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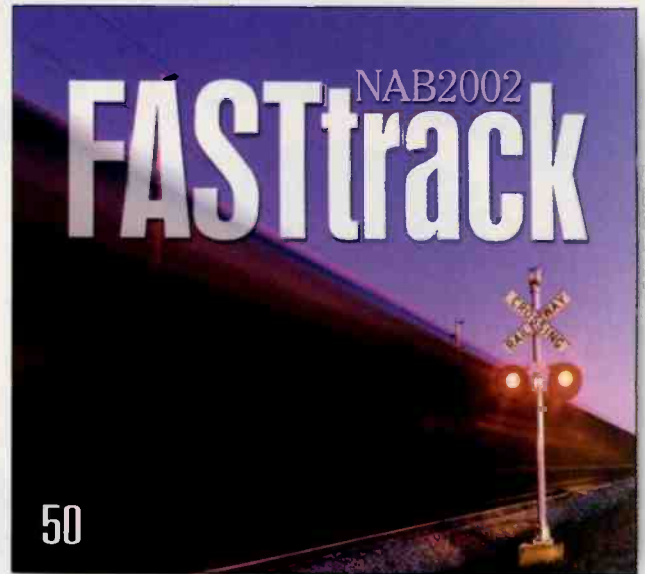
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Las Vegas is all about bright lights, big crowds and lots to see. So is NAB2002
Cover design by Michael J. Knust.



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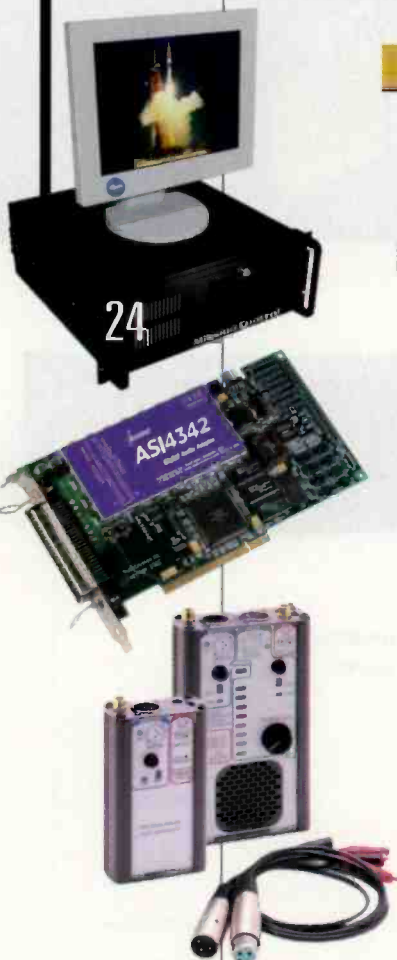
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Currents

Streaming will cost you

The U.S. Copyright Office has made a ruling regarding the royalty costs radio stations must pay for streaming music online. It's not cheap, either.

NAB announces Engineering Awards

The Radio Engineering Achievement Award Winner is Paul C. Schafer, president of Schafer International, Bonita, CA.

Sirius begins satellite service

Four markets were the first to receive the commercial service on February 14.

DC Court rules on pirate radio stations

The DC Circuit Court of Appeals has handed down decisions in two appellant cases regarding pirate radio and those who operate unlicensed LPFM stations.

Arbitron PPM reaches milestone

750 consumers are signed up for the Philadelphia market testing.

XM and Directv join marketing forces

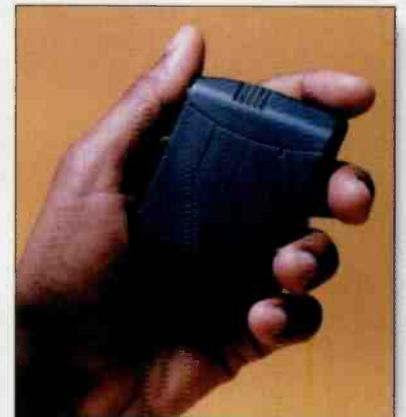
XM Satellite Radio and Directv signed a joint marketing agreement to help drive XM subscriber growth.

Paredes returns to Orban

Gareth Paredes has returned to Orban/CRL, taking on the role of sales administration manager.

Harris adds Humke

Harris has appointed Patricia Humke as director of operations for its studio products and systems operations.



Site Features

Currents Online Weekly E-mail

Get the Currents Online headlines delivered to your e-mail box every Monday morning.

The Engineer's Notebook

Learn a cleaner, easier way to prepare braided shield cables.

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Looking good

Welcome to the new look of *BE Radio*.

Because your time is valuable and your need for information continues to grow, we took a good, hard look at how better to deliver the vital information you require to best prepare you for your various professional challenges. The results of our efforts are on the following pages. The look of this publication is different and the perspective is fresh, but the information, data and insight you've come to expect from *BE Radio* is intact.

Our art director, Mike Knust, working with information and ideas from the magazine staff and readers like you, has brought this new design to its final form, including the bold new logo. While the previous look was constantly being reviewed and tweaked to keep it up-to-date, we had reached the point where a fresh start made the most sense. I think you'll find the new layout is easier to read because it is more open, more colorful and easier on the eye.

The redesign of the magazine fits well with our ongoing efforts to keep all the elements of *BE Radio* fresh and useful. The *BE Radio* website was redesigned last year. The *BE Radio* Currents Online Weekly E-mail was redesigned and substantially improved in January. The print version took the most time and effort, but I think you'll agree that the change is good.

A primary goal of the new look and presentation of this award-winning publication was to better reflect the changes going on in radio, from terrestrial to satellite to the Internet. The visual change is dramatic, but the useful information inside will still come from the respected writers you already trust, such as John Battison, Harry Martin, Kevin McNamara and Mark Krieger, as well as the many of the other names you regularly see here. All of our writers are working industry professionals. They know radio because it's their job and their passion.



As a preview of what was to come, we did sneak in two changes last January. One was the addition of the Contributor Pro-File. This feature introduces you to one of the contributors from the current issue, making it clear why that writer was chosen for that topic. Our contributors are active radio professionals and not just freelance writers. The other addition is on the last page each month. Sign Off takes a look at something from radio's past and some data that will affect its future. This feature will certainly bring back some memories, help you to consider an important element of what is to come, or maybe just be a topic of conversation at your next SBE meeting.

I encourage you to take a moment and let me know what you think about our new look. I welcome all comments, big or small. Your input will help us to make *BE Radio* the best it can be to bring you the information you need most.

Radio is changing. The information you need to stay on top of it is changing as well. *BE Radio* recognizes this and with our authoritative new look, *BE Radio* continues to be The Radio Technology Leader.

A handwritten signature in cursive that reads "Chriss Scherer".

Chriss Scherer, editor
cscherer@primediabusiness.com

Get ready for NAB.

This issue is packed with information to help you plan your trip to NAB2002. Don't forget to download the exhibitor listings for your Palm PDA. Go to www.beradio.com and download the ZIP file. *BE Radio* allows you to take the exhibitor lists with you.

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Webcasting made legal

By Scott Hanley

In previous editions of *BE Radio*, we've learned a bit about the Digital Performance Right in Sound Recordings Act of 1995 (DPRA) and the Digital Millennium Copyright Act of 1998 (DMCA). They are a mouthful, but thanks to these two new laws plus the results of a failed court challenge in response to these new laws, we now have a roadmap of the rights territory we'll be in with a digital future for terrestrial broadcasters as we try to be heard on the Web.

The new laws are pretty clear; digital content use is all about *content*. If you own content, you can use it in existing and new ways. If that content belongs to somebody else, you'll need to have permission to do so—and pay for the privilege.

IBOC notwithstanding, the view of our digital future at the moment is pretty much focused on

the Internet. In short, to be on the Internet you have to pay for:

- the technical costs, including hardware, software and bandwidth;
- original compositions and other authorship of creative works; and something new,
- the use of each specific performance by an artist/performer.

Old rights extended

There are two types of copyright for musical recordings. One is for the composition, the other is for the actual recorded performance. Up until the DMCA, broadcasters were exempt from paying royalties for performance.

In the U.S., radio has long dealt with the copyright issues of composers of music. Radio outlets that carry music have paid blanket fees to licensing agencies like ASCAP and BMI for years. Stations have been allowed to use compositions by paying the negotiated blanket payments, plus the

requirement of occasionally reporting playlists of music when requested.

As an aside, recently some news/talk radio and TV outlets have gotten out of the business of paying blanket fees, instead paying fees on a per-program basis, but that's another story.

The short rule is that if you play a song, you pay the composer. The new laws establish that *new* media (such as streaming webcasts) is a *new use*. So, additional compensation is due to the composer for the "extra" use.

As for costs, ASCAP and BMI have stated that their streaming agreements are "experimental" in nature, because they are not sure where the business model will land. For example, in 2001, the BMI Annual Minimum Fees listed on their website (bmi.com) ranged from \$200 to \$600.

When the Associated Press chose to exercise its copyright of written content in a "new use" on the Internet in the summer of 2001, it caught many broadcasters unaware, and unhappy. Under the AP's interpretation of the new laws as upheld by the courts, even reading AP copy on the air—and then on the Internet—is a new use.

New rights

The major change for broadcasters who want to stream their live or nearly live content is the addition of rights for performers. While other countries have long had a performer royalty payment, it's a new subject for U.S. broadcasters.

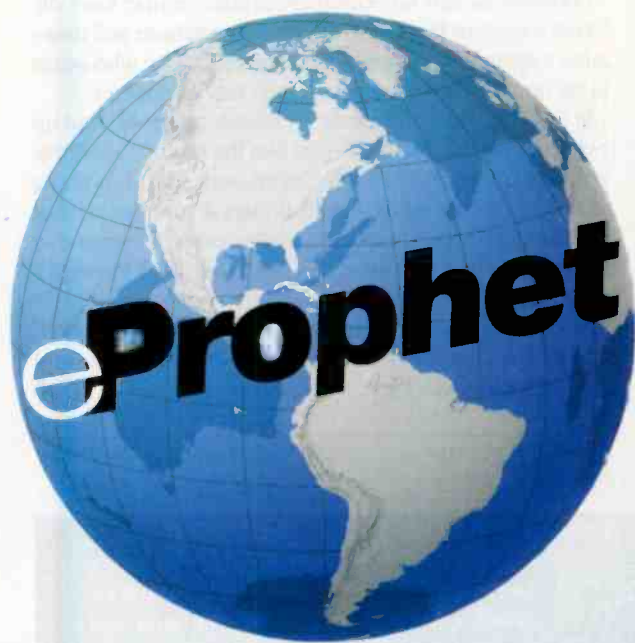
The Recording Industry Association of America (RIAA) has taken a lead role in promoting additional fees to performers and producers as well. The initial negotiations with RIAA seemed a bit bumpy, and the fee structure that was first sought seemed outrageously high to many broadcasters. The long-awaited report from the Copyright Arbitration Royalty Panel was issued February 20. The rates are lower than the RIAA's request, and they give broadcasters an advantage over streaming-only services, but they are based on a price per song, per individual listener - not a blanket fee. This first round of fees is retroactive to usage from 1998 to 2000. Negotiations for other years are underway. The report is subject to final approval by the Copyright Office in May.

The American Federation of Television and Radio Artists (AFTRA) also has a major stake in the new digital performance rights. Under the AFTRA Radio Recorded Commercials Contract, radio performers are entitled to 300 percent of the session rate for commercials recorded for radio if they are also used on the Internet.

This is the major reason that a number of large-market

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stations that rely heavily on AFTRA talent ceased streaming in 2001 until they could find a simple way to block from being webcast those commercials that were broadcast. A lower-cost agreement negotiated between broadcasters and AFTRA may finally return the spots to the Web, but only time will tell.

Statutory license

A major provision of the DMCA is the allowance of a Statutory License to cover broad groups of parties—in our case, radio stations and the record industry. A Statutory License Fee allows stations to pay one group, such as the RIAA, to handle the royalty payments. Otherwise, stations might have to negotiate with each individual copyright holder—an onerous task. There are hopes that a blanket royalty rate for the entire industry could be negotiated.

The DMCA also allows for other negotiated agreements. RIAA, AFTRA and others have also been working on licensing deals with streaming providers—companies that some radio stations pay to host their streaming.

Similar negotiations directly with several major radio groups were blocked by the Copyright Office in December 2001, but still could gain approval.

Stations that are not yet streaming may want to consider paying the \$20 fee for a Statutory License with the Copyright Office of the Library of Congress.

The digital future

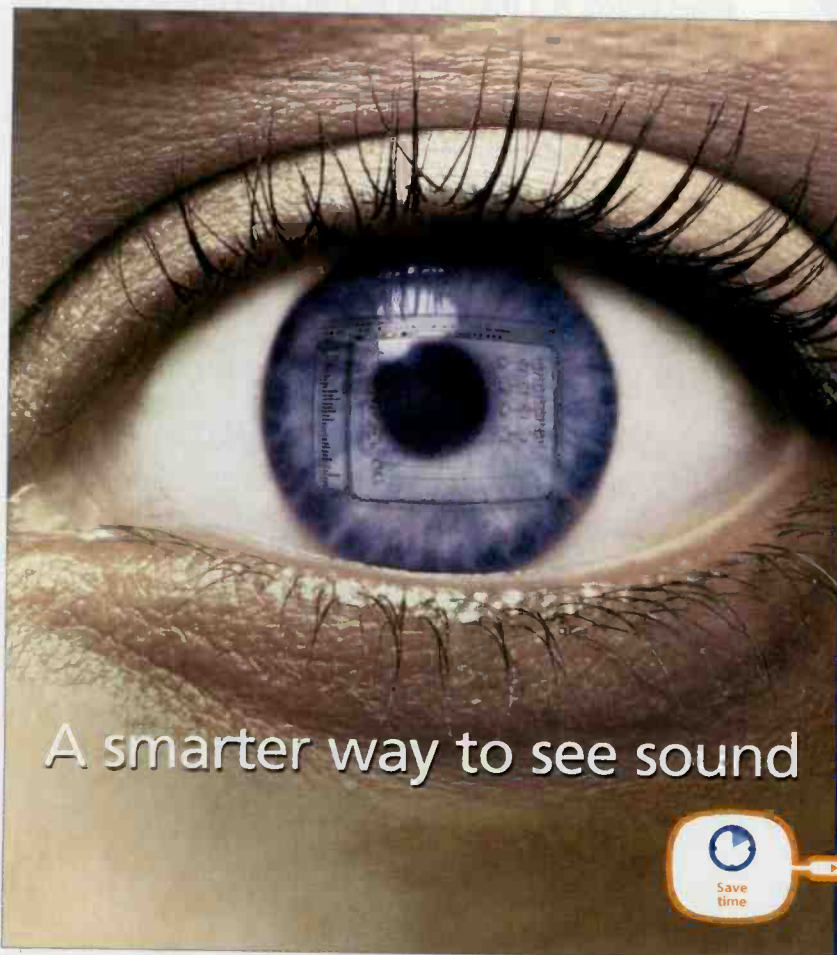
Seek legal counsel to help you sort out a strategy for an online presence as there is only one given for U.S. radio in the digital world: everybody pays.

Commercial and non-commercial stations may have different measures for how the rights organizations will determine a station's fair share, but ultimately, anyone who wants to be on the Net will be paying, one way or another.

In the long run, webcasting for broadcasters will end up being a business decision—just like the rest of our efforts. Without a good reason for the investment, there is nothing to sustain. If several thousand dollars a year (or tens of thousands) in technical and rights costs is beyond a station's reasonable investment, then the plans for worldwide reach must be placed on the back burner.

As a mark to level the terrestrial radio's competition from other forms of media: if everyone pays, so will satellite and Web-only competitors.

Hanley is director and general manager of WDUQ-FM, Pittsburgh, PA.



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DA maintenance

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

Directional antenna maintenance is primarily an ongoing process based on experience and adequate written records. Admittedly today, with the FCC's greatly reduced logging requirements, the paperwork can be considerably less than in years past. However, there is still no excuse for a DA that does not have adequately written and available records in the form of maintenance logs. Not only does a well-maintained logbook provide a guide to the daily operation but it can, and usually does, give a great deal of diagnostic help when a crisis occurs (and even with the best of maintenance, crises *do* occur; usually after normal working hours).



A thorough inspection of the tower and any accessory items must be done regularly. Photo by Jerry Goforth, WCLV-AM/FM.

Often a quick glance at operating parameter records will show a situation that has developed and sometimes might have been averted if a record had been kept carefully and analyzed regularly.

A properly recorded, correctly taken and regularly examined monitor point log is the best maintenance tool. The Commission no longer requires regularly taken and spaced monitor point readings, so it behooves the conscientious engineer to

make a point of having these readings taken on an acceptable routine. A slow change will show up when compared to previous measurements, and should lead immediately to a check of antenna monitor phase and ratio readings as well as common point current.

Electrical problems

A sudden large change in antenna monitor readings should be followed immediately by a check of the monitor points and log; it should never be followed by a frantic turning of phasor cabinet knobs in an effort to regain the normal monitor readings. In the absence of any drastic change in other operating parameters such a monitor change should be followed by the usual checks including common point current. If the system has a built-in Operating Bridge, the common point impedance should be checked whenever any of the above out of limit readings are observed and before assuming that the array has returned to operation in accordance with the license.

