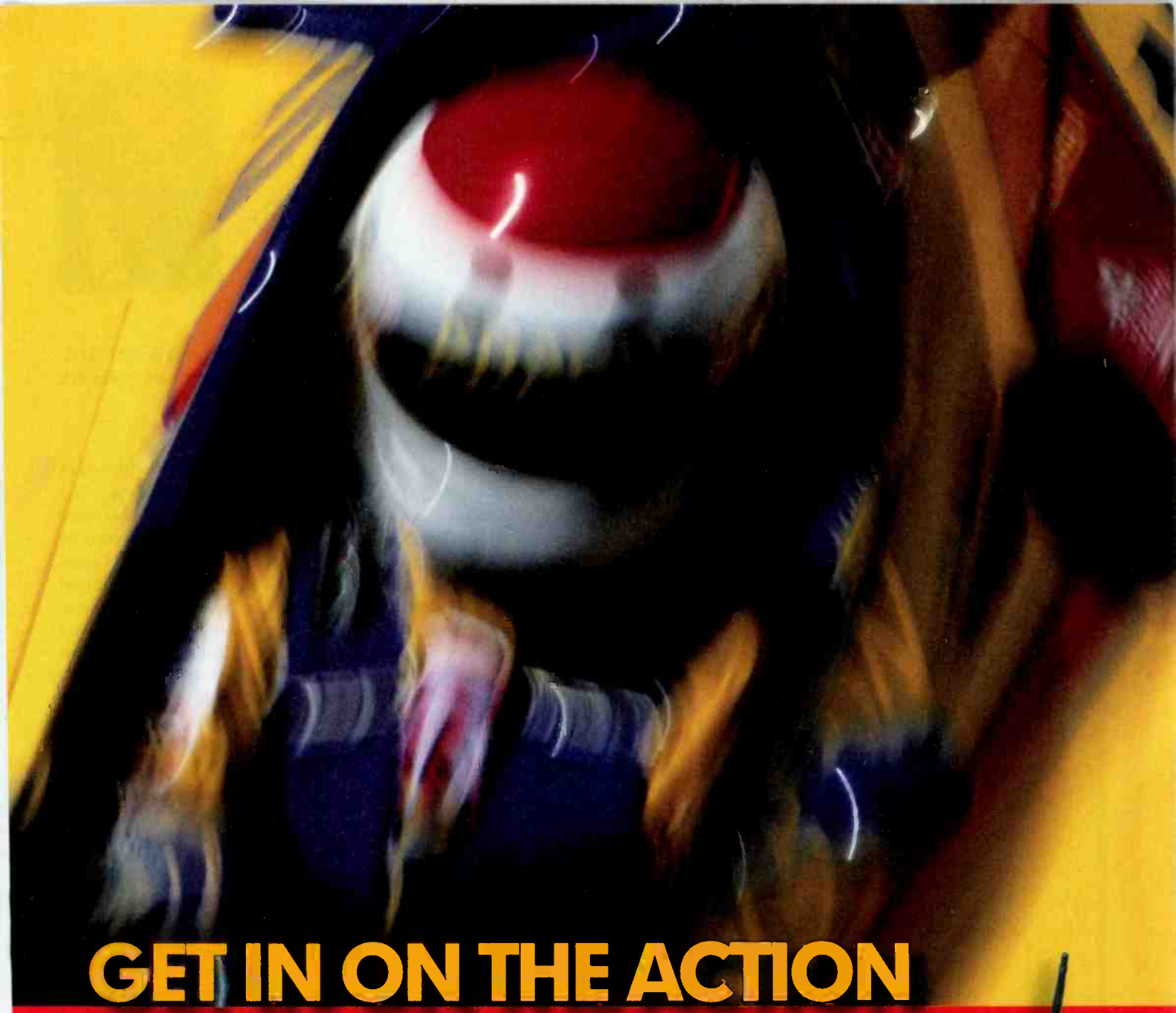
The debate over decency standards cannot be resolved through legislation or FCC rules. There is too much opinion involved. Parents that are concerned about their children being exposed to indecent material need to take positive action. Supervise the children's access to questionable material. Teach the children what is decent. While out of place in the family-oriented telecast, the incident during the Super Bowl was tame compared to what is readily available online or on cable.

While the decency issue goes on, there is a technology angle to be considered. Now that stations are walking on eggshells to ensure that their programs are clean, the lowly profanity delay has risen to a renewed level of importance. So while the chit-chat turns to rhetoric, watch the rejuvenated interest in the technology of delaying an audio stream.

I guess there is a technology angle after all.

Chriss Scherer, editor
cscherer@primediabusiness.com

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



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The results? Your listeners hear the sweat pouring off the winner – the sound of a skin-of-the-teeth victory with detail that's unprecedented.

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Concerning combiners

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

Until the advent of FM, combiners were rarely required. After FM was introduced, the need for a method of feeding two or more FM frequencies into a single FM antenna developed. AM operation had already made it obvious that antenna-originated signals from an adjacent station could feed back into the final stage of a transmitter and produce internal cross modulation. Unfortunately, much shorter wavelength of FM transmissions requires critical spacing in terms of electrical degrees when establishing a filter system.

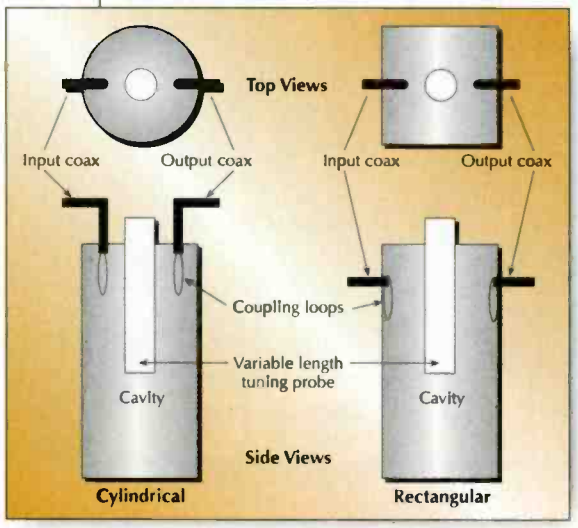

Figure 1. The general layout and connections for a typical combiner.

In the old days, there were few diplexed radio stations. As vertical real estate became more valuable, and stations started locating two or more AM transmitters on the same tower, i.e. multiplexing.

The components used for AM multiplexing are inductors and capacitors, which are finite in size and power handling ability and susceptible to external influences when operated at higher frequencies. The lower frequency of AM operation means that lumped components can be used, and adjustment is less critical than for the FM band. Hand capacity has less effect, and adjustment is simpler, although it must be just as precise.

Evolution of terms and usage

As FM operation increased, stations needed a method of combining two FM outputs into a single FM antenna. The shorter wavelength of FM means that spacing between individual components must be measured in terms of wavelength or electrical degrees. In some cases, coaxial cable is not suitable because the electrical length required is less than the distance between the units. To overcome this problem multiple cavity units were developed using common interior walls. The actual connection between each cavity is a hole in the common wall. This obviates the need for coaxial cable connections with possible electrical length and space problems.

The combiner bears no physical resemblance to the LC combinations found in AM filters. In fact, most combiners look like metal tanks with coaxial cables attached. Combiners form an unusual tuned circuit consisting of a cavity with one or more loops or probes connected to the coaxial cable. A cavity may be circular or rectangular. When the cavity is excited by the desired RF frequency a tuning rod system or probe is adjusted to tune the cavity to resonance.

A cavity resonator can oscillate in many different modes. The major mode is obtained by adjustment of the fine-tuning probe as the cavity is tuned to resonance. The mechanism of a cavity resonator can be compared to an LC circuit using small values of inductive and capacitive reactance with the internal surfaces of the cavity acting as the LC units.

Although cross-coupled bandpass filters have replaced notch filters, it is important to know how a notch filter functions. Its purpose is to prevent an undesired signal from passing. It has a similar effect to a series-resonant LC circuit that is used in AM diplexing. Notice that the notch

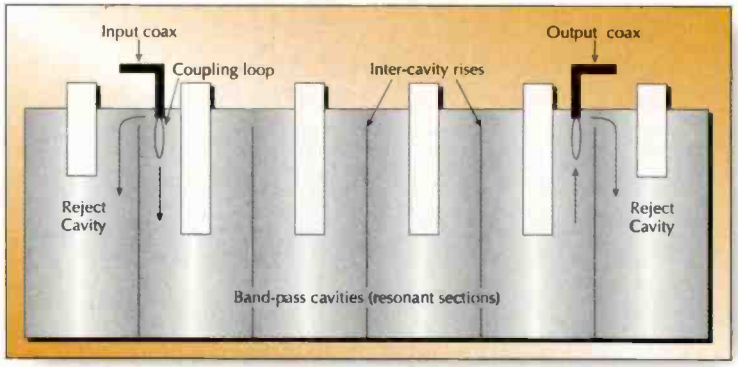

Figure 2. An integrated notch filter and bandpass filter design.

The Digital System that's Easiest to Use

Make your stations sound better

Announcers tell us, "I'm doing my best shows ever!" after they get Scott Studios' SS32.

Stations sound smoother and tighter, with all the songs, spots and sweepers digitally on hard drives, played instantly with a finger on the touchscreen. SS32 was designed by announcers so it's the most intuitive, most user-friendly and most popular digital air studio.

In fact, more U.S. radio stations have Scott Studios' systems than the second and third ranked vendors combined!

Simple and paper-free

Your scheduled spots, songs, promos and live scripts appear in your air studios automatically from traffic, music and copy computers. Six *Start* buttons at the left play your program log. Your announcers can rearrange events by touching any "cart" label, then touching any other log location for an instant move. Or touch the *Log* button to edit any part of the schedule.

Color coded labels

Scheduled events have legible labels with titles, artists, years, trivia, intros, lengths, endings, advertiser names, outcues and announcer initials. They are color coded by category. The pie chart at the bottom of the screen counts down intros and endings at 60, 45, 30, and each of the last 15 seconds.

Instant Play cuts at any time

On the right, 30 sets of Hot Keys (each with up to 30 keys and rotating up to 100 cuts) start anything on the spur of the moment. Instant Play buttons gracefully fade out with a second touch. Hot Keys show lengths, count down as they play and can be reprogrammed in a second or two.

SS32 has several screen layouts and graphic styles so each user can tailor their own display. By adding a second touchscreen, you get twice as many simultaneous functions from the one SS32.

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Every Song and Spot at Your Fingertips

The world's fastest requests

When you touch the *Songs* button in the lower right corner of the main SS32 screen (on the previous page), you activate this Wall of Carts touchscreen with all your songs online! Whatever's on the air, plus the next five events, are always visible at the left. Touch the tune you want and it plays instantly. Or you can *Stack* several songs to be added to your playlist wherever you want.

You can jump immediately to the title, artist, length, year or category you want by touching the desired display's button, then first few letters of the song name on the alphabet at the bottom of the screen. Songs are displayed any five ways you want.

Each song shows the date and hour it last played, along with when it's scheduled to play next.

Songs and other recordings can be restricted to appropriate days and dayparts. Unauthorized selections don't even show up on the Cart Wall. You can prohibit changes or require a password for changes on a shift-by-shift basis.

A total of ten user-defined Cart Walls are provided for songs, spots, jingles, sound effects, comedy bits, promos and other categories. They can play immediately or be added to the log.

Hear it before you air it

With Scott's SS32 digital audio, the same song, spot and any recording can be on the air and auditioned in all your studios at the same time. Simply touch *Preview* and any label to listen to the start or end of that song or spot in your cue speaker.

Experience is the Best Teacher...
Scott Studios has the Most Experience

It's a fact: More stations pick Scott Studios' air studio systems than the second and third ranked vendors combined.

Of the 25 largest broadcasters, 24 use Scott digital audio systems, including Infinity, Cox, ABC/Disney, Entercom, Citadel, Radio One, Cumulus, Univision, Emmis, Spanish, Journal and more.

KPWR (FM), Los Angeles, and Big Boy won Marconi Awards for Major Market Station and Air Personality of the Year. Emmis uses SS32 at KPWR (FM) and KZLA (FM), Los Angeles; WKQK (FM) Q-101, Chicago; KSHE (FM), St. Louis; and 11 more.

Dozens of Infinity/CBS stations use Scott Studios' systems, including legendary 50 kw KMOX (AM), St. Louis; KILT-AM-FM, Houston and clusters in Phoenix, Denver, Cleveland, Austin and Kansas City.

Brother Jon Rivers, long-time host of "Powerline" and "20: The Countdown Magazine" uses his Scott SS32 daily on his nationwide K-Love morning show. Jon is shown with his wife and co-host Sheri Rivers and recording artist Jaci Velasquez.

Here's Cox's WMMO FM air studio, using Computer Concepts' Maestro and EpiCenter for all digital audio. Cox stations use Maestro almost exclusively.

Citadel is a 200 station chain that standardizes on Scott systems. SS32 is shown here in use at at WTRX, Flint, Michigan.

Spanish Broadcast uses Scott SS32 in New York, Los Angeles, Chicago, and Miami, where WCMQ-FM's Barbie Simons and Susy Leman are pictured.

Radio One uses 62 Scott and Computer Concepts' systems in all of its 22 major markets. This SS32 is on-the-air at WHHH (FM), Indianapolis.

Live copy on screen

Your studio *can* be paperless! Live tags, promos, contest copy, music trivia, winner and request lists can be read or edited on your Scott SS32 screen. Copy can have security codes to prevent unauthorized changes.

Copy can also come in from news, copy or office computers.

Fingertip log editing

Another paper-free feature of SS32 is the ability to edit anything on available logs. Touch any event, then *clear* (delete) or *copy* and where you want it to go. There's also a *swap* function and *manual insert* (by keyboard).

Scott's *Make Good* button jumps to missed spots or songs at a touch. Log changes are password protected with different restrictions for each shift, category, function and user. Logs can be viewed or edited from any computer.

Jocks can see any 15 events to back announce music sweeps and promote upcoming songs. The on-air event can show at the top, middle or bottom of the log.

You get printouts showing everything that airs, with details when changes are made. You get clear discrepancy reports. Scott works with all traffic and billing or music computers for accurate billing and automatic reconciliation or affidavits.

Fast phones

Every time a jock answers the phone, it's auto-recorded. No need to start, stop or make labels (unless you want to).

Editing and airing great phones is as quick as a flash! Scott Studios' visual waveform editing lets you "rock reels" and "scrub" audio to hear and see edit points clearly. Pick out the best parts of phone calls for pacing and interest.

Recordings can be labeled as any cut number, category and name. Out-cue and start/end date/time can be entered. Play new cuts right away or put them in the log to play later.

Total Audio Control

Scott's *Live Mode* lets announcers assign each recording to a specific "cart deck" player with its own console fader. Every event can be started manually or our Auto-Segue can start the next event for you.

Logged cuts come automatically into the "on deck" area at the bottom. By touching that label and then the desired deck, the jock assigns each cut.

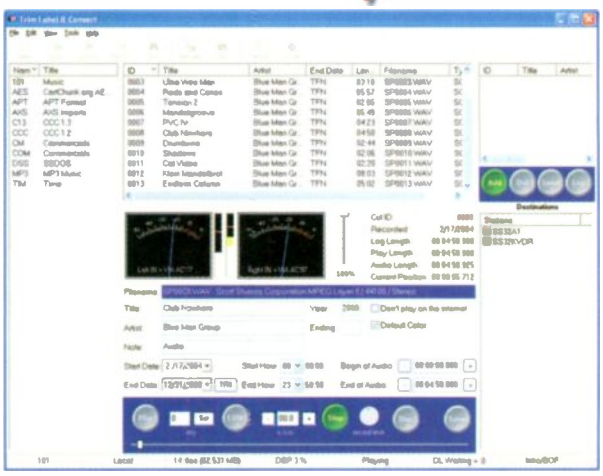
Auto-Segue has a fail-safe to prevent dead air if a needed event isn't manually loaded in time. Recordings can be moved to play from any fader.

SS32 Has More Features, Flexibility, Power

Production you already know

You save time because Scott *eliminates dubbing*. SS32 uploads spots in seconds from Adobe Audition, Cool Edit, Vegas, Sadie, Audicy, WAVE, MPEG II, MP3, Cart Chunk, apt-X and most other digital systems. Spots, actualities and songs can be recorded—and played—in any Windows PC.

With nobody back at the studio, SS32 can air wireless PDA actualities for remotes, news, sports or weather.



Perfect timing

Scott Studios' Stretch and Squeeze gives you exact 30 and 60 second spots for network spot substitutions—without voices sounding funny or any pitch shift.

Remotes by Internet

Scott Studios gives you money-making, public relations and public service opportunities to run remotes on short notice. SS32 works with a wireless PDA from anywhere. With a wireless laptop, you can adjust SS32 levels, play requests, fine-tune your log and read live copy—without a board operator.

Invincible

Scott is radio's leader in reliability and redundancy. Invincible includes a hot standby SS32 with hands-free auto-transfer. It's one reason why so many stations in New York, Chicago, Los Angeles, Houston, Dallas and other high billing markets choose Scott.

Within your budget

You choose: industrial or desktop computers. SS32 works with *any* hardware. You pay only for software features you'll use, so Scott systems are in *your* price range.

The best CD ripper

Save music dubbing time and improve your audio quality with Scott's TLC CD Ripper. It transfers five minute songs to hard drive in 15 to 20 seconds with direct digital quality!

Pre-dubbed music

Your startup library can already be on the hard drive when your SS32 arrives. Ask for details.

Website and HD Radio displays

SS32 sends your on-air song title and artist—even ad text or news and weather—to new digital radios. Your Internet site can also display album covers and trivia.

Start right

Scott Studios makes it easy for you to hit the ground running. We send a training technician to teach Scott School at your station. We spend a week working closely with your people. New customers tell us they're happier and more comfortable with SS32 within the first hour than they ever were with another digital system after years.

Stay right

You benefit from the *best training* and *toll-free phone support* from our large staff of experienced radio people. 24/7 help is as close as your phone.

Some features mentioned are options. Every SS32 is tailored to your specifications and budget. Features subject to change without notice.

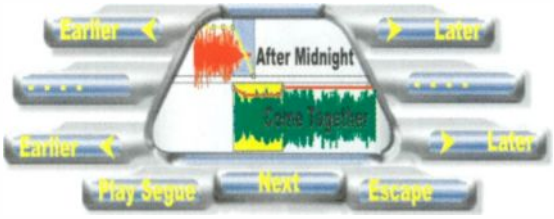
SS32 is Best, Live or Voice Tracked

Power users prefer SS32

Scott's optional second touchscreen lets announcers respond as fast as they can think. Every function is at their fingertips all the time. They can read live copy, edit phone calls, modify logs and play anything from the Cart Walls.

Seamless console interface

Most modern consoles can remote start most SS32 events. SS32 can control many console functions, simplifying shifts and helping jocks.



Segue editor

You can fine-tune timing and levels to perfection. Both SS32 and Scott's Voice Tracker give you complete control over music, announcer, sweeper and jingle transitions without any re-recording.

Voice Tracker®

Broadcasters repeatedly tell us that our Voice Tracker is their "secret weapon." Their stations sound better and save money. They overcome most problems they formerly had with announcers.

Every SS32 perfectly plays all recordings made in any Scott Voice Tracker, whether built-in to SS32, production, or added to an Internet computer.

Scott's Voice Tracker works "wet." The announcer records while hearing song endings, segues and song beginnings in headphones. Timing, levels, delivery and content can be perfect. It shows the time when a track will air, along with when each hour will end with logged music.

Scott also offers inexpensive "dry" Show Recorder software. Your announcer sees your music schedule but hears only his own voice while recording. Log and voice track transfers are automatic.

Voice/Music Synchronizer

You also get Scott Studios' exclusive Voice/Music Synchronizer. Every Voice Track can link to any adjacent song. If there's any reason the song doesn't play, a generic line by the same announcer substitutes automatically. He won't talk about one song but play another.

Distant City Voice Tracker

Nobody does it better than Scott Studios! With DSL or faster Internet, heads and tails of songs are automatically delivered to the distant city announcer's headphones. Music libraries don't have to be duplicated or manually copied. Finished voicers transfer and air with no staff attention.

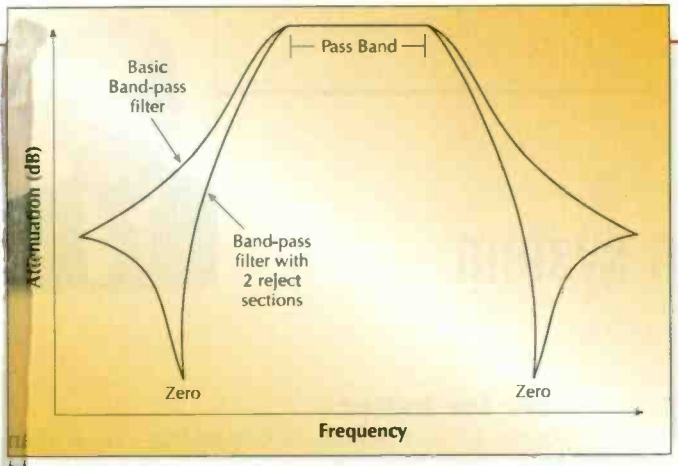


Figure 3. Improved response to a bandpass filter with the notch filter added.

filter is connected from the transmission line to ground. Its job is exactly what its name implies: to remove, or notch out, the undesired frequency.

Because of the need to observe correct system electrical degree spacing between cavities, and also sometimes for convenience, combiners are often constructed as integrated units consisting of two or more cavities. When this is done a rectangular iris, or opening, is made in the common wall of the cavity.

Cavities may be regarded as sections of coaxial cable whose size is determined by the need to obtain the

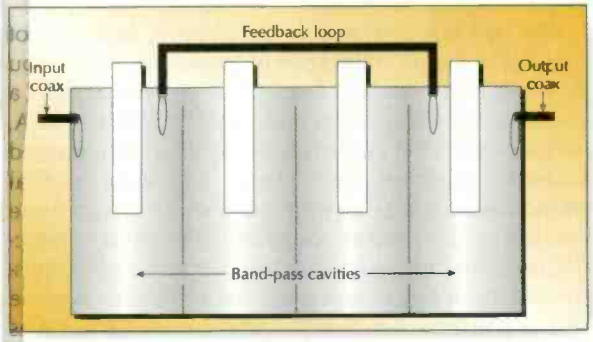


Figure 4. By adding a feedback circuit, the bandpass is improved as is the group delay.

optimum impedance of about 77Ω and avoid excessive power loss. In a cavity of 48" by 24" the tuning probe may be 3" to 6" in diameter, depending on the power level, and extend as much as 30" into the cavity.

Getting better

As bandpass filters became more popular composite notch filter and bandpass units were developed. The notch filter is formed as part of the total cavity structure with a cavity opening directly into the first section of bandpass filter. Any undesired signals that reach this bandpass filter are taken care of by the notch filters if necessary. Insertion loss and size increase with added BP sections.

Figure 3 shows a desired bandpass characteristic curve and the impact of notch filters at each end. Full bandpass utilization has become increasingly important as the FM signal becomes more complex and broader. A formerly unconsidered factor is known as group delay. The finite time required to pass through a filter increases with distance from the center frequency. Excessive group delay will introduce distortion.

To reduce insertion losses, improve bandpass operation and reduce size, the cross-coupling shown in Figure 4 has mainly replaced the simple bandpass filter. A lower power feedback coaxial line is connected between the first and last bandpass cavities. This provides a parallel transmission path that is tuned to cancel out unwanted frequencies at each end of the filter. This results in a bandpass characteristic that does not introduce excessive group delay and is similar to the one shown in figure 2 without using notch filters.

The input and output loops have to handle the full transmitter power. maller, low-power loops are also mounted in the input and output cavities. These form part of the feedback circuit and are connected by the small coaxial cable.

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New tower notification system

By Harry Martin

The FCC has adopted a Tower Construction Notification System that is intended to help guide broadcasters through the often difficult process of determining whether the site selected for a new tower is, in fact, taboo because of any number of historic, cultural or Indian tribal considerations.

The voluntary system facilitates review of proposed tower sites and alerts new tower proponents if their proposed construction might be affected by the site's proximity to sites of historic, cultural or Indian tribal religious significance.

The new system is not intended to supplant the government-to-government consultation process with federally recognized tribes. That process is mandated by the National Historic Preservation Act (NHPA). Nor does the new process alter the FCC's antenna structure registration process. Rather, the new process provides a tool to assist tower companies (and others, including broadcasters, who find themselves involved in the tower construction process) in ensuring that their proposed construction complies with all applicable federal, state, local and tribal rules. The FCC reviews proposed tower construction under the NHPA.

The system allows anyone proposing to build a tower to submit an electronic notification to the Commission about the proposed construction. The Commission will then provide this information to the relevant entities on a weekly (by e-mail) or monthly (by mail) basis. Those entities may then submit responses back to the Commission, and the Commission will forward those responses back to the notifier. Information regarding any proposed tower construction site nationwide will be sent to every tribe unless a tribe asks the FCC to limit notifications to a specific geographic area. Each State Historic Preservation Office will receive notifications relating to proposed tower construction at locations in their own state and any adjacent states.

