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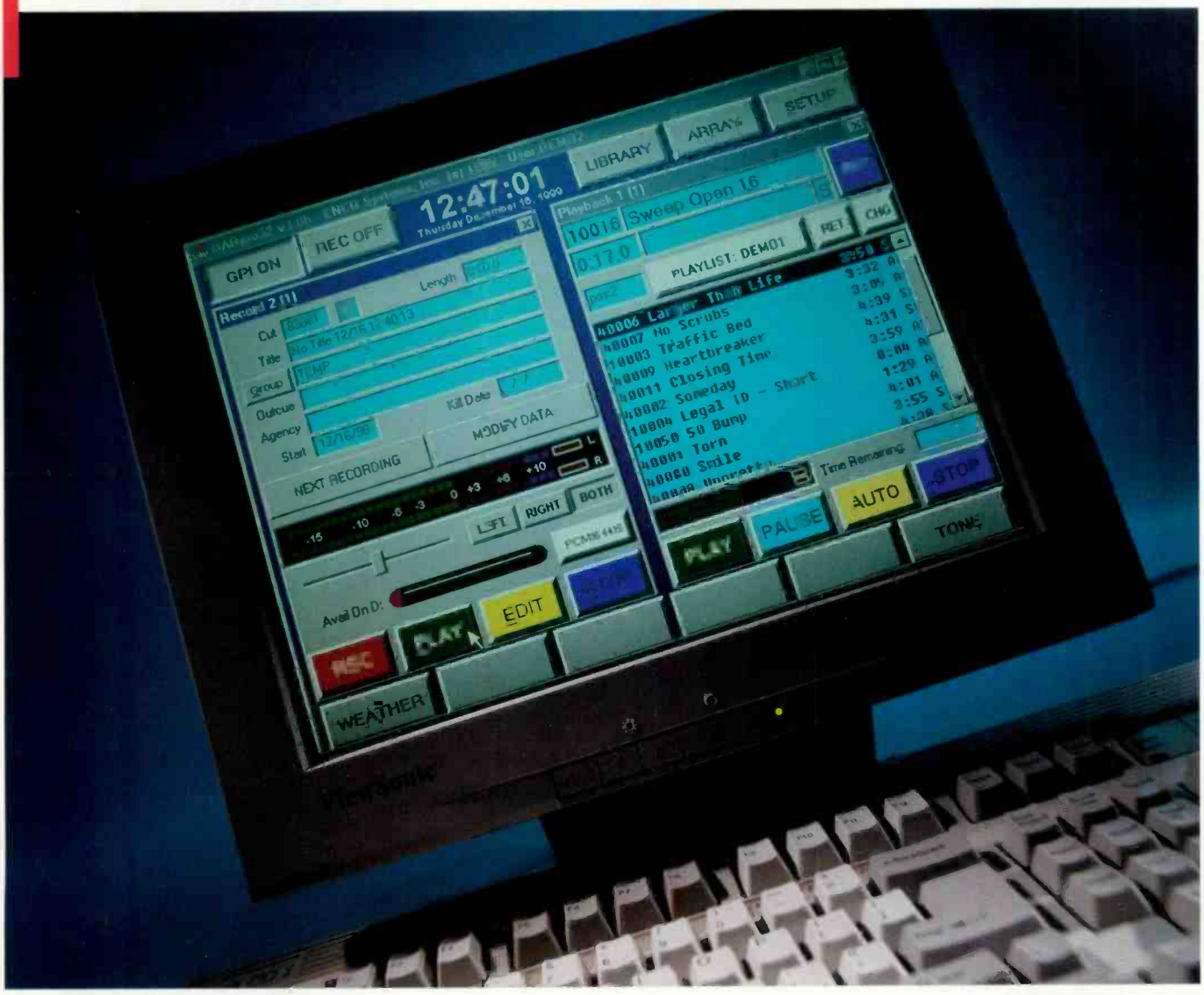

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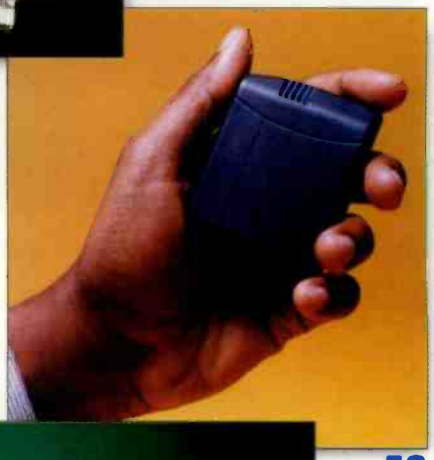

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ON THE COVER: Say what you like, talk radio is still the most popular format in the country. Photo courtesy of Gentner Communications. Cover design by Michael J. Knust.

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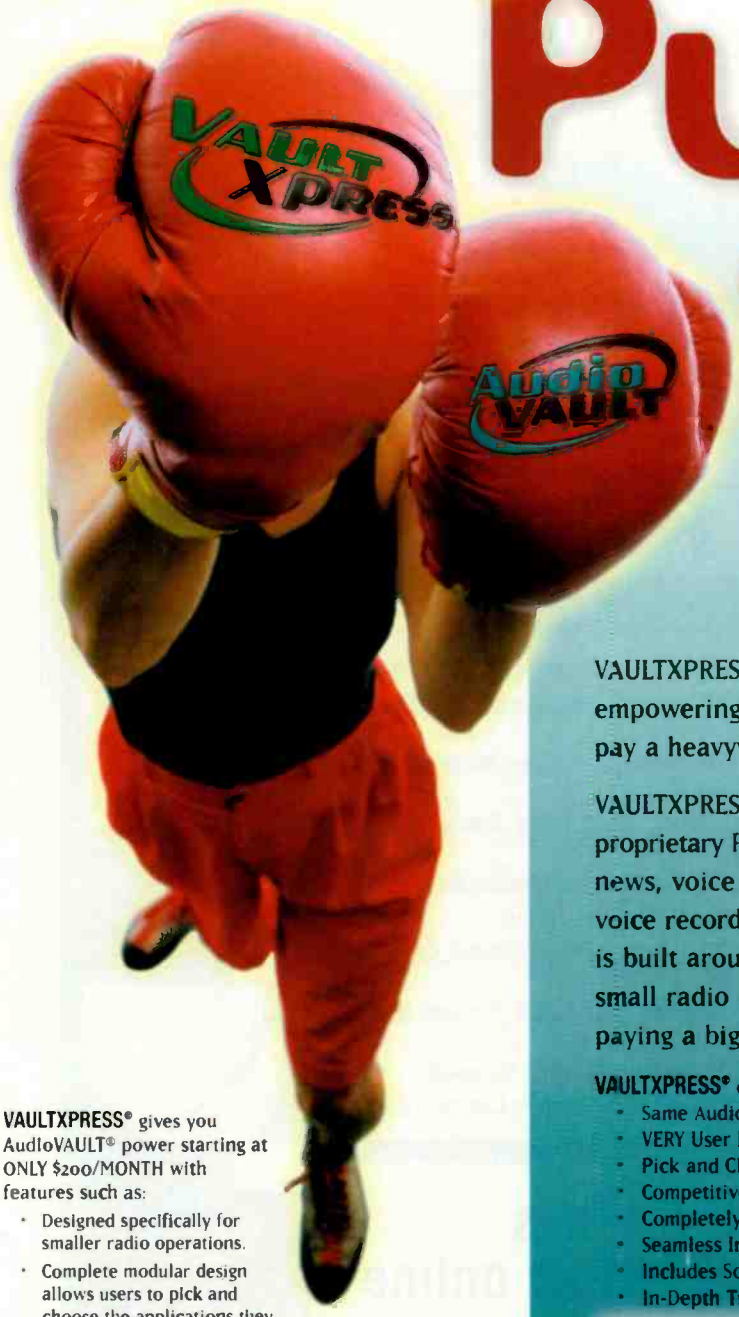