Even though regular inspections are a thing of the past there is a lot to be said for the old-timer's "handy feely" hand check of capacitor and inductor temperatures at sign-off, or even pattern change. A hot capacitor, or high temperature or discolored inductor is one of the easiest checks make to run down undesired and excessive RF current in the wrong place.

Look for warm spots in the transmission line. There should be none. It's not unusual for a line to be very slightly warm, especially indoors where there is no breeze or air movement to cool it. Any hot spots are an immediate indication of high standing waves. AM antenna systems are usually quite tolerant of standing waves, but VSWRs high enough to cause heating are usually an indication of an improperly adjusted antenna system. This means getting out the O-I-B and checking the phasor and ATU lines to find the mismatch. At this point

it will probably be a good idea to check actual base operating currents as well.

It is very good practice to post the phasor dial readings by each control knob; and also the common point's upper and lower current limits by the common point ammeter. Similarly posting the antenna monitor's phase and current ratio limits close to the monitor makes for quick referral in a panic situation.

The fact that an antenna monitor is brand new or just rebuilt doesn't mean that it is working properly. I've had several cases where a new, or rebuilt, monitor has come back with the same poor relay contacts that caused the original problems.


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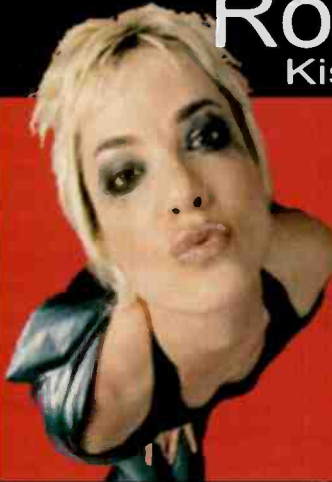
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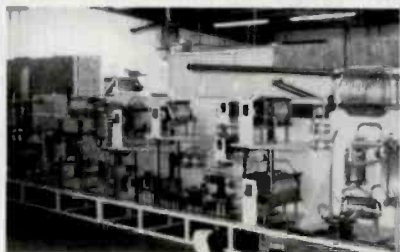


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If the monitor points are "in," RF currents are normal and the antenna monitor is "out," check the sampling lines. They should all be buried and any excess treated equally and also buried. If the system was properly installed originally, there will be a record of the original sampling line impedances and DC resistances. Checking the immediate operation against the original values will give a good idea of their condition. It is not unknown for trucks to drive over soft places around the tower and damage monitor lines.

If an antenna monitor or tower monitor input is suspect it can be verified by changing the inputs to the monitor and comparing readings on different inputs.

If the monitor points are "in," RF currents are normal and the antenna monitor is "out," check the sampling lines.

Transmission lines are normally safely buried or mounted on adequate supporting posts. However ice has been known to damage lines in exceptional conditions and so have vandals, so don't be too quick in dismissing these items in the long-term examination.

It's important to remember that RF current transformers in ATUs can be damaged by lightning or even RF arcs, therefore they should be examined for obvious damage and electrical performance. In this connection it is important to ensure that the lightning protection single turn ring in the RF connection to the ATUs be restored after work on tower bases. If this is omitted the next storm may put your station off the air.

Sometimes the insulators holding the tower-mounted RF current loops become cracked and

change operating indications. A strong wind can move such loops so that misleading voltages are picked up. Sometimes too, a gale may move just one such loop, possibly the reference loop. This can produce strange antenna monitor readings that tend to lead one away from the actual mechanical problems. Anything that affects the reference tower loop (or current transformer) will impact the readings for the other towers because it provides the reference voltage against which the other towers are checked.

It is not unusual for towers in directional arrays to support other devices such as FM or STL antennas. If the AM radiator is not shunted some form of feed line isolation will be used. This can take the form of a horizontal, or vertical, quarter-wave isolating stub or an isocoupler to carry the line across the base insulator. It is not unknown for isocouplers to develop faults and they should not be ignored if serious problems occur that are not amenable to other solutions.

In the past a surprising number of quarter wave sections have been finely tuned by means of an air capacitor across the section. This is an acceptable method of adjustment. However it is surprising how many newer engineering entries into the wonderful field of radio have not come across these little gimmicks. Such encounters have sometimes resulted in the

removal or re-adjustment of these useful "gimmicks" and caused considerable work in readjusting the decoupling section.

Finally, don't forget the humble field mouse. Doghouses and even metal ATU cabinets have an especially strong attraction for these little animals in the winter. There is protection from other animals and warmth from the RF energy. We've all come across cozy mouse nests located in the ATU inductances. Sometimes we've found roasted mice that have short-circuited coil turns. So, when regularly cleaning out the ATU cabinets or doghouses, be sure to look for animal nests in RF areas. Snakes also sometimes come in out of the cold.

In summer wasps and bees can often be found happily building nests in ATUs and doghouses. Systems that use RF contactors in doghouses to change antenna patterns have found that the contactors themselves seem to have an attraction for these insects. Perhaps the buzz from the operating coils attracts them? In any case, be sure that your ATUs and doghouses are cleared of other natural life styles. The best way is to seal and close every conceivable entry point.

"It's rock solid."

Ron Crider of Radio Colorado Network has some pretty cool things to say about BSI's digital automation...

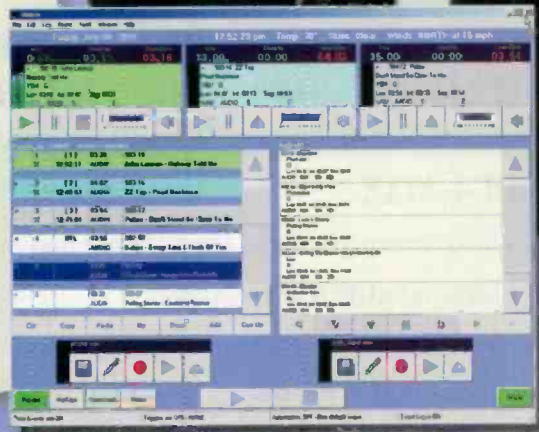
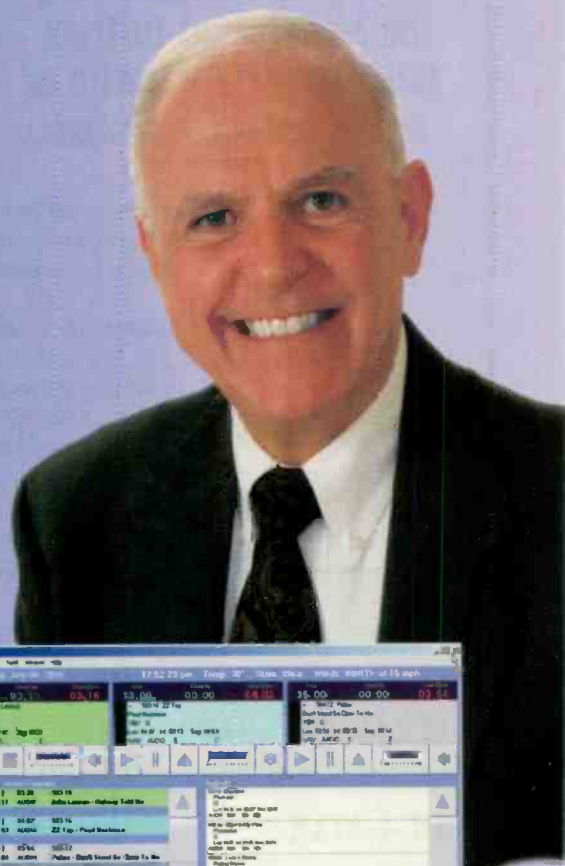
August 21, 2001

Broadcast Software International
1925 Bailey Hill Road, Suite A
Eugene, Oregon

Seldom do I take the time to write a letter to a manufacturer praising a product. In the case of BSI, this note is long overdue. January of this year, I installed BSI's digital automation to operate AM 1060 KLMO Denver/Longmont. The reliability using Windows 2000, "well it's rock solid". The multi-tasking is the best. We have numerous delayed programs, as well as live joins to 14 different satellite receivers every day. BSI has done a job above and beyond our expectations. The WebConnect permits our Indianapolis News Department to e-mail our weather reports as well as our local news directly into BSI's digital automation program without an operator here in Colorado. The temperature is frequent and always correct. Our imagination seems to be our only limitation to what we can do with BSI's digital automation. Since KLMO coming on line, we have installed another BSI automation program on KWYD Colorado Springs for its Christian format and are now installing BSI's digital automation to operate the entire Radio Colorado Network.

I have been in broadcasting for 40 years. The BSI systems are cutting edge, easy to operate, and reasonably priced.

Thank You BSI.
Ron Crider
President
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In a perfect world, data ... should automatically be transferred to/from the appropriate traffic or music rotation system.

contain other existing data formats and specifies the layout of certain public chunks with respect to order, what type?, etc. These formats are typically related, but not limited to, the storage and delivery digital multimedia files. Examples of existing file formats that are stored within the RIFF framework include Audio-visual interleaved data (.AVI), MIDI information (.RMI), Animated Cursor (.ANI), Waveform data (.WAV) and

of course the Broadcast Wave File. Consider that RIFF files are simply a framework that hosts a collection of chunks.

What is a chunk?

By definition, a chunk is "self-contained collection of data in a RIFF file." Specifically, the data takes the form of a fixed length string that contains a 4-character chunk identifier spelled out in alphanumeric text such as "cart", followed by a 32-bit chunk length indicator which describes the size

of the data portion of the chunk. Chunks provide a simple and effective method to embed and distribute different types of information within the standard .WAV (or .BWF) formats.

In addition to the cart chunk proposal, which is also called AES-X87 International standards organizations such as the EBU and the Audio Engineering Society (AES) have proposed a new chunk, AES-31, that permits wave files to carry multichannel audio plus information and a chunk that can be used with audio files specific to the film industry.

Its name, likely derived from the information that was found on the labels attached to carts, the "Cart" Chunk format provides a means to embed basic radio traffic information and continuity data within a BWF file. The Cart Chunk standard currently provides 20 fields of information, as shown in Table 1.

The Cart Chunk standard is currently under final review by the SC-06-01 committee on file formats with the expectation of full adoption in late 2002. At this point, several manufacturers of digital equipment have included the Cart Chunk into its data. To learn more about the Cart Chunk standard point your browser to www.cartchunk.org.

Kevin McNamara, BE Radio's consultant on computer technology, is president of Applied Wireless Inc., New Market, MD.

All of the Networks articles have been approved by the SBE Certification Committee as suitable study material that may assist your preparation for the SBE Certified Broadcast Networking Technologist exam. Contact the SBE at (317) 846-9000 or go to www.sbe.org for more information on SBE Certification.

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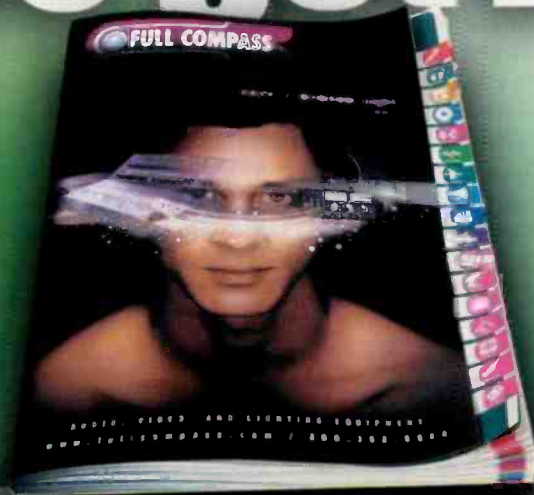
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New standards for towers near historic sites

By Harry Martin

According to a new fact sheet to be issued by the FCC, broadcasters who propose to locate their antennas on new towers near historic sites will face greater scrutiny to determine the environmental impact of their towers.

The proliferation of wireless towers has drawn the ire of the National Conference of State Historic Preservation Officers (NCSHPO), which sees the recent rapid increase in towers as a threat to historic sites. With their consciousness raised, NCSHPO and the Advisory Council on Historic Preservation (ACHP) signed an agreement with the FCC on March 16, 2001 to protect historic sites from encroaching towers. The new fact sheet, which is available at www.fcc.gov/mmb/mmb_siting.html, embodies this agreement.

The agreement encourages collocation on existing towers, buildings and other structures, striving to protect historic properties while reducing the need for new towers. However, the agreement—which is peppered with references to the wireless communications facilities that inspired it—is ambiguous as to its applicability to broadcasters. The fact sheet, released jointly by the FCC's Wireless Telecommunications Bureau and Media Bureau, clarifies that broadcasters are indeed covered. In fact, broadcasters may face serious sanctions, such as fines, if they locate on a structure that does not adhere to the agreement.

The terms of the agreement are straightforward. Commission licensees and applicants must comply with National Historic Preservation Act (NHPA) procedures for facilities that may affect sites that are listed or eligible for listing in the National Register of Historic Places. If a broadcaster's antenna is located on a tower, building or other structure constructed on or before March 16, 2001, the broadcaster likely falls under the agreement's grandfathering clause and will not need new review under the NHPA, except under enumerated special circumstances.


But if a broadcaster is located on a tower,

building or structure built *after* March 16, 2001, it *must* ensure that the tower has passed muster under the NHPA and has documentation to prove it. Collocation on a new tower will still require review if: (a) the NHPA analysis is not yet complete; (b) the FCC has determined that the collocation has a continuing adverse effect on an historic property; (c) a complaint against the collocation's impact on an historic property is before the FCC; or (d) the collocation will result in a substantial increase in the size of the tower.

Broadcasters who locate on new towers that were built after March 16, 2001 but which have not undergone historic review may face sanctions. To avoid this fate, broadcasters should check with the relevant State Historic Preservation Officer *before* putting their antennas on a "new" tower. Also, broadcasters leasing space on "new" (*i.e.*, post-March 16, 2001) towers might also consider insisting on a clear provision in their lease agreements requiring the tower owner to demonstrate and maintain its compliance with NHPA.

Independent reviews by the FCC, ACHP and NCSHPO of the impact of collocations on historic sites have been infamously cumbersome, often resulting in long construction delays. The NCSHPO/ACHP/FCC agreement is intended to streamline that process. The fact sheet, in turn, provides guidance to broadcasters on how to satisfy NHPD requirements and speed review of requests to collocate on new towers. Additionally, the ACHP has organized a telecom working group to streamline historic preservation siting requirements and create a model that individual states may use to speed their own reviews of the impact of communications antenna and related infrastructure on historic sites.

EEO update

In January, the Supreme Court declined to consider an appeal of a decision by the federal appeals court in Washington, holding that the FCC's former equal employment opportunity rules were unlawful. The Supreme Court's decision is the end of the line for the Commission's old EEO rules, which had been adopted in 2000. 

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

Dateline:

No biennial ownership reports are due in 2002. However, new permittees, new licensees as well as parties acquiring stations are required to file ownership reports within 30 days after approval of a construction permit, the filing of an initial license application or the consummation of a transfer or assignment.



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NAB Extra!

The Lights, The Sounds, The Products

What's the biggest part of the NAB convention? It has to be the products and services on the exhibit floor. With the expansion of the new South Hall in the Las Vegas Convention Center, there is even more ground to cover. The NAB Extra! is your preview into some of the products making their show debut this year. Some of the trends to look for: IBOC compatibility, updated operating systems, USB and other high-speed bus enhancements, and feature integration.

Windows XP automation Cartworks/dbm Systems

Booth L 2957

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Courier CO-STD-USB: Now has a USB connection to enable fast data transfer to a PC. The BBC has purchased more than 150 units. Supplied with the Courier is software connect to Windows Explorer. The USB connection allows the flashcard or hard disk used for recording to be permanently stored in the Courier without the need for removal. Files can be quickly downloaded to a PC by USB, the disk wiped and recording started again in a fraction of the time normally needed.