More for better

Despite the fact that the FCC is adding—rather than cutting—a middleman, the new system (in theory) should help abbreviate the often lengthy historic preservation review process. The system streamlines the process, providing one-stop shopping for tower proponents: They provide the FCC with the notification, and the Commission then handles the dissemination of that information to organizations that might be affected by the proposed construction. This replaces the alternative, hit-and-miss system in which would-be tower builders attempt to identify and contact all parties that might hold an interest in the historic, religious or cultural value of its proposed site. The FCC's new clearinghouse method should reduce the time committed to review, and broadcasters may therefore reduce the time, effort and money invested in a tower construction project.

Note that this new system is voluntary. You are not required to submit notification of a proposed tower if you don't want to. But whether or not you do provide a notification, you will be required to comply with the NHPA, even if you are not aware of any sites near the proposed tower that might be of any historic or cultural or tribal religious significance. So while the new system is not a free pass around the statutory obligations relating to the protection of certain culturally significant sites, it may help unsuspecting tower proponents avoid the unpleasant surprise of learning that their construction cannot proceed as planned because of NHPA-related concerns.

To use the notification system, turn your browser to http://wireless.fcc.gov/outreach/notification/ and click on the notify button. You will then be prompted to provide an FCC registration number (FRN) and associated password, after which you will be required to provide information about yourself and your proposed tower construction.

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

Dateline:

Radio stations in Michigan and Ohio must file their renewal applications on or before June 1, 2004. Renewals must include the Ownership Report (Form 323 or 323-E) and the EEO Program Report (FCC Form 396).

Also on June 1, stations in Illinois and Wisconsin must begin their pre-filing renewal announcements.

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The alphabet soup of Codecs

By Chriss Scherer, editor

What better way to get connectivity from the field or outside location?

The term codec describes the function of encoding and decoding audio to passthrough a defined data path. In radio, this term carries a more specific meaning to include the system used to send and receive audio as well as the encoding algorithm, interface and connection schemes. The first applications of a codec in radio were hardware devices for Switched 56 and ISDN service. Despite the more general use of the term codec to mean a coding algorithm, such as Layer III, G.722 or Apt-x, in radio we continue to apply it to the entire transmission system and not just the algorithm. It's easier to call the device a codec instead of a switched or fixed communications service interface for bidirectional, fixed-bandwidth transmission links with an audio encoder/decoder to accommodate the limitations of the transmission medium.

While the industry will continue to use the terms in their already-defined uses, for clarity here we'll refer to a codec as the complete transmission device and the coding method as an algorithm or an encoder.

Codec usage in radio has become second nature. When they were first introduced, codecs were magical devices that were difficult for non-technical people to understand. Today there are few challenges remaining when providing a high-quality audio

Resource Guide

A sample of available codecs

While the Resource Guide is far from a complete list, it should provide enough basic information to help you get started.

The **Telos Systems Zephyr Xstream** ISDN transceiver includes MPEG AAC (Advanced Audio Coding), low-delay AAC-LD, Layer II and Layer III coding algorithms. An Ethernet port allows for streaming over IP and also networked remote control. It is available in a rack-mount version, rack-mount version with mixer (MX) or portable version with mixer (MXP). V.35/x21, Ethernet-only or ISDN-only options are also available. The mixer version adds a four-channel stereo mixer. The portable version provides the mixer as well and also adds a rugged, road-ready portable chassis. The mic inputs feature selectable AGC/limiter processing presets from Omnia.

Also from Telos Systems:
Zephyr Xport POTS/ISDN codec

216-241-7225
www.telos-systems.com

The **Comrex Matrix** handles POTS, ISDN and wireless in one package. Available in a studio (rackmount) version and a portable version, it delivers 15kHz full-duplex audio on a single, standard telephone line via an integrated V.34 modem and is compatible with the Comrex Bluebox, Hotline and Vector codecs. It provides ISDN operation using ISO/MPEG Layer III or G.722 via an optional module. With the optional GSM module, up to 7kHz of audio can be transmitted via a wireless provider. The software is flash upgradeable through a multi-purpose dataport. A rechargeable NiMH battery kit is available.

Also from Comrex:
The Nexus and Envoy ISDN codecs, and the Bluebox and Vector POTS codecs.

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- vRoute "virtual" router controllers

WKDF: 1 Numix-12 Console w/12 fully assignable faders, access to 8 stereo buses

WGFX: 1 ROC-5 Console, 1 ROC-10 Console, 1 RTE-3 Router Controller

"The limitations of average consoles and routers just don't apply."

–Cameron Adkins, Citadel Broadcasting, Nashville, Tennessee

Take what you know about the average audio router and console and throw out the normal limitations. The Logitek Audio Engine not only can accommodate any input or output standard, analog or digital, but automatically handles all remote machine control functions within the engine and routes those functions to whatever room or control surface at the same time. *This is not your father's router!*

With Logitek at the heart of this facility, I am most proud of what it has allowed me to accomplish here. The Logitek system has taken away the boundaries of the traditional project and allowed me to be a better engineer.

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The alphabet soup of Codecs

connection from one point to another. What was once a struggle to create the necessary connection has become routine. If a POTS line or ISDN is available, it's easy. If an Internet connection is all that's available, it can be done with a little more effort. Some stations are even finding success with Wi-Fi and other less-poven connection methods.

In any outside broadcast or remote setup, simplicity is the key. The operation of the current codecs is slightly more involved than placing a telephone call. Some configuration of the units is necessary, but even these steps can usually be handled by the least-technical people. Most codecs provide a way to store common settings for instant recall. Instead of manually entering various numbers and selecting types of service, the user can select a setting with an obvious name, such as *City Amphitheater*, and be done. Once the unit is connected, the user dials a number or enters an address, which can also be stored in a phonebook for simple recall.

In addition, many units auto negotiate, meaning that they

The **MDO AudioTX Communicator** runs on Windows 98 and above and uses any standard sound card. The unit can be used with a laptop and connects to all major ISDN audio codecs. The software will automatically detect the codec on the other end and reconfigure itself. The system can communicate via IP or over private leased lines. The software supports a single BRI and communicates via MPEG 2 and MPEG 3 in mono/stereo/joint stereo modes, G.722 and G.711.

Also from MDO: **AudioTX Capture ISDN call recorder, AudioTX POTS**

+44 121 256 0200
www.audiotx.com

A line of streaming audio codecs with three models, all are ISO/MPEG standards Layer II and Layer III fully compliant, with two models also TCP/IP and UDP addressable over the Internet. **Orban Opticodec** technology meets the needs of anybody moving audio over the Internet, and of individuals working in radio and TV broadcast, and in voice, music and other audio-on-demand environments. Opticodec reduces the bandwidth required to transmit audio between the source and remote, studio or other TCP/IP, UDP or ISDN receiver location.

Also from Orban: **Opticodec-PC software codec**

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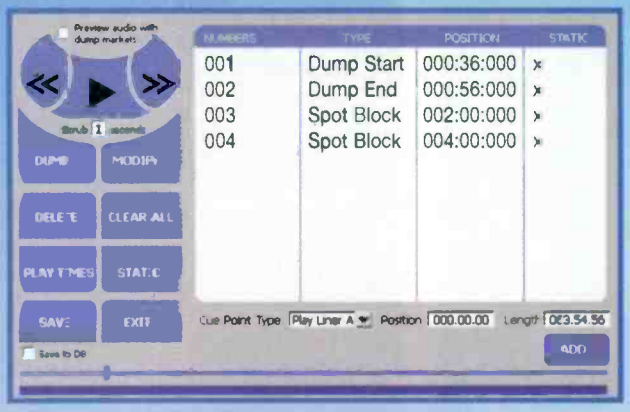

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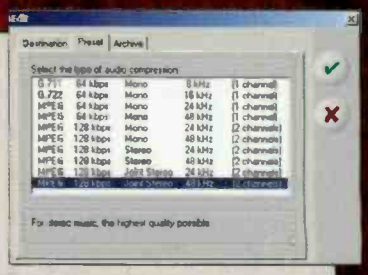
The alphabet soup of Codecs

The **Maycom Isys Pro** is a PC-based, Windows ISDN codec. It runs in combination with an ISDN board and Maycom's M20 audio board. It can store all live communications instantly onto the PC hard drive. The software can also automatically accept and record audio from reporters in the field or remote studios. It supports MPEG2 Layer II, G.711 and G.722 protocols. Connections are made by selecting the phone number desired from the phone book window and clicking the dial button. During a connection, the main window shows the connection status of the two B-channels and a count-up timer.

+31 481 453466
www.maycom.nl



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sense the equipment on the far end and make the necessary changes in configuration settings. This eliminates the additional effort in set up.

Many functions and overall operation are now universal between codecs as well. Non-technical users have accepted the technology and have become familiar with the concept. Like other technology introductions, initial use may be awkward, but in time becomes simple to use. In many cases, causal users are able to use the technology without much difficulty.

From start to finish

When codecs were first introduced, their specific function required specific hardware. The inner workings of a hardware-based codec have software inside of them, but the software/hardware marriage is optimized for the unit's function. The hardware approach is common in many devices used around the station, and it works well.

Software designs rely on a robust operating system and associated hardware. In a purely hardware package, this can be controlled. The IT side has improved to make software-based codecs practical, as we have seen in other developing technologies. To make it all work, interface hardware—a sound card and necessary modems, terminal adapters or NICs—is required.

Given the proliferation of PCs everywhere, applying the function to a software design was inevitable, and there are several companies today that offer software-based codecs. The software approach can merge the various elements into a simple interface for seamless operation of the various components.

The software-based designs provide the same complete system as the hardware designs, but it is eas-

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The alphabet soup of Codecs

The **Systembase C450xr** includes the capability to work with 13 international ISDN standards on-board for world-wide use. It can operate with a path up to 384kb/s. The 20-bit VU meters display audio levels. Features include an external trigger dial, dial on audio/hang up on silence mode, 26 configuration memories, a 1RU enclosure and an auto-ranging power supply. The codec also provides an X.21 connection port.

Also from Systembase: **C310xr and C400xr ISDN codecs**

+44 1747 861123
www.systembase.com

The **Musicam USA Netstar** allows bi-directional real-time audio, contact closures and ancillary data in a 2RU chassis. Stereo analog and AES/EBU inputs and outputs are standard. Netstar can send and receive bi-directional audio via IP, ISDN and all types of dedicated data circuits. This product contains coding algorithms including G.711, G.722, MPEG 1 and 2 Layer II, and MPEG 1 and 2 Layer III for compatibility with older codecs. In addition, it provides MPEG 2 AAC and MPEG 4 AAC low-delay encoding for high audio performance at lower bit-rates.

Also from Musicam USA: **Roadstar portable ISDN/IP, Superlink, CDQ Prima Series ISDN, Prima LT and LT Plus ISDN codec, Road Runner POTS, Liberty POTS.**

732-739-5600
www.musicamusa.com

The **Mayah Merk II** is a codec and built-in mixer with four switchable mic/line inputs and four headphone outputs, switch-able phantom power 48V with LED indication, one or optionally four ISDN BRI connections, 10/100Mb/s Ethernet for audio-via-IP and wire-less-LAN and extended mixing capabilitites. Available coding algorithms include G.711, G.722, L2, L3, MPEG 2/4 AAC, Apt-x, Enhanced Apt-x, CT-aacPlus, MP3Pro and linear audio together with networking via ISDN, X.21, E1 and Ethernet. The unit also offers low delay-algorithms.

Also from Mayah: **Sendit software POTS/ISDN codec, Centauri ISDN/IP codec**

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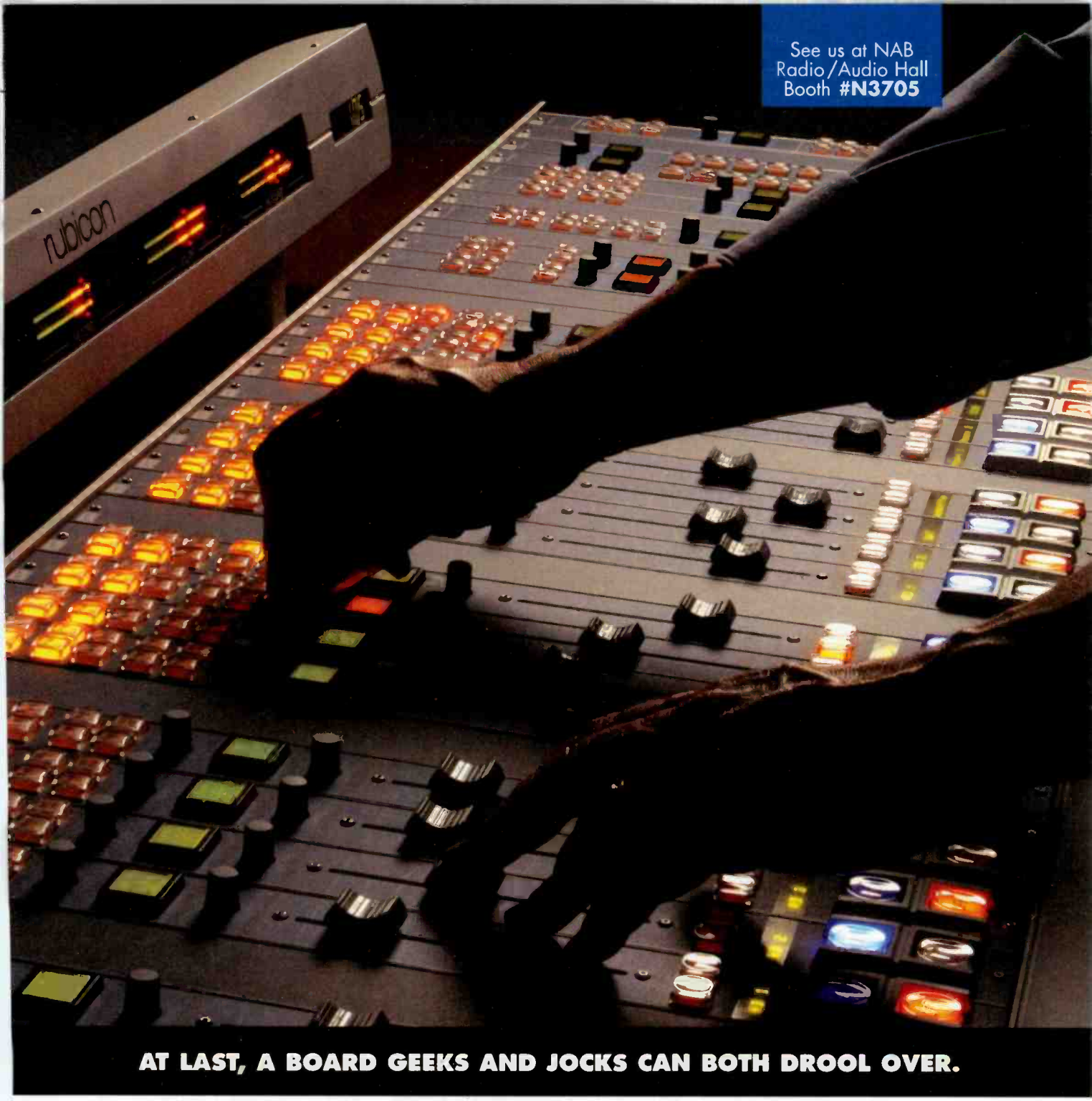

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The alphabet soup of Codecs

The **Tieline Technology Commander** POTS codec with optional ISDN upgrade and wireless interface delivers 15kHz bi-directional low delay audio over a standard telephone link. It features two mic/line switchable balanced audio inputs, one balanced output, two CMOS relay contact closures, a switchable 10-LED VU meter and full remote controllability. The Commander can be upgraded with a plug-and-play ISDN interface card and software kit capable of delivering 15kHz audio over a single 56 or 64kb/s B channel or 7kHz speech using the G.722 algorithm. A range of datacasting upgrade options is available. Commander is available in a 2RU rack unit and a compact field unit.

Also from Tieline Technology: **Imix POTS/ISDN codec with mixer, Patriot POTS codec**

888-211-6989
www.tieline.com

The **Audio Processing Technology Worldnet Tokyo** is a multi-algorithm, full-duplex, stereo audio ISDN codec offering all popular coding algorithms, including standard 16-bit Apt-x, Enhanced 16-, 20- and 24-bit Apt-x, MPEG 1 and 2 Layer II/Layer III (MP3), G.711, G.722 and MPEG 2 AAC. This allows the unit to connect to all established ISDN audio codecs. The unit will accept as many as four BRI ISDN lines. Separate send and receive algorithms can be used.

Also from APT: **Worldnet Rio, Worldnet Rio Lite, Worldnet Milano, Worldnet Chicago, Worldnet Skylink, Worldnet Ohio, Worldnet Duo and Worldnet Porto.**

323-463-2963
www.aptx.com

The **ATA Scoop E-Z** is a portable audio codec. It can communicate via POTS and ISDN, Inmarsat terminals and wireless/GSM connections. Broadcasts benefit from the maximum bandwidth available. Audio features include a two-channel audio mixer, selectable compressor and limiter, phantom and T-power, VU or peak LED metering and two headphone outputs with adjustable output. The unit can automatically answer and recognize incoming call types for ISDN and POTS. It measures 9" × 6" × 3" and weighs less than 4lbs.

Also from ATA Audio: **Scoop Studio ISDN/POTS codec, Hifi Scoop 3 ISDN codec.**

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ALWAYS ON.

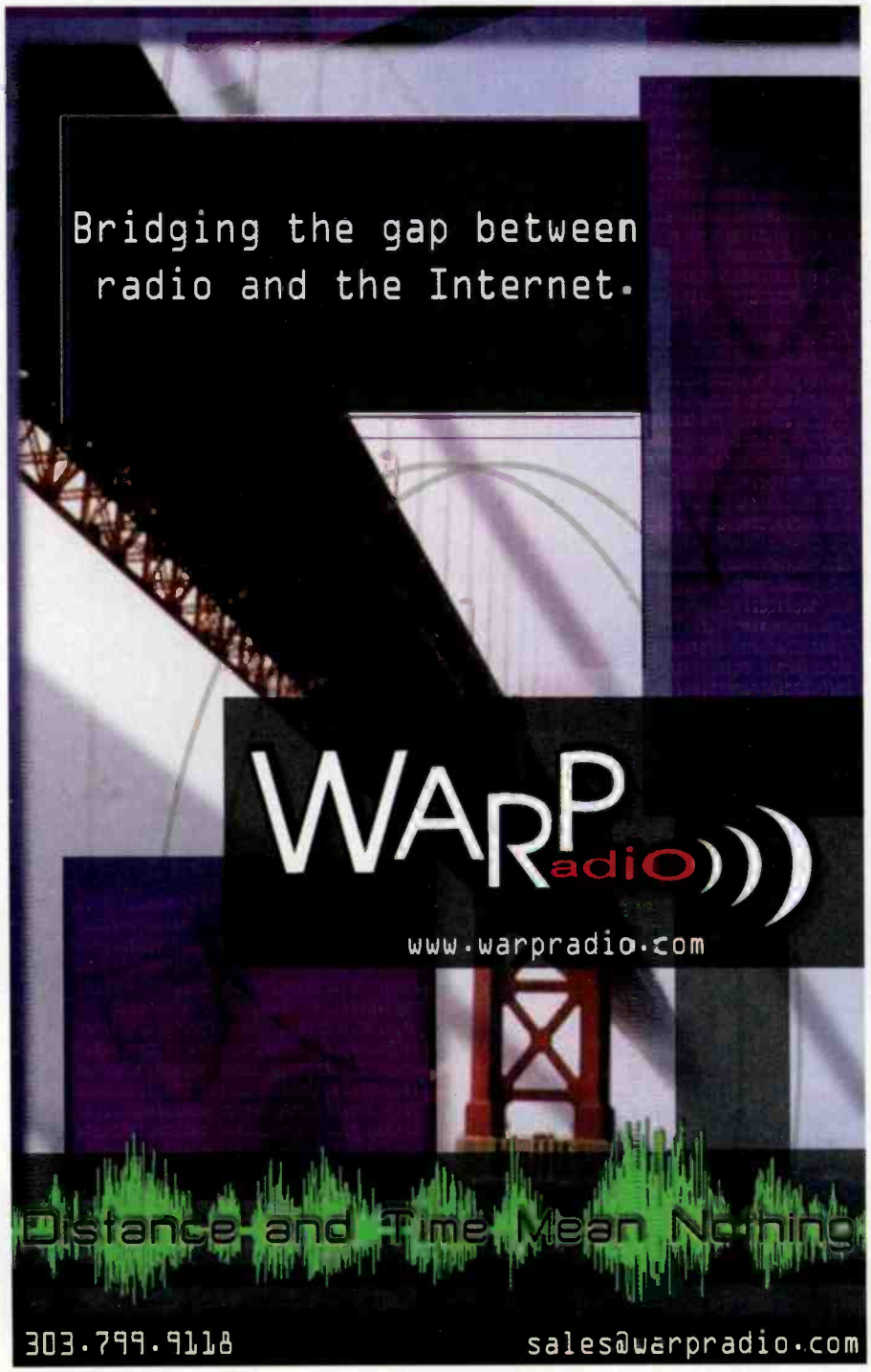
The alphabet soup of

Codecs

The golden age of wireless—remotes, that is

By Tom Hartnett

Ten years ago, the word cell phone was defined by a clear set of technical protocols. The word meant an analog modulated two-way radio operating in a band around 900MHz. A cell phone can still be defined this way, although it's getting harder to find them.



Personal communication service

PCS, or digital cellular (2G), was a response to the increased demand for portable phones. Contrary to what digital cellular companies would have you believe, the advantage in PCS is really theirs, as it allows them to crowd many more phone calls into their frequency allotments. Most of us use 2G phones today. Around 1994, a new band was opened at nearly double the frequency (1,900MHz). Three distinct digital modulation techniques are defined for this band. TDMA was adopted by a few North American operators due to its easy conversion from analog cellular. GSM, although similar technically, was an international standard that defined a larger feature set and became popular worldwide. CDMA, based on an entirely different (and arguably more advanced) modulation scheme was chosen by some operators. So the band became a mix of different, incompatible digital protocols. Table 1 shows the national players and their respective digital technologies. Note that with the exception of Nextel, TDMA is in its sunset years.

Real-time challenges

To provide anything better than cell-phone quality audio over these networks, broadcasters must use a data service rather than the voice service provided by the network. Because these were designed for e-mail and Web-serving applications, this is especially challenging. GSM and

WHAT'S YOUR DATA DILEMMA?

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The alphabet soup of Codecs

CDMA providers each offer packet-based, high-speed Internet connections (GPRS and 1X respectively) but due to factors such as latency, asymmetry and dynamic allocation, they haven't proven suitable for real-time transfer. They can be useful in non-real time audio file transfer. So broadcasters must rely on connection-oriented circuit-switched data (CSD) services.

A wireless CSD network can be considered a chain of three distinct links. The first is the actual radio link between the mobile phone or codec with an integrated phone and the local cell tower. The second link exists inside the network cloud and comprises the trunks that transfer data between the cell tower and a modem pool owned by the wireless provider and residing somewhere in the network. The final link is an analog telephone connection between this modem pool and the modem at the studio For broadcasters purposes, this would be contained within a studio codec. Obviously, data must move smoothly through each of these links to support real-time audio applications.

Wireless Provider	Technology	Notes
AT&T Wireless	TDMA	Migrating to GSM
Cingular	TDMA/GSM	Migrating to all GSM
Nextel	TDMA	Custom iDen Push-to-Talk
Sprint PCS	CDMA	
T-Mobile	GSM	
Verizon Wireless	CDMA	

Table 1. U.S. national wireless carriers

CDMA has a problem here. Comrex's testing shows CDMA CSD connections to be packet-based within the network cloud, providing many data stalls and bursts along the chain. This means that unless we want to add many seconds of delay in smoothing buffers, CDMA isn't a candidate for real-time. This leaves GSM.

GSM has its own challenges. The available data rate on GSM is low (9.6kb/s) and requires powerful audio algorithms to provide wideband audio. As an example, the Comrex GSM algorithm reduces

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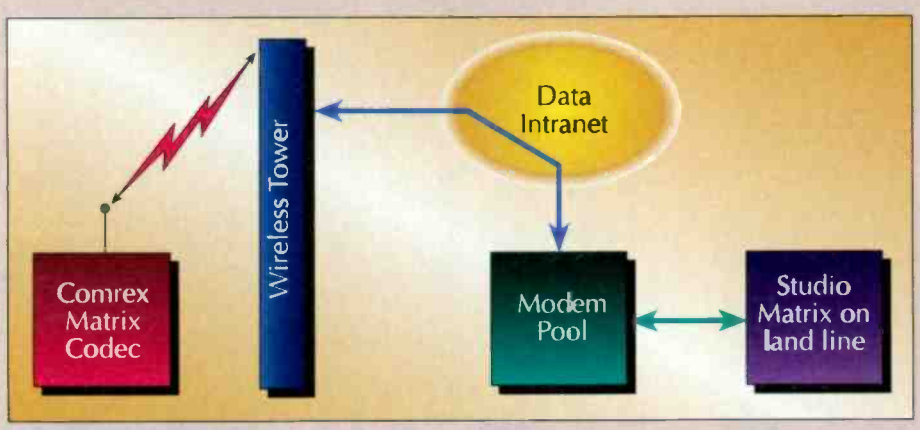

Figure 1. A CSD network will typically have three links.

data by a factor of 30:1 to achieve this. But GSM does indeed provide a steady stream of data from point A to B, so it's the best choice for remote broadcasts.