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Viewpoint

A time to act (or not)

In May, I broached the subject of an improper use of EAS, specifically, Amber Alerts. I received some comments about my remarks, most supporting my view that, in general, EAS works and that it should strictly be used for matters of emergency or danger to the public. I also cited the effectiveness of EAS during the tornado that struck Parson, KS, in late April.

In situations such as tornadoes, any delay in relaying information can result in disaster. One major advantage of EAS is that it can react almost instantly to an event. This instantaneous reaction also means that a mistake can be relayed just as quickly, but such errors can be easily controlled.

So what determines whether a situation warrants an EAS activation? Your state and local area operational plans should outline most of this. If not, don't complain about your plan; take action and get it updated. In instances not covered by your plan, a snap judgment may be necessary.

Why am I bringing this up? During the U.S. Open on June 18, a Tampa TV station interrupted the golf broadcast with a weather alert. From a golf fan's point of view, the timing was awful. Just as Tiger Woods was making his final putt, the local station interrupted with a weather warning. A waterspout had been spotted over Tampa Bay. (A waterspout is basically a weak tornado that occurs over water.)

Like a tornado, a waterspout's course is unpredictable. Although they typically do not come onto land, it is possible. This break in programming was not welcomed by the viewers, and the station was flooded with telephone calls. The next day, the general manager of the station apologized for the interruption and the station's error in judgment. The general manager felt that the weather department could have waited a few minutes before breaking in. However, a significant amount of damage could have occurred in just a few minutes.

This situation is an excellent example of the broadcast station's ability to promptly inform the public of inclement weather. The station did the right thing and informed the public immediately in a situation where time was a critical factor. Certainly, many viewers were disappointed about not seeing the final shot, but they would have been even more disappointed if the waterspout had become a severe situation that destroyed their homes.

Whether or not the waterspout actually caused damage is irrelevant. Here in Kansas City, we have severe weather, tornado watches and tornado warnings on a regular basis, especially in the spring. One evening last May, when the weather was severe, I noticed which stations were relaying information and which were not. Now I know which stations to tune in for timely weather information.

Each station should determine what action to take for a variety of events. The responsibility should be taken seriously and should not be abused. Alerting the listening audience for every event — major or minor — is like sending all of your e-mail messages with a high-priority tag. In time, no one will pay attention.

In contrast, breaking programming for the weather alert was the right decision to make, according to the station personnel. The general manager's apology for interrupting the broadcast did not improve the station's image. More likely, he further eroded the credibility of the weather department.

Many people have become complacent in their listening and viewing habits. They want what they want when they want it. Missing a final shot in a golf match will not affect anyone's lives in the long run. Missing a weather alert, in contrast, can be deadly.

Chriss Scherer, editor
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Repair or replace?

By Kirk Harnack

When equipment fails, engineers repeatedly face the same decision: repair or replace. Rookies often anguish over this dilemma. Experienced engineers tend to be more decisive. Quick decisions are usually valid as long as we pause occasionally to consider our assessment process.

How many factors surround the decision to repair a broken piece of gear or simply buy a new one? The obvious list-toppers might include cost to replace versus repair, time available to repair, availability of repair parts, prior experience repairing this equipment, and likelihood of estimated repair actually solving the problem.

The decision to repair or replace is influenced by many factors.

Other issues that bear on the repair/replace decision include pride in your repair skills, the availability of required test equipment and the complexities of installing a different, inexact replacement. Additional considerations are the experience of others regarding the difficulty of a successful repair, arranging for factory repair and even station politics.

Whatever your considerations, the decision can be placed in an overall context using this goal: to re-enable effective broadcast operations with the most reliability at the best cost within the time dictated by the equipment's failure impact.

Getting started

One of the most contentious factors in deciding to repair or refurbish has to do with our own experience, or lack thereof, with a given piece of broken gear. This is especially true for consumer or semipro equipment. Much of this equipment is not constructed to be serviceable; it is designed to be discarded and replaced upon failure. However, if a repair can be effected quickly, then even some "throwaway" gear should be considered for repair.

Many experienced engineers set a replacement-cost rule of thumb. If a piece of gear costs less than $200 to $300 to replace and it cannot be repaired in an hour or less in-house, then it's likely headed for the junk pile. It is not worth the time, trouble and uncertainty to attempt a repair. Naturally, exceptions to this rule abound. If the unit is under warranty, let the dealer or factory repair or replace it. If the equipment is desperately needed and a little more work can revive it, then do so. However, it's not likely to be cost-effective to keep a $150 cassette deck waiting on the bench while a service manual, parts and more repair time all become available.

What about mid-priced, semipro equipment — that $1,000 CD player or $600 cassette deck? Because they are a bit pricier, these items deserve more consideration prior to replacement. If you are responsible for fewer than four to six units of a similar make and model, then shipping broken units off for factory-authorized repair may make the most sense. However, engineers who care for a larger number of similar equipment models should familiarize themselves with troubleshooting and repair procedures, then fix the gear in house.