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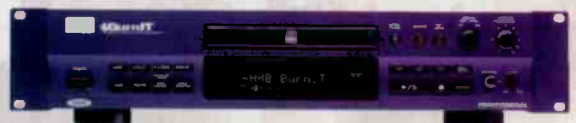
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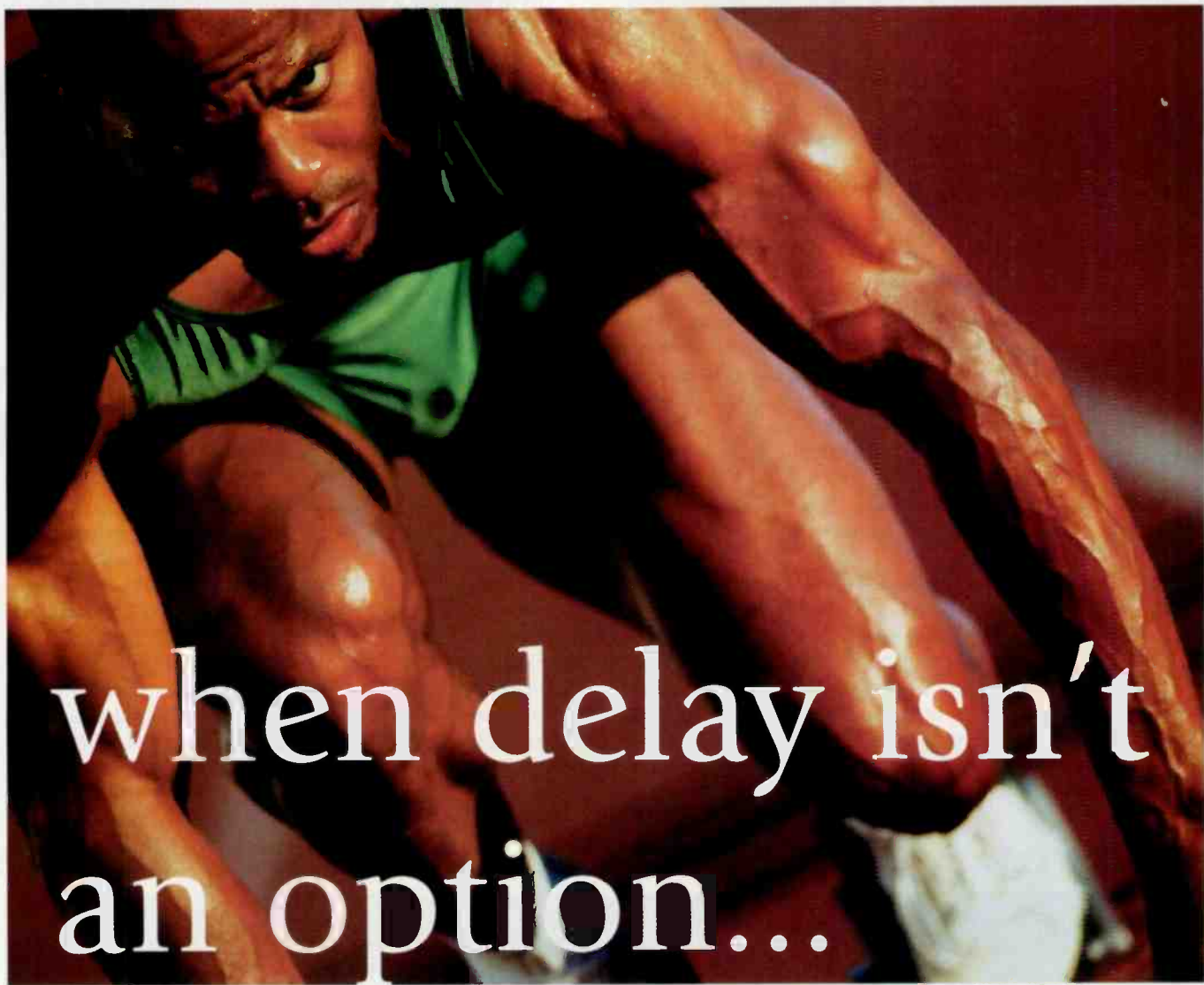
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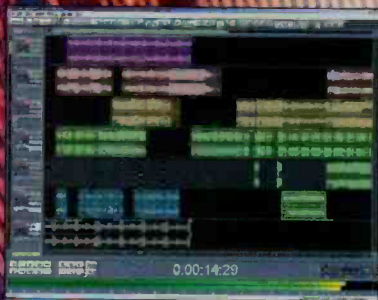
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NAB Extra! The Products



PC editing software Syntrillium Software Booth L 2469

Cool Edit Pro 2.0: New version offers PC users a range of new features such as real-time effects and track EQ, disk-at-once CD burning, MIDI and video playback support, MTC master generation, six new DSP effects, loop-based music composition, and a compressed-loop file format. Topping the list of new features are

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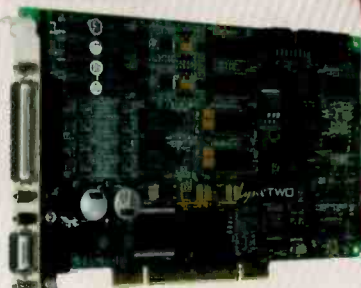
888-941-7100; fax 480-941-8170 www.syntrillium.com; sales@syntrillium.com

IBOC exciters Broadcast Electronics Booth L 2705

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Audio interface card Lynx Studio Technology Booth L 3226



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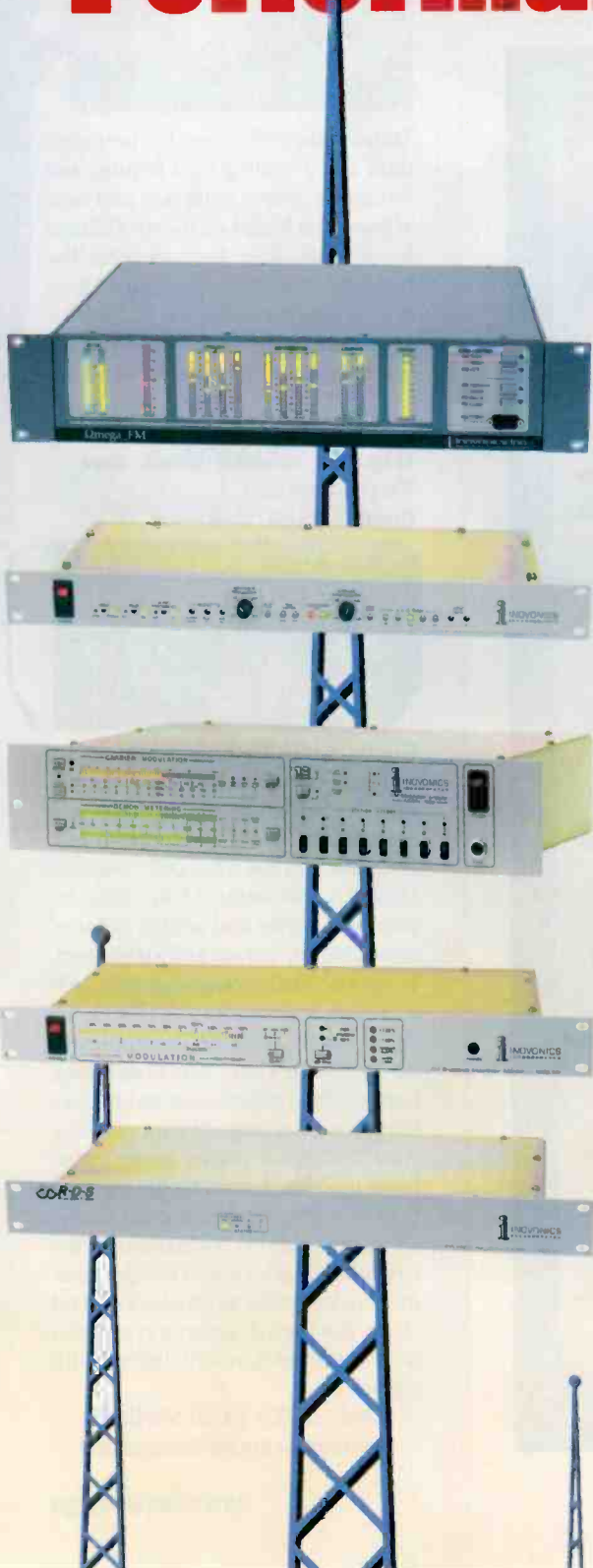
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Booth L 2030



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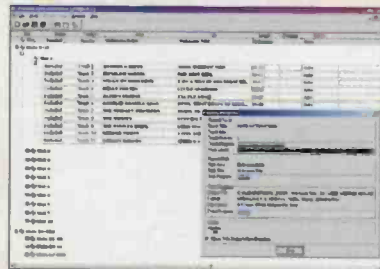
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NAB Extra! The Products

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CBT Systems

Booth L 2525



On-air light: The unit features traditional sand casting, buffed aluminum housing and Plexi-glass lens. The light easily installs on a standard two-gang j-box and optional legends and flasher module available. Additionally, CBT Systems offers a full studio and control room "On-Air" lighting control system that interfaces to switcher and/or audio production consoles' "On-Air" status and tally indicators. The optional legends "standby," "silence" and "applause" are available for an additional \$25.00 as well as the optional flasher module.

858-536-2927; fax 858-536-2354

www.cbt-net.com; doreen@cbt-net.com

Matrix—

QUITE POSSIBLY THE LAST CODEC YOU'LL EVER BUY.



THE CODEC FOR THE FUTURE

Your remote equipment toolbox may already include ISDN and POTS codecs plus a slew of other stuff. Now they are talking about high speed GSM digital wireless—and coming soon...3G.

The Matrix's modular approach is designed with this future in mind. The core of the Matrix's flexibility revolves around full access to its powerful coding engine through easily inserted modules and upgradeable flash memory. Whatever may be coming down the communications pipeline, the Matrix is ready.

THE CODEC FOR TODAY

WIRELESS

- 5 kHz real-time, full duplex audio on GSM wireless phones
- Up to 10 kHz real-time, full duplex audio on HSCSD GSM
- 15 kHz real-time, full duplex audio on portable Inmarsat terminals (with optional ISDN module)
- 15 kHz non-real-time, "Store and Forward" feature may be used on many mobile circuits
- Optional battery kit delivers power for up to 7 hours



ISDN*

- Layer III for 15 kHz at 64 kb/s
- G.722 for wide compatibility with other codecs
- Turbo-G.722 for 15 kHz with only 6 ms of delay
- Layer III transmit with G.722 return to reduce delay
- 1200 baud ancillary data available
- Fully international terminal adapter works worldwide

* ISDN module required



POTS

- 15 kHz full-duplex audio on a standard telephone line
- Available in portable or rackmount versions
- Modular design enables use on future circuits
- Will work at data rates as low as 9600 baud
- "Store and Forward" allows 15 kHz, nonreal-time audio transmission at any data rate



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COMREX

NAB Extra! The Products

Audio processor

Omnia Audio

Booth L 2251

Omnia-4.5fm: With its 96kHz sampling rate, 24-bit resolution, stereo and bass enhancement features, five-band limiter and AGC,

the Omnia-4.5fm offers extensive sound control. Software updates are simplified with the exclusive PC-Card-based design. Also includes Ethernet remote control, digital I/O with automatic sample-rate conversion, pilot-protected distortion-canceling composite clipper and a full-color TFT display.

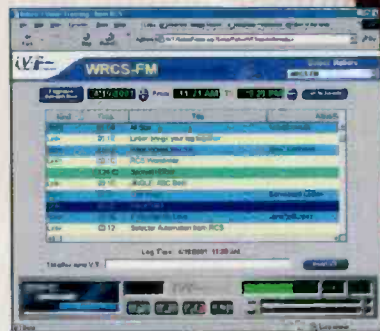
216-241-3343; fax 216-241-4103; www.omniaaudio.com; info@omniaaudio.com

Internet

voice tracking

RCS

Booth L 2533, L 5303, S6618



Master Control addition: Allows stations to use off-site air talent with Internet access. Voice tracking allows one person to create eight shows or more in the time someone normally does one live. Real Feel Internet Voice Tracking allows control of song starts, fades, and placement of voiceovers.

914-428-4600; fax 914-428-5922

www.rcsworks.com; info@rcsworks.com

Tube mic preamp

Aphex Systems

Booth L 2434



207: Built on the foundation of the 107, including the patented Reflected Plate Amplifier tube circuit, the 207 adds the patented Aphex MicLim circuit. The 207 is a two-channel tube microphone preamplifier and instrument direct interface. Additional features: two independent channels, microphone and instrument inputs on each channel, 20- to 65dB of continuously variable gain, switchable 48V phantom power with ramp-up feature, input polarity reverse, 20dB pad and low-cut filter switches, LED headroom meter display for each channel, switchable -10dBV/+4dBu operating level, balanced XLR and 1/4-inch I/O.

818-767-2929; fax 818-767-2641; www.aphex.com; sales@aphex.com

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Digilink-Free On Air Software

Professional On Air Radio Software for FREE!!!

By Rod Graham, Arrakis Systems

Digilink-Free On Air software for the Windows PC was introduced at the April, 2001 NAB convention in Las Vegas. At that show, the Arrakis booth was mobbed and Digilink-Free received a trade magazine award. Since then, more than 10,000 copies of the software have been downloaded and downloads continue at 1,000 per month. With Digilink-Free on air all around the world, it is obvious that the pioneering concept of free radio software has proven to fill a real world need for professional broadcasters.

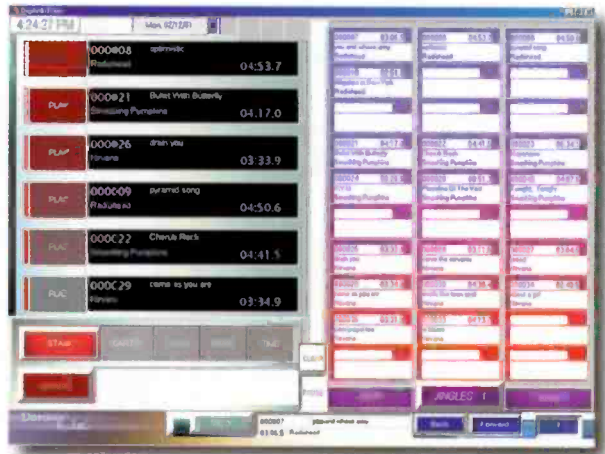
Why **FREE** Software?

The answer is simple. Technology waits for no one. Companies can lead, follow or get out of the way, and Arrakis Systems has been a technology leader for more than 20 years. PC software & hardware for On Air Radio is not the rocket science it was ten years ago, when Arrakis began building digital audio systems (we actually hired a Russian Rocket Scientist). Today, the clear trend in the computer industry is toward free to extremely low cost software & hardware products. Digilink-Free is simply another Arrakis technology first.

A **NO Compromise Radio Station in a Box!!!**

Digilink-Free is a powerful and full featured Live On Air and On Air Automation system, complete with internal Scheduling and Production Record capabilities.

With thousands of Arrakis Hard Disk Audio systems around the world, we are experts in radio automation, and we have made Digilink-Free one of the most capable products at any price. As an example, Digilink-Free plays uncompressed .wav, MP2, and MP3 formats and can actually mix 3 audio files to Air at the same time for a music segue with voice over. To vastly improve Scheduling & Production, Digilink-Free will adjust a short 28 second spot on play back to an exact 30 seconds without any post-production. Not just an On Air product, the internal Digilink-Free Scheduling system is complete. It supports both manually assembled and imported schedules. Compatible with Arrakis Digilink IV Schedule and Logging formats, it interfaces with all leading 3rd party music and traffic scheduling systems. For Production, Digilink-Free features manual and timed recording plus a powerful voice tracking system to quickly assemble your show.



On Air, Scheduling & Production

- Live On Air with Cart stack & Jingles
- Flexible Hard Disk Automation
- One Week Air Schedule
- One Week Timed Record Schedule
- Touch Screen Compatible
- Hundreds of Jingles at your Fingertips
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- Voice Track your Show in Just Minutes
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- Much, Much More . . .

DIGILINK+PLUS NEW FOR 2002

MORE OPTIONS...

Digilink+Plus with Hardware control!!! for those few times Digilink-Free needs more power

Digilink-Free is the perfect Radio Station in a Box, and it is FREE! It is an integrated software package that supports Live On Air, On Air Hard Disk Automation, Scheduling, and Production. As an integrated software package it is perfect!

There are times though that you may need the hardware power of a second play channel for cueing, or console start control, RS232 machine control, audio routing switcher support, a network time sync, or more. For these times, there is Digilink+Plus. Simply add a 2nd audio card to your PC and Digilink+Plus, and you will have a second play channel for cueing. Combine Digilink+Plus software with Router+Plus hardware (shown below), and you have console logic in control, routing switcher control (4 in X 6 out), and more.

If you need full featured, professional satellite automation, Arrakis now has Digilink+Sat!!!!

Use Digilink-Free everywhere that you can, but you now have the option of using Digilink+Plus wherever you need the power of professional broadcast quality hardware.

Scheduling+Plus, \$49.95

This separate scheduling utility is ideal for manually scheduling traffic, music, promos, PSAs, and other audio files. Print Logs.



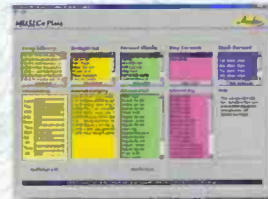
Audio File Manager+Plus, \$19.95

This invaluable utility enables you to copy and name files, quickly rename, assign intro & extro times, start & kill dates, etc. to thousands of files. Save many, many hours of your time



Music+Plus, \$49.95

Powerful music scheduling. Set selection criteria, create song libraries, rotations, perform conflict management, & more...

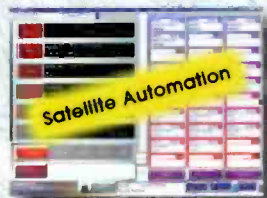


Digilink+Plus, \$49.95

Control a 2nd audio card, RS232 serial control, audio router control*, console start control*, much, much more...



*requires Router+Plus hardware, sold separately



*requires Router+Plus Hardware, sold separately

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Digilink-Free a new low cost console

A low cost radio console for Digilink-Free

The success of Arrakis Digilink-Free, a free On Air Software package, has emphasized the need for professional, yet inexpensive products for the Radio Industry. As the #1 manufacturer of low cost consoles, Arrakis is introducing a new console, at the April, 2002 NAB

convention in Las Vegas. This is an innovative NEW console which has been designed from the ground up to meet this emerging market need. Features that are important in this product are low price, extreme ease of installation, and a zero maintenance design.