Can you hear me now?

As anyone with a mobile phone knows, cellular service is prone to fades and dropouts, so it's important to have reasonable expectations in performance. Our experience so far with GSM has been surprisingly good, with many broadcasts able to maintain stable operation for several hours. Comrex has even experimented with units in moving cars, boats and trains with reasonable results (although we can't recommend you move your morning show to your news van). The main issue we see is interference with other mobile phones, so we recommend avoiding traffic jams and other areas with high cell-phone usage.

What's on the horizon for Verizon and the others?

The deployment of third-generation wireless service (3G) has been predicted for many years. The technology promises an incredible amount of digital throughput, as well as infrastructure to support multi-media services (like real time audio). Deployment has slowed due to lack of a killer app and upgrade costs, but tests are underway in a few cities. While this network certainly holds hope for remote broadcasts, what is standardized and what is deployed are often different things. For example, in several countries where 3G is available, the only point-to-point high speed data offerings are the videophone service. Perhaps concerned about network capacity, carriers have chosen not to allow generic access to the high-speed data channel yet. Because broadcast applications can't dictate which offerings a wireless company will provide (and our killer apps often differ from the general public), GSM networks remain the best choice for making cell phones sound good. But we continue to keep an eye on new technology deployment in the hopes of making wireless remotes sound even better.

Hartnett is technical director of Comrex.

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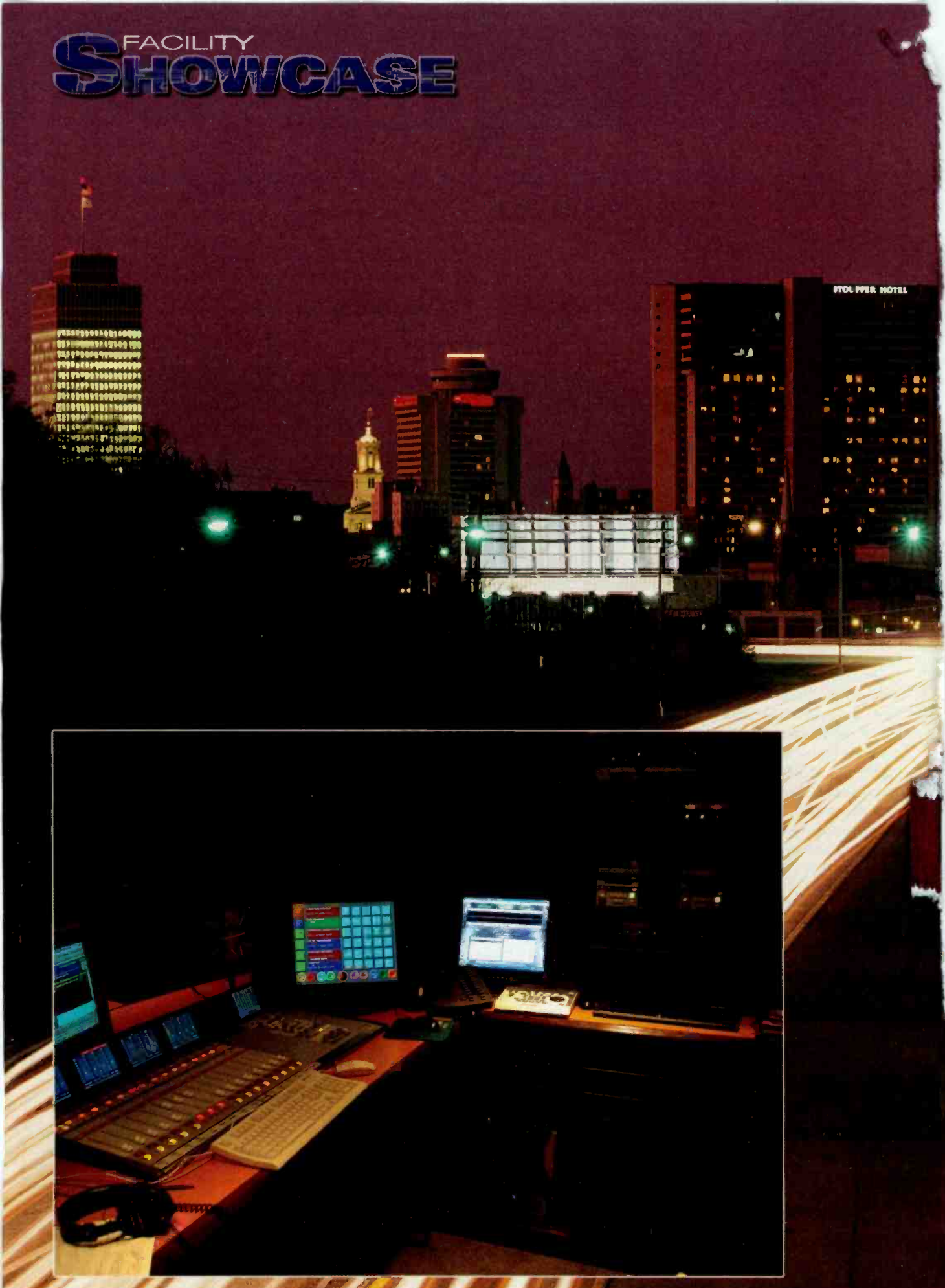
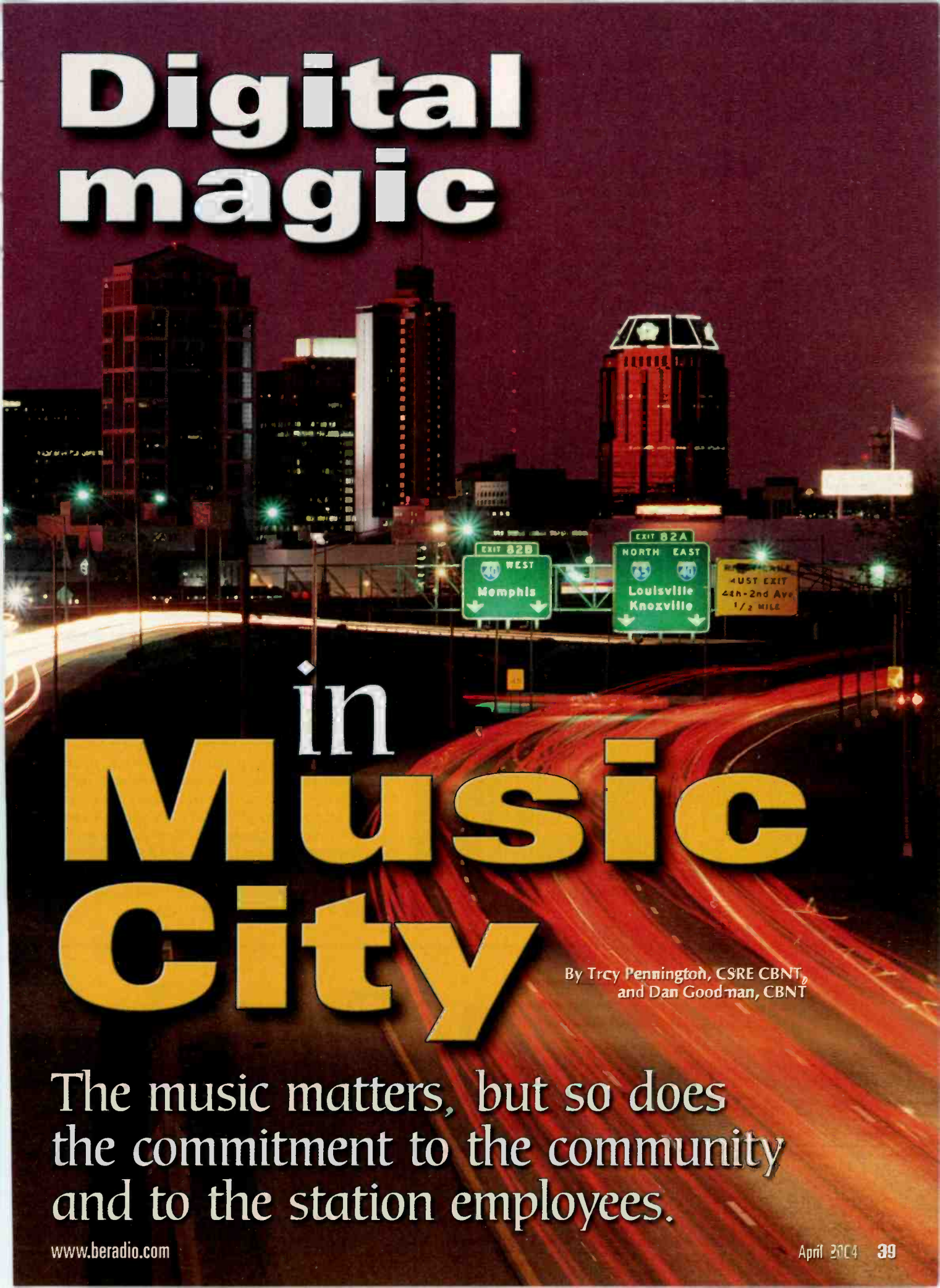


Digital magic in Music City



By Trey Pennington, CSRE CBNT, and Dan Goodman, CBNT

The music matters, but so does the commitment to the community and to the station employees.

Music City

The air studio of WNPL, Blazin' 106.7.

Being involved in the building of a true showcase facility is an opportunity that few engineers ever realize in their careers. In early 2003, Cumulus Media purchased two radio stations (WWTN-FM and WSM-FM) from Gaylord Entertainment to add to the existing Cumulus Nashville cluster of WRQQ-FM, WQQK-FM and WNPL-FM. This created the need to incorporate the new stations into the existing group as quickly and efficiently as possible. The company decided to completely rebuild the facility, using the latest technology to accommodate the various needs of the stations involved and build Nashville's top radio facility. The result is a facility that revolves around Wheatstone's Bridge Router and G series consoles, where any source is available in any studio.

This is Music City, USA, where live music plays a big part of each of the stations in the cluster, so a live performance/TV studio was incorporated as part of the overall design.

The Super Talk 99.7 WTN control room.

With the facility's needs identified, the process of making it happen presented a challenge. The existing cluster was located in a 27,000 square-foot, two-floor facility. The entire first floor was used for the three studios, production rooms, management offices and sales bullpen. The second floor was empty and had previously housed *Billboard* magazine. Because the building was occupied, the challenge was to move the sales and management teams into temporary off-site locations while ensuring they had e-mail, fax, phone, traffic and Internet access. Once the staff was moved, the second floor was demolished and new studios for all the stations were built. Then the station on-air operations were moved upstairs so demolition of the first floor could begin.

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Also, thank you Emmis, Cox, Citadel, Spanish Broadcasting, Radio One, Entercom, Journal, Infinity, West Virginia Radio, several other recent Cumulus clusters including Eugene, Fayetteville, Flint, Montogmery, Mobile, Davenport, Youngstown and others...plus Nassau, Saga, Piedmont, McDonald, Border Media, Sheridan, Shepherd, American General Media, Triad, Sinclair, Inner City, Qantum, Millennium, Mortensen, Crawford, South Central, Mapleton, Max Media, WMTW, Bristol, Wheeler...and many others I don't mean to forget...they'll be so mad...but thank you...thank you again...

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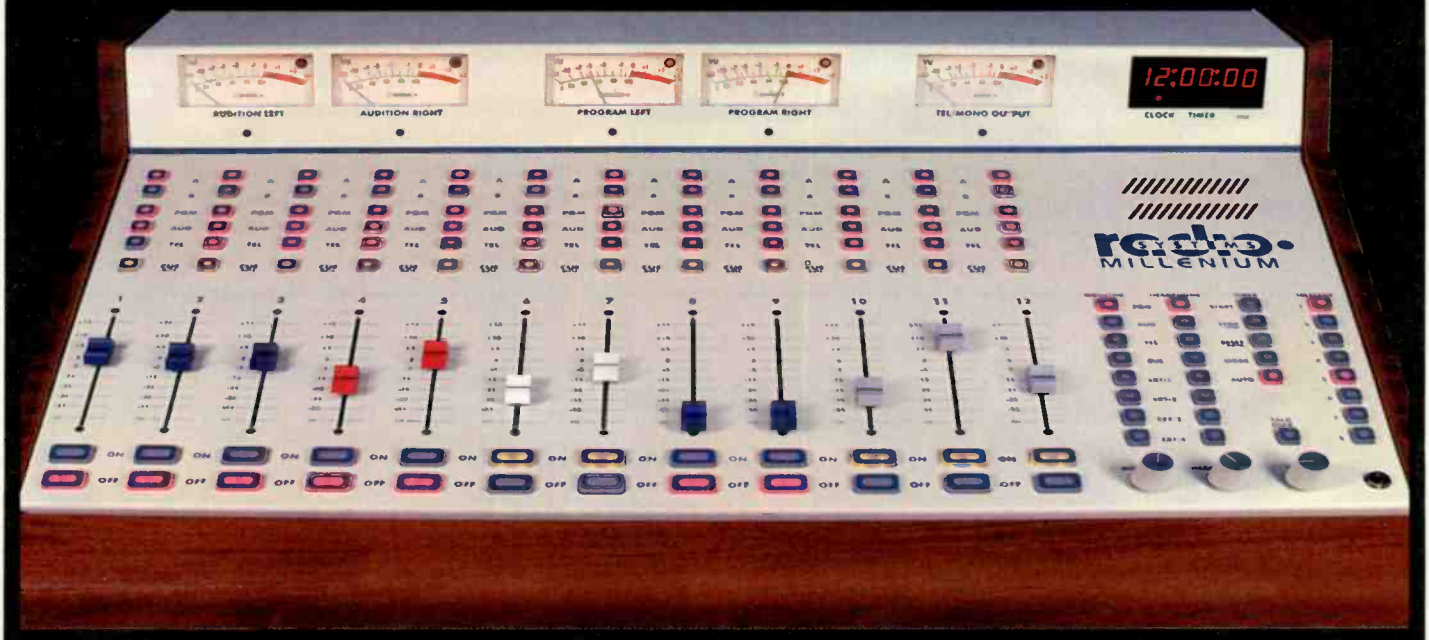

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Once this was completed, the two new properties were relocated to the new building and the sales and management teams returned. In the meantime, satellite dishes were moved, STL paths were established, IT was planned and the engineering staff tended to the day-to-day engineering duties. Sounds simple, right?

Another view of the Super Talk 99.7 WTN control room.

Step inside

The rooms are laid out in pods of two studios with a room in between, an office for the program director and a show-prep space for the talent. The rooms between the studios are used for a talk-talent room, a phone screening room and a DJ mix room, depending on the formats of the surrounding stations. A fully-functioning news room, four production studios, a rack room and a large live performance studio were also built.

The rack room is 400-square-feet with storefront windows consisting of 19 Middle Atlantic racks that house the processing, microwave, satellite and phone equipment as well as the CPUs for the Scott Studios automation system, editing and Internet access for all of the studios. We use Avocent for KVM extension. In a unique situation, the Avaya IP Office phone system will break out all of the BRIs and POTS lines for the studios' Telos 2x12 phone systems. PRIs feed the Avaya and the Avaya outputs 80 BRI circuits for complete digital connectivity to the studios. These BRIs feed all studio telco audio as well as all the ISDN codecs. This system is separate, but networked to the master Avaya system for office use. By using a PRI/BRI/IP approach to communications we can effectively change the number of lines allocated to studios as needed without ordering new lines from the phone company. The IP capability of the system allows us a great deal of flexibility, such as providing a phone set at a remote to answer the request lines with an Internet connection.

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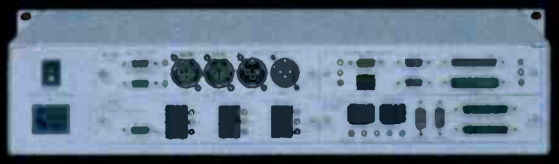

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Music City

located in the rack room as well. The punch blocks are made by Krone. Audio cable to the studios is Gepco 24-pair AES-3 cable (552624GSC). Audio cabling between the racks is Belden Brilliance 1800B AES-3. Two 24-pair CAT-5 cables run the logic between the rack room and each of the studios. For voice and data, there are 12 CAT-5 cables run to each studio from a Hellermann Tyton color-coded patch field. However, almost all of the studio audio is routed through fiber.

Local source equipment, such as mics and CD players, connect to a Wheatstone Bridge satellite cage in each studio. Each cage connects to the rack room via fiber. This eliminates large quantities of trunk cable and further shields the studios from grounding and surge issues. We used six-strand multi-mode fiber. Coaxial cables are extended to each studio via a patch bay in one of the racks for cable/satellite TV, Internet and security cameras.

The rack room is behind a glass wall facing into the hallway.

Taking control

The consoles and routing system are furnished by Wheatstone. The on-air and production studios use G-5 digital consoles, and the Performance Studio has a D-9 digital 32-channel console with multiple buses. All of the consoles are connected via fiber and CAT-5 and are on their own network administrated via software by a dedicated PC in the rack.

The routing system is a Wheatstone Bridge router that provides the capability to route any source to any destination in the facility including the Performance Studio. This allows us to route the Performance Studio feed to any station at any time.

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With our Nashville location, there are plenty of country music artists that are glad to come in and perform. Because of this, we wanted to build something that was the right fit for that community. The room is equipped with Whirlwind patch panels for instrument direct input, video and data. There are three panels located in separate locations inside the studio. All patch jacks are routed through a digital patch bay in the studio control room.

All of the studios and production rooms are equipped with Scott Studios Automation. Voice tracking for any station can be done from every room so there shouldn't be any waiting time to voice track, which eliminates the frequent congestion of a voice-track room that hinders other clusters.

Most Cumulus facility installations now place the rack room behind a glass wall to provide an easy view of the equipment, which is impressive to non-technical visitors.

Meet the team

All of the wiring integration was handled by Studioworks Broadcast Design Group of Portland, OR. Voice and Data integration was completed by Skyline Communications of Indianapolis. The building construction was supervised by R.C. Matthews Construction and Pan-American Electric of Nashville. The architectural design was by KPS of Atlanta. The studio furniture was built by European Cabinetry of Atlanta. Gary Kline, CSRE CBNT, Cumulus corporate director of engineering, oversaw the corporate interests and real estate matters.

It is amazing—even magical—how the entire project just seemed to come together so quickly, especially toward the end of the project. Strict adherence to timelines and a team effort ensured

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Pennington is regional engineering director for the Cumulus stations in Mobile and Athens, AL; Pensacola and Ft. Walton Beach, FL; and Nashville. Goodman is market chief engineer for Cumulus-Nashville.

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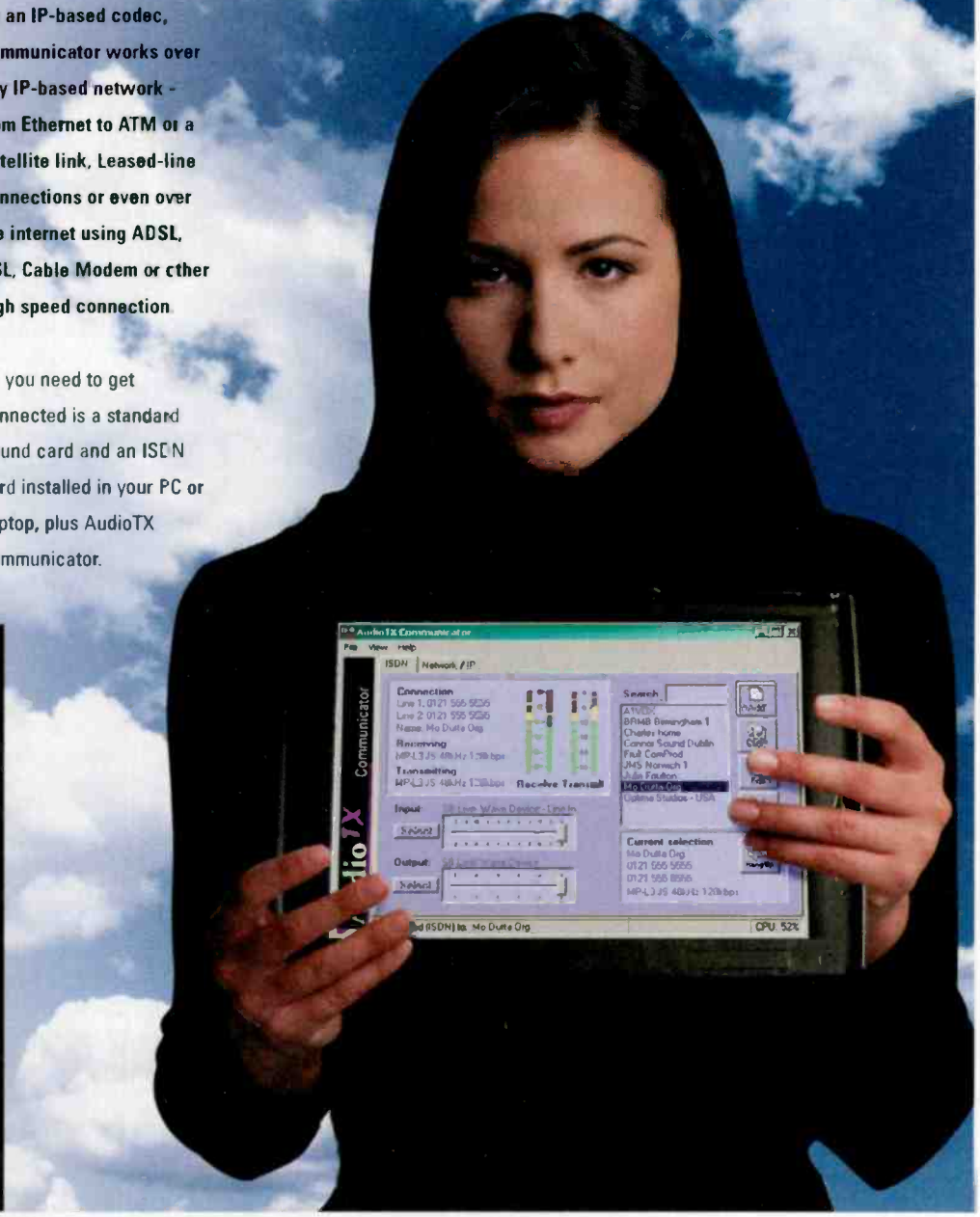

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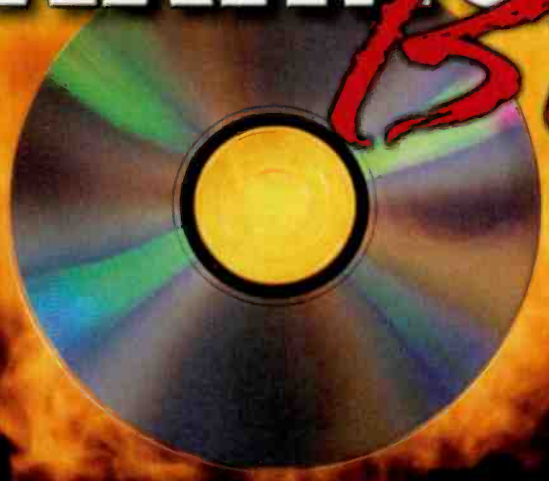
By Alex Kosiorek



The Compact Disc Recordable (CD-R) remains the most common optical media format used in audio/radio production environments. Ever since the CD-R became common as a storage medium for digital audio and data, questions and opinions have addressed which brands and types of CD-R are best, the optimum speed to burn a disc, as well as appropriate ways to label and care for the disc. These concerns are actually increasing as optical media evolves along with the plethora of drives available in the marketplace.

For some, this subject may seem a little mundane. You may have used one type of optical media for ages and haven't had a problem. Or you plan to purchase the least expensive media available, unaware of the variables of optical media. Up until a year ago, I consistently used the same brand media and burned at the same speed without a hitch. I based my choices on research published a few years prior, tempered by personal experience. Then, I encountered problems that I hadn't seen before and was stuck with a hundred-plus CD-Rs with audible errors when played on consumer players. After some research, I found that the composition of the CD-R I was accustomed to had been altered.

With the increasing number of optical formats, faster drives and combination drives on the market, the demand for higher speed media has risen, and media manufacturers have produced optical media to accommodate, making it crucial to monitor the optical media stock you purchase for valued audio productions and archival usage—even if you haven't changed brands.

Faster, faster

With higher speed media, manufacturers have changed the data-recording layer of a CD-R. The data layer of a CD-R is different from that of commercially released pressed/molded CDs and CD-RWs in respects to their composition. A standard CD has a read-only data layer made up of a molded aluminum substrate. CD-RWs data-recording layer is made up of a rewritable phase changing metal alloy. With the CD-R, this layer is made up of an organic photosensitive dye, which can be changed only once by the writing laser of a compact disc recorder. This organic dye will degrade over a long period of time. This degradation can be accelerated considerably by improper care and storage–eventually making the disc unusable.

This raises the question: What is the best way to determine the best disc for a specific application? First, one of the main variables that comes into play is the type of CD-R recorder being used. There are basically two types of drives: stand-alone CD recorders that record in real time (1×) and internal/external computer drives that burn at multiple speeds. Choose wisely when purchasing CD-R media and ensure that the media type is formulated specifically for that drive type.