Another common barrier to efficient repair of broken equipment is an engineer's familiarity and confidence with that equipment. We must decide if the learning curve is too steep to justify digging into unfamiliar items. Additionally, the test equipment required by some equipment to ensure its proper or legal operation may present another impediment to local repair. Fortunately, factory and third-party repairs are available for most broadcast equipment.

What about larger equipment? When is the proper time to replace a broadcast console, audio processor, STL system, transmitter or antenna rather than repair it? It is helpful that most broadcast equipment is designed for field repair. Broadcast equipment usually comes with repair manuals and a spare-parts kit. Manufacturer technical support is often quite good, too, when dealing with broadcast-specific equipment.

The replacement of larger, fixed equipment is often due to factors besides its need for repair. Ownership, studio location, transmitter site and changes in city of license occur frequently enough to necessitate replacement of many larger items.

For those who are coping with the challenge of repairing older equipment that is likely to stay put, the decisions are more difficult, and additional factors may bear on these assessments. Issues regarding new equip-

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ment often involve long-term financing and tax implications for the owner as well as installation and construction or remodeling expenses.

Consider a station's old, tube-type AM transmitter. At power levels above 1kW, the electricity savings of a new, solid-state AM transmitter make replacement easy to justify, whether or not there are serious maintenance issues with the existing transmitter. In addition, with the cost of older tube types increasing and availability decreasing, even smaller, old AM transmitters are good targets for replacement. If there is no auxiliary or backup transmitter, the justification is even more obvious.

What about a 15- to 20-year-old FM transmitter? Which is more sensible: replacement or repair? Much of that decision rests on the care and environment the transmitter has had over the years. Although most transmitters will endure a dirty setting for a few years, a well-kept, clean environment will return worthwhile dividends in transmitter longevity. Parts availability and the proximity of maintenance expertise are factors, too.

One disturbing trend is the haphazard modification of transmitters or disregard for their important systems by "engineers" unqualified for such work. It's somewhat common to see a transmitter's safety and overload circuitry disabled, or its air filters and access panels permanently removed and even discarded. Qualified engineers should endeavor to correct such ills by restoring the equipment to proper operating condition. The most prudent repairs to almost all equipment are those that restore it into the condition as it left the factory. Down the road, such practices ease the repair/replace decision-making process.

Stay in touch

Internet forums, listservs and chat rooms bring a wealth of experience and knowledge to all participants. Faced with a sticky or unfamiliar problem, an engineer may freely ask others what their experiences have been. Virtually without fail, a well-defined problem expressed to other engineers online will yield a good answer — and quickly. (Sometimes a handful of conflicting answers is presented, leaving the engineer with another dilemma.) This online community and willingness to share expertise greatly empowers engineers to work more accurately and reduce uncertainty in making repair decisions. Recommendations for replacement equipment are also easy to elicit from online engineer groups.

Use all of the resources available to you. You may have more than you think.

Another resource is BE Radio. *If you face the repair/replace problem and need information, let us know. Our technical staff and consultants will gladly help you.*

Kirk Harnack, BE Radio's *consultant on contract engineering, is president of Harnack Engineering, Cleveland, MS.*

To: The Broadcast Community

From: G. Scott Benton
President
Commercial Communication Associates, Inc.

Dear Friends,

I am pleased to announce the new ownership and management of CCA by Commercial Communication Associates, Inc.

Commercial Communication Associates, Inc. was formed in a concerted effort between myself and a group of private investors. This new company was formed for the purpose of purchasing the assets of CCA Electronics, Inc. The purchase was finalized on the 24th of March 2000.

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Our new management team was selected to reorganize the company from the ground up. The entire team is comprised of previous CCA employees. Our employees have a combined experience of more than 200 years. I would like to take this opportunity to introduce them to you. Many of you will recognize some of our names from the past.

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I wish to personally thank those of you who have been calling with words of congratulations and encouragement. It's great to be back!

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IBOC update

By David Layer

Like the proponents of IBOC DAB, members of the National Radio Systems Committee, a technical-standards-setting body jointly sponsored by the NAB and the Consumer Electronics Association, are also working hard to determine if these systems represent a "significant improvement over existing services."

Recently, major progress has been made in pursuit of that goal. At the April 8, 2000 meeting of the NRSC's DAB Subcommittee (held at NAB2000), two important evaluation reports were adopted (available on the NRSC's website at www.nab.org/SciTech/nrsc.asp). These reports were written by the Subcommittee's Evaluation Working Group (EWG) and were based on data submissions made to the NRSC by the two active IBOC proponents, USA Digital Radio and Lucent Digital Radio, in December 1999 and January 2000 (respectively). The conclusion reached for both systems was that "...the 'state-of-the-art' for IBOC technology indicates the reasonable probability of substantial improvement for broadcast listening compared to current analog performance in the AM and FM broadcasting bands."

Multipath fading scenario	Digital TOA S/N (dB-Hz)	Digital Signal Power (dBmW)	Analog Signal Power (dBmW)	Analog Signal Strength (dBμV/m)	*Estimated distance to digital TOA operating point (km)*
AWGN (no fading)	54.8	-113.2	-91.2	23.8	**101.0**
9-ray Urban Fast	57.3	-110.7	-88.7	26.3	**96.9**
9-ray Urban Slow	62.3	-105.7	-83.7	31.3	**89.3**
9-ray Rural Fast	57.5	-110.5	-88.5	26.5	**96.5**
9-ray Terrain Obstructed	57.2	-110.8	-88.8	26.2	**97.0**

Table 1. Block error rate results of one hybrid system in different types of multipath situations.

First steps

Issuance of these reports concluded the first phase of the NRSC's IBOC evaluation. In this phase, the NRSC had to rely on the proponents themselves for data collection and presentation. Consequently, the resulting information was only suitable for a comparison between IBOC and analog system performance; it was impossible to compare the performance of the two IBOC systems, since each proponent followed different test procedures.

Even though the proponents worked independently during this first phase, the NRSC's Guidelines, made available to the proponents in early 1999, included sections on suggested test procedures for laboratory and field testing of both AM and FM IBOC systems, as well as a discussion of how the NRSC would evaluate any submitted data.

When the NRSC received and evaluated the proponent submissions, it became apparent that a significant number of the recommended test guidelines were neither conducted nor reported. This is noted in the NRSC's reports, and is the reason that it's conclusion is "heavily qualified," since the EWG was unable to assess performance under some of its evaluation criteria with adequate engineering credibility.