No engineer required

Arrakis is famous for product innovation in its Revolution Consoles, Digilink Automation Systems, and modular Modulux Furniture Designs. This new console follows in the same tradition and embraces the realities of today's Radio Stations by being primarily designed to accept consumer source equipment: CD players, MDs, DAT, etc. Today's consumer products are so high performance and so inexpensive, that the traditional balanced, high level, professional consoles and sources have little to no advantage. If the consumer CD player fails, you simply replace it rather than use an expensive engineer's time to repair it. The other obvious advantage is that an engineer is not required to wire the studio. If you can plug in a stereo system you can plug in this console.

10 channels - analog & digital

The next important requirement for this console is that it be fully featured to handle today's sophisticated station needs. To that end, the new console has 10 total stereo line or full featured telephone inputs. The console is fully digital on the inside with source logic control and all of the features that you expect in an Arrakis Radio Console.

The Unveiling at NAB!!!



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THE ISSUES, THE PEOPLE, THE TECHNOLOGY

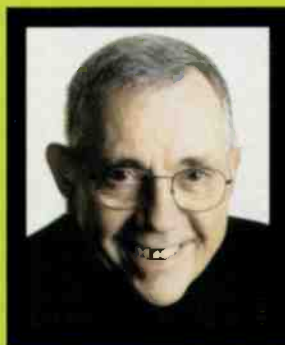
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NAB Extra! The Products



Automatic mic mixer Dan Dugan Sound Design Booth L 2918

Model D-2: Includes the features of the Model D, but with digital signal processing. Includes a separate control panel, three processing groups for multi-channel mixing, and group assigns for each channel that allow the creation of left-center-right panned mixes without shifting the ambience. The processor unit provides eight analog line-level channel inputs and eight outputs on XLR connectors.

415-821-9776; fax 415-826-7699; www.dandugan.com; dan@dandugan.com

Wireless phone audio Interface JK Audio Booth L 2552



Daptor Two: The Daptor Two plugs into the 2.5mm headset jack of a cell phone to allow users to send and receive audio from a mixer or tape recorder through the phone. This passive box features transformer-balanced XLR inputs and outputs and unbalanced 1/4" inputs and outputs. A field mixer can be used for wireless remotes or IFB feeds.

800-552-8346; fax 815-786-8502
www.jkaudio.com; info@jkaudio.com

PC sound card Digigram Booth L13362



MixArt8CN: A CobraNet I/O module for the miXart8 sound card, miXart combines Digigram onboard processing with audio mixing functions. When connected to third-party CobraNet-compliant devices, miXart8CN is the foundation of powerful audio systems distributed over large-area networks. The core of the system, the miXart8, has eight (or four stereo) analog I/O paths, including four studio-quality microphone preamps on its input bank. Eight channels of CobraNet input and eight channels of CobraNet output are provided, operating independently of the analog inputs/outputs. The network connection, using standard 100BaseTX Ethernet protocols, is available on two, redundant RJ45 jacks, which provide on-board backup.

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NAB Extra! The Products



Headphones

AKG

Booth L 2271

K 141 and K 240: Now available in a 55Ω version for use with low-impedance systems, such as keyboards, mixers, portable CD players. New models incorporate AKG's Varimotion XXL diaphragm technology, which offers a more sensitive diaphragm than its predecessors for greater aural clarity. Both versions have a semi-open design. The K 240 has a circum-aural design and a 15Hz to 25kHz frequency response. The K 141 has a supra-aural design and offers a frequency response of 18Hz to 24kHz.

615-620-3800; fax 615-620-3875; www.akgusa.com; info@akgusa.com

Audio connectors

Neutrik

Booth L 5838

NL4FX series: Adds increased power handling, connection security and flexibility. The new SPX series handles up to 50A on all contacts for audio applications. Electrical contact is made only after the NL4FX is completely inserted and locked. This feature prevents arcing when disconnected under load. The one-piece internal chuck accepts cables with outer diameters of 6 to 14mm. A right-angle version NL4FRX will be available to address connections in tight spaces without lengthy re-wiring. Termination is with screw terminals or by solder. Boots are available in five colors.

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



ISDN/POTS talk show multiplexer

AEQ

Booth L 3142



Systel 6000: Includes all the necessary features for multi-conferencing, intercommunication, cue/PFL and on-air control for PSTN/POTS networks, ISDN or audio lines that can be analog or digital, internal or external. It also includes, expands and makes very flexible all the functions of four-wire multiplexing consoles or systems that are frequently used for sport commentary and news correspondents.

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SS 8.2

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8x2

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8x1 DAS

Routes any one of eight AES/EBU digital inputs to three common outputs.

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SM-6

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3x2

Active audio switcher with three stereo inputs and two stereo outputs.

SS 3.1

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SS 2.1/BNC

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SS 2.1/TERM

Passive switcher/router with two stereo inputs and one stereo output or vice-versa.



SS 12.4



SS 8.2



16x2



8x2



16x1



8x1 DAS



6x1



SM-6



3x2



SS 3.1



SS 2.1/BNC

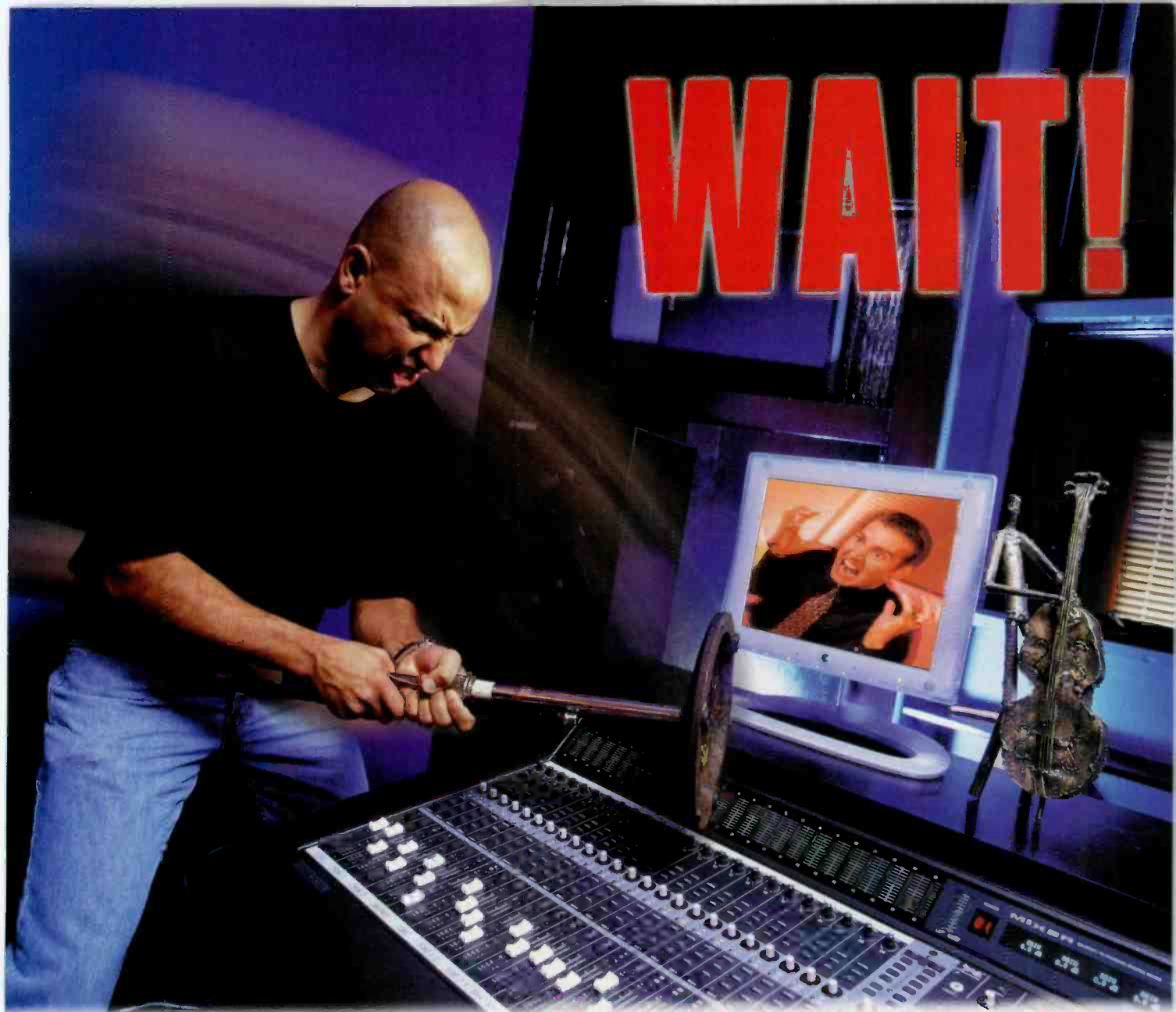


SS 2.1/TERM

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WAIT!



Maybe it's not your mixer

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NAB Extra! The Products



Portable handheld printer

Wireworks

Booth L 4835

K2500: Portable wire label printer is a handheld unit that can print to shrink tubing, industrial labels and self-laminating wire wraps. The unit can also print barcodes. There are 10 resident bar codes and it can prompt in eleven different languages. The unit prints up to six lines of text from six to 72 points with a 6600 character memory. The K2500 comes with protective jacket, rechargeable batteries, charger, and owner's manual.

800-642-9473; fax 908-683-0483; www.wireworks.com; info@wireworks.com

Stereo output multiplier

Henry Engineering

Booth L 3102



Patchbox: Not a distribution amplifier, the Patchbox distributes an analog stereo output several various output connectors. This passive distribution device creates 11 stereo outputs from one stereo input: five balanced, six unbalanced. Ideal interface when both professional and consumer equipment is used. All 11 outputs can be used simultaneously without interaction or signal degradation. PatchBox needs no power, and adds no noise or distortion to the audio signal.

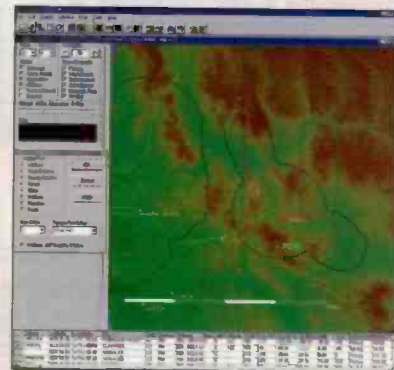
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Booth L 2043

rfInvestigator-FM: Engineering software



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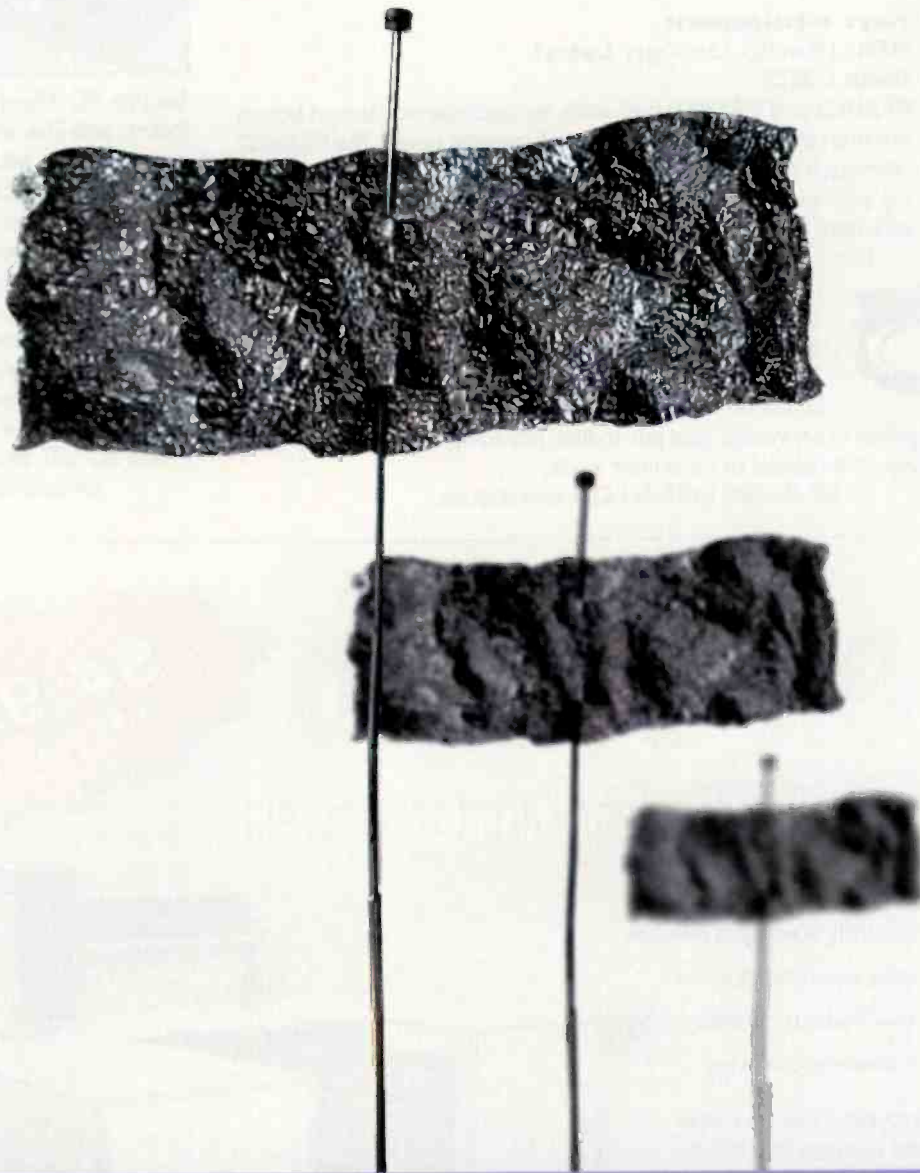
Together, they'll be the closest thing to a 'no dead air' guarantee.

See them both at NAB, Booth #RL2223
and just say, 'No Dead Air'
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NAB Extra! The Products



Four-port, C-Band antenna

Andrew

Booths S8423, L 9111

4.9M Earth Station Antenna: Suitable for use in broadcast news reporting and public-switched services, the antenna's feed system includes a four-port circularly polarized combiner, which enables systems integrators and designers to bring their antenna systems on line faster and more economically. It joins the already type-approved two-port version of the same antenna.

800-DIAL-4-RF; fax 708-349-5444; www.andrew.com; rose.wolski@andrew.com

Test equipment

RDL (Radio Design Labs)

Booth L 3327

PT-AMG2 and PT-ASG1: Both units are ready for portable or bench use from either internal battery or AC adapter power. The PT-AMG2 offers multiple functions for setting up, calibrating and troubleshooting any audio system. Housed in the unit are a precision tone generator, LED level meter and in-phase indicator. Mic and line-level

I/Os are provided using both balanced and unbalanced connectors. A built-in monitor speaker with level control is also provided. The PT-ASG1 contains the ultra stable 700Hz tone generator from the PT-AMG2 with balanced mic and line-level outputs on the XLR connector and -10dBV unbalanced on the RCA jack. Units may be used separately or

together to set system gain mic-to-line, line-to-mic, mic-to-mic or line-to-line at either professional or consumer levels.

800-281-2683; fax 805-684-9316; www.rdl.net

Voice editing system

Audion Laboratories

Booth L 2705



VoxPro PC: Users can access folders and files within a given work group, in addition to the files they create. Changes made by group members are immediately visible to members of the same group working at other VoxPro stations. A central location can be created for all user information, thereby giving users access to their audio files from any VoxPro on the network.

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NAB Extra! The Products

Pots and wireless codec

Comrex

Booth L 2643

BlueBox: This codec delivers the audio quality of a Matrix or Vector (15kHz on a single dial-up line). The BlueBox is compatible with all existing Comrex POTS codecs, including the Matrix, Vector and HotLine. The BlueBox also provides GSM wireless operation to improve the audio quality of GSM phone feeds. Additionally, the BlueBox can connect to the hands-free port on mobile phones and place calls to telephone hybrids (no codec is required on the receiving end of the call). The BlueBox includes one mic/line switchable input, one headphone output and one line level output. An additional -10dBu tape input allows connection to a minidisc or DAT player. There are no special circuits to order and no distance limitations.



With the introduction of the BlueBox, the HotLine has been taken out of production.

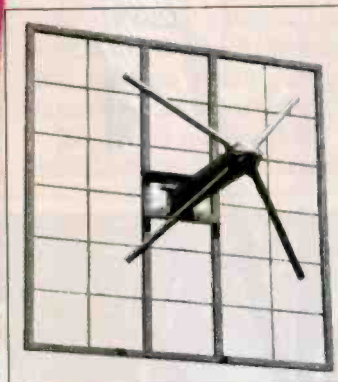
800-237-1776; fax 978-635-0401

www.comrex.com; info@comrex.com

FM antenna

**Kathrein,
Scala Division**

Booth L 8668



Model 754 154: A circularly polarized broadband FM directional antenna of hot-dip galvanized steel especially suitable for triangular or round masts. Even under severe icy conditions the antenna is still functional due to its heavy-duty construction and the fiberglass covers for the feed points. Rated for 2.5kW per input.