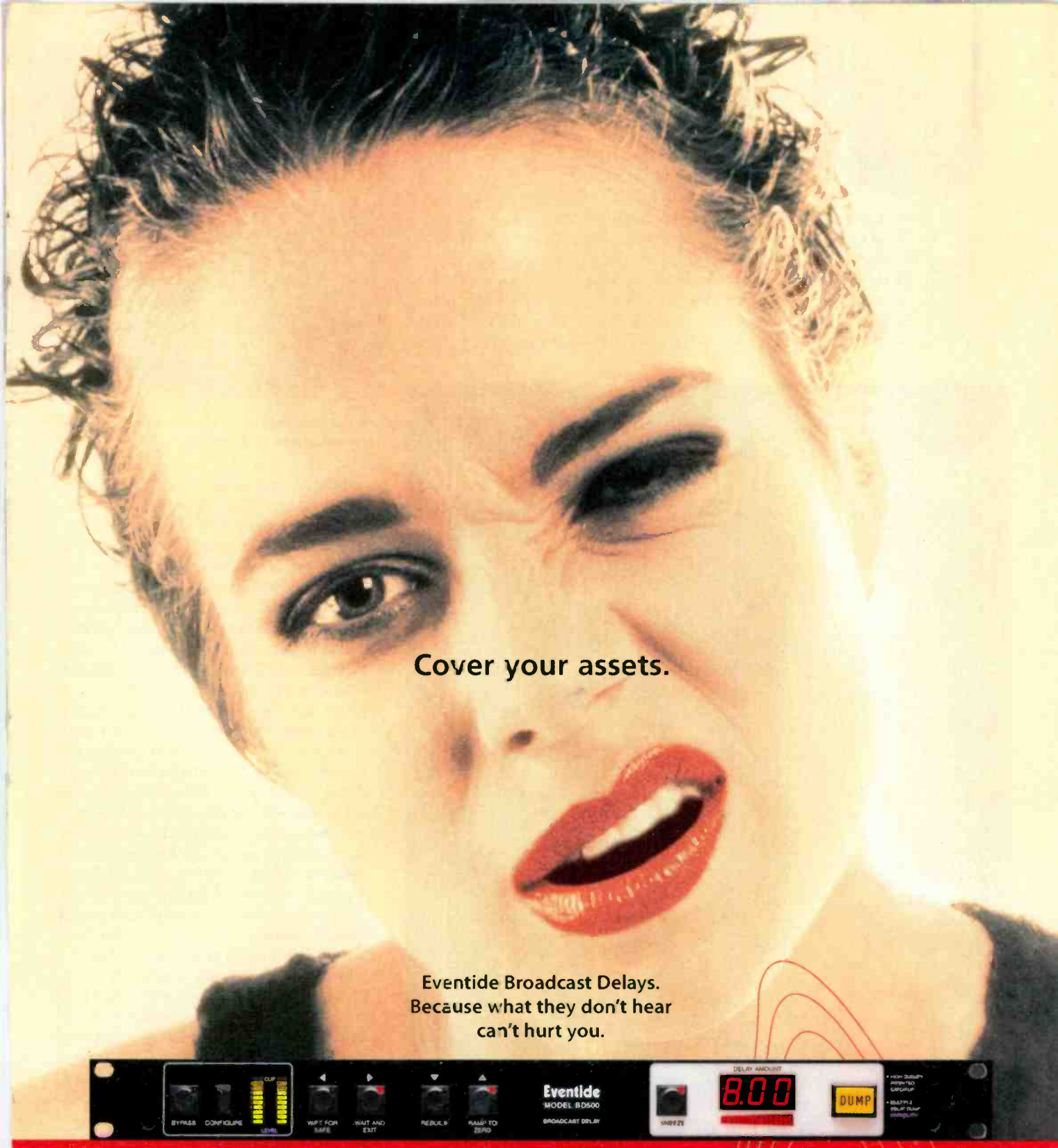
Recordable discs used in a stand-alone recorder should be formulated specifically for slower burn speeds. A disc that is labeled high speed compatible or 1× to 48× is highly unlikely to be formulated for slow burn speeds. Many users of stand-alone audio CD recorders have problems when using media formulated for speed ratings in excess of 24× or 32×. Even if the higher speed-rated disc records and finalizes appropriately in the stand-alone CD recorder, considerable amounts of errors may exist on these discs such that they are unplayable in certain players or the playability may deteriorate over time.

Also, because stand-alone recorders use lower-powered lasers than that of multi-speed computer counterparts, using higher speed-rated discs strain these units, which can reduce component life. Where does one find these lower speed discs? Various manufacturers have them available, many labeling them as music CD-R or audio CD-R. Verbatim produces them under these names as well as Digital Vinyl. Be careful, however, because some of these discs have high-speed ratings. It will take a little investigation to find the lower-speed discs, but a general rule of thumb is: the lower the speed rating the better, and if you see a speed rating higher than 32×, the discs are not formulated for slower speeds.

With computer drives that burn at variable speeds, especially new drives that can burn as fast as 52×, determining the best disc and burn speed becomes more difficult. With all the different types of discs available, there isn't a specific speed that will always produce the best result. Results will vary from one drive model to another, with different media, and in some cases even with different drive firmware. There are several dedicated test tools that evaluate media performance, made by companies such as Clover Systems and Stagetech, easily costing $5,000 or more. However, there are affordable and practical methods that can help.

Careful evaluation

The first step in evaluating media for a particular high-speed CD recorder, is to read the manual or manufacturer's website to see if specific brands of media are recommended. Ideally, in those cases, the manufacturer has tested the media and tuned the unit for satisfactory results. Be careful, however, of who the manufacturers,



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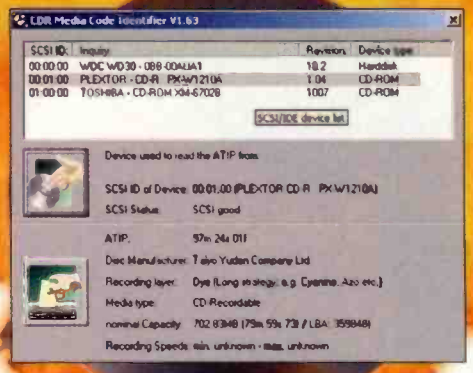
MAXIMUM BURN

or anyone else for that matter, suggests. Most of the media commonly found in big box consumer stores are made by a wide variety of other media manufacturers. Fuji, Imation, Maxell, Memorex, Sony and TDK are several that do not make their own optical media. Those brands are made by CMC Magnetics, MAM-A (formerly Mitsui), Prodisc, Ritek, Taiyo Yuden and lesser-known manufacturers. Even though another manufacturer makes the media, it may not be made to the same tolerances as if it were branded with their own name on the package. In several cases, especially with generic discs, the lowest bidder will create the media, thus the actual manufacturer and quality can change without notice. To determine who makes the media you are using, download a CD identifier or CD info application, which can be found and downloaded through a Web search. A CD identifier will tell you the manufacturer of the disc, as well as organic dye configuration, and other information. Again, buyer beware, some lesser-known media manufacturers can produce a disc that can fool a CD Identifier to indicate that it is made by a major manufacturer.



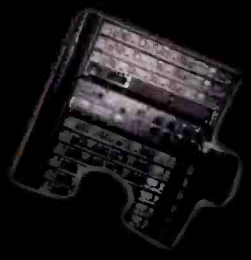
A CD identifier program will reveal the true manufacturer of the media.

If you purchase the media recommended by the optical drive manufacturer, and burn at or below one-third of the drive's maximum rated burn speed (i.e. 4× to 16× in a 48×-rated drive), your chances for having problems will be low. For valuable audio productions, use name-brand media from manufacturers that make their own media. Key manufacturers of media include MAM-A, Ritek, SKC, Taiyo Yuden, and Verbatim Data Life Plus (Mitsubishi Chemical). Stay away from generic discs or those that are store-name branded. This is especially true for critical applications.

To determine the best media and burn speeds further, there are some basic tests you can perform. To do so, buy small quantities of quality name brand media. Take the small quantity of CD-Rs you bought and record onto them at different burn speeds (using increments of 4x if possible) with the software and hardware you commonly use, producing playable audio discs. When burning the discs, ensure that the only variable changing is the burn speed. This may be difficult to specify, depending on your application. Easy CD Creator, for example, allows you to select a specific burn speed, but in many cases, you will see the burn speed fluctuate as you increase the requested burn speed. Use the same files and software version for each test. Also, use lengthy audio files that will consume the majority of the CD-R's capacity.

Creative Studio Solutions, Inc. -

Solving The Integration Puzzle



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CUSTOMER SERVICE: 24/7 Customer Support Hotline

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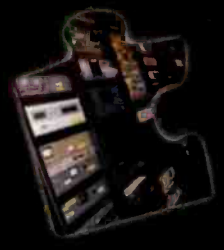

KOSI On-Air Studio - Entercom Communications - Denver

CREATIVE STUDIO SOLUTIONS, INC.

www.CreativeStudioSolutions.com

Phone: 303.425.5004

Swishing and swirling audio is the sad result of bit rate reduction combined with the wrong processing. Unless all sources, storage media and transmission systems are linear the audio will be bit rate reduced at least once, probably several times. Each pass generates more artifacts. Lower quality processing, multiband compression, limiting and clipping can make those artifacts even more apparent. But level control is still essential.

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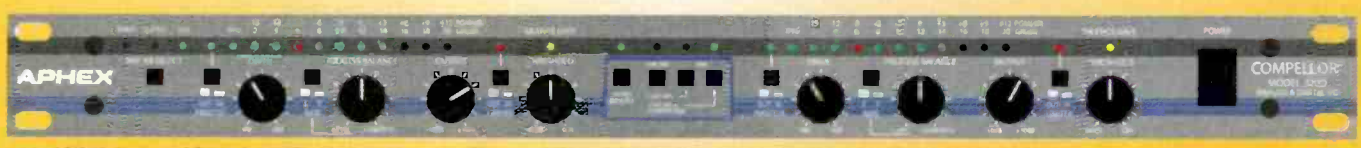

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Also note that when producing these discs, it is important that you create playable audio, not data discs, for two reasons. First, audio discs use a different type of error correction than data discs. Second, audio discs are the main type used in our production environments.

Critical efforts

Whenever you are testing or making a critical CD-R (especially one for archival storage or for replication), burn the discs in disc-at-once mode instead of track-at-once mode method, which is available in many audio and duplication applications. Disc-at-once mode will burn the disc in its entirety without switching the writing laser off. Track-at-once will burn each track separately, switching the write laser on and off. Track-at-once produces errors on the disc, often rectified on playback via error correction. In addition, track-at-once discs do not conform to the Red Book specifications (the standard for audio CDs), thus making them incompatible with various players and not excepted by various duplication facilities.

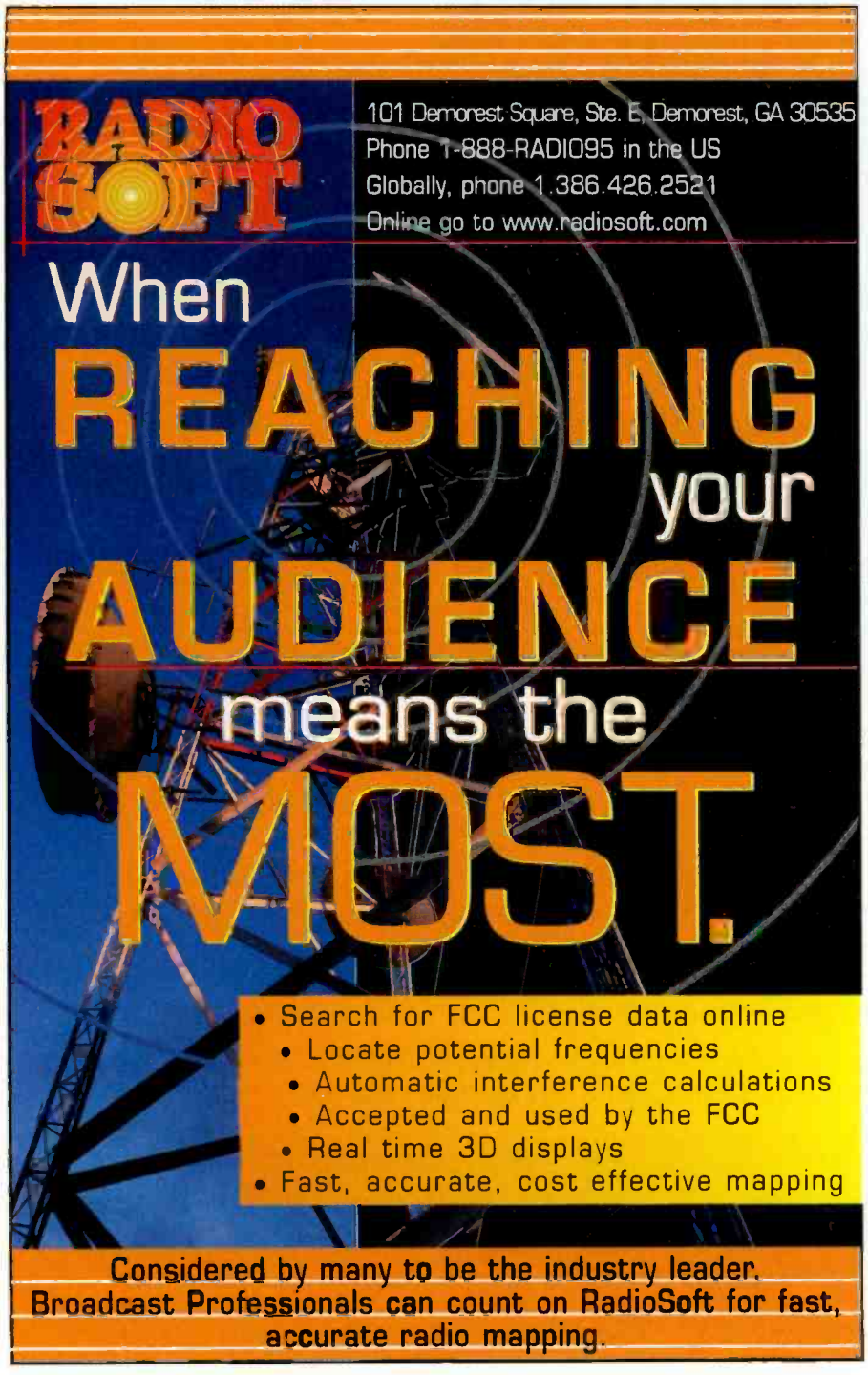
Another thing to avoid is creating errors when labeling a disc. Do not use a ballpoint pen or an alcohol-based pen. Because the data-recording layer of a CD-R is located close to the top (label side) of the disc, ballpoint pens can scratch and damage that data layer. Alcohol based pens can dissolve the disc coating, causing data loss. Use a water-soluble ink pen instead. Several media distributors have CD marking pens available. Other precautions include keeping media away from sunlight/ultraviolet light, heat and moisture.

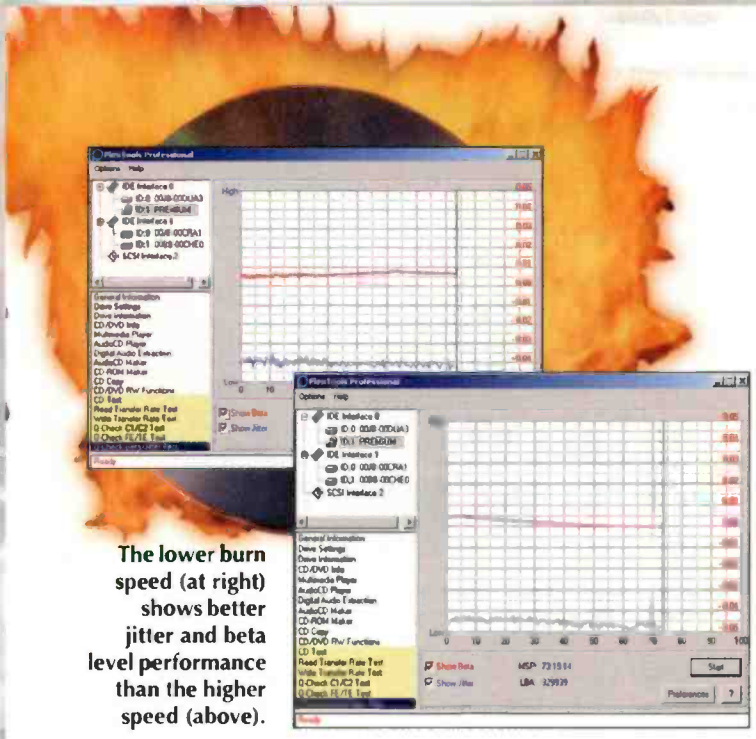
There are several applications that can assist when testing discs. The most thorough program, allowing for evaluation of media, is Plextools Professional by Plextor (www.plextor.com). Its one drawback is that the testing functions of this program only work with Plextor's Plexwriter Premium drive and with its upcoming DVD+/-RW/CD-RW drive model PX-712A. Note that the Plexwriter Premium drive is affordable and highly rated among audio recording and mastering engineers, Nero/Ahead Software and others. Some other useful tools include those listed below.

Useful tools

- CD Speed, an application from Nero/Ahead Software is a free download
  www.cdspeed2000.com
- CD/DVD Diagnostic from Infinadyne
  www.infinadyne.com
- Exact Audio Copy
  www.exactaudiocopy.de

Among Plextools Professional test functions are those that check for C1 (or sometimes referred to as BLER), C2 and CU errors, along with jitter and beta tests (checking the symmetry of the pits and lands of a disc). C1 errors are commonly found on a disc. However, high amounts of these errors can create uncorrectable errors when the discs' playability decreases. The same holds true for C2 errors, however, these along with CU errors (which are more critical) shouldn't exist on a newly burned disc. CD Speed also checks for C1 and C2 errors, but only if the drive supports these test functions. The other useful feature from Plextools is the jitter





The lower burn speed (at right) shows better jitter and beta level performance than the higher speed (above).

and beta tests. Jitter and beta allow fine tuning to find which burn speeds are best for the media and drive.

I performed these tests using recommended media on a wide variety of computers/drives in our production studios and at home. A greater amount of errors occurred on older drives and inexpensive OEM drives. When using recommended media on newer drives, C1 errors were low and all other errors nonexistent. It was the jitter and beta tests that were most revealing. A lower jitter level (seen in blue) and consistent unwavering beta level (in red) are preferred. For instance, test results show that the best jitter and beta levels using Vertabtim Data Life Plus 48x 74-minute Inkjet Printable Media, burned using Nero 6, in a Plextor PX-708A, in our particular computer configuration is at 8x and 16x. I have observed higher jitter or wavering beta levels at other burn speeds.

Notice the same media used in Rimage Amigo II duplicator produces poor results in this test. These discs produced audible errors when played in certain consumer players.

Another useful, simple test available on Plextools, CD Speed and Exact Audio Copy is the ability to perform a Digital Audio Extraction (DAE) with a basic error report. DAE is a process of extracting the audio from a disc and then saving that audio onto a computer's hard drive in various formats (WAV, MP3). Each program checks, reports and can correct errors while extracting the audio in a slightly different fashion. However, a general rule of thumb is that a DAE of a newly-created disc should report no errors. Users should perform these tests on more than one computer/drive, or at least perform the tests on a different optical drive from the one that the disc was originally created on.

The last of the mentioned programs, CD/DVD Diagnostic offers a unique method to check for errors. It performs what the program calls a readability test. During this test, the program basically disables many

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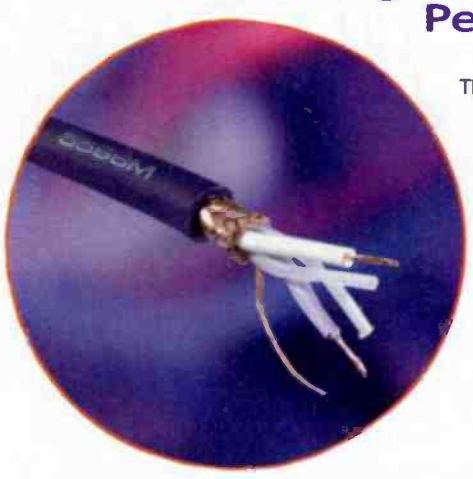

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- *Low-Jitter*
- *Minimizes Pulse-Rounding*
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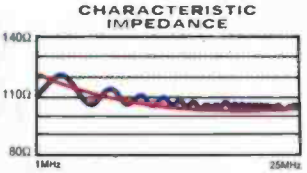

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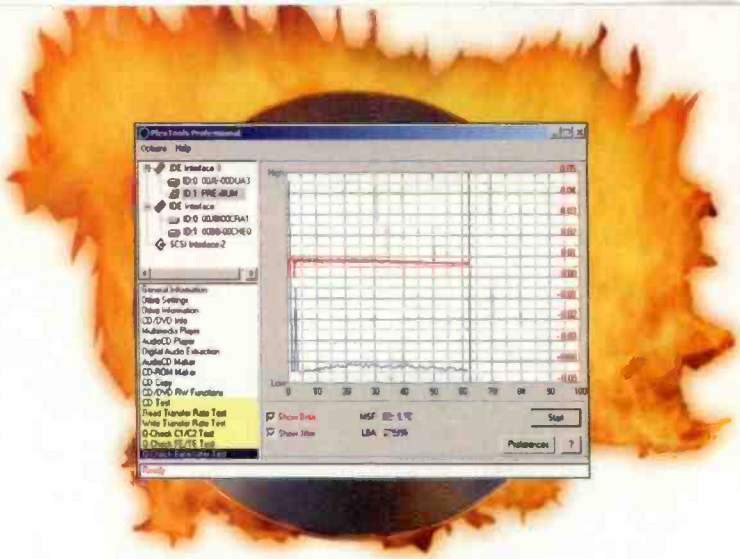
of the data recovering methods normally used by the reading drive. It then reports on what is called soft and hard errors. Soft errors are those that the reading drive normally would correct without informing the computer. Hard errors are those that may be recovered from if additional reads of the disc are made. CD/DVD Diagnostic and its more expensive counterpart CD/DVD Inspector provide a statistical model of the tests performed to determine if a disc is good or bad. Following the instructions of the program, I found on that newly created discs burned at speeds between 4x and 16x produced little or no errors whatsoever. Soft errors did occur with a discs burned at 32x and above on certain burners, indicating that faster burn speeds produce read errors in various drives. Also, the Rimage-created disc noted previously as having higher jitter levels also produced higher amounts of soft errors using this program.

Because of the multitude of variables with CD-R media, drives and ancillary components, the complexity of determining the best media and drive combinations increases. Performing these tests can be an educational experience. The optical media arena is changing and expanding. However, there are some basic affordable test tools now available to help maintain this equation. Overall,



The same media from the charts on page 53 shows poor results when used in the Rimage duplicator.

the following guidelines will produce the best results:

- Purchase media formulated for your drive and application.
- Use higher rated drives.
- Be cognizant of how the discs are created.
- Burn discs using the lower 1/3 of the drives writing ability.
- Label and care for your discs appropriately.

By taking these measures, your CD-R masters should last a considerable length of time and be able to be read by a wide variety of players.

Kosiorek is the audio recording and mastering engineer at the Corbett Studio at WGUC-FM, Cincinnati.

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

Vic Jester, Market DoE, Radio One, Atlanta

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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

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(but you get the present).

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More gems from NAB

By Kari Taylor

So many new products to see at NAB2004, yet so little time. Don't wait until you arrive at the convention to decide what you need to see, many of them are right here in our follow-up of product peeks and hidden gems of NAB2004.

On-air control surface
Wheatstone
Booth N2802

Generation 8: This control surface offers four faders dedicated to call-in segments to provide error-free interface to four callers or remotes, each with independent caller feed, independent fader feed, user-selectable talkback communication and adjacent channel linking. A dedicated LCD display screen keeps the operator informed and in control. One CAT-5 cable conveys all the control from this surface to the company's Bridge System. Users can bring any system audio source (inputs or mixes) to any console fader or monitor pot. Set destinations for mixes, aux sends and mix-minus feedss to anywhere in the facility. The surface can store and name switch and fader settings for each operator's task and recall them by spinning an encoder and pressing a take button.

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www.wheatstone.com; sales@wheatstone.com

Audio workstation
Mackie
Booth SL5913

dxb*200 and dxb*400: The two units share the same basic architecture and footprint. Both feature dual touch-screen interfaces, 96kHz operation, on-board automation and effects, 25 100mm Penny+Giles faders configurable I/O card cage and a Firewire I/O card option for streaming to desktop or laptop computers. Both are compatible wth select VST plug-ins and both integrate Mackie Control Universal unctionality for controlling Pro Tools and Logic The dXb*400, feattres a 96 x 96 channel I/O matrix and 72 channels of EQ and dynamcs at 96kHz. The unit is also equipped with more advanced surround sound functionality that includes 24 buses, flexible panningassignment and complete surround monitoring features.

800-898-3211; fax 425-487-4337; www.mackie.com; productinfo@mackie.com

Studio monitor
Tapco
Booth SL5913

S-8: The 8" monitor is a two-way, bi-amplified monitor with dual high-precision internal amplifiers that deliver a total of 120W RMS. The speaker offers a 1" waveguide-loaded silk-dome tweeter that provides smooth, non-fatiguing high end. Rear-panel controls allow for acoustic tailoring with low-frequency boost and high frequency cut and boost switches. Inputs include 1/4" TRS/XLR balanced and RCA unbalanced. All rear-panel controls and connections are recessed into an amplifier panel. The front panel includes separate power and clipping LEDs.