One example of the NRSC evaluation can be found in Appendix G of the USADR evaluation report. The submission included lab results of *block error rate* (BLER) versus RF signal-to-noise ratio for various operating conditions. USADR stated that the 1 percent BLER operating point corresponded to the *digital threshold of audibility* (digital TOA), meaning that for BLER values less than 1 percent the IBOC audio is unimpaired.

Given this information, the EWG performed an analysis using the BLER data, relating the BLER values to a predicted service area assuming typical transmission parameters for a class B FM, 50kW ERP, 152m HAAT station. For this case, the distance to the protected contour, using FCC (50,50) curves, was determined to be 65.4km. Table 1 shows the estimated distances to the *digital TOA operating point*, based on the laboratory BLER data. This analysis suggests that the distance to the contour representing digital TOA, for each scenario provided, appears to be greater than the distance to the corresponding analog protected contour.

The road ahead

With the phase one effort complete, the Subcommittee (at its April 8th meeting) unanimously agreed to begin a follow-up, phase two test program in which proponents would submit their systems to the NRSC for common testing by an independent test facility. Conducted under subcommittee supervision, these tests will allow IBOC to analog comparison and a system-to-system IBOC comparison.

To that end, the subcommittee has established a Test Procedures Working Group (TPWG) to prepare the necessary test procedures. Both proponents have expressed their support for this latest effort and are participating in the development of the test procedures.

David Layer is director, advanced engineering for the National Association of Broadcasters, Washington, D.C., and provides NAB staff support to the administration of the NRSC.

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Antenna monitor checks and maintenance

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

The FCC once required chief engineers at broadcast stations that use a directional antenna to sign off on a weekly transmitting installation inspection. With the onset of deregulation and the associated relaxation of the Rules, this requirement has been dropped. In its place, a sort of catch-all regulation has been imposed. The onus of compliance with the Rules is still there, but the FCC no longer requires detailed, daily inspections and maintenance. Now, the commission's approach is one of assuring the U.S. that everything complies with the Rules, although you don't have to check and log everything every day. But heaven help you if the FCC inspects you and finds you out of tolerance.

The antenna monitor is a critical device in a directional antenna array.

The most important device for stations with directional antennas is its antenna monitor. The monitor should be checked daily to ensure DA compliance, even if an approved antenna-sampling system is used. The phase and ratio readings are the prime indicators of directional antenna stability and correctness of operation.

When the typical number of antenna-monitor readings outside of the normal ±5 percent phase and ±3 degree ratio readings is exceeded, consider the antenna monitor's accuracy. If you have followed routine preventive maintenance, it is usually safe to trust the monitor readings and troubleshoot in other areas. If nothing appears to be broken or unusual (assuming common-point current is correct), an excellent basic check is to read tower base-operating currents and calculate the ratios to confirm correct conditions. If these ratios are correct and monitor points are in, but the antenna monitor says they are out, check the antenna monitor and its sampling system.

The average station engineer cannot do much in the way of antenna monitor maintenance and repair, with the exception of older monitors in which mercury-wetted relays are used. These relays can produce erratic readings. Take care not to change any component settings. In new monitors, relays are not used; thus, one possible fault is eliminated. However, the omission of the relays also makes it less likely that the station engineer can get the monitor working properly. Two caveats must be observed. If they aren't, the price of ignorance is new monitor calibration.

Two caveats

Ignore the meter-adjusting screw on the front panel. For the less-experienced engineer, the desire to "twiddle" a screw is often overwhelming when trying to make a piece of equipment read correctly. If the zero setting of the meter is changed, the calibration is useless. It is not possible to reset the antenna indications if this meter's zero setting is disturbed.

If erratic meter readings are observed, it is possible that the power supply is at fault. Don't neglect a possible low primary ac voltage that might be low for an unexpected reason. The older the monitor, the more likely it is that electrolytic capacitors have dried up and lost capacity. Power-supply operation can be checked in the usual way with a voltmeter to determine the voltages available at the various test points.

If low power-supply voltages are found, all electrolytics should be changed and the supply tested under load. It is crucial to make sure that when power supplies are being investigated, any trimpots are not moved unless to reset operating voltages. In fact, if nothing but electrolytics have been changed, other adjustments should not be necessary.

If, after making the checks discussed, the problem still exists and monitor problems can be confirmed, send the monitor to its service department for repair and recalibration.

Beyond the monitor

In many DA installations, all of the sampling lines have the same length. Usually, one or more tower lines will have excess length. This excess line should be stored underground so all lines will experience the same temperature changes simultaneously. In this way, all antenna monitor readings will be affected the same amount and remain correct. Unfortunately, sometimes the line storage area (usually coiled and buried by the transmitter building) is disturbed and line is damaged. Some sections may even become unburied.

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RF Engineering

If they are used, tower-mounted pickup loops should be visually and mechanically inspected to make sure that they are positioned securely and have not changed position because of wind, vandalism or lightning damage. Consistency of mounting angle should be checked to be sure each loop is in its original position with reference to the tower and the other loops. Be sure connections to sampling lines are secure, tight and waterproof.

Sampling transformers inside the doghouses should be checked for lightning damage, as should the network itself. Sampling-line connectors should be cleaned and tightened.

When the DA system is installed, measure and record the sampling line characteristics using an in-line bridge and signal generator. Record the line impedances with and without the sampling loop or sampling transformer connected. DC resistance should also be measured and kept with the details of the antenna system.

If installation data is not available, it is still a good idea to make a check of the sampling lines at this time. Assuming all sampling lines are the same length, each one should have approximately the same impedance and DC resistance. Obviously, for this measurement, the transmitter should not be on.

Another way to check the sampling system is to use your field-intensity meter and measure the signal delivered to the antenna monitor. Most FIMs in use today have an RF input connector. This connector can be used to measure the RF picked up by the monitoring loop or transformer.

Before unplugging any lines at the rear of the antenna monitor, be sure each line is clearly identified with a label. I have found several monitor installations where the sampling lines were not identified properly and we had to search out and check each one.

The transmitter should be on and the line voltages measured and recorded. The levels will not all be the same because each tower usually contributes a different power level, although occasionally one finds a system with equal power distribution to each tower. However, knowing how much power goes to each tower enables one to judge the correctness of the voltage readings. Excessive high or low readings could point to sample loop or transformer problems, or even to line damage.

Tower-mounted pickup loops should be visually and mechanically inspected for proper orientation.