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DAB transmitter

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Booth L 5414

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NAB Extra! The Products



Headset mic assembly Sennheiser Electronics Booth L 2923

HMD 280 and HMD 281: Both feature a lightweight, ergonomically designed 102dB SPL headphone monitoring system, which attenuates ambient noise by 32dB via a closed-back, circum-aural design. Both also share a super-cardioid microphone mounted on a flexible, acoustically isolated boom. Earpiece attenuation, coupled with low structure-borne noise and high microphone directivity, ensures reliable communications even in noisy production environments. The HMD 280 has two earpieces and the HMD 281 has one earpiece. The headphones provide a frequency response of 8Hz to 25kHz. The mic provides a frequency response of 50Hz to 13kHz.

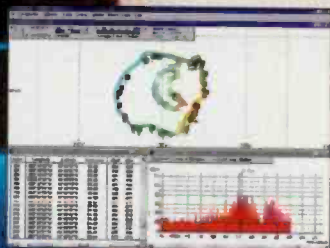
860-434-9190; fax 860-434-9022; www.sennheiserusa.com; lit@sennheiserusa.com

Audio fiber optical multiplexer Multidyne Booth L 5349



DAM-4000: A 40-channel, 24-bit audio fiber-optic multiplex system offering performance exceeding RS-250C short-haul and broadcast specifications. The transmitter and receiver modules plug into a 10-channel frame with redundant power supplies or are available as stand-alone units. The systems support 110/220vac and optionally for 48vdc. An XLR interface panel is available with selectable line or mic level inputs.

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AM monitoring and evaluation Audemat Booth L 2441

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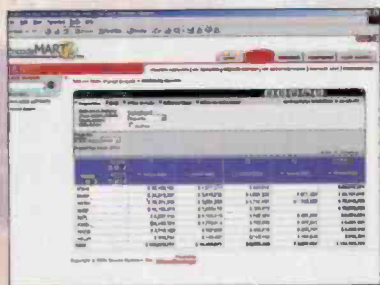
Isocouplers
Kintronic Labs
 Booth L 3274



FMC-1.9G-PCS and FMC-2.4G-SS: Isocouplers designed for mounting cellphone antennas and wireless Internet antennas on hot AM towers. The model number specifies the frequency range of the product for use with each particular service. Typical VSWR is less than 1.3:1. Insertion loss is less than 2dB.

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www.kintronic.com; kt@kintronic.com

Spot data management tool
Encoda Systems
 Booth L 8416



Encoda Mart: Data mining and business analysis tool offering advanced browser-based access to centralized databases containing detailed spot information. Broadcast groups can create and access pre-built revenue analysis tools including trending, pacing, forecasting and business retention reports based on multiple parameters. Data can be consolidated from Encoda traffic systems including BMS, BIAS, Columbine, and JDS and can be mapped to meet corporate reporting standards.

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www.encodasystems.com; info@encodasystems.com

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Miniature microphone
DPA Microphones
 Booth L 2055



4071: Frequency response is customized for clarity of voice in body-worn applications, with low-end roll off and presence boost. Features a customized frequency response with a permanent 4dB soft boost at 4- to 6kHz. An acoustic low-cut has also been incorporated in the 4071 capsule to provide greater headroom. The low-cut feature also reduces wind noise and low-frequency rumble when used outside. Mounting accessories are available.

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- 
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- 
THE CLASSIC TI-101 IS STILL AVAILABLE
 And for those in search of a good, basic analog hybrid – Radio Systems still makes the classic and dependable Symetrix TI-101.



FASTtrack

NAB2002

Your time at the NAB convention is limited. Don't waste it wandering around the show floor hoping you will find what you're looking for. Use the BE Radio FASTtrack instead. This exclusive BE Radio feature organizes the show floor into specific product categories, and then arranges the exhibitors by their booth numbers. With this, you can quickly chart a course through the show floor. An alphabetical exhibitor listing can be found on the show-floor map in this issue.

Booth information current as of February 11, 2002.

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The FASTtrack and Radio Hall Map provide the information you need to make the most of your time at the show.

Special: If you rely on a Palm OS PDA, download the FASTtrack and exhibitor listings to your PDA for even faster searches. Find the link to the FASTtrack PDA on the BE Radio home page at www.beradio.com.

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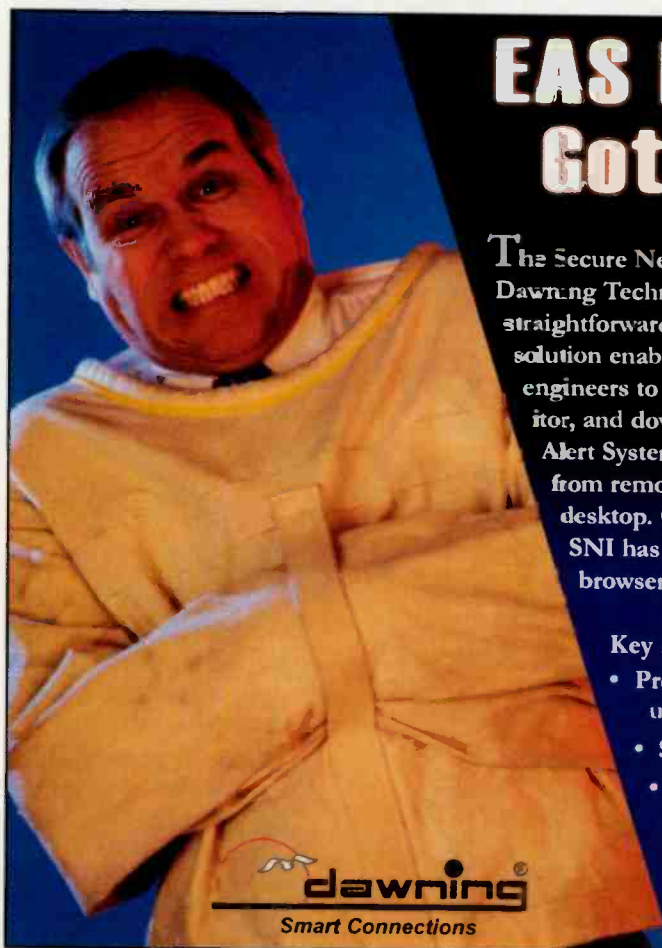
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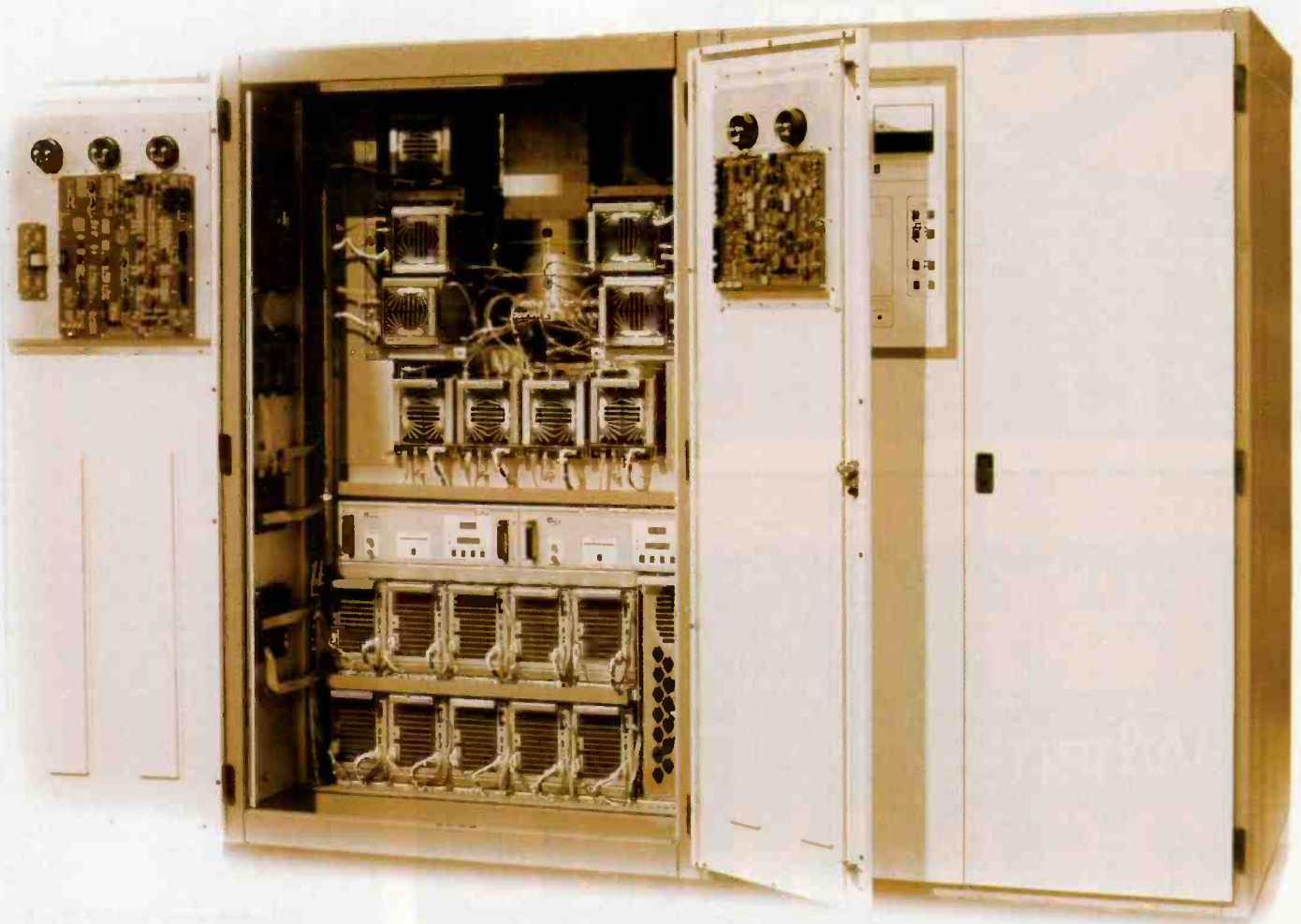
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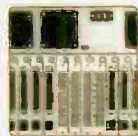
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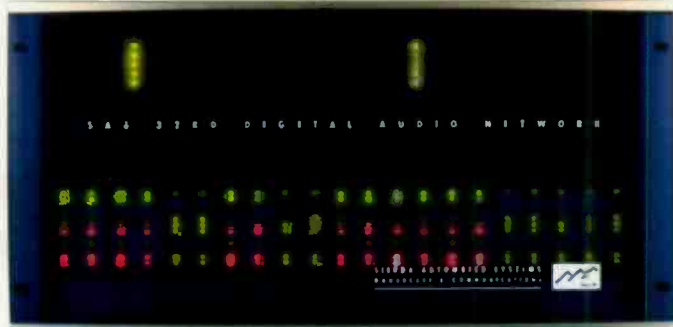
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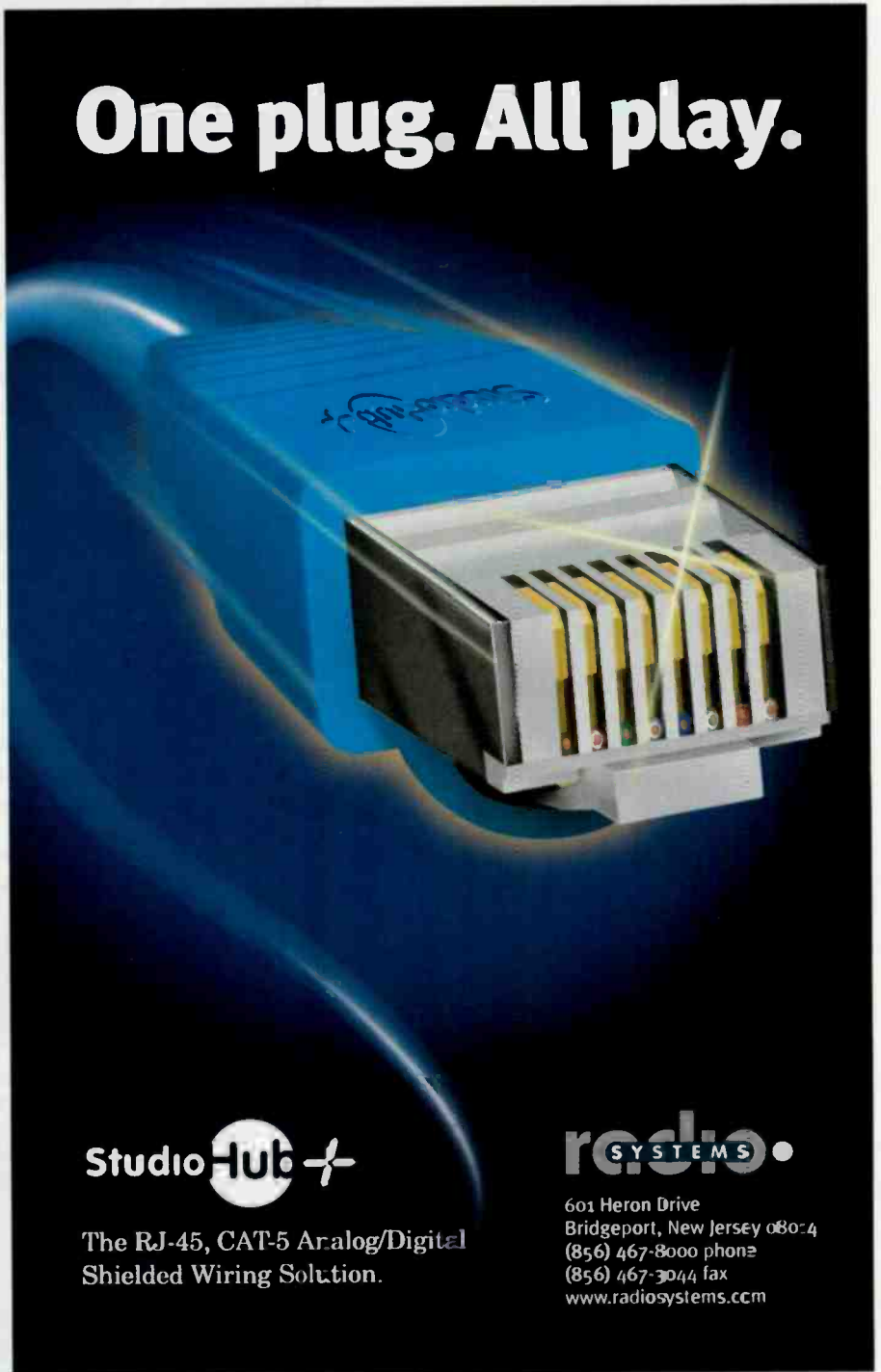
By Chris Scherer, editor

Changing from old-style analog to nearly completely digital can be an operational challenge, but the reward is worth the effort.

Studio EB, one of two mirrored control rooms, in the new WCBS-AM studio facility.



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In 1962, WCBS-AM, New York, built its Blackrock facilities in midtown Manhattan; a facility that would serve the station for nearly 40 years. During that time, the station grew and the best efforts were made to keep the facility up to date with the station's needs. When incremental changes are made to a facility, an unfortunate consequence is that the changes are typically based on short-term needs and do not work well with long-term plans.



Studio 8A, the second of the two control rooms, is setup for dual-anchor use.



After 38 years, the WCBS-AM studios were ready for a major upgrade. The biggest challenge was to take the 38 years of facility operation and rebuild it in only six months.

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with its sister companies CBS Television and Westwood One Radio Networks. The 8th and 9th floors of one section of the building were available. The plans were set into motion.

Radio Systems served as the project's system integrator, providing wiring design services. During the planning phases, WCBS visited Radio Systems' offices several times to finalize plans and make the final decision to install the Klotz consoles, an approach suggested by Radio Systems. The original plan was to use a separate router and digital console approach that would be integrated later. The main advantage to this decision is that mix-minus settings could be created and stored for instant recall. With this on-the-fly mix minus creation, it is not necessary for station personnel to call a station engineer to set up a feed each time.



The edit suites, rooms 8F through 8I, have analog consoles with selectors for the sources on the Klotz router.

Seeing double

The studios occupy the 8th floor and consist of two production studios with a shared voice-over booth, four edit suites, two on-air control rooms, a news area with 12 workstations and a producer's

position, and master control.

Having two on-air control rooms is not a typical practice, but because of the 24-hour news format, having the second studio allows each studio to be maintained without any on-air interruption or air staff inconvenience. The two rooms also allow each shift to set up in the studio before going on the air.