425-487-4333; fax 425-487-4337; www.tapcogear.com; sales@tapcogear.com

Audio adapters
Audioscience
Booth N405

ASI5000: There are initially three products in this series. The ASI5044 provides four stereo inputs and outputs in balanced analog and AES/EBU digital formats. A digital-only version, the ASI5041, has four AES/EBU inputs and outputs and the ASI5042 has balanced analog I/O only. With the ASI5042 and ASI5044, the analog interface is balanced and uses 24-bit over sampling converters that support sample rates from 32kHz to 192kHz. Low noise analog circuitry delivers more than 100dB of dynamic range with THD+N better than 0.002 percent. The transformer coupled AES/EBU interface on the ASI5041 and ASI5044 can operate at rates from 32kHz to 192khz. The card's sample clock can be synchronized to any of the four AES/EBU inputs. A 200MHz on board DSP provides 12 play streams and eight record streams coupled to a mixer that allows any play stream or physical input to be mixed to any physical output or routed to any record stream.

302-324-5333; fax 302-738-9434; www.audioscience.com; sales@audioscience.com

Cellphone and mixer interface
Marti Electronics
Booth N1902

Cellcast Remote unit: This dual-function product is a GSM compatible Digital Cellcast digital mixer and cellular remote unit. The GSM upgrade completes the remote unit's local compatibility with major cellular providers such as AT&T, T-Mobile and Cingular.

217-224-9600; fax 217-224-9607
www.martielectronics.com; sales@martielectronics.com

Dual-transmission audio processor
Omnia Audio
Booth N1416

Omnia-5EX HD: Paired parallel processing paths, one optimized for conventional broadcasting and the other for DAB, webcasting and satellite systems, route processed audio from the multiband mixer section to discrete output stages. The FM section receives distortion-controlled final limiting with pre-emphasis, and an upper-frequency response of 15kHz. The DAB section features a program-adaptive look-ahead limiter and user-selectable frequency response up to 20kHz. New processing algorithms provide clear processing for solo voices and instruments. Bass management controls, with two bass limiter functions, tight and girth, allow users fine control over low frequency processing. Dynamic bass limiter algorithms can change waveform characteristics based on frequency, resulting in deeper bass on smaller speakers.

216-241-3343; fax 216-241-4103
www.omniaaudio.com; info@omniaaudio.com

Open-air headphones
Sennheiser Electronics
Booth N2812

HD 650: Based on the design of the HD 600, these dynamic open-air headphones combine a flat frequency response (10Hz to 39.5kHz, 0dB to -10dB) with natural dynamics. This model features an enhanced bass response and includes an upgraded cable and reduced distortion in the high frequencies, making it useful for editing and mastering applications. Additional features of this unit include matched transducers with tight tolerances (±1dB), computer-optimized magnet systems for minimizing harmonic and intermodulation distortion, lightweight aluminum voice coils to ensure accuracy and fast transient response and Neodymium ferrous magnet systems for high efficiency.

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www.sennheiserusa.com; lit@sennheiserusa.com

Voice processor
Symetrix
Booth N1610

Air Tools 6200: This dual-channel, DSP-driven voice processor can handle signal processing of microphone or line-level signals in dual-mono or stereo. Processing blocks are editable from the front panel or from a Windows-based GUI accessed via USB or Ethernet ports, and changes are stored in any of the 1,024 onboard preset locations. Processes include filtering, parametric equalization, compression, de-essing, gating and room simulation. The processor also supports Homer Link, an interconnect protocol that makes it compatible with the Studio Matrix system.

425-787-3222; fax 425-787-3211
www.symetrixaudio.com; symetrix@symetrixaudio.com

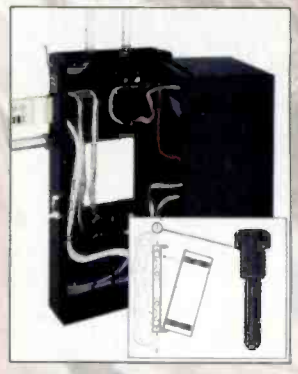
More gems from NAB

Wireless microphone system
Sennheiser Electronics
Booth N2812

Evolution Wireless G2: This second-generation mic offers broader switching bandwidth (3MHz), which in turn creates 1,440 channels available to the user. The bodypack transmitters and mobile receivers have been reduced in size by about 30 percent. The scan function automatically searches for free channels, and the system features intuitive user menu and large backlit displays. The unit also offers a new battery concept. The body-pack transmitters and mobile receivers are powered by two AA cells to ensure a longer operating time and stable RF performance. In addition, a powerful rechargeable battery pack, the BA 2015, is now available for the hand-held transmitter, the bodypack transmitter, the plug-on transmitter and the mobile receiver.

860-434-9190; fax 860-434-1759
www.sennheiserusa.com; lit@sennheiserusa.com

Wall cabinet
Middle Atlantic Products
Booth SL2180



DWR series: This wall-mount cabinet features the Tool-Free Quick-Mount System, permitting easy and quick mounting of the center section to the backpan on the job site. Additional enhancements to the redesigned DWR series include cable management advancements, a new 24" usable depth and optional granite gray powder coat. Advanced cable management capabilities are also an integral feature of the series, which comes in usable depths of 15", 20" and an additional new 24". Two pairs of fully adjustable rackrails can be recessed to allow cable managers to be rack mounted. The series features lacing points throughout the center section and knockout universal connector panels on the backpan that can accommodate BNC, XLR and other connectors.

973-839-1011; fax 973-839-1976; www.middleatlantic.com; sales@middleatlantic.com

Data management system
Broadcast Electronics
Booth N1902

Audiovault RBDS: A software-based management system for advanced data services, this system includes data content management and encoding, and it can be adopted for IBOC applications. A traffic announcement function allows a station to cause RBDS radios to pause a listener's CD or cassette in favor of radio programming so that the listener will tune into a station's traffic announcements. The system will also show the alternative frequency function of RBDS that allows a listener driving out of a particular FM station's geographic reach to be automatically tuned to the station's secondary frequency in a nearby geographic region. The RBDS system comprises of content management, at the individual station via a local server on the station LAN, or for multiple stations/clusters via a central server.

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

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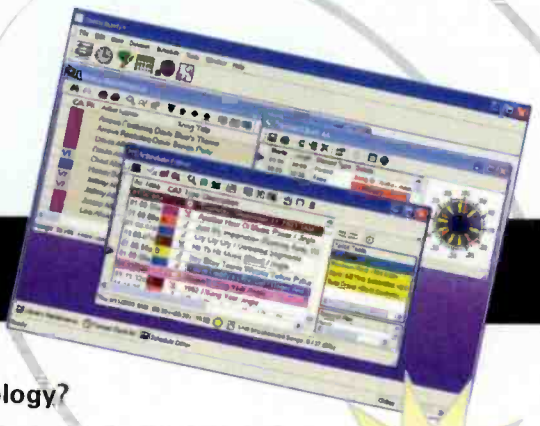
for Windows



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Digital source selector
Sonifex
Booth C5236

RB-DSS10 and RB-SS10: The RB-DSS10 10-way digital source select unit is a 1RU 24-bit/96kHz-capable device that produces a single AES/EBU and S/PDIF level digital audio output from 10 selectable AES/EBU or S/PDIF digital input signals. The unit will also route remote signal inputs through the remote connector to the selected input source. The RB-SS10 10-way analog source select/mixer unit is similar to the RB-DSS10, but has analog audio inputs and outputs, and can also mix the inputs to the output as well as route them.

207-773-2424; fax 207-773-2422; www.independentaudio.com; info@independentaudio.com

Audio workstation
Tascam/Teac Professional
Booth N2418

2488 Portastudio: This four-track, 24-bit, 36-channel workstation offers a capacious hard drive, powerful signal processing and built-in CD-RW drive. The recording and mixing workstation runs 24 tracks at 24-bits/44.1kHz. Eight inputs can be simultaneously recorded into the inputs. Twenty physical faders control the mixdown channels; each channel has three-band EQ and access to three built-in effects processors. A 40GB internal hard disk gives the user ample space for up to 32 24-track songs and virtual tracks for comping. Plus the 2488 has a USB 2.0 port for back-up via computer. Loop effect provides reverb, delay, chorus and more on an aux send and return.

323-726-0303; fax 323-727-7635
www.tascam.com; tascamlit@tascam.com

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More gems from NAB

Energy storage system
Active Power
Booth C1217

Clean Source DC: This line of battery-free energy storage systems has been enhanced to include expanded power levels and incorporate several changes in the evolving product line. The models provide tightly regulated, adjustable dc voltage to replace or augment batteries configured with uninterruptible power supply (UPS) systems backing up critical applications in the 100kW to 2,000kW power ranges. These systems are available with unit power ratings of 100, 140, 200, 250, 425 and 500kW, and can be paralleled in combinations up to 2000kW. They accept an input float voltage from 400Vdc to 600Vdc to supply a charging current of 15A to 100A per flywheel.

512-744-9461; fax 512-836-4511
www.activepower.com; jlozier@activepower.com

Extended-time profanity delay
Prophet Systems
Booth N3312

Content Check: The profanity delay equipment allows users to record, listen and edit programs while they are happening, tailoring the programs to the audience, market and time slot. With more than 60 minutes of user configurable delay, the equipment allows the user to edit more than seven to 20 seconds of content, users can remove the whole joke, bit or segment from the show. This product is configurable for uncompressed or compressed operation.

800-658-4403; fax 308-284-4181; www.prophetsys.com; sales@prophetsys.com

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Analog STL system
Armstrong Transmitter
Booth N706

X Link STL system: An analog STL system, the X Link is a 10W system that replaces the FML 10 system. The transmitter and receiver feature microprocessor control that evolves the FML10 to a user-friendly menu driven system. Frequency, power output, signal strength and all metered parameters are available on the front panel LCD display and via remote control. The system's receiver is more sensitive making it useful for long STL paths. This system interfaces easily with the company's two and four channel digital converters to allow a station to add digital audio to the analog platform. The transmitter and receiver operate on 24Vdc, 110Vac or 220Vac.

315-673-1269; fax 315-673-9972
www.armstrongtx.com; sales@armstrongtx.com

Audio analyzer
Rohde & Schwarz
Booth C2532

R&S UVP: This is a compact instrument for all measurements occurring in the analog and digital audio world. Features include a digital audio interface with up to a 192kHz sampling rate, expanded measurement bandwidths and analysis tools. This unit can perform several measurement functions simultaneously, and presents the results in conclusive graphics that can be intuitively operated using the Windows operating system.

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

Tube mics
Pearl Microphone Labs
Booth N1300

CT40 and DT40: These tube microphones combine the classic Pearl rectangular dual capsule and quality Nuvistor vacuum tube resulting in a flat, warm sound. The CT40 has a fixed cardioid pattern while the DT40 can be configured for five patterns to accommodate a variety of recording situations. Both models are supplied with flight case, power supply, cable and shock-mount. Specifications of these mics include a sensitivity of 28mVPa; frequency response from 20Hz to 25kHz; and an impedance of 200Ω.

207-773-2424; fax 207-773-2422
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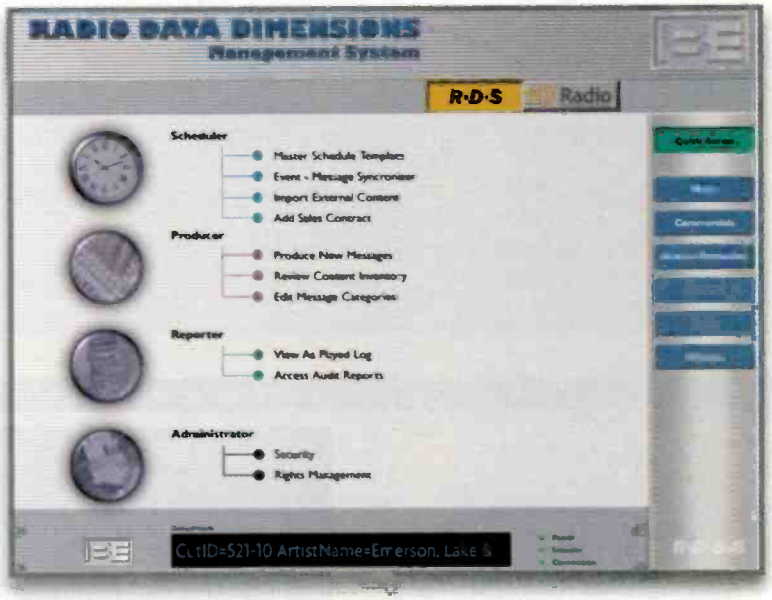
info@independentaudio.com



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More gems from NAB

Compact Flash recorder
Marantz

Booth N3026

PMS670: This solid-state recorder offers a one-touch digital audio recording capability of more than 70 hours on 1GB Compact Flash cards. The unit can record in linear PCM and compressed MP3, MP2 and BWF audio formats using 40 assignable audio-quality settings. The recorder features a non-stop record function with four hours of battery life and includes an EDL marking system for creating new files on the fly during recording, providing easy file selection during playback. The system offers variable bit-rate recording with user-adjustable sampling rates from 16kHz to 48kHz. The recorder includes a USB connection that allows it to be linked to a PC or Mac for easy file transfer.

630-741-0330; fax 630-741-0652
www.marantzpro.com; info@marantzpro.com

Modular digital console
Studer

Booth N700

On-Air 3000: This console is aimed at the mid-to-upper-segment of the radio market. The console's operating concept now includes color GUI screens. The system is a modular design and uses the new fanless S-Core DSP engine. The standard fader module is comprised of six channel strips. As many as eight modules may be fitted to provide a maximum console size of 48 faders. Layout options range from an engineer-operated continuity console to a single-fader panel for announcer and newsroom use or a PC-operated system with no physical desk controls. The console offers three main stereo mix buses and an audition facility, four stereo aux buses, 16 mix-minus sends configurable as auxes and three independent studio monitoring/talkback circuits, including two PFL circuits for split desk operation. Individual channels are each equipped with four-band parametric EQ, full dynamics, de-esser, HPF and input/output routing.

818-920-3212; fax 818-920-3208
www.studer.ch; sales@studer.ch; kholmes@harman.com

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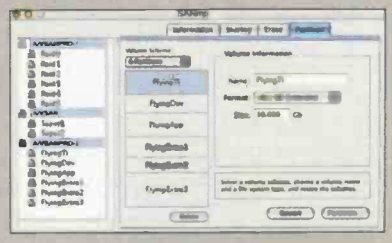

SANmp: This multi-platform software allows workstations with different operating systems to concurrently access information from a Storage Area Network. With this software, users can upgrade to the latest OS or add Windows workstations to their Mac environment. In addition, the system does not require a server or Ethernet connection. Features include the ability to easily configure and manage the storage network, set access privileges at the user level, and share and access audio and graphics files from a centralized storage location. Another benefit is the ability to integrate Mac OS and Windows workstations, regardless of whether the systems are running Nuendo, Sonic HD, Final Cut Pro, Pyramix, Avid or Pro Tools.

877 537 2094; fax 314 423 4867
www.studionetworksolutions.com

Mic boom
Heil Sound
Booth B2718

PL-2T: Using a system of balanced internal springs rather than outboard springs, the boom handles microphones up to 1.5lbs. The mic cable is threaded inside the boom by removing the top and back plates. This hollow channel eliminates the use of wire ties to secure the mic cable. The equipment is shipped with the standard C-clamp mount that will accept a 1.5" thick table. An optional flush mount is available which screws to the top of a surface. The unit accepts 5/8"–27 threaded mic clips or shock mounts. The chrome-threaded stem can be locked into its position depending on the type of microphone or shock mount.

618-257-3000; fax 618-257-3001
www.heilsound.com; info@heilsound.com

Stereo display
DK-Audio
Booth C3843

PT0600M: Sharing the same motherboard as the MSD600M++ surround sound meter, this unit combines the jellyfish surround display with a rotary control knob on the front panel, enabling it to act as the master volume control for speakers in stereo configurations. The meter is built into a half-rack width package.

+45 4485 0255; fax +45 4485 0250
www.dk-audio.com; info@dk-audio.com

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More gems from NAB

PC mixer
Henry Engineering
Booth N1100

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 soundcard 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.

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

Stand-alone automation system
Arrakis Systems
Booth N2022

Champion: This on-air workstation combines the company's Digilink Xtreme software and the the Champ-6 workstation hardware. It features an embedded PC and audio playback system in a fanless unit. It has four stereo sound cards built in with play and record, analog and digital audio I/O and logic control for all four audio channels. It is Windows XP OS compatible with built-in networking for audio and schedule interfacing.

970-461-0730; fax 970-663-1010
www.arrakis-systems.com sales@arrakis-systems.com

Pro Tools effects plug-in
Eventide
Booth N704

H3000 Bank Delays: The plug-in will provide Pro Tools users with the feature set and functionality of the Band Delays algorithm from the H3000 in a plug-in format. The plug-in features hot keys, which provide four editing controls, providing quick access to scalable multiple parameter manipulation of the four most important adjustments to the effect. The product also features eight tempo-based delays each with programmable resonant filters and independent panning controls.

201-641-1200; fax 201-641-1640; www.eventide.com; audio@eventide.com

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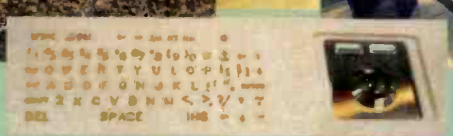

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Portable powered mixer
Soundcraft USA
Booth N1018

Gigrac: This integrated mixer-amplifier features eight input channels. The first four inputs are mono mic or line inputs. Inputs five through eight accept mono or stereo sources. Each input has a two-band equalizer. There is a seven-band master graphic equalizer on the output as well as a selection of preset digital effects. The model 300 has a single 300W power amp while the model 600 has two 300W power amps. The lid of the unit's road-ready case is designed to stow microphones and cables. The mixer can be removed from its case for fixed installations. It occupies 4RU.

818-920-3212; fax 818-920-3208
www.soundcraft.com
soundcraft-usa@harman.com

Internet transmitter monitoring
Burk Technology
BoothN3702

ARC-16 Web interface: Providing Web-based control and monitoring for the ARC-16 transmitter remote control system, all connected ARC-16 units can be linked to a single Web interface to allow site control from a standard Web browser on any networked PC. LAN/WAN capability provides users the means to control their sites via their local network, the company intranet or from anywhere using the Internet. The Web interface also sends alarm notifications by e-mail or SMS to any e-mail-enabled device. The interface needs only one serial connection to the ARC-16 for Web-based control of all connected units, and the connection from the Web interface to the system may be direct or via a full-time modem. This allows the user to install the system at the transmitter site, at the studio location or anywhere an Ethernet connection is available.

800-255-8090; fax 978-486-0081
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Power conditioning system
Staco Energy Products

Booth C1211

Firstline: Protecting against voltage fluctuations, brownout conditions, harmonics and transient surges, this system isolates the connected load from the primary ac supply. The system can be configured for any 208,400 or 480Vac application. It can handle an input voltage range of ±20 percent, while holding output a tight regulation of ±0.5 percent for balanced loads and ±3 percent for unbalanced loads. It has a total harmonic distortion of less than 3 percent for linear loads, and less than 5 percent for non-linear loads. It also regulates frequency to a stringent ±0.05 percent.

937-253-1191; fax 937-253-1723
staconergy.com; sales@staconergy.com

Studio furniture
Omnirax

Booth C2014

Presto: The desk surface of this product is wide enough for large keyboard controllers, control surfaces or smaller mixers, while providing eight rack spaces in two bays within easy reach. The shelf above the rack spaces can hold computer monitors and nearfield monitors. The shelf below is available for a computer and storage. The dimensions of this unit are: height 37.13", depth 31.38", width 55.9" weight 125lbs.

800-332-3393; fax 415-332-2607; www.omnirax.com; info@omnirax.com

Music library
Manhattan Production Music

Booth C2545

LiveTrax: Containing music performed by live studio musicians, the genres in this library span everything from cutting-edge rock to orchestral. New CDs will be created and distributed to subscribers. The library will be available for blanket and laserdrop music licensing, depending on the project. Some CDs will feature full songs with lyrics, allowing for a more soundtrack-like feel.

800-227-1954; fax 212-262-0814; www.mpmmusic.com; mpmusc@aol.com

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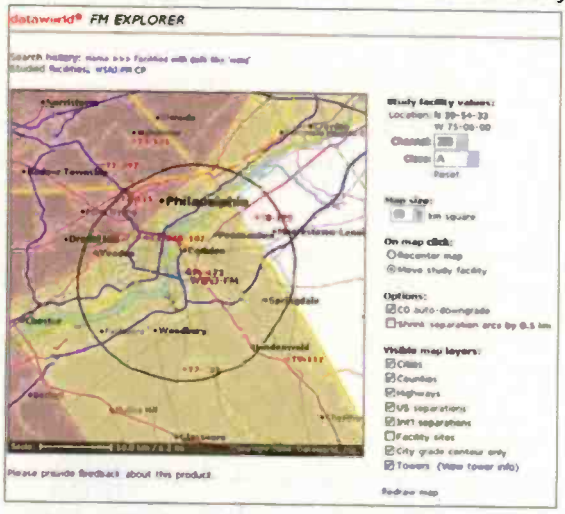

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Composite Audio Switcher/DA
Broadcast Devices
Booth N2718

CDS-300 and CDS-302: These composite audio switcher distribution systems switch and distribute FM base band stereo,subcarrier, RBDS and SAP signals.The CDS-300 is a standard two-input switcher that accepts two composite inputs that can be distributed to two composite input exciters.The CDS-302 is identical in function to the CDS-300 but also features a silence sensor and automatic switching capability. Add one of four auxiliary modules available for both units and interface composite signals to AES digital equipment.

914-737-5032; fax 914-736-6916; www.broadcast-devices.com; sales@broadcast-devices.com

Audio router
AEQ
Booth N1312

BC 2000 D Router: More than an audio switching router, this unit allows centralized or decentralized audio management, the link and communications of all studios, as many as 2,048 x 2,048 channels with no limitation of simultaneous connections. The unit offers a decentralized system linked by MADI connections between all the subracks. It handles digital, analog even microphone inputs and outputs, as well as non-audio signals such as Dolby E and MPEG. Its signal processing capability includes mixing, equalizations, filters, compression, expansion, limiting, reverb and delay.This product can be configured to be totally redundant, and it has automatic error correction capability, plus remote diagnostic and remote repair abilities. It may be used as an intercom router using dedicated panels.

954-581-7999; fax 954-581-7733
www.aeq.es; sales@aeqbroadcast.com

RF monitors
Audemat-Aztec
Booth N1426

Navigator 100,Navitgator 1000:These FM Navigators offer DSP technology, front panel LED display (10 characters) and navigation interface, RS232 serial link and antenna or MPX input/MPX output. The 100 FM features a GPS receiver, removable flash card for measurement and a loudspeaker. The Navigator 1000 is the same version as Navigator 100 without GPS. It is useful for monitoring RBDS subcarrier and decode RBDS data.