The foregoing may seem like a great deal of effort merely to determine that the installation is in good condition. It is a lot of work, but having the database of line characteristics makes future problem-solving much easier.

If the installation is found to be in good condition, monitor points are in, and all other indications are normal, it is reasonable to blame the monitor and send it for repair.

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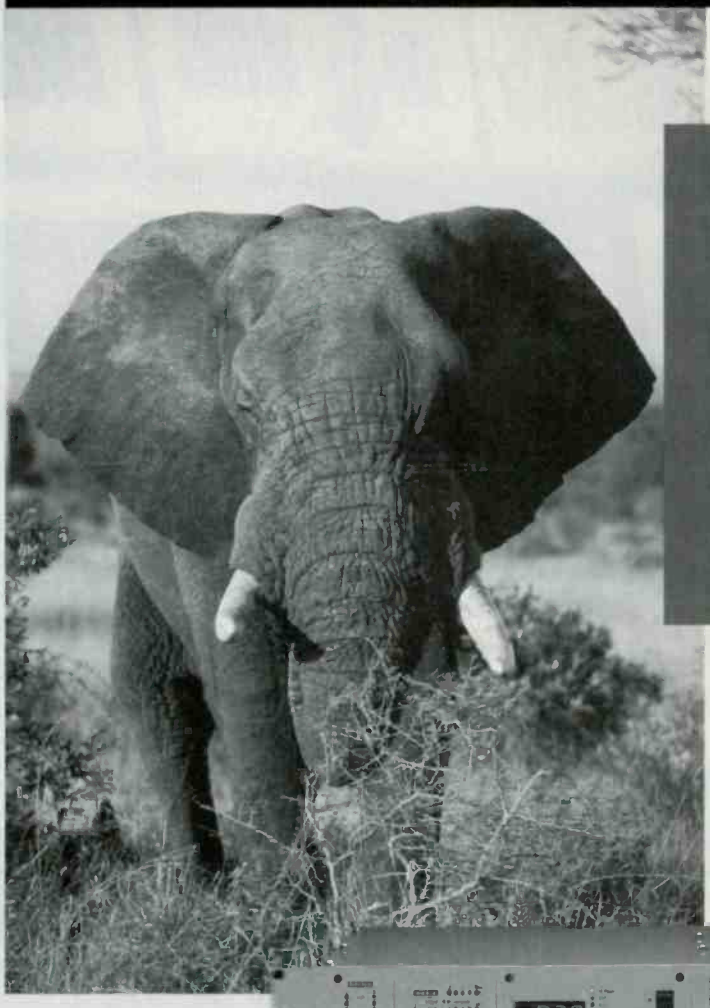

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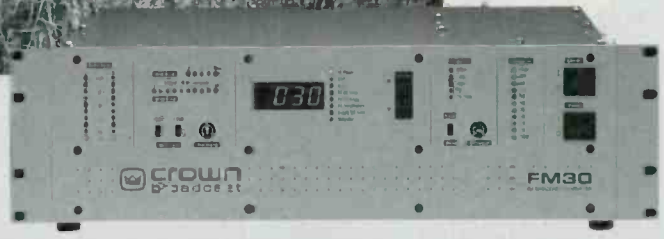

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Sharing audio files

By Kevin McNamara, CNE

One of the realities of designing any digital audio system is the little matter of which audio file formats make the most sense. Audio doesn't just go to the transmitter any more; many stations are feeding digital audio to the Internet or to other stations. It is no longer uncommon to receive production materials or spots via the Internet or dial-up link. If you want to have some fun with a group of engineers, just ask them which format is best; it could keep you entertained for a long time.

All kidding aside, transferring audio files of different formats between various broadcast environments can still be a problem. Several manufacturers of digital audio equipment have incorporated a means to share audio files, either by utilizing standard audio file formats natively or permitting audio files to be exported in one or more standard audio file formats. Largely due to the efforts of a few manufacturers, sharing audio files will continue to become less of an issue. Understanding a few of the common file formats may help.

Field	Description
Originator	Name of the file originator
Originator Organization	Additional reference field
Origination Date	Date of file creation
Origination Time	Time of file creation
Time Reference	Time-code information
Version	BWF Version information
Reserved	Future usage
Coding History	Type of coding used (PCM or MPEG, mono or stereo, sample rates, bit rates, etc.)

Table 1. Field descriptions of the Broadcast Wave Format.

Until a few years ago, the WAV file format was the universal medium to exchange audio files; now, the MPEG file is the dominant choice for the delivery and transfer of audio files. The Broadcast Wave Format (BWF) permits compatibility with a wide variety of audio file formats, including MPEG, along with the ability to embed data streams that can be used to deliver additional features, such as text information or signaling.

The origins of the WAV (waveform data) file are detailed in the *Resource Interchange File Format* (RIFF) by Microsoft as a means of storing digital audio files. WAV files can support either Pulse Code Modulated (PCM) non-compressed audio or other compressed encoding schemes such as MPEG, ADPCM, and G.721. The RIFF does not specify any new methods of storing data; rather, it defines a structured framework that may contain other existing data formats. These formats are typically related to, 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 (.AVI), MIDI information (.RMI), Animated Cursor (.ANI) and Waveform data (.WAV).

The RIFF structure

The RIFF is a binary file format containing multiple nested data structures, called "chunks." Each chunk can define specific information about the data stream, such as its structure or actual contents; it may even contain another chunk called a "sub-chunk."

A RIFF file starts out with a single file header or "form-type" which describes the overall file contents. A WAV file is generally a RIFF file with a single WAV chunk that is comprised of two sub-chunks: the "fmt" chunk, which describes the sample rate, sample width, etc., and the "data" chunk, which contains the actual data. Although not required, other chunks can be used which define other items.

MPEG file format

MPEG stands for the *Moving Picture Experts Group*, which is a working group within a subcommittee of the International Organization for Standardization/International Electrotechnical Commission (ISO/IEC) that develops international standards for the encoding/decoding of compressed digital audio and/or video. Essentially, the encoding technique used in the creation of MPEG files "strips" off audio that is "non-essential." The actual compression method is defined by one of three "layers" and can also be described as "perceptual noise shaping." Conversely, the MPEG decoding process attempts to synthesize or recreate the original audio content based on the coded bit stream.

In order to understand the syntax behind the various MPEG formats, you should be aware that there are presently three "phases" of the MPEG format defined, MPEG-1, 2 and 4. Each of these phases offers different, yet complimentary standards that address a wide range of different applications. The hierarchical structure of the MPEG format permits "backward" compatibility with formats of a lower phase. MPEG files are also typically followed by a designation of layer I, II or III, which represent the particular "coding" algorithm used in conjunction with a given phase.