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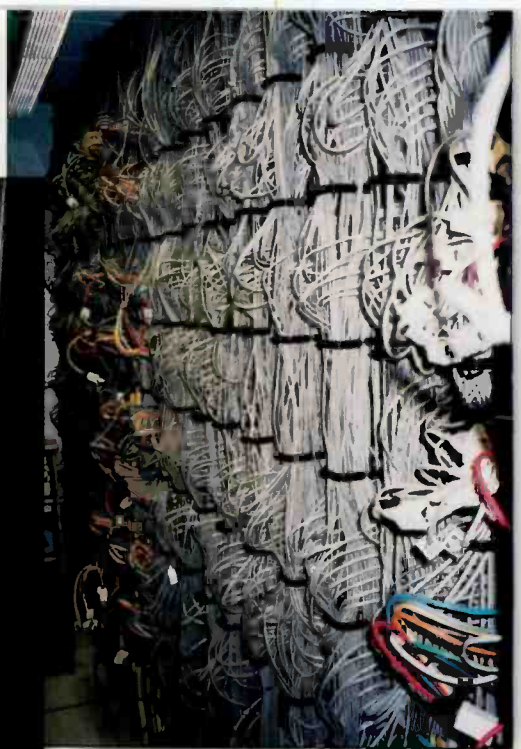
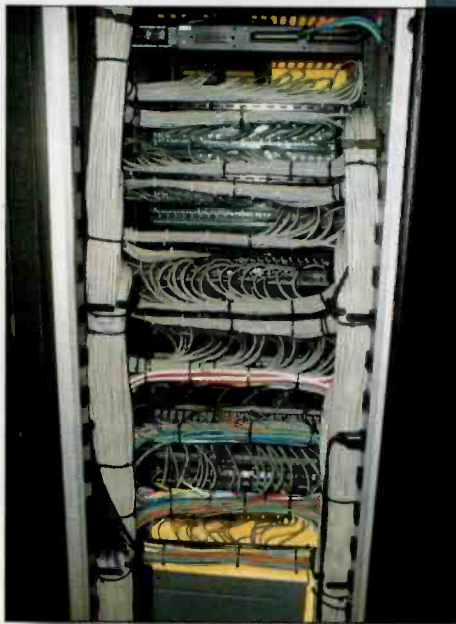
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This second purpose, while deemed desirable during the planning stages, is not used on a regular basis. Nonetheless, the capability exists when needed.

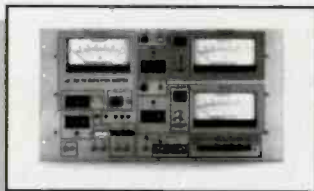
The two on-air control rooms are mirror images of each other. The rooms have dual, equal-size control consoles. Because most of the air shifts have dual anchors, it was important for each anchor to have some level of control over audio sources. The equal treatment also requires both anchors to be familiar with the console and studio operations, so if one anchor is absent, the other anchor is still in complete control of the control room. The dual arrangement also maintains an equal status between the anchors and does not place a physical hierarchy within the room.



CAT5 wiring is run throughout the facility with the Radio Systems Studio Hub

system. Radio Systems was also the system integrator for the project.

Typically, both anchors set their consoles the same, but because of the routing design of the Klotz system, each console could have a completely different arrangement. There are three computer monitors above the console. Two of them display information from



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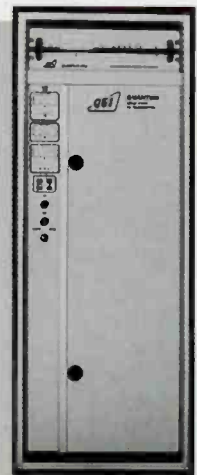


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the Prophet Systems NextGen automation system. One shows the commercial line-up and the other shows the news actualities. The third screen is for the office network and typically is used to access the Internet.

The all-news format relies on a great number of outside sources such as traffic helicopters, traffic contributors and live actualities. Nearly every outside source requires its own mix-minus return feed. Creating this multitude of mix-minuses with a stand-alone analog console would have required a great deal of time and equipment. Changing the unique settings of these return feeds for each possible studio or workstations location would have made the task impossible. The router design of the Klotz Vadis allows these return feeds to be created once without intervention from the operator or engineering staff when a different use is needed.

The production studios also mirror each other, with the voice-over booth sitting between them on one corner. The editing suites are smaller rooms with basic program recording and editing functions. These suites also have the only analog consoles in the facility. This was done because these rooms typically do not require a large number of audio sources to be available. The most frequent use of these suites is to edit and assemble new

elements of program features that have several interview pieces or require substantial editing.

The news workstations are used to gather news and make it available for on-air delivery. This includes writing the script, assembling any audio



Two production rooms, also in a mirrored configuration, share a voice-over booth.

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The rack room efficiently occupies the floor space at one end of the facility. The second row of racks houses the computer-based equipment.

elements and saving the audio elements to the on-air system. The on-air scripts are read from paper. Each anchor has a printer at his position.

transition to a new facility, they also moved into the digital age overnight. The change from carts and reel-to-reel recorders to digital consoles and automation was a difficult transition for some. Once the

In the center of the news area sits a producer and associate producer. These people oversee the overall on-air operation and ensure that all the required elements are available and ready to go.

The station's main conference room is located next to the newsroom. There is a large window facing into the newsroom, where a clear view of the air studios is available. This allows the conference room to be used as a green room for guests and their entourage to prepare for and observe the interview. Tie lines also allow the conference room to be patched into the audio system for use as a large interview or performance space.

Moving in

The studios were completed and operational in October 2000. The station's occupancy was immediate upon the facility's completion. Because of this, the shutdown period took place over the first few months of operations. Not only did the air staff

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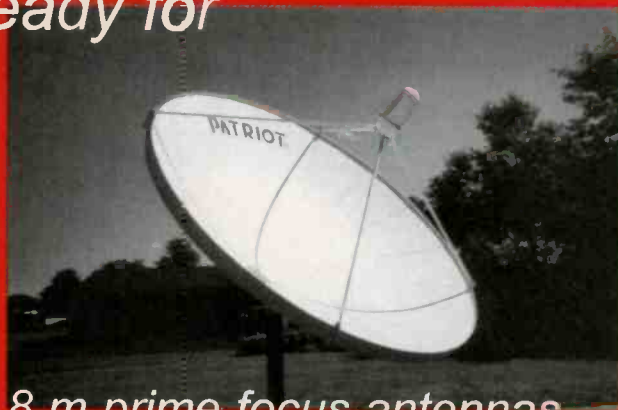
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new methods and systems were learned, the staff embraced use of the new systems and found it hard to believe how operations were handled in the old facility.

While the Klotz consoles are the center of the facility's operation, the backbone is the Radio Systems Studio Hub wiring system. All the studio interconnects are CAT5 wire. The StudioHub installation at WCBS is the largest terrestrial radio station installation to date. Many StudioHub components were also custom built for WCBS, and Klotz wrote custom software routines to accommodate the installation.

Stations continue to embrace digital technology to take advan-

tage of its flexibility. For WCBS, the digital plan will allow the station to upgrade and grow without fear of becoming trapped in antiquated surroundings. The choice to go digital was not simply because it was digital, but because it should allow the station to operate in its new facilities for at least the next 40 years.

Thanks to Mark Olkowski, Barry Siegfried, Dan Lohes and Jeremy Schumacher of WCBS-AM for providing information for this article. Rack photo on page 70 courtesy of Radio Systems. All other photos by Chriss Scherer.

Equipment List

360 Systems Instant Replay
 360 Systems Short Cut
 Alesis Point Seven monitors
 Benchmark MicroFrame audio system
 Burk ARC16 remote control
 Comrex Hotline POTS codecs
 Crown D-75 power amps
 Denon DN-961FA CD players
 Digidesign ProTools DAW
 Dorrrough 1200 audio test set
 Electro-Voice 7100 power amps
 Electro-Voice RE27 microphones
 Electro-Voice Sentry 100A monitors
 Eventide BD500 profanity delay
 Fostex 6301B powered monitors
 Klotz Spherion control surfaces
 Klotz Vadis audio frames
 KRK 7000B monitors
 Luxo mic booms
 MediaTouch iMediaLogger
 Middle Atlantic racks
 Moseley PCL6010 STL
 O.C. White mic booms
 Panasonic telephone system
 QEI Catlink T-1 interface
 Radio Systems clock system
 Radio Systems Millennium consoles
 Radio Systems Studio Hub + wiring system
 Studio Technology furniture
 Symetrix 565E compressor
 Tascam 122 Mk III cassette decks
 Tascam MD-301 Mk II minidisk decks
 Telos Delta 100 hybrids
 Telos One hybrids
 Telos Zephyr ISDN codecs
 TFT EAS system
 Wohler Amp 2A monitor amp

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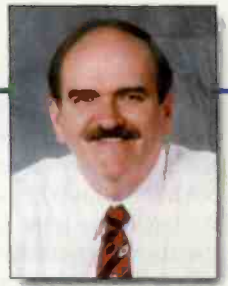
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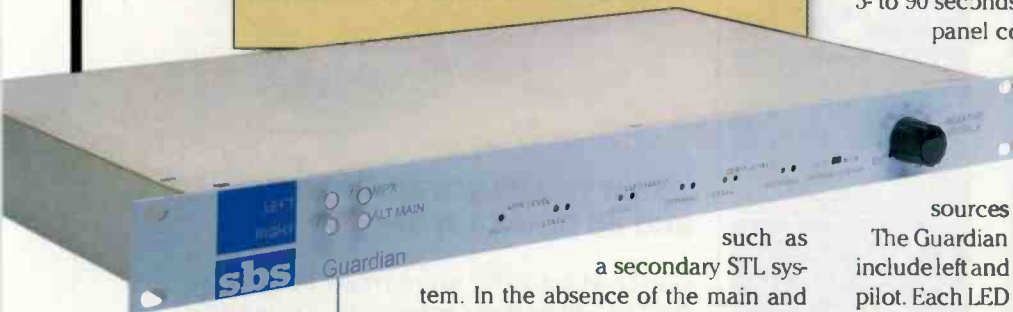
SBS Guardian 2

By Ron Bartlebaugh

The one rack-space Guardian 2 stereo audio and composite signal-fail control unit produced by Sound Broadcast Services (SBS) is designed to provide management of analog audio and composite signals. The unit has a main stereo audio input, an alternate stereo audio input, and a reserve stereo audio input. If one of the main audio input channels fails, the Guardian will derive a mono signal to both output channels from the remaining input channel. If both main audio input channels are lost, the unit will switch to an alternate audio source

Performance at a glance

- Compact size (1RU)
- Baseband audio or composite signal operation
- Adjustable thresholds
- Front-panel status indicators
- Automatic switching of backup sources
- Available from Broadcasters General Store



such as a secondary STL system. In the absence of the main and alternate audio inputs, the Guardian 2 will switch to and start a reserve audio source such as a CD player. The unit utilizes high-quality sealed relays in its audio switching circuits, thereby eliminating active components in the audio path.

In addition to monitor and control of baseband audio, the Guardian 2 can also monitor a composite signal. When loss of the primary composite signal is detected, the unit will switch to an alternate composite signal source. There is no active circuitry in the composite signal path of the unit. The composite detector threshold level is front-panel adjustable via a LED and a recessed trim pot and can be defeated for use at stations that broadcast in mono. The composite monitor includes a pilot detector

that will switch to the backup system immediately if the pilot fails. An adjustable PLL pilot lock circuit is part of the composite detector configuration.

Smart sensing

The Guardian 2 discerns between fault conditions such as line hum versus program audio via the use of 300Hz to 3kHz bandpass filters that are followed by separate dynamic and static level detectors. SBS states the possibility of false triggering is nearly eliminated by using this combination of filters and detectors. The static (constant level) detector looks for fixed audio levels while the dynamic detector looks for varying overall levels. The static detector threshold at which the Guardian 2 will switch to its fault mode is adjustable from -25 to 0dB and is adjusted by utilizing a 2kHz tone, a front-panel recessed trim pot, and a front-panel LED indicator. The dynamic detector adjustment establishes the dynamic program level that will cause a fault condition and is adjusted using program audio, a front-panel recessed trim pot, and a front-panel LED. The time before a fault is detected is adjustable in various steps from 5- to 90 seconds via a front-panel rotary switch. The front-panel composite detector recessed trim pot control along with its associated LED indicator sets the level at which the detector operates. The audio detectors can be defeated for stations that only wish to use the unit to switch between audio

sources via external commands.

The Guardian has additional front-panel indicators. They include left and right audio, composite signal, alt/main, and pilot. Each LED indicates green when in the normal mode and red when in the fault mode. The pilot LED shows only green when the pilot signal is present.

The rear-panel includes a DB-25 connector. Several status functions, including power supply and audio status as well as multiple latching and momentary contacts for the control of external devices, are present on the connector. Other functions found on the DB-25 include the ability to remotely switch the system to the alternate or reserve audio source or to feed both audio outputs via either the left or right inputs only. Outputs for all detectors are included in the connector pin out for interfacing the Guardian to an external logging or alarm system. All OK status outputs are open collector, capable of sinking 100mA with a maximum-switched voltage of 30V DC or 50V AC.

More connections

Other connectors on the rear panel include audio I/O as well as composite signal I/O. The main, alternate and reserve audio input connectors and the audio output connectors are balanced XLR with switchable 600Ω termi-

nations on the main and alternate audio inputs. The composite signal I/O jacks are BNC female. The power connector is a filtered IEC 320 male connector with an integrated fuse. The Guardian 2 appears to be well shielded for use in high RF environments and has a rear-panel ground lug. The internal construction is good to excellent. A single high-quality printed circuit board is used and all integrated circuits, of which there are many, are on sockets. The accompanying manual is well written and includes schematics and a complete parts list with the names of the parts manufacturers. Overall, the unit is well-constructed for long-term use in unattended installations.

Installation and setup is made easy using the front-panel adjustments and LED indicators. The switching between the main, alternate and reserve audio sources was smooth and quiet. We configured the Guardian to start a CD machine and to report an alarm condition when, by using the circuits available at the DB-25 connector, it was forced into the reserve audio mode. Both functions worked well as planned. The reserve audio input includes a switchable 10dB gain amplifier for use with equipment having lower output levels. I also successfully tested the loss of one audio channel function whereby the unit switches the remaining audio input channel to both outputs. The composite signal detector is an added bonus rarely found on similar units of this type and switches rapidly to a back-up composite signal source when the primary composite signal is lost. The circuitry of the unit appeared to be stable even when subject to several rapid power outages under test conditions. The SBS Guardian 2 is a practical and yet unique product. Its many uses, such as automatically switching between STL systems or audio processors, are only limited to the creative minds of engineering personnel. 

Ron Bartlebaugh is director of engineering for the WKSU Stations, Kent, OH, and president of Audio and Broadcast Specialists, Akron, OH.

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Field Report



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Mackie HR824

By Jon Taylor

do some freelance. I also have a great radio job at KCFX-FM, Kansas City. That does not mean that my freelance work is not lucrative; it has done me very well. KCFX is a guarantee and I also produce "The Kansas City Chiefs Radio Network" (KCFX being the flagship station of one of the largest networks in the NFL). I produce promos and sweepers for many medium-to-large market, KCFX and The Chiefs, and the occasional national radio or television commercial. I've heard most studio monitors

have had the plugs perpendicular to the monitor surface. With the 824s thus designed, they preserve a major benefit of powered monitors: space saved by a bulky power amp taking needed rack space.

Something I found pleasing were the option switches on the back of each speaker. They are switchable positions based on placement and room size. Mackie calls them *acoustic space applications*. There is a performance switch for "against the wall", "in corners" or "away from walls". This is known as "full-space", "half-space" and "quarter-space." Also, if you know your room well, there is a switch to tweak the low- and high-frequency response. It's a joy to experiment with these settings because each decision really does affect the sound.

Performance at a glance

Flush connection points on back
10kHz, ± 2 dB high shelving
Overload light triggered by both amplifiers
80Hz bass roll-off switch

Front on/off switch
Switchable acoustic space applications
Foam-filled cabinet interior
Ruler-flat response



known to radio.

The Mackie Company has long been known for its monitors. Realizing that what you hear is the ultimate end-product and flat-real sound is the key to good production of any nature, Mackie produced a small, powered monitor that delivers real, accurate sound. With a 150W amp on the back of each cabinet, it's not lacking for power.

Unlike many powered speakers, Mackie's are well designed. A TRS, $\frac{1}{4}$ -inch or XLR plug can be connected without it sticking out horizontally from the amp. In other words, you can place this speaker flush against a wall. Many powered speakers prior to the HR824s

The particulars

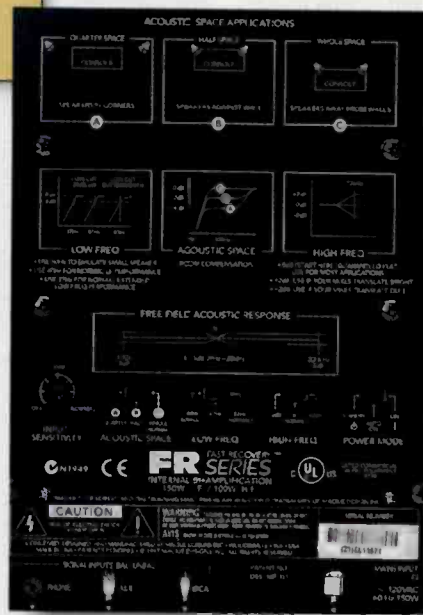
Mackie also gives you a roll-off option. The bass roll-off reduces low frequencies below 80Hz. For high frequencies, there is the availability to decrease sounds above 10kHz by 2dB.

Another bonus to powered speakers is the front panel power switch. It's nice to know when you leave the studio for the day that your monitors are off. Also, you're not as likely to change a setting by mistake while fumbling on the back for a power switch.

Also on the front panel is an overload switch. I've already said the HR824s are loud, but they are also punchy. The throw is short and hard. At 50 percent and plus volume they are accurate and flat. The sound picture is uniformly accurate.