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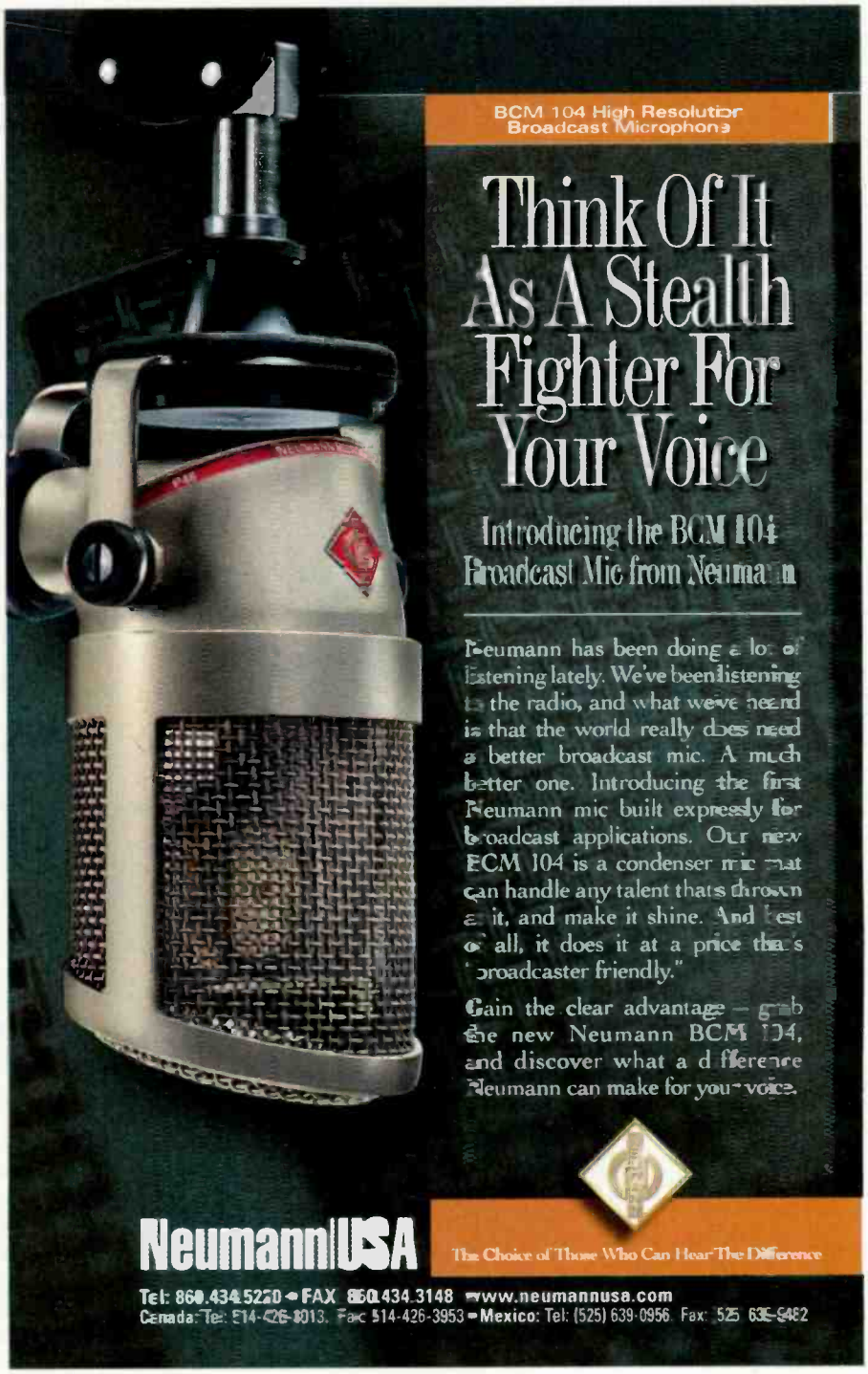
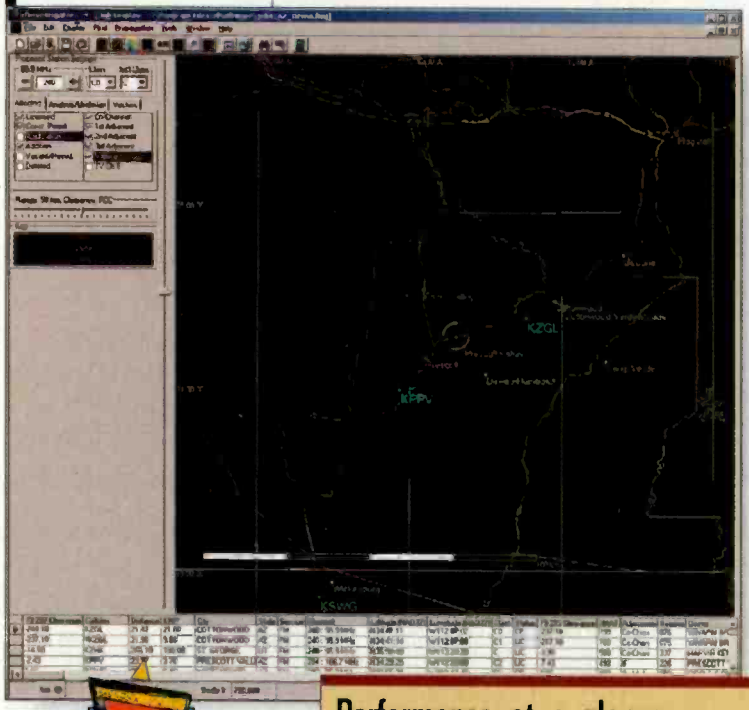


RFSoftware RFInvestigator

By Don Mussell

Throughout the years, I have filed hundreds of FCC applications. In the old days (20+ years ago) I had to use whatever tools I could piece together to perform the allocation studies, find open channels, plot the terrain graphs, create contour maps and crunch the numbers. It took several days to do all of the calculations and obtain the topographic maps, and then sometimes a few weeks more if there was a complicated set of protections to be figured into the mix. Non-commercial applications were even more difficult, because those applications required spacing and contour interference studies, which needed timely license and application data from the FCC reference room. That meant gathering the data by hand in person or using a Washington, DC, service to gather, copy and mail the countless paper files required to provide a detailed and timely source for the study.



DEMO ROOM

Performance at a glance

- Analyzes STL microwave paths
- Calculates population within contours and contour overlaps
- Includes 30-second terrain data
- Three-second terrain data is available
- Antenna pattern tool to design DAs
- Performs free-space and Longley-Rice path loss calculations

Those old days are gone. There are some powerful software tools now available that do most everything that is required to search for new allocations, and also provide the ability to modify and upgrade any existing AM or FM station.

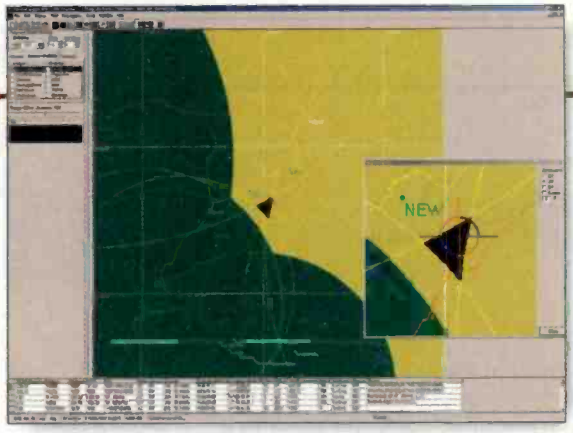
I was given the opportunity to evaluate the RFInvestigator 2.0 suite of programs, and it is an impressive package. Included under the hood of this powerful set of programs are a group of software tools that can be used to complete commercial and non-commercial channel allocation searches. All of the tools I need are here, including open channel searches and studies, contour maps, automatic directional antenna pattern design, terrain profiling and other helpful features. In short, everything that I need to gather, analyze and prepare the data for FCC applications for clients is right here at my fingertips.

By purchasing the optional DB-Builder, I can download the FCC database from the FCC website myself and use it directly with the programs. This alone pays for itself quickly because the FCC downloads don't cost anything.

Making it easy

To test the program, I used my 2.4GHz PC notebook and the supplied CD from the company. The program comes with a short movie that explains a typical set of tasks for the program and provides a glimpse at some of the features. The manual is helpful as well, and after a few minutes the software was loaded and configured. I was ready to try my hand at an FM class upgrade for one of my commercial FM clients. For the most part, the program suite is fairly intuitive and easy to follow. After a few more minutes, I had the station of interest up on the screen, and the open allocation spacings around the station were plainly in view. A couple more mouse clicks and I had an answer for the upgrade question. The answer was yes, but the station would require contour protection and a directional antenna. This might take some time, I thought. But a few more mouse clicks and something I thought impossible was created before my eyes. A directional antenna pattern meeting FCC rules concerning minimum two-degree variation and power levels was finished and waiting for my inspection before I could even begin to think about all of the calculations needed to do it by hand.

As a test, I decided to try moving one of my client's stations to an adjacent site to determine if the situation would be better or worse from a coverage and interference basis. Once again, I found it fairly easy to compare



To help determine potential new tower sites, existing tower and transmitter site locations can be quickly mapped.

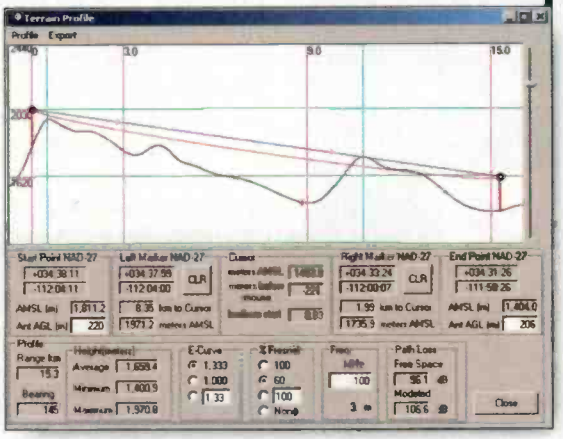
the sites using the array of tools available within the program. By examining the sites using the Terrain Profiler, I determined that the alternate site had a problem with terrain blocking the signal from full line-of-sight coverage to the city of license. To confirm my results, a mouse click provided a color terrain view that confirmed the size and locations of the hills that would be a problem.

So not only did I quickly figure out a way to upgrade the station, but I also saved valuable time in researching the viability of the alternate site, and all without having to switch between different programs and operating platforms.

In thinking about finding a site for another client to relocate, a new tower would need to be constructed. With another mouse click, the software showed the locations of all the nearby AM broadcast towers, which was handy for determining if a collocation was possible, or if the new tower would be close enough to an existing AM broadcast tower to require a de-tuning network to be added. In short, every time I came up with a seemingly difficult question, the software seemed to have the answer ready and waiting.

It is obvious that the company has brought some considerable engineering expertise and experience to this set of programs. Much of what I am used to doing, even with the assistance of various software programs I have on hand, was made faster and easier to accomplish using the RF Investigator. For the serious allocation consultant, or the group engineer or owner seeking to maximize the facilities of any station, the RF Investigator is a fully-loaded and powerful tool to accomplish everything needed to get the most out of any facility.

I only wish I had this wonderful suite of programs to use back when I was doing applications and studies by hand.



The Terrain Profiler provides an easy view of the relative terrain between two points.

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These reports are performed by the industry, for the industry. Manufacturer support is limited to providing loan equipment and to aiding the author if requested.

It is the responsibility of Radio *magazine to publish the results of any device tested, positive or negative. No report should be considered an endorsement or disapproval by* Radio *magazine.*

Mussell is a consulting engineer in Bonny Doon, CA.

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TDM Data Solutions EAScriber Pro

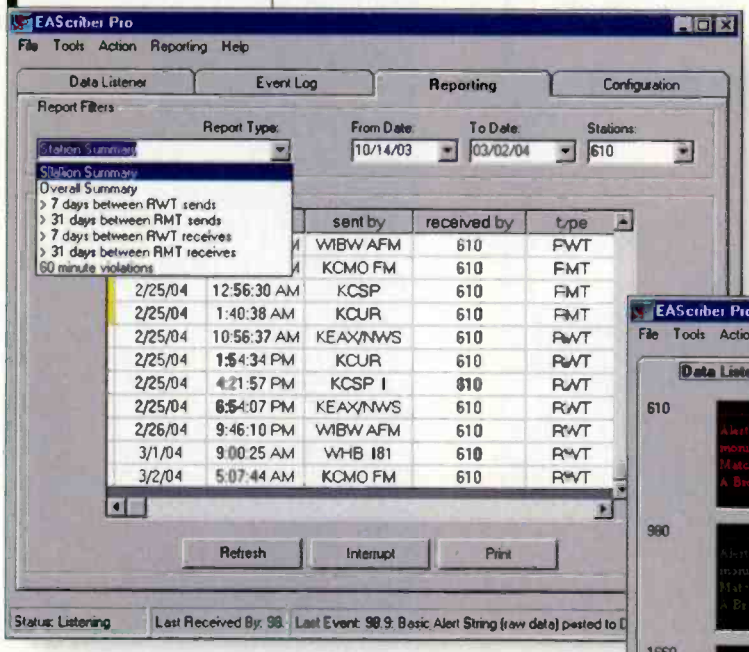
By Kirk Chestnut, CSRE

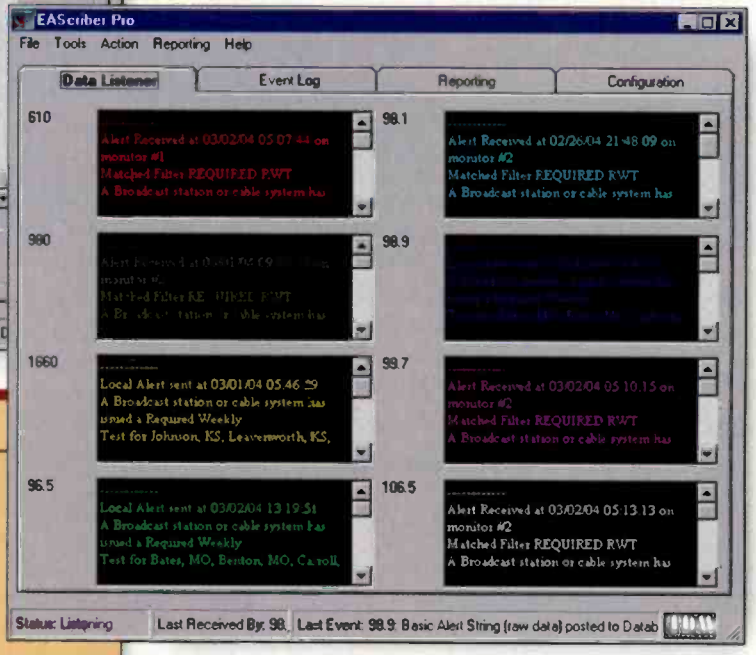
Weather warnings have been pouring into the studios all night about as fast as the falling rain outside. The air staff braces for another round of storms while you try to restore power to a transmitter knocked out by lightning. It's about this time you realize that those tiny rolls of paper in the EAS decoders won't last much longer. The last thing you need to worry about could also be the most critical. Wouldn't it be nice to have all of your EAS equipment logging to a computer?

EAScriber Pro from TDM Data Solutions addresses this problem. EAScriber takes data from third-party EAS equipment and stores it as a Microsoft Access database file or as a text log. Equipped with a modest computer running Windows and a multi-port serial card, it is possible to monitor as many as eight EAS decoders. Once the data is captured, the worries of manual logging or replacing printer rolls disappear.

Any Pentium-class computer will do the job. Station clusters with more than two decoders will need to consider the purchase of a multi-port serial card. TDM can supply the needed hardware if necessary.

The base price for EAScriber Pro covers one EAS decoder. Discount prices apply for use with three or more decoders. TDM provides basic software support free of charge. An annual software maintenance fee of 40 percent per year guarantees upgrades and off-site support. Compared to the level and frequency of FCC fines for EAS non-compliance, I found that the purchase price more than justified any potential fine.





Performance at a glance

- Real time EAS activity database logging
- Monitor as many as eight stations
- Redundant file logging system
- Helps to improve compliance with Part 11 EAS regulations
- Database easily integrates with a website
- Reporting feature for creating reports filtered by date and station ID

Put into use

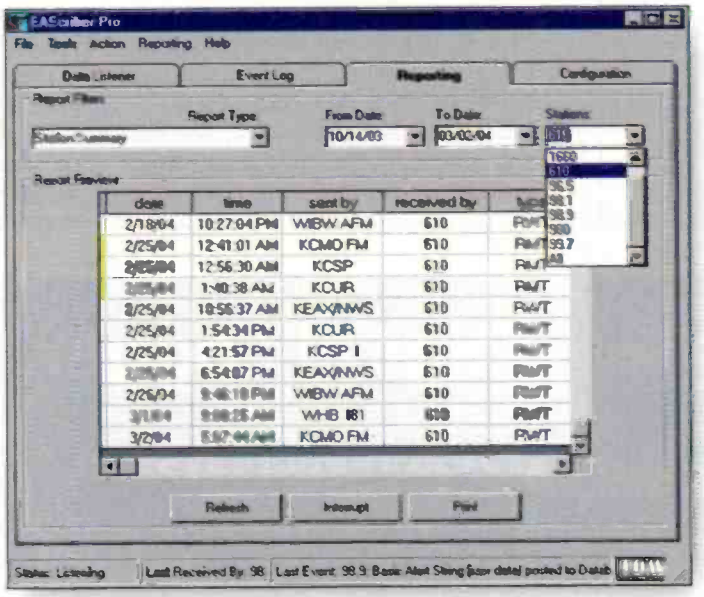
EAScriber is a snap to install. Plug in the serial cards and attach the serial cables to each EAS decoder. Install the serial card drivers and then install the EAScriber software; it's that simple. The program provides four easy to navigate panels for data listening, event logging, reporting and configuration.

The data listening page displays the text output from each decoder in real-time. This information is identical to the printer output. One can view activity simultaneously from as many as eight decoders on this panel.

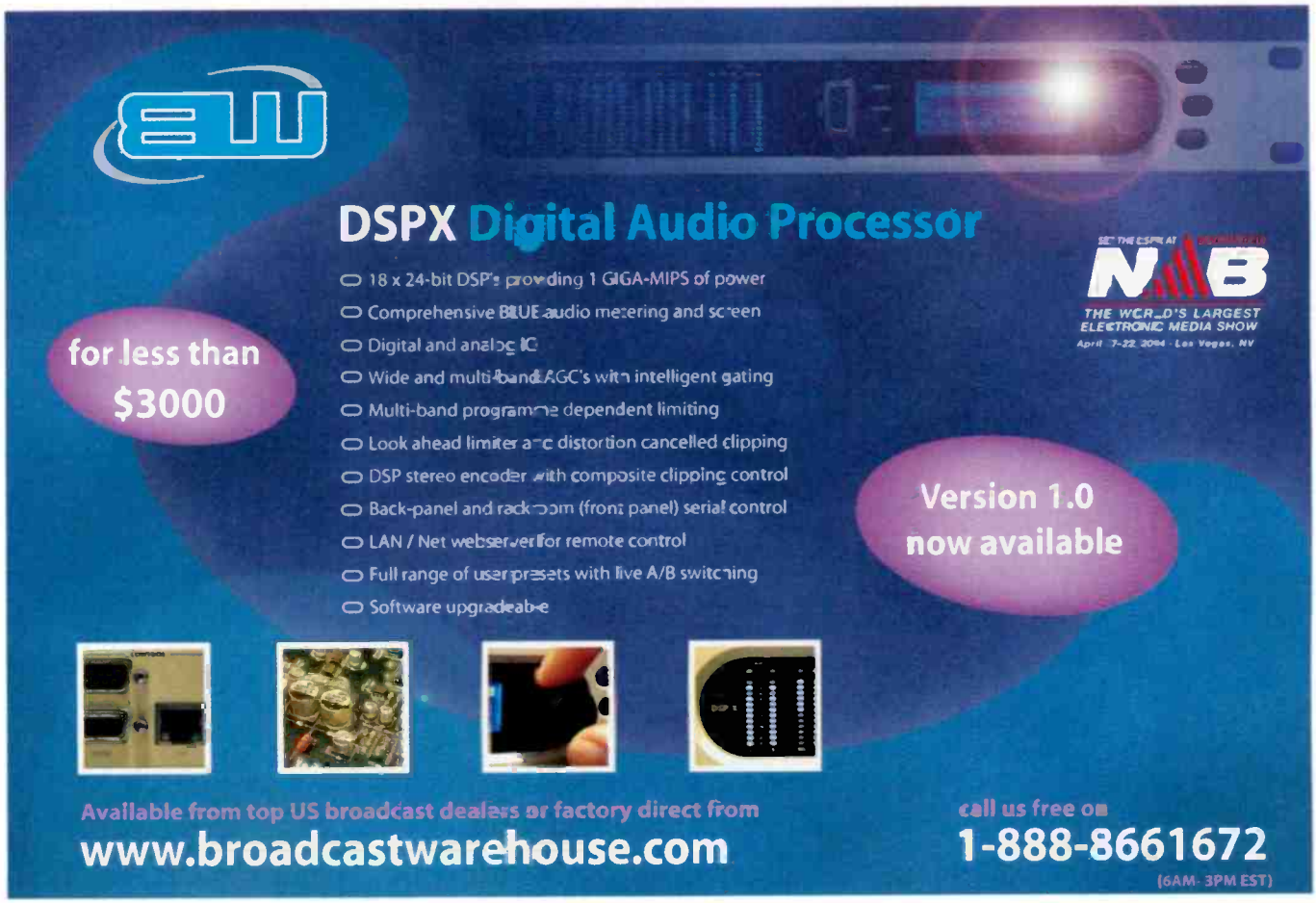
The event log page shows the raw EAS text as received from each decoder as well as operational notes inserted by EAScriber Pro. Once the log has been reviewed, you may write the log to a file. This provides a means for that regular weekly chief operator review. Log files are named using the date the file was saved.

The reporting page allows the user to customize reports by station, time frame or missed tests. Filtered reports can be generated showing required weekly tests (RWT) sent and received with more than seven days elapsed between tests. The same is true with the 31-day required monthly test (RMT) interval as well as a 60-minute RMT relay violation.

The configuration page manages data port configuration and labeling. The user enters station call letters associated with each respective port as well as the data baud rate. A configuration option is available for the Sage Multi Station Relay Panel system where multiple stations use the same decoder. The system is TCP/IP configurable where RS-232 is not practical.



The reporting features can customize reports by station, time frame or missed tests.



Out of the box

The hardest part of the installation process was getting the data from each air studio to the central equipment room where the logging computer was located. We stretch the limits of RS-232 on a regular basis around the building with runs of 100' or more. To boot, the RF in our facility can create a lot of problems so we run all of our serial data through shielded CAT-5 cable.

The logging computer we use is a 333MHz Pentium II running Windows 98. The multi-port serial card, which we purchased from TDM, is a RocketPort eight-port PCI card. This computer is connected to our network so files can be shared among the engineering group. We can back up these files to external storage media.

Ours was a perfect application for this product. We manage eight radio stations under one roof, so you can imagine the mounds of paper we would go through just to stay compliant with FCC rules. Situated in tornado alley, Kansas City sees its share of severe weather each year. Invariably, a single storm event will generate enough EAS activity to run a roll of paper dry before the night is over. I'm lucky to get the air staff to take an interest in knowing EAS operations let alone training them to feed a new roll of paper in those little printers.

Once everything was installed, we began testing communications between the computer and the decoder by cycling power on the decoders one at a time. Almost without fail the system worked flawlessly. In a couple of cases, communication was established once I corrected my own wiring mistakes.

Because the computer now logs every move the EAS decoders made, we have deactivated the printers. This made us realize how dependent some of our board ops were on the paper printouts. The whirring noise of the printer was their cue that something was up that demanded their attention. It has

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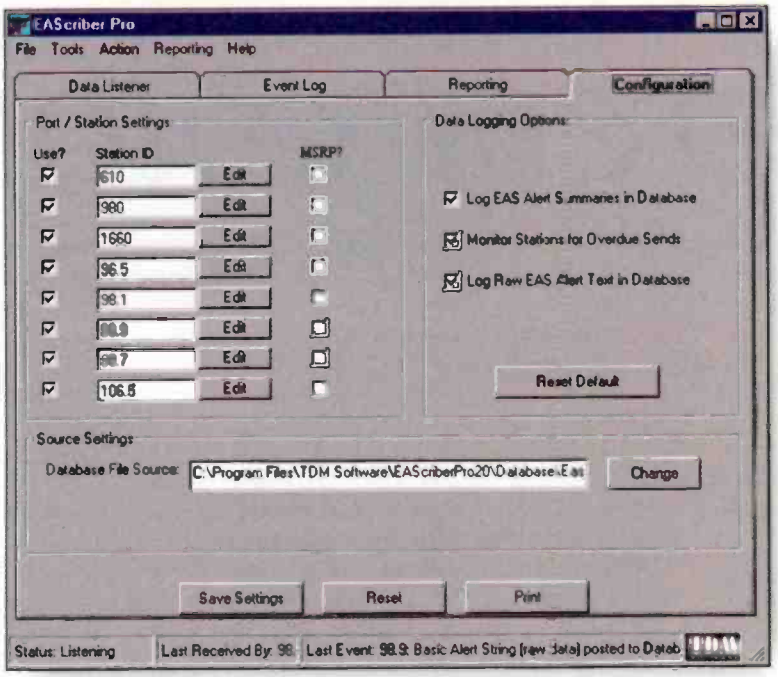
become a case of solving one problem but creating another. Now we use strobe lights to alert the operator to the most serious EAS events, however other means are in the works to give the operator a visual cue to an EAS alert like storm watches and warnings.

For years, we've talked about the tapeless studio. Now we are moving toward the paperless studio. The final crowning achievement will be the development of an EAS pop-up screen for the board op's Internet computer. This will give our board ops the information they need without the extra paper storage.

Chestnut is is an engineer with Entercom Kansas City.



The configuration page manages data port configuration and labeling.

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BUILT FOR BROADCAST

AUDIOSCIENCE

An MPEG of a different color

By Oliver Kunz

Low bit-rate audio coding is an enabling technology for a number of applications like digital radio, mobile multimedia applications and Internet streaming (Web radio).

The limited overall bandwidth available for a digital transmission system makes it desirable to use a low bit rate per channel to distribute the audio in the given transmission data rate. Therefore, system designers have to use highly efficient perceptual audio codecs, such as MP3 or AAC, at low bit-rates.

In Internet streaming applications, the connection bandwidth that can be established between the Web radio server and the listener's client application depends on the listener's connection to the Internet. In many cases today, people use POTS modems or ISDN lines with a fairly limited data rate; lower than the rate that would be desirable to produce an appealing audio quality by means of conventional perceptual audio codecs. Even with connections to the Internet through high-bandwidth connections such as DSL, the ever-present congestion on the Internet limits the connection bit-rate that can be used in a stable manner over a longer time period.

In mobile communications, the situation is similar to the digital radio scenario. Because the overall bandwidth available for all services in a certain geographic area (a network cell) is limited, the system operator has to take measures to allow as many users as

How SBR stands out in a crowd

possible in that network cell to access mobile communication services in parallel. For commercial reasons, the network operators have to ensure that they use their available spectrum as efficiently as possible by means of speech and audio codecs. Considering the effect that the advent of multimedia services has on the data rate demands in mobile communication systems, it becomes apparent that even with G3 phone technology, cellular networks will have to use perceptual codecs at a fairly low data rate.