In practice, MPEG file formats offer the following:

MPEG-1 defines a single channel and two-channels that can be strapped as dual mono or stereo with samples rates of 32-, 44.1- or 48kHz. The predefined bit rate range from 32kb/s to either 448-, 384- or 320kb/s for

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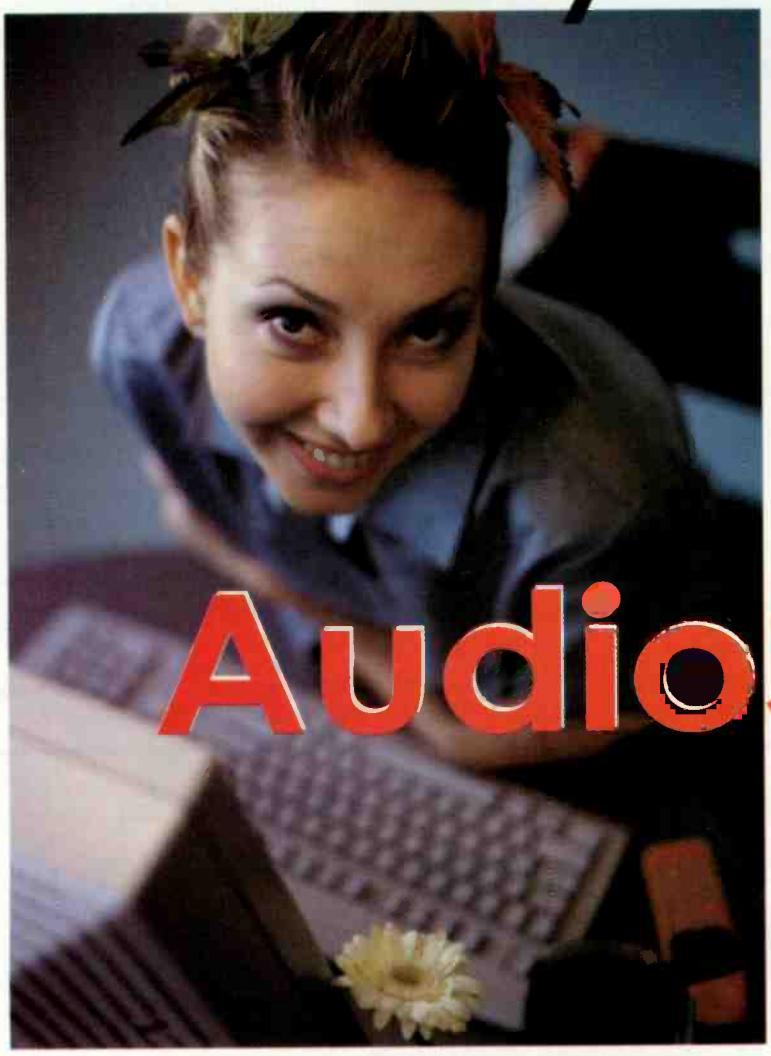

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layers I, II or III respectively. Files with the extension of *MP2* or *MP3* are actually the MPEG-1 format using the layer 2 or 3 algorithms.)

MPEG-2 is further defined into 2 types: MPEG-2 BC (backward compatible) and MPEG-2 AAC (advanced audio coding.) Originally developed for the HDTV market, MPEG-2 BC, formally called MPEG-3, supports up to 5 main channels, a low frequency enhancement channel and bit rates up to 1Mb/s. MPEG-2 BC allows lower sampling rates of 16, 22.05 and 24 kHz for bit rates from 32- to 256kb/s for layer I or 32- to 160kb/s for layers II and III. MPEG-2 technology is widely used for the distribution of broadcast quality audio and video.

MPEG-4 is a newly defined standard that adds features to enhance its multimedia capabilities. Look for a new standard, MPEG-7, to be introduced in the near future.

Field	Description
Sound Information	Homogeneous or non-homogeneous sound data and related information
Frame Size	Defines frame size when using homogeneous files
Ancillary Data Length	Sets the available space within a sound file reserved for ancillary data use
Ancillary Data Definition	Specifies the type of ancillary data

Table 2. The MPEG Audio Extension chunk.

Broadcast Wave format

The Broadcast Wave Format or .BWF is intended to work entirely within the framework of the existing RIFF/WAV formats. It does this by applying some restrictions to the original WAV format and adding additional chunks that are used to provide specific information required in professional audio environments.

The primary addition is the *Broadcast Audio Extension* chunk that contains information used in all professional audio productions applications. Table 1 defines the individual elements of the format.

In the case of MPEG coded data, two additional chucks are used. The "fact chunk" stores information relative to the contents of the WAV file, such as the length of the sampled files. The MPEG "Audio Extension" chunk is used to further define MPEG coding options. Some of the information within this specification is detailed in Table 2.

One advantage of applications designed to read RIFF formats is that they will ignore those chunks that are not recognized. Manufacturers designing applications that use the BWF can still maintain any information that they feel is proprietary within a particular chunk, while maintaining a high level of interoperability using other chunks.

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

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FCC Update

Noncommercial licensing scheme adopted

By Harry Martin

Licenses for noncommercial TV and radio stations will now be awarded under a point system that the FCC has adopted. The new system favors local applicants and those with few stations. It replaces the time-consuming comparative-hearing process and was selected instead of proposed lottery and first-to-file systems.

The FCC will begin accepting NCE applications for full-service stations and FM translators during filing windows. Although it has not yet announced the opening date of the first window, the FCC has said it will not accept applications for new and major changes to NCE stations on reserved channels until then — except for applications filed in response to previously announced cutoff periods that have not yet closed.

Under the window-filing system, unopposed applications will be granted automatically and the winner among competing applicants will be determined by *a fair distribution analysis*. This means the proposed station serves populations receiving limited or no other NCE service. If that factor does not apply, the new point system will be used. The applicant with the most points under the following criteria wins the following:

Diversity of ownership. The principal community contour of the proposed NCE station does not overlap the principal community contour of any commonly controlled broadcast station (2 points).

Technical parameters. An application covers 10-percent greater area and population than the next-best proposal (1 point), or an application covers 25 percent greater area and population than the next best proposal (2 points).