The HR824s can compete with any powered speaker-sub combos with two times the price tag. There are two

power amps on each unit. The low-frequency amp is 150W into 4 Ω with a burst power output of 300W. The high frequency amp is 100W into 6 Ω with a burst power output of 210W. From directly in front of the monitors or at a 15-foot distance, the sound is similar to a "live" sound.



Rear panel detail.

NTI New Sound Generation

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The tweeter is a one-inch alloy dome that has fantastic power handling. An 8.75-inch woofer with a mineral-filled cone and a long-throw voice coil handles the bottom end. Inside the speaker is a massive magnet, which lends to the over-all weight.

The cabinet of the HR824 is a resin wood material. The enclosure is filled with sound dampening material. Many smaller monitors have that boxy sounding midrange as a result of not enough fiberglass dampening inside. The extra foam keeps that sound pure and not bouncing around the cabinet until it finally finds a place to exit, thus delivering less-than-true sound reproduction.

Each monitor comes with a signed certificate of performance verifying the flat response of ± 1.5 dB from 39 Hz to 22 kHz, and certifying that the monitor has undergone a thorough bias and quality-control adjustment. The verification is made with a DSP-based audio measurement system. With this, any two HR824 monitors are perfectly matched.

Look, we all know the "sweet-spot" sound we long for. If you did it right, the Mackie HR824 will let you know. No sound will come out of these monitors that was not there when you recorded it. If, through the HR824, your piece sounds the way you envisioned it, then it's done.

Taylor is creative services director of KCFX-FM, Kansas City.

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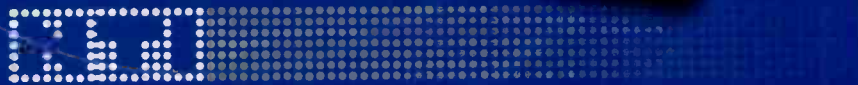
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Broadcast Electronics Predator

By Allen Sherrill, CSRE

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Mot long before I came to work for the Tucson radio stations owned by Journal Broadcast Group, the company had purchased KGMG, a Class-C2 rimshot FM station. Because the transmitter was located on top of a mountain northeast of the city without line-of-sight to some of the outlying suburbs, the station had signal problems in parts of the city, some of which housed desirable demographics. After considerable investigation of the problem, our conclusion was that a fill-in translator was the best solution for fixing the "hole" in the station's predicted coverage. Unfortunately, the FCC had imposed a freeze on new commercial FM translators, but with a great deal of effort we were able to purchase an existing local translator and upgrade its license to suit our needs.

When it came time to purchase equipment to build the translator, our goal was to buy a digital transmitter to match the upgrades we've done at our other FM

Performance at a glance

- Self-contained high-power digital exciter
- Frequency adjustable from front panel
- Short boot-up period
- Provision for automatic analog audio backup
- Simple AC power requirements
- Connections for PC control



sites. Any of the digital FM exciters currently on the market would probably have been suitable, but our application required a transmitter power output of more than 200W, and our preference was for a standalone transmitter instead of an exciter mated with a power amplifier. Broadcast Electronics' Predator with the optional 250W RF output module nicely fit these requirements.

Put to use

The Predator occupies 4RU, measures 16-inches deep and weighs less than 30 pounds. In addition to the front-panel LED status indicators and modulation meters, there is a small LCD display with a membrane-style keypad, used for setting exciter parameters and displaying various readings. The display may be a little difficult for some to read, but I found the operation of the keyboard to be intuitive and effective.

The Predator's frequency is set from the keypad. This feature can be disabled via an internal jumper, which is probably the preferred setting. There is also a provision for synchronizing the exciter to an external frequency reference for use in synchronous FM applications.

Our unit has the digital AES/EBU input module option. One regret is that I didn't include the additional analog composite input module, which would allow for automatic switchover to an analog audio source if the AES signal fails. However, there is a provision to allow use of one of the rear-panel SCA inputs as an emergency composite input, enabled by a single internal jumper change. The Predator's AES input accepts sampling rates from 32kHz to 56kHz, which are converted to its internal 32kHz rate. The manual warns that if any form of compressed audio is fed into the AES inputs, overshoots will result. A digital limiter circuit is included in the digital stereo generator to remove these overshoots.

The Predator has simple power requirements: 100-240

VAC, 50/60Hz, single phase, which

makes it easy to power from a typical rack outlet. AC-to-RF efficiency for the 250W transmitter is specified at 40 percent assuming operation at full power. Once AC power is applied, the unit takes less than ten seconds to boot and produce RF

Final preparation

As soon as the Predator arrived at our office, I put it on the bench and connected it to a dummy load. I ran it at full power for several hours on the bench, and then installed it in its permanent location and ran it for a couple of weeks into a dummy load, without any problems. One minor difficulty presented itself during installation; the Predator, being primarily intended as an exciter, does not have an RF output on-off control, but rather the typical exciter RF "mute" connection for use with transmitter control circuits. An external latching relay was necessary for remotely turning the Predator's RF on and off. The remote interface does include provisions for RF power control and voltage,

current and status metering. There are also ports for connecting a PC, either directly or via modem.

Once on the air, I had the airstaff monitor the translator signal to compare it with the main site's signal. The air staff was quick to notice the slight audio delay from the digital exciter.

The Predator has operated nearly trouble-free since it was put into service in April of last year. The only problem occurred after a power failure at the translator site, when the backup generator came online briefly; during the switchover back to AC mains, the Predator "glitched" and the RF could not be turned on. The cure was to cycle the Predator's AC power. We've since installed a UPS to protect the unit from AC power line disturbances. Apart from weekly meter readings and occasional dusting of the unit's cooling fan filter, I have not had to perform any maintenance on the Predator.

I've done informal listening tests between the primary and translator signals. The differences, if any, between the two signals are subtle, as one would expect if both transmitters were being fed from the same processor (although the main transmitter has an analog exciter and a conventional composite STL). The Predator has a fuller low end when compared to the analog transmitter's audio.

We're happy with the Predator's performance in our fill-in translator application. It has admirably fulfilled our require-

ment for a self-contained digital exciter/translator transmitter, at a reasonable price. 🎤

Sherrill is chief engineer at KMXZ, KZPT, KFFN and KGMG, Tucson, AZ.

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Insight on Sessions

There's more to the convention than just the show floor.

By Barry Thomas, CPBE CBNT

BE Radio answers your session questions.

Each year, the NAB and SBE team up to offer the most concentrated broadcast engineering education opportunity available. Each Spring, the NAB convention hosts the Broadcast Engineering Conference (BEC) which has been the launching point for countless broadcast technologies and new ideas. This year, the BEC offers a rich landscape of engineering issues to explore.

The Saturday, pre-conference sessions of the BEC are typically reserved for workshops and schools, and this year is no exception. SBE and IEEE offer extended workshops that build on real-world broadcast engineering issues.

Saturday April 6

SBE Broadcast Networking Tutorial, 9a.m. to 4p.m.

This day-long session is presented through the Ennes Educational Foundation Trust.

This popular workshop was offered last year and will provide education on computer systems and networks based on the unique needs of today's broadcast installations. Immediately following this program, the SBE will offer testing for its Broadcast Networking Technologist (CBNT) certification.

Preregistration is recommended, but on-site registration will be available for the exam period. More information is available at www.sbe.org.

IEEE Streaming for Broadcast Engineers Tutorial, 9a.m. to 4p.m.

This IEEE will include presentations on video and audio content distribution over IP, DTV Datacasting, and a broadcast engineer's perspective of the process. This session is a highlight of the NAB Xstream conference and is available to full conference registrants.

Sunday April 7

Broadcast Engineering Conference Opening, 9a.m. to 9:45a.m.

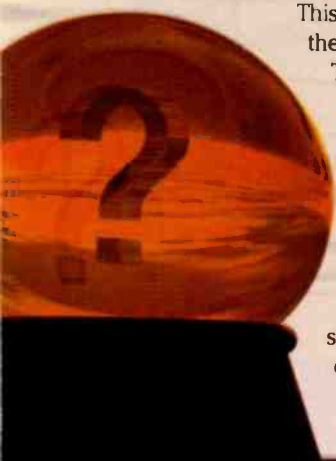
This is one session not to miss. The world watched in horror in September as World Trade Center collapsed. Broadcast engineers mourn not only the lives that were lost but also the one-of-a-kind broadcast transmission facility and those engineers who manned it. Dr. Oded Bendov, one of the original designers of the facility and Patrick Walsh, project manager for the antenna system will be presenting a visual history of the design and installation of the antenna system that was home to 14 NTSC and DTV television stations and four FM stations. The director of the New York/New Jersey Broadcaster's Coalition, William Baker, will discuss the plans for replacement of the massive facility.

Domestic DAB Developments, 9:45a.m. to 12:15p.m.

This engineering session will be an in-depth look at the state of IBOC and its future. It will include a state-of-the-industry report and technical presentations by the NRSC on adjacent-channel tests, AM and FM lab and field tests, data transmission over IBOC and even audio processing techniques.

Worldwide DAB Developments, 3p.m. to 5p.m.

International sessions often provide valuable insight on broadcast technology and the future of our industry. These





sessions comprise a worldwide look at DAB radio and video experiences and research in UK, Canada and Japan. Digital transmission standards and methods will be discussed as well as wireless IP networking, 3G, and broadband network technologies. Expect extensive discussion of IP-based media contribution networks for audio and video digital broadcasting.

The elements of this session will include an update on Digital Radio Mondiale, a DAB update for Japan, a report on integrating 3G wireless and DAB on the Isle of Man and implementing a DAB contribution network using IP.



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SBE @ NAB

The Society of Broadcast Engineers has several events planned during the NAB convention. Be sure to add these your date book as well.

April 6

9:00a.m. to 2:15p.m. - Ennes Workshop
2:30p.m. to 5:30p.m. - CBNT exam session
LVCC N251

April 8

10:00a.m. to Noon
SBE Frequency Coordinators Meeting
LV Hilton Meeting Rooms 13 & 14

2:00p.m. to 4:00p.m.
Tower Consortium Meeting
LV Hilton Meeting Rooms 13 & 14

April 9

9:00a.m. to 11:30a.m.
SBE/NFL Game Day Coordinators Meeting
LV Hilton Meeting Room 13 & 14

9:00a.m. to Noon - Certification Exams
LV Hilton Conference Room 10

1:00a.m. to 3:00p.m. - EAS Meeting
LV Hilton Meeting Room 12

2:00p.m. to 4:00p.m. - SBE Frequency Coordination Meeting - BAS 2 GHz Transition Group
LV Hilton Meeting Room 13 & 14

5:00p.m. to 6:30p.m. - Membership Meeting
LVCC, S220

April 10

EFD Committee Meeting - 1:30p.m. to 3:00p.m.
Location TBA

- CS





Monday April 8

This mixed set of topics covers real-world situations and problems facing radio stations. The first session, *Regulating Antennas and Towers - The Zoning and Siting Wars*, deals with a problem many stations encounter when a new tower site is sought. Federal, state and local government agencies and neighborhood associations have restricted antennas and towers with policies that are hardly uniform. The center of the discussion will be the National Antenna Consortium's proposal for a unified national antenna policy.

In *Digital Broadcasting Around The World: Real World Experiences*, attendees will learn about what is happening with DAB outside the United States. The *IBOC Implementation* session will provide answers to some of the common questions stations ask about the conversion to IBOC, from the antenna to the transmitter and into the audio chain.

Tuesday April 9

The practical information continues on Tuesday with more sessions designed to help attendees improve their stations' facilities.

Radio Facilities Engineering Part I, 9a.m. to 12p.m.

Changing ownership and market considerations have initiated the increased modification of radio facilities. This session will involve design considerations and field reports of antenna and FM combiner/master antenna systems but will also include engineering documentation procedures, digital audio wiring, and ISDN/Switched Telco principles.

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Insight on Sessions

Radio Facilities Engineering Part II, 1p.m. to 3p.m.

The Tuesday afternoon session will be comprised of presentations that address the future of radio broadcast technology. There will be a presentation on transmission power measurement considerations as well as discussions of advanced program monitoring technologies, interactive radio technologies and the continued convergence of radio and computing technologies.

Radio Transmitters: A Practical Workshop, 3p.m. to 5:30p.m.

This workshop, now a regularly occurring event, offers important, real-world information about transmitter maintenance. This is always a popular and information-filled workshop so you'll want to arrive early and bring your notebook.



Wednesday April 10

The last day of the Broadcast Engineering Conference includes the annual Technology Luncheon, where the NAB's Engineering Achievement Award winners receive their awards.

Emergency Preparedness & Security for broadcasters, 9a.m. to 11:30a.m.

The current US state of alert has offered another reminder of the importance of the broadcaster in emergency preparedness. The session will provide important preparatory steps for network and broadcast facilities to serve the public and stay on the air during disasters. These technical and management procedures will apply to stations regardless of market or status.

Technology Luncheon, 12:00p.m. to 1:45p.m.

The NAB2002 Engineering Achievement Awards for Radio and Television will be presented at the luncheon. Paul C. Schafer, president of Schafer International, will receive the radio award.

AM Directional Antenna Essentials, 2:00p.m. to 5:00p.m.

This is an essential session for anyone who is responsible for an AM antenna system. Noted AM designers and consultants Benjamin Dawson and Ronald Rackley will present critical information and experiences with directional arrays.

Continued on page 93

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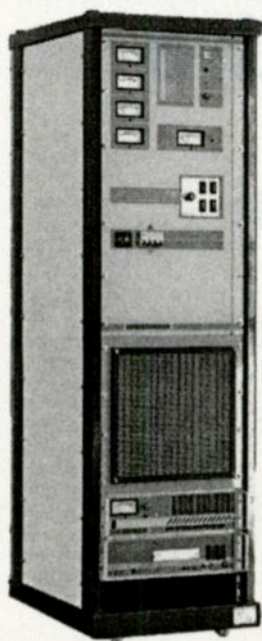
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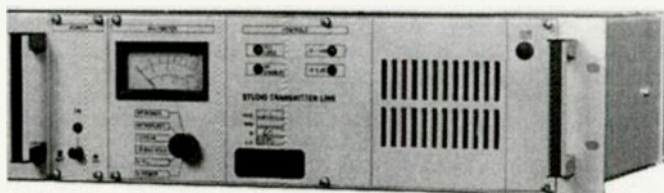
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Insight on Sessions

Continued from page 84

Outside the BEC

While the Broadcast Engineering Conference is your chance to hone your technical chops, there are other events of note to add to your schedule.

Sunday, April 7, Radio Opening Reception, 4:00p.m. to 5:30p.m.

Start your NAB2002 experience by hooking up with colleagues and new friends in Radio.

Monday, April 8, Cyberjocking: Sound Live Every Time, No Matter Where You Live, 1:00p.m. to 2:15p.m.

Can you tell the difference between live and voice tracked?

Wednesday, April 10, Amateur Radio Operators Reception, 6:00p.m. to 8:00p.m.

Spend a relaxed evening talking shop, swapping tales and enjoying the fellowship of the radio amateur community.


Xstream Conference

Convergence of radio and streaming technology has required radio engineers to be aware of and, in some cases, fluent in the language of streaming media. The Xstream conference kicks off with the IEEE Streaming Media Supersession on Saturday (outlined previously) and continues with sessions on successful website operations, IP multicast and a complete overview of the convergence of the broadcasting and online worlds.

Indeed this year's NAB conferences will offer a wealth of education for the broadcast engineer with available exposure to important emerging technologies. Of course I recommend you make a point and enjoy the NAB experience further and get tickets to Jay Leno's one-night-only performance at the Bellagio on Sunday night, April 7. Full-conference registrants receive \$25.00 off the admission for this unique performance just for broadcasters.

I encourage you to visit the NAB website, www.nab.org, and click on the *Conventions and Conferences* sections to explore the complete

program and schedule your days before you attend. Your full conference registration will give you access to any of these sessions. SBE members receive the NAB-member registration rate, which can save significant money over non-NAB-member fees.

Don't forget to allow plenty of exhibit floor time to see the new technology available for your stations! 

Thomas is chief technology officer of StratosAudio, Los Angeles.

Who will win?

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The list of award recipients will appear in the June issue.

The BE Radio Pick Hit judges operate anonymously and independently during the show, looking for products that fit a real need in radio. We'll announce their names after the awards have been presented. The BE Radio Pick Hit Awards are the premier technical awards presented at NAB2002. Look for the award plaques on Thursday, April 11, as you walk the convention floor.

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Online audio processing

By Cornelius Gould

It is generally advisable to use a separate processor when setting up an Internet stream for the purpose of re-broadcasting your station over the Internet. With the recent AFTRA scare, many stations have resorted to a split between the over-the-air feed and a source for the Internet audience during commercial breaks.

Depending on the method used, stations may find themselves needing some kind of separate audio processing for webcasting operations. Many are faced with the question, "What should I do for Internet processing?"

let through. This is why a 28.8kb/s MP3 Internet audio stream sounds so unnatural when compared to one at 128kb/s.

The critical area in any of these perceptual coding schemes is the high-frequency area. Our ears are most sensitive to what goes on in high-frequency areas, and it's pretty hard to manipulate data in this area without the change being noticeable.

The key to minimizing some of these effects is to keep the codec's input levels as close to zero as possible. It also helps to keep the upper spectrum free from clipping distortion or excessive high-frequency processing.