The technical challenge

Using perceptual codecs at low bit rates, however, is not without its downside. State-of-the-art perceptual audio codecs achieve CD-quality or transparent audio quality at a bitrate of about 128kb/s (about 12:1 compression). Below 128kb/s, the perceived audio quality of most of these codecs begins to degrade significantly. The codecs either start to reduce the audio bandwidth and to modify the stereo image, or they introduce annoying coding artifacts resulting from a shortage of bits in the attempt to represent the complete audio bandwidth. Both ways of modifying the perceived sound can be considered unacceptable above a certain level. At 64kb/s for instance, MP3 would offer an audio bandwidth of about

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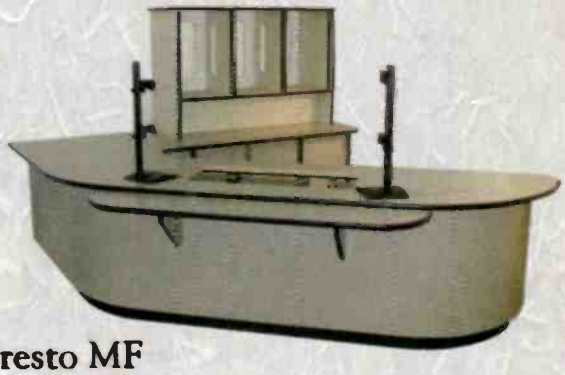

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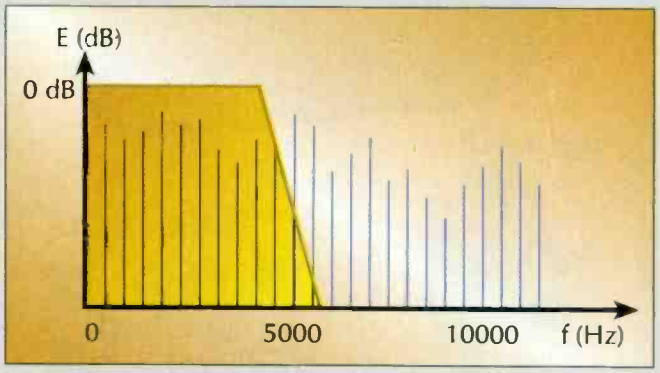
An MPEG of a different color

10kHz or introduce a fair amount of coding artifacts. Each of these factors severely affects the listening experience.

The technical solution

Spectral Band Replication (SBR) is a newer audio coding enhancement tool. It offers the possibility to improve the performance of low bit-rate audio and speech codecs by increasing the audio bandwidth at a given bit-rate or by improving coding efficiency at a given quality level.

SBR can increase the limited audio bandwidth that a conventional perceptual codec offers at low bit-rates, so that it equals or exceeds analog FM audio bandwidth (15kHz). SBR can also improve the performance of narrow-band speech codecs, offering the broadcaster speech-only channels with 12kHz audio bandwidth used, for example, in multilingual broadcasting. As most speech codecs are bandwidth limited, SBR is important not only for improving speech quality, but also for improving speech intelligibility and speech comprehension. SBR is mainly a post-process, although some pre-processing is performed in the encoder to guide the decoding process.



Audio bandwidth limiting is common in many forms of audio transmission.

From a technical point of view, SBR is a method for highly efficient coding of high frequencies in audio compression algorithms. When used in conjunction with SBR, the underlying coder is only responsible for transmitting the lower part of the spectrum. The higher frequencies are generated by the SBR decoder, which is mainly a post-process following the conventional waveform decoder. Instead of transmitting the spectrum, SBR reconstructs the higher frequencies in the decoder based on an analysis of the lower frequencies transmitted in the underlying coder. To ensure an accurate reconstruction, some guidance information is transmitted in the encoded bit stream at a low data rate.

The reconstruction is efficient for harmonic as well as for noise-like components, and allows for proper shaping in the time domain as well as in the frequency domain. As a result, SBR allows full bandwidth audio coding at very low data rates, thus offering a significantly increased compression efficiency compared to the core coder.

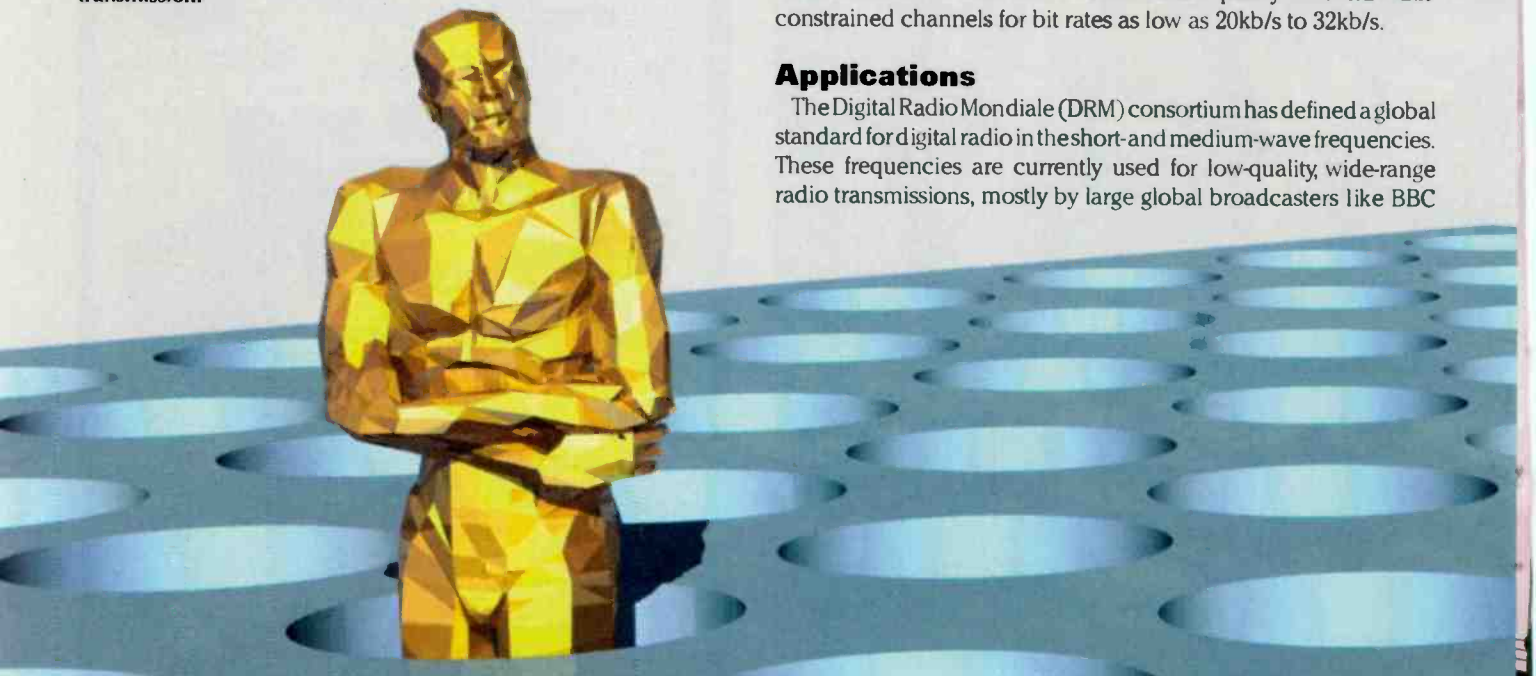
The performance

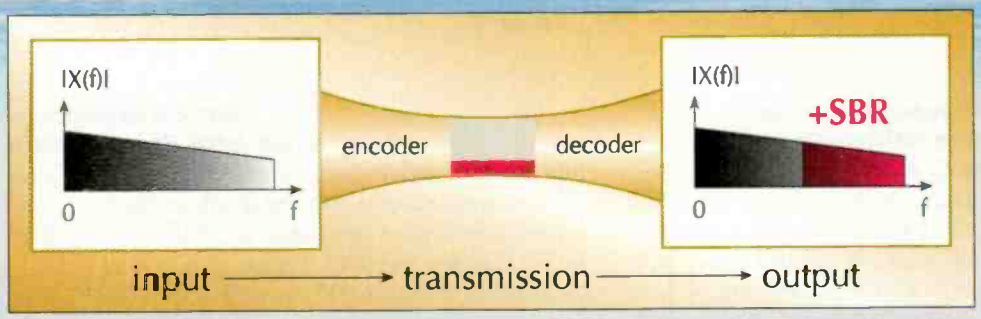
SBR can enhance the efficiency of perceptual audio codecs by about 30 percent in the medium to low bit-rate range. The exact level of improvement that SBR can offer also depends on the underlying codec. For instance, using SBR in conjunction with MP3 can achieve a quality at 64kb/s stereo that compares to conventional MP3 at a bit rate of more than 100kb/s stereo. SBR can be used with mono and stereo as well as with multichannel audio. SBR offers maximum efficiency in the bit-rate range where the underlying codec itself is able to encode audio signals with an acceptable level of coding artifacts at a limited audio bandwidth.

Currently in the process of standardization, Enhanced AAC Plus will further reduce bit rates and increase audio quality for bandwidth-constrained channels for bit rates as low as 20kb/s to 32kb/s.

Applications

The Digital Radio Mondiale (DRM) consortium has defined a global standard for digital radio in the short- and medium-wave frequencies. These frequencies are currently used for low-quality, wide-range radio transmissions, mostly by large global broadcasters like BBC





SBR restores the high-frequency content that was removed to accommodate the encoding path.

World Service, Radio France International, Voice of America and Deutsche Welle. The transmission channel characteristics and the current channel spacing, which will be maintained in the digital system for reasons of co-existence in the transition period, do not allow a high data rate, making this system a good candidate for the use of SBR. Within the DRM system, SBR is used in connection with AAC.

XM Satellite Radio began using a customized AAC Plus audio encoding algorithm with neural audio optimization in April 2002. AAC Plus combines the AAC algorithm with SBR technology. AAC Plus is commercially available for Internet streaming applications, and it is used by Telos, Orban and RealNetworks.

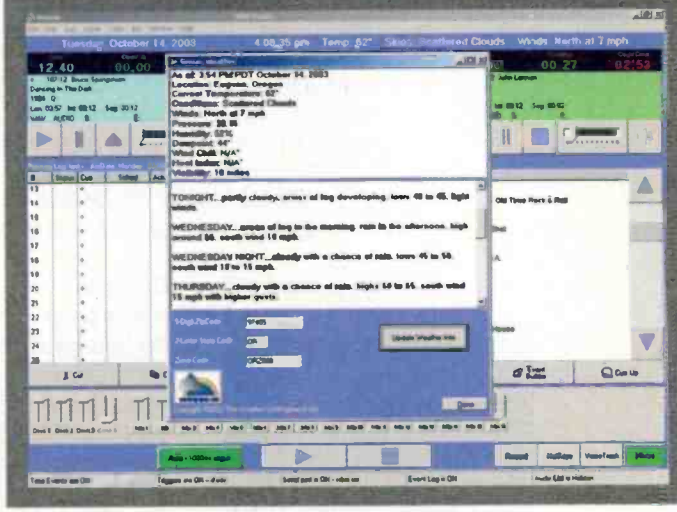
The audio encoding algorithm used by Ibiquity for IBOC is called HDC, which combines Ibiquity's proprietary encoder with SBR.

At the end of 2003, mobile network operators launched the first services to download songs to mobil phones, using AAC Plus. These providers include mmO2, Vodafone, and SK Telecom.

A combination of MP3 and SBR in a backwards compatible way, MP3 Pro has been integrated into the existing MP3 market. Conventional MP3 players can still render a useful output from an MP3 Pro bit stream, while MP3 Pro players can decode the added information. The performance of MP3Pro is significantly higher than that of MP3. MP3Pro at 64kb/s performs better than MP3 at 96kb/s, offering the user a convenient way to improve the storage efficiency of his portable player. MP3 Pro will also be able to improve the fidelity at 128kb/s, allowing true CD-quality storage and replay. At the lower bit rates used for streaming applications today, MP3 Pro will help to increase the audio bandwidth of the compressed signal, giving it a substantial subjective quality boost over current streaming formats.

Kunz is the VP of strategic marketing for Coding Technologies, Nürnberg, Germany.

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.

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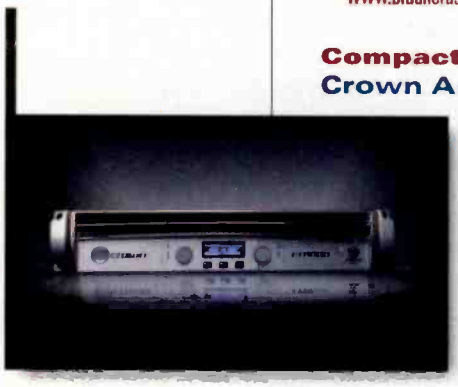
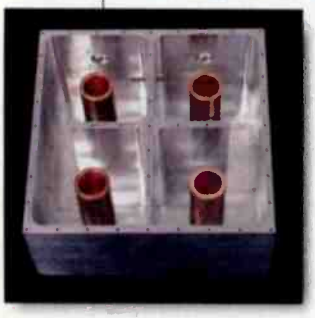
Crown Audio



I-Tech Series: Each amplifier in this series occupies 2RU of space and weighs less than 28lbs. The units feature a Class I switching output design to deliver power while generating a fraction of the heat of conventional designs. The power supply delivers full power regardless of ac mains voltage from 120V to 277V and from 50Hz to 60Hz. Power factor correction allows these units to draw current from the mains efficiently, providing more power from a single 20A breaker. The front panel provides an LCD display and menu-based system with full amplifier diagnostics. AES/EBU digital audio inputs are standard, along with balanced analog XLR inputs and passive-through outputs.

800-342-6939; fax 219-294-8250
www.crownaudio.com; mamiller@crownintl.com

STL receiver filters
Integrated Microwave



Cavity bandpass filters: These filters are narrow bandpass cavity filters for 900MHz STL receivers. Designed as preselector filters, these cavities offer low loss, steep skirts and a rugged housing. Typical uses include rejection of other STL signals, paging services and cell phone noise. Each filter is sold pretuned to the user's exact STL frequency. Ultimate rejection is better than 80dB.

858-259-2600; fax 858-755-8679; www.imcsd.com

RF connectors
Pomona Electronics

BNC: These space-saving connectors are designed for specific applications such as cross-connect panels requiring multiple BNC connections. The 6700/01BNC within-series adapters have nickel-plated brass bodies with gold-plated center contact pins and sockets with a PTFE insulator. The connectors permit parallel routing of cables, horizontally or vertically, for well-organized cable dressings with less stress on conductors. They also offer a 50W impedance, zero to 4GHz frequency response, a voltage of 500V and insulation resistance of 5,000MΩ minimum. The 6717/18/19 coaxial 50W connectors with adapters come with white valox or metal cases, nickel-plated brass bodies with gold-plated center contact pins and sockets with a PTFE insulator. Users can mount two BNC connectors in the same PCB space that was required by one. The voltage is 500V and insulation resistance of 5,000MΩ maximum and it offers a shock og 50G, vibration 20G from 80 to 2000Hz.

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

Acoustic treatment
Realtraps

Microtraps: This product is 2' × 4' and 1" thick, making them lighter than the company's Minitraps while occupying less space. A dual-layer membrane enhances its low frequency absorption. Like the original Minitraps, these are made with rigid fiberglass and metal, so they have a Class A fire rating and can be installed in public venues.

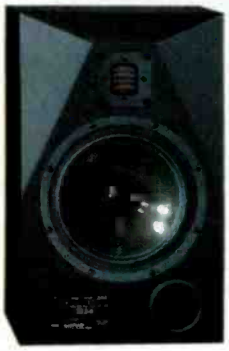
860-210-1870; fax ; www.realtraps.com; sales@realtraps.com

Disk editor
SAW Studio

Saw Studio Version 3.6b: The latest version of this product features slower mixer settings and a scrolling-adjustment mode to be less sensitive to small mouse changes. This results in an overall feeling of more control. The SRP/Rec latch operation has been enhanced to automatically detect a marked area and override the latch function for auto punch-in at the marked area. Also, the SRP punch-in code has been adjusted to help eliminate record buffer overruns under certain conditions on certain systems.

www.sawstudio.com; support@sawstudio.com

Midfield monitors
Adam Professional Audio



S2.5 and S2.5-A Nearfield: The high frequencies in these monitors are reproduced by the A.R.T. tweeter, a transducer that squeezes air in and out in a 4:1 ratio instead of pushing it in a piston-like 1:1 ratio. The woofer has an 8" diameter and uses a Hexacone diaphragm. Its diaphragm is 3mm thick and consists of a honeycomb core that is coated with Kevlar on both sides. These monitors are useful for small to medium control rooms and production or broadcast studios. In its active version, it has a control panel on the front that carries a stand-by switch, as well as tweeter level and shelving filter controls to adapt to different room acoustics.

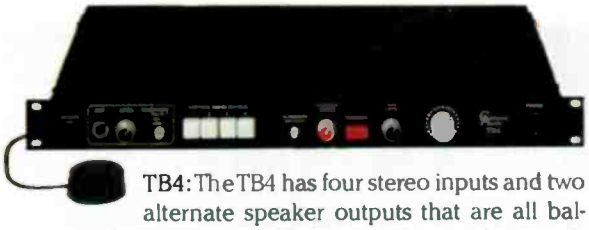
49 30 86300970; fax 49 30 86300977; www.adam-audio.de; info@adam-audio.de

Structure security alert
Resonant Results

Tower Watcher: This security alert system protects a site from liability, base jumpers, damage, intruders and vandals. The unit detects movement and activates a remote control system. It is a structure security alert with a large-object detector. It monitors tower activity and features a remote-control interface, along with universal mounting. The system is on duty 24 hours a day, seven days a week.

608-839-3950; fax 608-839-3949; www.resonantresults.com

Talkback monitor
Coleman Audio



TB4: The TB4 has four stereo inputs and two alternate speaker outputs that are all balanced on XLR connectors. The control room signal path is passive and uses a stepped attenuator that tracks to 0.05dB for level to the speakers. There is also a balanced stereo cue input and output on 1/4" RTS jacks with a master level control for the headphone amplifier feed. The remote talkback mic is connected with a 12' cable and has a separate level control. The engineer headphone output can select the main signal or the cue signal.

516-334-7109; fax 516-344-1420; www.colemanaudio.com

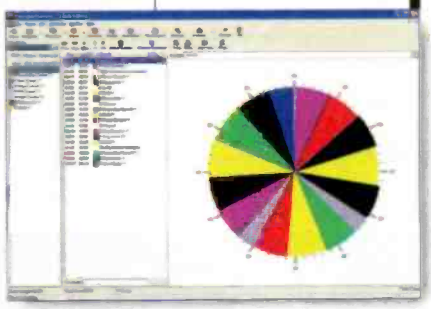
Plug-ins
Sound Toys

Ultra FX: Featuring eight plug-ins, the first to be released is Filter Freak. This is a digital plug-in that captures the sound of analog filtering. Built around a steep 48dB per octave analog modeling filter, nearly any filter character and sound can be created. Some modulation features of this product include programmable rhythmic filtering, triggered envelopes and tempo-controlled LFOs. The unit supports Digidesign's HTDM, RTAS and Audiosuite plug-in formats and Pro Tools HD, LE and Mix systems. The Phase Mistress plug-in combines the warmth of analog phasing with tempo-locked modulation and programmable LFOs. This plug-in's features include true stereo output, programmable modulation modes, MIDI tempo synchronization for remix and dance music, the ability to design sweep shapes for infinite variations of filter sweep effects and adjustable control of the intensity and depth of the phasing effect.

877-COOL-EFX; fax 802.951.9799

www.soundtoys.com; sales@wavemechanics.com

Music scheduling software
Micropower



Powergold: This 32-bit Windows music scheduling system can handle simultaneous, multi-user access, and it supports Novel networks, Windows 95/98/ME/NT/2000 networks or peer-to-peer networks with or without Windows NT. The software allows the user to share songs from one central music database. Users can create a music schedule in one database and send it to other databases in the company. Each station then has the ability to automatically merge user-defined portions of that schedule into its own schedule. Open and edit in multiple windows at the same time, such as the schedule editor, the music library and the clocks. Rotate and schedule non-music events with the same power and control as song scheduling from one piece of software.

800-870-0033; fax 501-221-3200

www.powergold.com

Amplifiers
Crest Audio

ST series: Designed for use in live and fixed installations, this series of amplifiers offers a resonant mode power supply. This technology results in an amplifier sounding like one with a classic linear power supply, without the size, weight and thermal waste. Long-term reliability and efficiency is improved, plus a 20dB lower noise floor is achieved. The amplifiers are built with large storage capacitors in the power supply that

contribute to solid low-frequency performance. Topping off at 1,000 WPC at 4Ω, the largest model, the ST2000, weighs 24lbs. in 2RU. All ST series amplifiers have a frequency response of 10Hz to 20kHz.

201-909-8700; fax 201-909-8744; www.crestaudio.com

Monitor
NHTPro

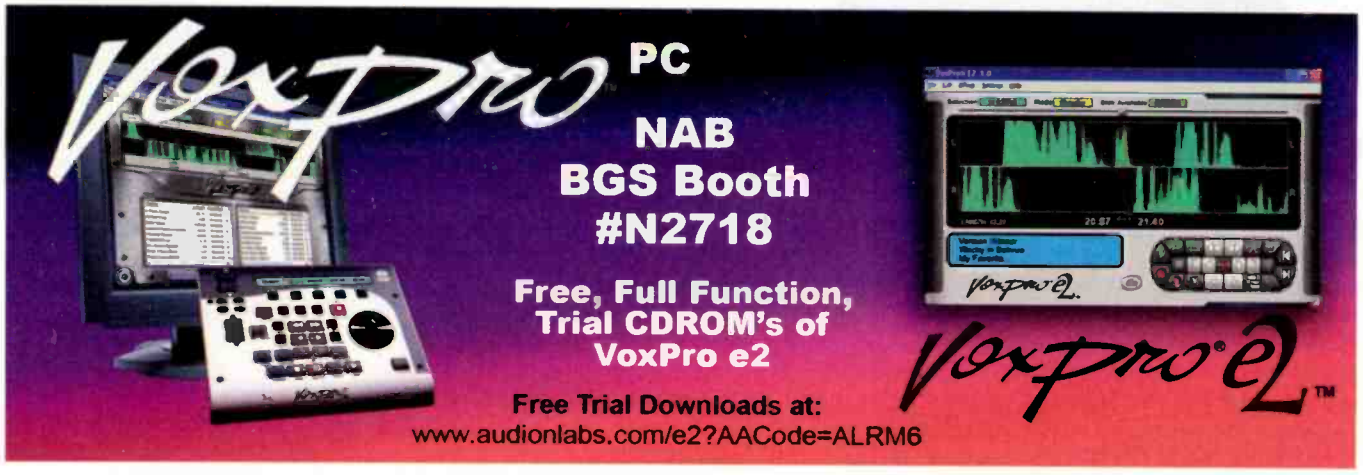
M-20: This near- and mid-field monitor features a flat, wide baffle across the tweeter and a narrower baffle surrounding the woofer, providing more even dispersion and enhanced imaging over an extended listening area. There are no parallel surfaces inside the M-20's cabinet, so internal standing waves remain random, affording an improved overall midrange frequency response of 45Hz to 20kHz ±1.5dB. The monitor is sold by the channel, and includes a 250W monaural control amplifier that fits in a single rack space. The amp features boundary compensation, listening distance proximity and switchable input sensitivity as well as a diagnostics window to display the average power output, heat sink temperature and line voltage.

800-648-9993; fax 707-748-5945; www.nhthifi.com

Noise filter
Drawmer

DF330: The DF330 offers frequency-controlled low-pass filter circuitry that sets itself to open and close bandwidth to the highest frequency of input audio. A nine-segment LED shows the high frequency cut off of this auto filter. The unit also offers a downward expander section used to reduce as much as 40dB of broadband noise during momentary silences in the program. When the program begins, the expander release restores full gain. The attack time of the expander is self-setting and the release times are variable with a five-segment LED gain reduction meter. Other features include an overall bypass switch, rumble filter bypass, separate expander bypass and variable filter bypass, plus a stereo link switch. Inputs and outputs are -10dB (¼-inch unbalanced) and +4dB (XLR balanced) so outputs from -10dB tape machines can be de-noised and converted to +4dB.

+44 1924 378669; +44 1924 290460; www.drawmer.com; info@drawmer.com



Radio transmitters
Nexus Broadcast Products

NBEA 2kW: With its solid-state Mosfet design, this amplifier offers a switching power supply of 90V to 220V. It covers the entire FM broadcast band and features an output power of 2kW ±0.5dB. Other features of this amplifier include a female N input connector, an input/output impedance of 50Ω; an AM signal-to-noise ratio greater than -55dB synchronous and asynchronous, a Mosfet efficiency from 60 percent to 70 percent and RF unit cooling 2h.p. axial fans.

800-219-7461; fax 903-524-2260
www.nexusbroadcast.com; info@nexusbroadcast.com

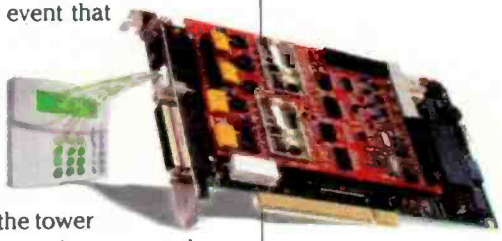
Equalizer and mic preamplifier
Toft Audio Designs

AFC-2: This unit provides two independent channels each with switchable mic/line input, selectable 48V phantom power and instrument input. Input phase reverse operating is possible on mic and line inputs on each channel. Musical four band sweep equalization ranging from 40Hz to 15kHz in overlapping ranges is also available. The amp is a compact 1RU system with internal power supply. Other features include balanced XLR input for mic input and jack for line input and line output and ¼"-thick anodized aluminum sculptured front panel.