Localism. An applicant is physically headquartered, has a campus, or has at least 75 percent of its board members residing within 25 miles of the reference coordinates of the proposed community of license (3 points).

Statewide network credit. The applicant is a public or private entity that either has authority over a specified number of accredited schools in a single state or works with the entity that has authority over those schools and regularly provides educational programming to the schools (2 points).

If there is a tie under the point system, the permit will be awarded to the applicant with the fewest existing stations authorized in the same service (e.g., NCE-FM). If that does not break the tie, the applicant with the fewest pending new and major change applications in the same service will be the determining criteria.

A four-year holding period applies once a permit is awarded. During that time, the winning entity must retain the characteristics under which it received the permit. The permit or license may be transferred only under the following conditions: 1. If the transferee would receive at least as many points under the system; and 2. The permit is sold for an amount not to exceed expenses.

The new NCE standards had been under consideration since the commission put the NCE comparative hearings system on hold in 1995. During that time, consideration of the new standards was embroiled in conflict between public radio stations and religious broadcasters. Consequently, the final rules did not adopt the proposed preference for applicants receiving government funding, which would have favored public radio broadcasters over religious broadcasters. In addition, the rules do include all accredited schools, rather than only public schools, under the state network preference.

$4,000 fine for $2 on-air prize

An FM station attempting to capitalize on the recent popularity of a TV game show sponsored a contest called *Millionaire Monday*, in which it offered listeners the opportunity to become millionaires. However, what the station failed to disclose was that the contest winner would be given one million Turkish lira, the equivalent of $1.90. This case is similar to one earlier this year in which a radio station failed to state that it was offering its prize in Italian lira. In both instances, the FCC fined the stations $4,000 for failing to accurately and fully disclose a material term of a radio contest.

Also, a radio broadcaster was fined $19,000 when a former employee reported the station to the FCC, prompting an investigation. The FCC found the station was operating with unauthorized studio-transmitter links as well as several other violations, including failure to broadcast required station-identification announcements and the use of a long-wire antenna for AM broadcasts.

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

Dateline

Radio stations in the following states must place in their public files and on their websites their first *EEO Public File Report* by August 1, 2000: California, Illinois, North Carolina, South Carolina and Wisconsin. The reports must cover EEO recruitment from April 18 (the effective date of the new EEO rules) to July 31, 2000.

You want to hear something? Let's Talk

By Chriss Scherer, editor

Technically speaking, what makes one of the most popular formats work?

Talk radio is one format that lives on despite cultural and social changes. In fact, the events that challenge other formats serve to reinvigorate talk radio. A basic understanding of talk-radio tools will suffice in music-oriented formats, but success in talk radio rests on a refined knowledge of the equipment in question.

While music-based formats rely on repackaging audio content, talk-format content is created on the fly. A topic can be determined in advance, but the magic is in the spontaneity of the host and guests. The starting point for talk radio is the microphone. Without a good-sounding host, nothing else matters.

Picking up sound

Your choice of mic should be based on the environment and the user's skills. A highly directional mic or a host who moves around and turns his or her head will not pick up the host well, just as an omnidirectional mic in an ambient-noise environment may pick up too much room noise. Some hosts prefer a particular mode for its sound. Some stations use a single, standard mic for the entire facility. Use the same criteria for mics that you use for other station equipment. The equipment should fit the situation rather than vice versa. (For a complete explanation of various mic patterns and characteristics, see The Right Mic, *BE Radio*, February 2000.)

In most cases, a cardioid studio mic will be the best choice. Also, use the same mic for the host and the guests, unless differing models are chosen for a particular reason. Using the same mics in the studio results in a consistent sound from one person to the next.

Using a mic processor is also wise. The voice is capable of a wide dynamic range. Although most studio mics can faithfully reproduce this range, chances are your main on-air processing or board operator will have to work to keep up with these dynamics. If there are multiple audio

sources, the task will be even more difficult. The mic processor will usually be set to compress the mic signal and perhaps some general gain reduction as needed. Most processors also offer some equalization. Use the controls judiciously; too much processing can produce interesting effects but may also result in an unnatural sound.

Some hosts are more animated than others and do not like to sit in one place while they work. Others may move their heads excessively and take themselves off the mic's axis. To remedy these problems, use a headset mic for the host. A headset will follow the host's movements and make it nearly impossible for him or her to be lost. Headsets can be especially helpful if the host is watching many guests or controls during the show.

In-studio guests present another problematic situation. Not every guest is familiar with proper mic technique. People who do not speak into mics are often afraid of them and thus speak more softly than usual. It may be necessary to use an end-fed mic instead of a side-fed one. Their smaller profile can be less intimidating. Another idea is to use tabletop mic stands instead of boom arms. Although these are less flexible, their smaller hardware should set guests at ease.

Another option is using lavalier mics for guests. These mics are similar to headset mics in that speakers cannot get away from them. The difference is that, once it is pinned on, most people forget they are wearing one (although they are quickly reminded if they try to leave the room with it on).

When using mics, keep in mind that acoustic problems should be solved acoustically. If guests cannot be heard, have them speak up or move closer to the mic. If a mic is picking up too much unwanted sound, move the mic or the unwanted source, or point the null of the mic toward the unwanted source.

Helpful electronics

When multiple mics are used, it can be difficult for the board operator to accurately control the level of each one at any given time. Unused mics will also pick up room ambiance, which can degrade the sound of other mics. Use an automatic mic mixer that can automatically mute channels when a mic is not being used. These also perform basic level control for each input.

Earlier, I mentioned using a mic processor. Another way to keep all the mics in check is to use the sidechain of the processors. Link the host's mic processor to the guests' mic processors so the host signal will duck the guests' audio slightly. This allows the host to retain control even when all the guests are shouting. With this configuration, the host can at least announce a break and then remedy the situation off-air.

Let's go to the phones

A staple of talk radio is listener calls. Quality audio from a reliable on-air telephone system is essential. There are two critical parts in an on-air telephone system: the switch and the hybrid. In some systems, these parts are integrated. In others, they are separated. The function of the switch is to handle the routing aspects, including screening, putting the call on hold and picking it up on the air. The hybrid is the audio interface. Analog telephone calls have both sides of the conversation on a single pair of wires. The hybrid acts as a two- to four-wire interface, separating the received and sent audio signals. Telephone systems can be configured to handle multiple callers at once, which is convenient if you want to take calls with a guest who is also on the phone.