Most perceptual codecs were designed without audio processing and deliberate spectrum manipulation in mind, so in some ways, the use of audio processing is not the best approach. But the alternative is sloppy levels, which can be much worse.

Another option to consider is using a lower sample rate, as this will reduce the amount of high-frequency components the codec sees. This approach will usually result in better performance in suppressing artifacts.



Audio processors designed for webcasting will produce the best sonic results.

There all kinds of options available to you ranging from just using an Aphex Compellor to employing one of the full-featured digital audio processors available from companies such as Omnia or Orban.

What should you choose? It depends on what streaming system you're using. It will also depend on your format.

Digital reduction basics

Bit-rate reduction algorithms, such as MPEG, Real Audio, Microsoft's MSV2 codec and others used for webcasting generally take the form of "lossy" data compression. Remember that a linear 44.1kHz stereo audio stream is about 1.6Mb/s. The MPEG Layer 3 at 256kb/s compression ratio is about 6:1. At 128kb/s the ratio is approximately 11:1.

Through *data reduction*, data is removed to make the audio stream (or file) smaller. This data is gone forever. (A complete description of how masking works is covered in "How it works," *BE Radio* February 2002, page 64.)

The lower the bit-rate, the more artifacts are

Practical solutions and caveats

A strong, quick solution to webcast processing is a general AGC such as the Aphex Compellor. However, a big weakness in the use of such a device is in a lack of consistent spectral balance over a wide range of material. About 50 percent of the programming content (for current music) will sound acceptable; the rest will fail due to the lack of proper spectrum management. Multiband audio processing is a must for higher degree of quality control.

One drawback to using a spare multiband processor is that it was likely not designed for the Internet. Diode clippers and poor crossover design can make the sound worse.

Crossovers that are not dynamically flat are also an enemy of codecs. Many processors are designed using textbook crossover filters. These filters operate fine as long as the gain state is static, like a speaker crossover. However, when you change the gain relationship of the output of the crossover, many textbook filters will exhibit problems with peaks or notches forming in some parts of their passband due to the absolute phase relationship of the same frequencies appearing in the lowpass/highpass skirts of neighboring filters.

In such a case, the phase angles of audio within the highpass/lowpass skirts will rotate and either be out of phase with or in phase with frequencies in the passband of neighboring filters. When this mess is all summed together after feeding through compressors, you have random peaks and notches floating around the audio spectrum.

Old analog multiband processors can suffer from another problem. Due to parts tolerances and changes in temperature and humidity, the left and right crossovers will most likely

not match each other. The roaming notches will be different for the left and right channels.

These random, narrow-bandwidth peaks and notches roaming around the audio spectrum drive low-bitrate codecs crazy, contributing to the strange phased-out sound of many Internet channels that attempt to use multiband processing to some degree. This is especially true for any low-bitrate stereo encoding.

The DSP units produced by the leading audio processor manufacturers address all of these issues. But if you cannot afford one of these, knowing what you're up against can help you make sound judgement calls and nifty modifications to some old box lying in the corner of the shop.

As good as the weakest link

The first rule of sound cards is that not all sound cards are created equal. The biggest quality issue you will face is how well the sound card will function at the desired sample rate. A \$3000 Net processor connected to a \$20 sound card will yield unimpressive results.

Of concern here is how well the sound card filters frequencies above the *Nyquist frequency* of the sample rate in use for streaming. The Nyquist frequency is highest analog frequency that can be converted to digital without severe problems. This point is exactly half of the sample being used. As an example, a 44.1kHz audio sample rate is capable of reproducing audio frequencies up to 22.05kHz.

Exceeding the Nyquist frequency generates digital aliasing distortion. Steep filtering of the analog signal, called anti-aliasing filters, are used to ensure that no data beyond the Nyquist is present at the input of the analog to digital converter.

This aliasing distortion accounts for most of the artifacts observed in the majority webcasts. These aliasing products produce scratchy and/or metallic audio, high-frequency birdies or jingling noises heard on top of white noise



A high-quality sound card, preferably with digital inputs, is the best choice for the good streaming audio quality.

sources (such as tape hiss, or crowd cheers).

Choosing a sound card with support for your desired bit-rate and with exceptional anti-aliasing filters is a must. Look to professional soundcards that support the sample rates you wish to use.

Another problem with most budget sound cards is poor design. The layouts on budget cards can introduce computer noise into the audio.

Use a sound card with a digital input. This will allow you to take the digital output of a DSP-based processor and feed your codec via a direct digital link. Alter the output sample rate of the DSP processor to match what is used online. A sample rate converter between the DSP box and the sound card can also be used.

Thanks to Rolf Taylor, a patient second set of ears as the author experimented with hundreds of different configurations to try to get the best webcast audio performance.

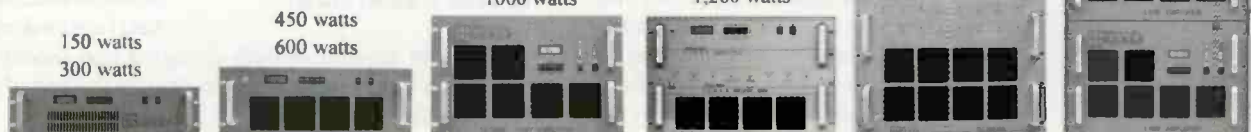
Gould is senior staff engineer for Infinity Broadcasting Corporation, Cleveland, OH.



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Not sold on IBOC

disagree with you on your Viewpoint [*Making the Grade*] in the January 2002 issue regarding IBOC. Digital enhancements should be *in the receiver, not in the transmitter*.

DSP should be standard in receivers, particularly in AM receivers. Analog C-Quam AM stereo provides decent sound on a decent receiver, unlike so many receivers today with 50-cents worth of parts.

The IBOC FM report states that FM IBOC doesn't cause "significant interference." This

is unacceptable, as it should cause no new interference. Is the FCC forgetting its rule that all new services must be backwards compatible and not cause new interference problems? NTSC color is compatible with black and white TV, C-Quam AM stereo is compatible with mono AM and FM stereo is compatible with mono FM. All of these services managed to be backwards compatible. Does the FCC really care anymore?

IBOC FM must be 99 percent compatible with the current FM stations or it's back to the drawing boards. IBOC AM is a technical nightmare with skywave reception, and it is unlikely that an IBOC AM night-time signal will sound any better than a poor Internet audio connection. IBOC AM is also incompatible with the 350 stations currently broadcasting with C-Quam AM stereo. If IBOC AM isn't stereo, then music won't migrate back to the AM band.

IBOC AM has to exceed FM and not simply be "FM-like." If all of the efforts spent on IBOC were instead directed at complex DSP algorithms, AM noise-blanking systems, diversity antennas and AMAX quality receivers, then analog radio would exist and thrive with even higher quality than it does today.

IBOC must be a factor of ten better than analog in order for the general marketplace to want it. I also don't believe that the Ma and Pa radio stations can afford IBOC upgrades, and IBOC is just one way for Clear Channel and Infinity broadcasting to force these little stations that refused to be

assimilated (purchased) by their bloated legal broadcasting monopolies off the air.

The marketing hype behind IBOC has forgotten two important things: people are basically happy with analog stereo AM and FM, and they are not happy with the programming. Listening to Howard Stern in digital doesn't make his show any better.

John Pavlica
system engineer

Innovative Controls Corporation
Toledo, OH

Repeating history

Nice Viewpoint in the December 2001 issue. [*Something to Celebrate*, a review of Marconi's transatlantic tests.] We don't look back at our history enough.

Robert E. Richer
president

Crossed Field Antennas, Ltd.

Solid on solid-state

I found John Battison's RF Engineering, January 2002, on solid-state tower lighting informative. Last month I changed both of our Franklin antenna towers to the Dialight system for my side lights. The greatest resistance to my decision was that solid-state lights have no history of damage from

lightning. I countered with the point that we have very infrequent lightning activity, and if a lightning strike hit the tower hard enough to knock out the solid-state lights that I will have a much larger problem.

The installation went very quickly. There is no perceptible difference in brightness between the old tungsten units and solid-state.

Also, I am looking to

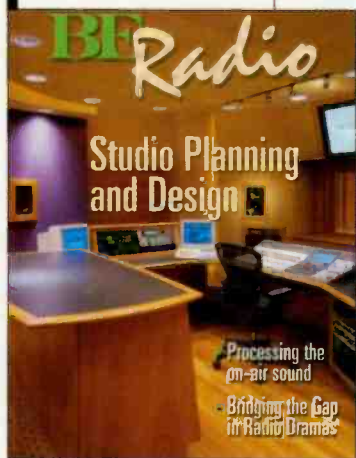


The KFBK Franklin tower.

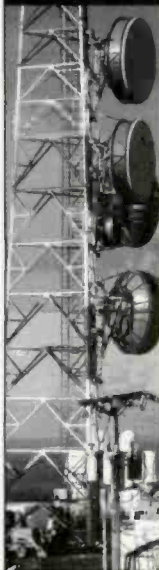
reducing the amount of bulb changing and money involved with that activity. I plan to change the rest of our towers to this system in 2003.

Ross du Clair
chief engineer

Clear Channel Sacramento



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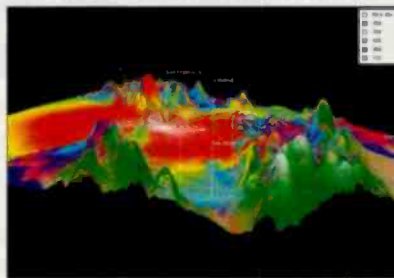
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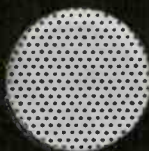
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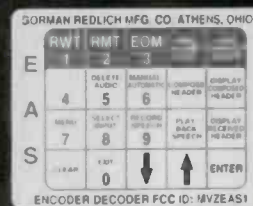
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1KW	FM	1981	Harris FM 1K Single Phase
1KW	FM	1968	Harris FM 1H
2.4KW	FM	1995	QEI Quantum Solid. State, Single Phase
2.5KW	FM	1984	Harris FM 2.5K Single Phase
2.5KW	FM	1980	Harris FM 2.5K Single Phase
2.5KW	FM	1979	Harris FM 2.5K
2.5KW	FM	1976	Collins 831D Single Phase
6KW	FM	1994	Henry 6000D Single Phase
10KW	FM	1974	Harris FM10H/K
15KW	FM	1980	McMartin BF15,000
20KW	FM	1974	Harris FM20H/K
25KW	FM	1978	Collins 831G2C
25KW	FM	1980	CSIT-25F
30KW	FM	1988	BE FM 30A
30KW	FM	1988	BE FM 30A
30KW	FM	1983	BE FM 30
50KW	FM	1982	Harris Combiner w/auto
Combiner			Exciter-transmitter switcher

EXCITERS

AM TRANS-MITTERS	Year	Model	Description
1KW	AM	1982	Harris MW1A
5KW	AM	1980	Continental 315R-1
5KW	AM	1980	Harris MW5A
10KW	AM	1982	Harris MW10A
10KW	AM	1982	Continental 316F
50KW	AM	1978	Continental 317C-1

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LOS ANGELES	105.7	100W	FM	1000m	100W	Open
LOS ANGELES	105.9	100W	FM	1000m	100W	Open
LOS ANGELES	106.1	100W	FM	1000m	100W	Open
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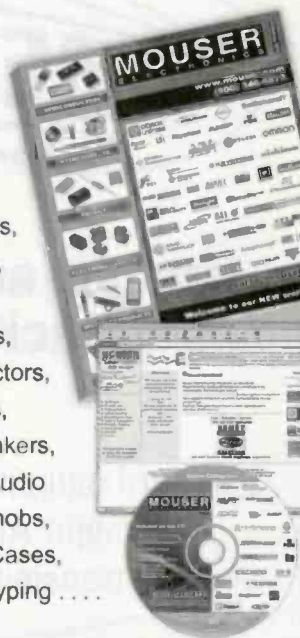
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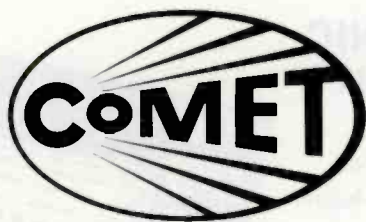
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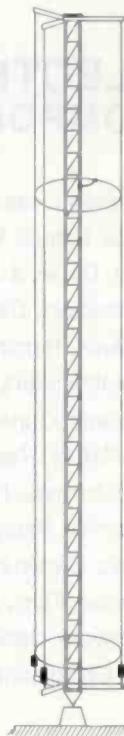


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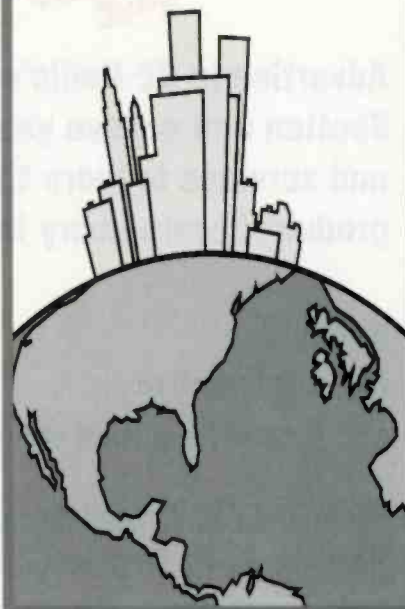


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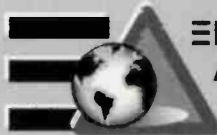
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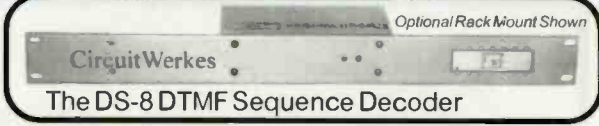


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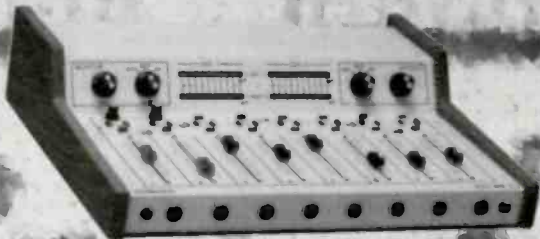
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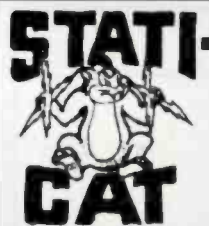
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Contributor Pro-file

Meet the professionals who write for BE Radio.
This month: Managing Technology, page 10.



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Written by radio professionals
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Radio

THE RADIO TECHNOLOGY LEADER
BE Radio Magazine

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Shaping radio today and tomorrow

By Chriss Scherer, editor

Do you remember?

Walking the show floor at the NAB convention to see the newest equipment is the primary mission of most NAB attendees. The convention offers plenty of chances to see the latest innovations and equipment advances. With the convention just around the corner, this photo of a studio layout from a 1982 McCurdy Radio Industries ad that shows what was state-of-the-art for its day.

This studio layout features a 22-channel McCurdy SS8670 console flanked by two triple-deck and one recorder ITC SP cart



machines, a Technics SP-15 turntable with Audio-Technica to-earm, and two Otari MX5050BII reel-to-reels.

The layout is typical of what you would have seen on the show floor of the 1982 NAB convention, which was held in Dallas. The hot topic of radio discussion that year was AM stereo.

Systems from Motorola, Kahn, Harris and others were under constant debate on the show floor and in technical sessions.

That was then



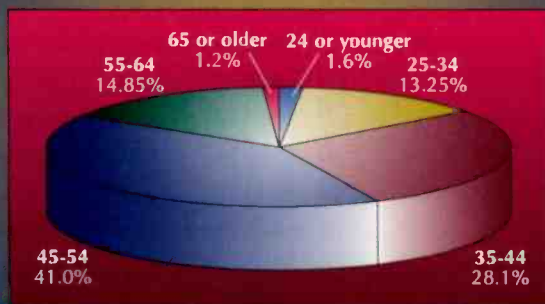
The FM stereo standard was approved by the FCC in 1961. Stations were first allowed to transmit with a stereo subcarrier at 12:00 am on June 1, 1961. The first station to commence stereo operations was WEFM, Chicago, owned by the Zenith Radio Corporation. By December 1963, when this photo was on the cover of *Broadcast Engineering*, more than 200 stations were broadcasting in FM stereo.

The FM stereo system used by Zenith Radio during 1959 and 1960 was proposed by both Zenith and RCA to the FCC. The proposed stereo standard was first shown in May 1961 at the NAB convention in Washington, DC. On April 20, 1961, the FCC adopted the stereo standard.

Sample and Hold

A look at the technology shaping radio

Age distribution of radio engineers in North America



In our annual Salary Survey, BE Radio asks respondents to provide their age. Look for the results of the 2002 Salary Survey in the September issue.

Source: BE Radio Salary Survey 2001

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complement of control panels and PC applications to choose from—all designed for straightforward operation and a rapid learning curve.

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MIXED SIGNAL SWITCHING is easily accomplished with a choice of AES digital or ANALOG 24-bit A>D input cards, and of course 24-bit digital or 24-bit D>A ANALOG output cards, all of which can be serviced from the front of the cage. All signals are routed entirely in the digital domain.