877-563-6335; fax 310-373-4714; www.toftaudiodesigns.com

Tower lights alarm monitoring
Jabco

Alarmsoft: Unattended alarm monitoring of tower lights is enabled with this central station monitoring system. This feature allows tower companies to self-monitor, labor free, their alarm events such as lights, temperature, power, burglary or fire. This product can be used to monitor tower lights, HVAC, pump stations, refrigeration, temperature, or any event that would normally be monitored by an alarm company or an answering service. It can also keep a log of employee access to the tower or other sites. During an alarm event, the system will auto-locate a representative of the tower firm for response to the alarm.



800-234-0064; fax 757-855-7314
www.alarmsoft.com

Media transfer
Teksouth

IQ Light Speed: Designed to provide high speed and secure transfer of media and broadcast data, this system allows the user to transfer files seven to 39 times faster over the Internet or local networks. The system integrates extendable encryption and proprietary algorithms to achieve reduction in media transfer times. This product can transfer all types of media files while managing the security and bandwidth limitations implicit to FTP and VPNs. It allows transmission of multiple compressed, encrypted files asynchronously, with built-in resiliency. This product has an automatic restart (fail over) feature that leads to high fault tolerance. When there is an unexpected interruption of the media transfer, there is a restart of the transfer from the point of communication failure.

800-842-1470; fax 205-631-1514
www.teksouth.com

Portable digital audio recorder
Core Sound

PD Audio-CF: Rather than being a single piece of hardware, this system is produced with inexpensive hardware and software components the user can select to assemble a compact recorder. The centerpiece of the PD Audio system is the PD Audio-CF, a Type I Compact Flash S/PDIF interface with optical and coaxial inputs. The unit can be mounted in PDA hosts that run Windows CE, PocketPC or Linux, or used with laptop and desktop computers running Linux, Windows 2000 or Windows XP. The PDA-based PD Audio operates on rechargeable batteries and can quickly transfer audio data to a laptop/desktop computer via removable solid-state memory cards, removable PC card hard drives, CF card hard disk drives, high capacity external 2.5" hard drives using the PC card interface, SD cards and via wired and wireless LAN.

888-937-6832; fax 201-801-0912
www.core-sound.com

Satellite receiver
Profline

TRS: The Transline TRS, DVB audio receiver demodulates a single-channel and multi-channel-per-carrier DVB transport stream to the stereo audio output and data output and was developed for closed network broadcasting applications. An AES/EBU digital audio output, ASI output and X.21 MPEG audio output extends the functionality toward full digital transport and remultiplexing of the transport stream in DVB or DAB without decoding and re-encoding artifacts. The wide symbol rate from 256kb/s to 30Mb/s allows for single carrier per channel and multi-carrier per channel operation. The receiver supports MPEG Layer 2 and Layer 3, analog and digital audio output, X.21 and ASI output.

31 26323 6969; fax 31 26323 3952; www.profline.nl; info@profline.nl

Interactive media service
Yes Networks

Yes: With more than 1,000 radio stations tracking more than two million songs per week in every genre of music, listeners can now identify, interact with and purchase the music playing on the radio, as well as the products and services associated with their favorite songs and performers. By adding two lines of programming code, a station can provide its listeners an easy-to-use tool for identifying songs playing on the air and buying the CD, merchandise and concert tickets. The service works by monitoring radio stations across the country. Using digital fingerprints of each song, the technology identifies the pattern of a song as it plays, matches it against its database and within seconds, presents the name of the song and links directly to the products and services associated with it.

610-699-1908; www.yes.net; contact@yes.com

Stereo line mixers
Terratec

Sine SLM162, SLM82, SLE82: Housed in compact enclosures, this trio of stereo line mixers cater to studio and field applications that require flexible mixing in a small space. Offering 8 or 16 inputs with a stereo output, the 1RU mixers offer a signal-to-noise ratio of greater than 97dB and frequency response ranging from 20Hz to 20kHz, ensuring incoming signals are routed through with no signal loss.

+49 2157 8179-918; fax +49 2157 8179-22
en.terratec.net; presse@terratec.de

Digital accessories
LA Audio

Digiboxes: These digital toolboxes are housed in compact aluminium cases, and are comprised of an AES channel divider, AES and S/PDIF converter, AES three-way splitter, S/PDIF four-way splitter, word clock/super clock generator, word clock/super clock converter and four-way clock distributor.

+44 20 8418 0778; fax +44 20 8418 0624
www.laaudio.co.uk; sales@laaudio.co.uk

Graphic equalizer series
Sabine

Graphi-Q 3100: This equalizer provides the user instant hands-on, front panel control, or the user can choose the blank front panel versions for the ultimate in system security. RS-232 remote computer control, 70 on-board program memories and

remote switching via contact closures are standard in all units. The GRQ-3102 and 3102S are dual channel units and the GRQ-3101 and 3101S are single channel units.

800-626-7394; fax 904-418-2001
www.sabine.com; sabine@sabine.com

Backup system
Tunetracker Systems

Tunebacker: Tunebacker is a double-redundant backup system consisting of two removable hard drives, allowing radio stations to keep one drive attached, to accept daily backups, while the other drive is kept stored in a fireproof box or other safe location. The new system, which is intended for use with the Tune Tracker Radio Automation System, works completely automated and requires no user intervention once installed, other than to swap drives once a week.

866-835-5678; www.tunetrackersystems.com

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email: sales@armstrongtx.com

AM longevity

Having read the Reader Feedback section in the January issue of *Radio* magazine, I must wholeheartedly agree with Jim Jenkins. AM radio is far from dead, despite what the million dollar so-called consultants may tell us. I know of many AM stations, like the former WBYM, that made a very good profit by playing country music with real jocks 18 hours a day. The key to AM radio is to not treat it like a joke to begin with. Thinking that no one listens to AM is flat wrong. The aforementioned station won many listeners from the FM offerings out there by being community-minded and just by getting back to the basics of old-fashioned radio.

Corporate radio is ruining this business. So many good stations have been destroyed by taking on new corporate owners, such as WCMS in Virginia Beach. Despite being the oldest continuous country station in the world, it has been reduced to automation only, and even its very high ratings didn't stop the suits from tearing it apart. How I long for private radio ownership to return in this country.

David R. Lyons
fmr. production director, WBYM
Carrollton, VA

I'd like to second Jim Jenkins' letter in the January issue of *Radio* magazine. A "consultant" is all too often the trendy guy-du-jour who uses your watch to tell you what time it is, and then walks off with it. After 38 years in radio, I have observed that most stations in most situations would be better off spending the money they allocate for consultants, to hiring the best people they can and letting them do their jobs, rather than retaining some off-premises guy to second-guess their own people.

As far as digital goes, the critical issue is whether the listener and sponsor will see enough benefit, net of the serious technical complications that the IBOC system apparently presents, to justify purchase of relatively expensive new radios. The consensus seems to be, at least so far, "almost certainly not." The average listener who wants to hear a few tunes and the traffic and weather on the way to work or who wants to check out Rush or Paul Harvey doesn't care about technology. He just wants a little information or entertainment that sounds acceptably good.

Again, I agree with Jim: as an industry, our shortfall isn't technological; it's programming—starting with some of the vile stuff that's generating so much unnecessary controversy these days. That's where we should be focusing our attention, rather than trying to fix audience problems by simply buying some new box for the chief engineer to install.

Robert C. Savage
owner, general manager
WYSL-AM 1040
Avon, NY

IBOC shmi-boc, I'm not convinced yet

I am careful about panning new ideas. There are some smart folk out there that have created an amazing day and age with digital dexterity. Still, IBOC worries me on a number of levels, some of which I cannot quite put my finger on. With roughly 20 stations as a contractor, the first problem in developing a working understanding of IBOC is time; there ain't any and I don't think I'm unique. I don't think I largely care about that, yet, even with my first small-market hybrid transmitter install coming up within a week or two. The hybrid is a handsome, 40 percent efficient box with enough bundled connectors to remind me of my first Heathkit. It came with lots of manuals, including a 100-page schematic book in large format. A 1.5kW TPO will require about 10kW of utility service. I'm sure it will work even though I swear the factory tried to hide Serial No. 1 on the nameplate.

I don't care about fully understanding the box because there will never be any field repair applied to it at the discrete component level. From a small and medium market perspective, my concerns go past this.

I am old enough to have witnessed the migration from AM to FM, then back to AM when, once again, we all discovered that what created listeners was creative programming (e.g. AM talk radio). So, the serviceable but relative low fidelity AM medium has no trouble reigning king when it is

comments?
radio@primediabusiness.com

EYE ON IBOC

programmed well. The lesson is that the modulation method is important but it is not the key to success. The migration to digital, by any method, is axiomatic; it is going to happen. But I submit that the necessity of IBOC is secondary to the shear technical momentum and some questionable thinking that is driving it forward.

The hype about digital quality strikes me as non sequitur, promising audio bandwidth I cannot hear from program sourcing that can barely reach analog's 15kHz bandwidth as it is. Is this a solution looking for a problem? It will be consumed by listeners largely in a mobile environment, which is not exactly a quality listening room. Optionally, it will be in the office on a clock radio that falls short of a Bose. Sure, some folks will ultimately listen on their home digital receiver system, assuming they are not using the DVD at the time.

Many programmers now drool over the ability to further destroy the dynamic range because it can now be done so well, digitally. And they will want to do it with MP3 source material, re-encoded into an editor for real-time analog recording into a compressed WAV or MPEG2 automation so it can be played through an analog console feeding an Apt-x STL. With any luck, the AES out will then get re-encoded by the new digital processor AES input, come out at yet another rate where it can then achieve final conversion to 44.1kHz at the exciter AES input. This is a real scenario.

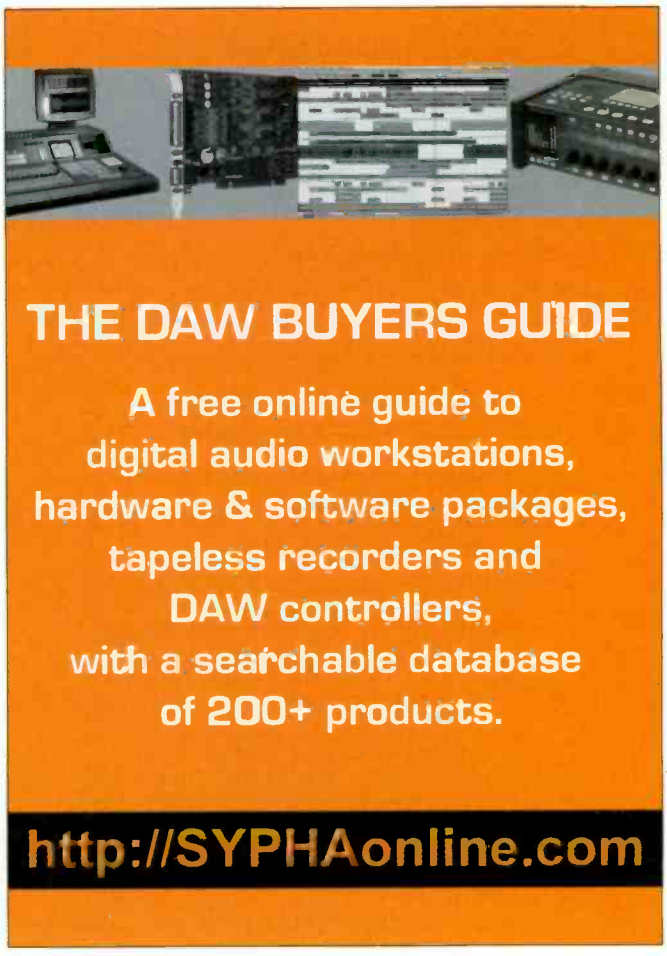
Without fail, when I try to explain why this might not be a good idea, the conversation stops immediately with a blank stare from the audience. During the silence, I am tempted to ask, "Is anyone home?" With any luck he will respond with by saying, "But, it's digital! It has to be good!" Right.

We're all on the same page; we are all going for quality with this mess and now we are going to add IBOC to further this aim.

This is less likely in the major markets where there is money and where the additional data capacity of IBOC when analog finally disappears might actually be profitable. In small and medium markets where current analog and/or digital subcarriers are a vast wasteland as it is, one can be assured that today's small-market corporate bean counters, who have never seen a transmitter, will always select the lowest common denominator when it comes to operational quality. So, please don't insult my intelligence by suggesting adding IBOC to this is a necessity. Try something else.

The development of digital studio LAN source routing, uncompressed digital STLs and companion processors has, in its own right, done tremendous good in improving the radio facility, providing the station starts with something other than MP3 or MP4 sources. From there, I'm not so sure, and editorialists can do me a favor: quit telling me how wonderful IBOC is. Start telling me how wonderful it could be if only stations would do it correctly. And teach me how in as few a words as possible. Remember, I'm a contractor. I don't have time but I have fooled myself into thinking I'm intelligent. Don't stop with me. The guy to whom you really have to get is the corporate bean counter and I don't know anyone who likes the thought of that job.

Be very concerned about solid-state IBOC obsolescence. In 2001, I retired a low-efficiency *1990* solid-state FM when its modules could no longer be repaired. After puckering over the cost of a full refit, the choice was clear. It was more practical to put in a decent 1985 *tube* transmitter. It cost less, runs better and the power bill went down. This problem now affects



perfectly good analog FM exciters, IPAs and consoles. My crystal ball is boiling with images of $30,000 solid-state IBOC refits for Class A stations, that create a seizure in the manager's office.

I managed stations for 20 years until I returned to engineering. As a contract engineer I am very much an oxymoron but consider it might give me a little different perspective than the technical purist.

When the subject of IBOC on a small-market station is raised, I ask, "How will this purchase go to your bottom line as a startup operation? You can always add digital, later." Those blank stares really spook me.

IBOC comes with the anvil of high capital cost with a license that looks suspiciously similar to a BMI/ASCAP contract. Do you think the licensor will really care about you when the introductory deal is over? Sure it will. I have this horrible image of someone showing up with a miner's hat digging for the bottom line. In a small market, that could require alchemy, creating gold out of nothing. In the pending install, the licensee is now puckering a little suggesting that the STL might be Internet streaming.

What made me think that this might happen? But, that hybrid sure is pretty.

Richard J. Boekeloo
owner
DB Broadcast Services
Brunswick, GA

Variation on a theme

Besides the big cost to stations and listeners, which really does little for the audio quality, FM IBOC is not really IBOC, but puts digital data on the two adjacent channels. This has already resulted in complaints from listeners. And the audio time delay of the system is another headache. I have already said that I will not install it. The big ones to gain are the equipment manufacturers.

Stanley Swanson
KBNL, Laredo, TX
sswanson@hcjb.org

The on-channel and adjacent-channel debate resurfaces from time to time. It's true that the data is placed on either edge of the analog signal, but because it borders the center channel and occupies nearly the same spectral

NEW! CircuitWerkes Telephone Solutions

The TelTap - Manual Telephone Coupler & Passive Tap Interface

The The TelTap is a versatile and inexpensive telephone coupler. Once connected to a standard RJ-11 plug, the you have a choice of seizing the phone line or just tapping the line. The TelTap can be used to either send or receive audio regardless of which mode is selected. A ring LED indicates the presence of an incoming call. The TelTap lists for just $89.00.

The Telco-6 - Ringer Relay

Calls come in, you get relay outputs. It's that simple. Accepts up to six independant telephone lines. Each incoming ring closes the associated relay. Each relay has two sets of form "c" contacts. Relays stay steady on during rings. All interface connections on screw terminals.

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mask, it is considered on-channel. The ongoing efforts to call it an in-band adjacent-channel channel (IBAC) technology will not change it.

The system audio delay has been discussed as well. Stations that want to adopt IBOC will need to make some changes to deal with the inability to monitor directly off the air. System delays from digital processing, digital STLs and remote feeds have been introducing small amounts of delay for some time. If a station is going to install IBOC technology, it will have to account for the system delay and build it into the overall costs.

Opinions on IBOC vary greatly and cover the extremes of support and opposition. We at Radio *magazine follow the developments closely and report on what is happening, but the final decision to install the technology or ignore it is up to individual stations.*

Chriss Scherer, editor

'Appy about the killer app

Hey Chriss, we loved your March 2004 Viewpoint on the killer app. Is your Viewpoint on the Web anywhere? We'd like to put it in our daily clips about tech stuff.

Jenny Lawhorn
senior manager, media and public relations
NPR
Washington, DC

Indeed it is. Each issue in its entirety is posted online at www.beradio.com. Additional material is also available online, such as additional photos for a Facility Showcase, Industry Links and our Buyers Guide.

Chriss Scherer, editor

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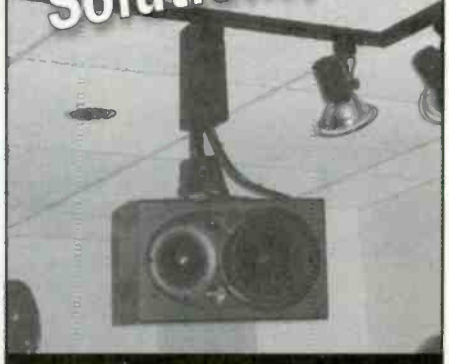

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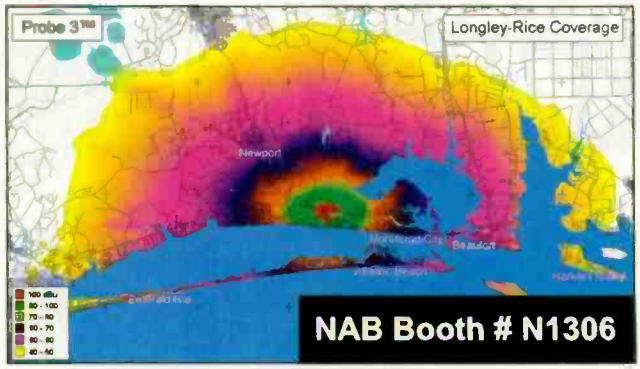

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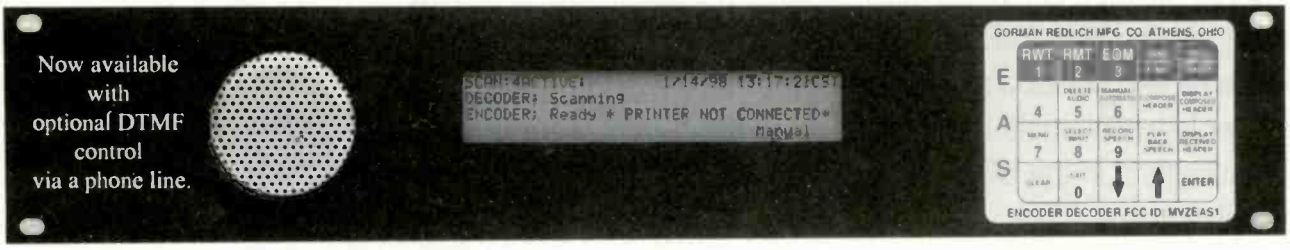

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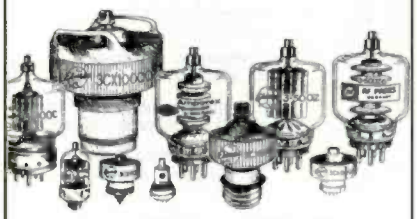

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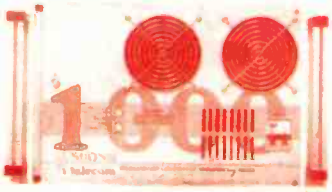

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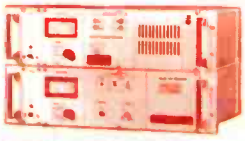

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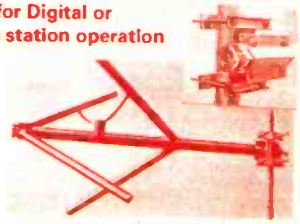

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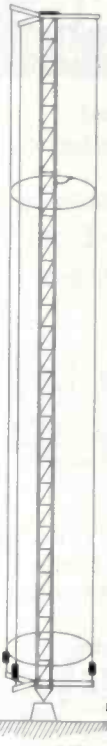

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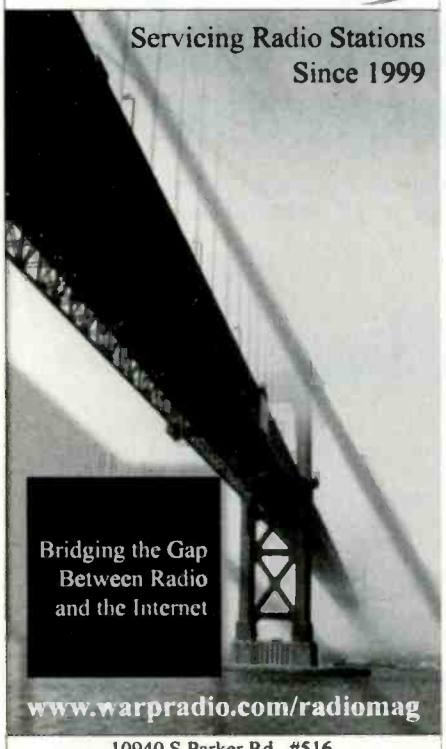

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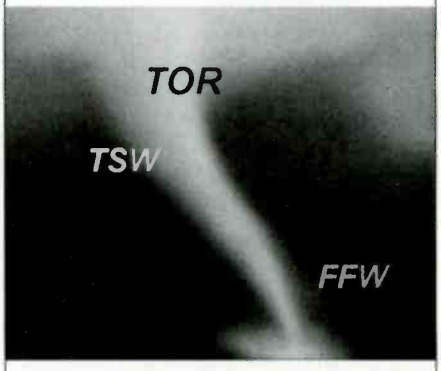

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Contributor Pro-file

Meet the professionals who write for *Radio*.
This month: Maximum Burn, page 48.

Alex Kosiorek
Audio Recording and Mastering Engineer
Corbett Studio, WGUC-FM
Cincinnati

A graduate of the Cleveland Institute of Music/Case Western Reserve in Audio Recording, Kosiorek has focused on music production that uses high-quality reproduction, mixing and mastering through advanced media, audio systems and artistically sensitive recordings. He has worked on several award-winning projects and with organizations including the Smithsonian Institution, Telarc International, New World Symphony and the University of Arizona (KUAT Communications Group).

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Written for radio professionals

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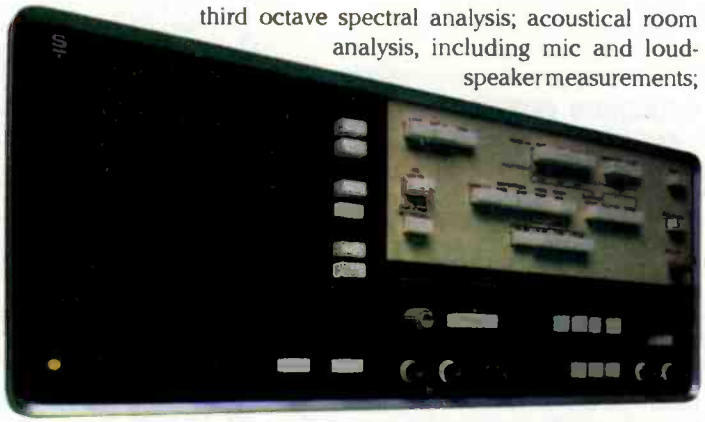
Shaping radio today and tomorrow

By Kari Taylor, associate editor

Do you remember?

The Sound Technology 1500A was a microprocessor-controlled audio measurement test system. According to an ad in 1981, the unit was conceived to be the ultimate precision test instrument for tape recorder analysis. It was designed around advanced microprocessor hardware, and showed the user "the whole story on an integral CRT with adjustment cursor."

Applications of the system included tape recorder mechanical and electronic performance checks; thorough phono cartridge analysis; one-third octave spectral analysis; acoustical room analysis, including mic and loudspeaker measurements;



evaluation of audio quality for VTRs; and research and development for the audio tape manufacturer.

Sample and Hold

The shape of radio today

Radio continues to be a popular medium.

Time spent (in hours and minutes) indicates average use among survey respondents who partake in the activity.

Source: Ball State University's Center for Media Design, 2004.

That was Then

Forty years ago this month, the first official meeting of the Society of Broadcast Engineers came to order. After writing an editorial suggesting the formation of a new organization and then later running application form in *Broadcast Engineering* magazine, John Battison convened the first official meeting of the Institute of Broadcast Engineers (IBE) at the NAB convention on April 5, 1964.

They voted at the first meeting to change the name to the Society of Broadcast Engineers. Battison became the organization's first president.

On the occasion of the SBE's 40th anniversary, Battison reminisced, "The Society of Broadcast Engineers was conceived in my office in Washington, DC, in 1961. It was born in 1964 in The Willard Room C in the Chicago Hilton, courtesy of NAB, and today, on its 40th birthday, it is a strong and hearty force in broadcast engineering thanks to the members who followed after me."

The SBE will commemorate its 40th anniversary during the membership meeting on April 20 at NAB2004.

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