Hybrids are available with features and prices ranging from basic analog designs to complex digital versions with DSP power. The more advanced units constantly monitor the telephone call and make minute adjustments to compensate for level and frequency response. Recently, systems have been introduced that work with

The talk studio should be comfortable for guests and still provide the host all the needed tools. Above, the computer monitor is used for call screening.

Let's Talk

ISDN and other high-capacity telephone services.

When designing a talk studio, consider installing a telephone monitoring system. By having the caller audio available on a small speaker monitor, the people in the

Automatic mic mixers like this unit from Shure provide consistent audio levels and reduce sound from unused mics.

studio do not have to wear headphones all the time, especially guests who are not accustomed to the radio environment. I mentioned before that some guests are afraid of microphones. These same people are even more intimidated by hearing their own voices through headphones. Removing the headphones will make guests more likely to converse with the host rather than focusing on what they hear in their headphones.

Speaking of headphones, you should have two separate headphone feeds established. One feed, for the guests, will have only the program audio on it. The other feed, for the host, will include an IFB for host/board operator communication.

To make sure each caller has something to add to the

show, each call should be screened before it is put on the air. A call screener will answer each call and assess whether the caller has a relevant comment and is suitable to be put on the air. Some creative methods have been used to convey information to the host, from sticky notes on the studio glass to basic terminal programs with a screen splitter to display data for the host. Call-screening software can make this process much smoother and faster.

The software usually integrates into the telephone system. As calls come in, the program indicates which line has been ringing the longest. It can also indicate which caller has been on hold the longest. Callers can be prioritized and updated quickly. The software will also automatically refresh and indicate when a call is active, then reset when

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Let's Talk

the caller hangs up. Many screener programs allow some basic text messaging as well.

The call-screener program can display information about the caller to aid the host. Some programs also offer database functions so you can track frequent callers or avoid problem callers. Some read caller ID data to further streamline the process.

Many factors can influence the selection of a microphone for a talk show. A headset mic may offer a more consistent sound and give the user more freedom to move.

Oh @#%&!

One of the biggest concerns in live radio is profanity. Callers, guests and even hosts sometime forget their manners and let something slip. In these cases, a profanity delay is cheap insurance.

The concept of time delay can be difficult to understand. Board operators and on-air talent should be familiar with how the system works. Modern systems can build time up and down for a simpler transition in and out of delay. Use of a profanity delay also requires a monitor feed that comes before the delay device.

While much of the equipment needed for a talk radio format can be found in almost any other format, the demands of the talk-radio format are often greater because the equipment is under constant use.

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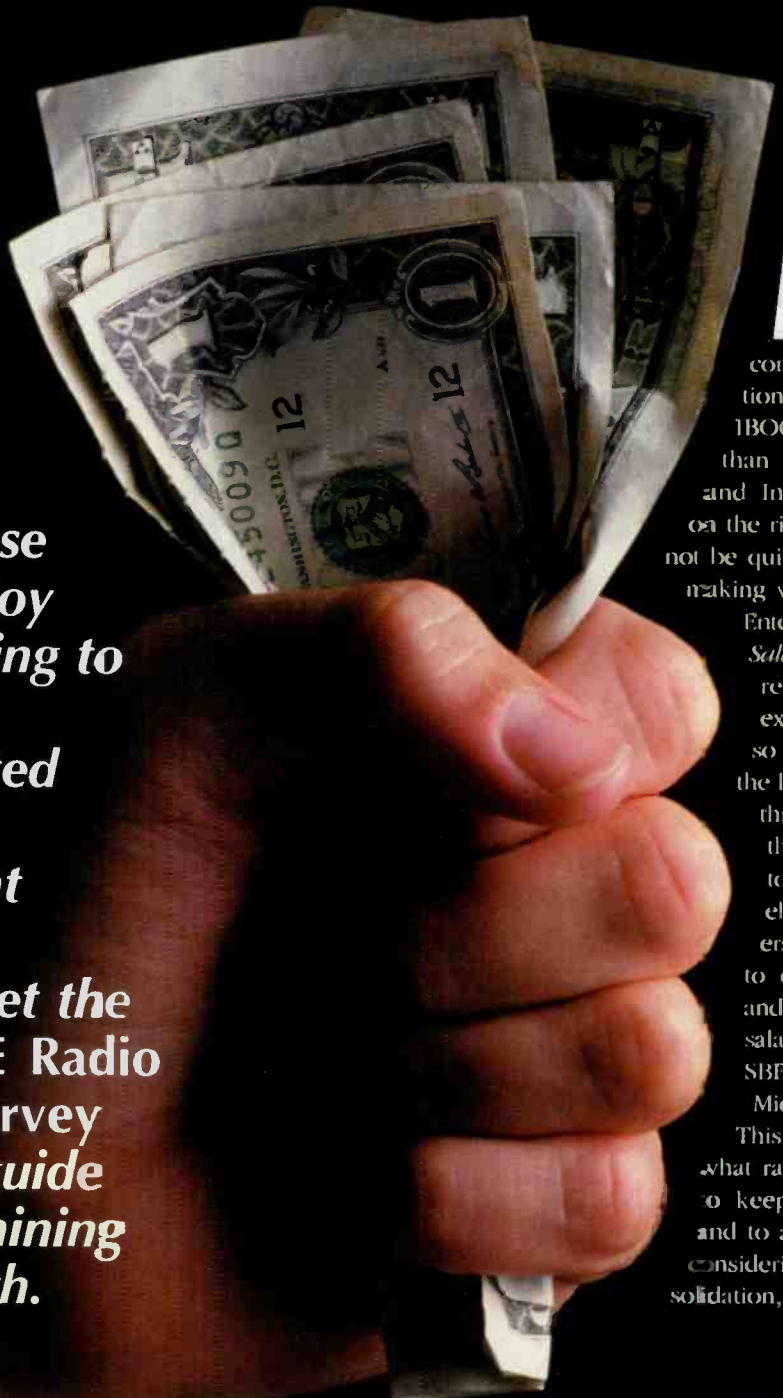
2000 SALARY SURVEY

By Dana Martin, associate editor



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webcasting and satellite digital radio. We also asked what changes engineers anticipate in the radio industry in the next five years.

The method

Cover letters and questionnaires were mailed to 1,200 *BE Radio* subscribers selected on an *nth*-name basis among radio station and network subscribers. This year, letters were also sent via e-mail to 5,800 additional *BE Radio* subscribers to inform them of an online version of the questionnaire with an electronic link to the survey. There were 890 usable surveys returned, with a response rate of 36 percent for the mailed surveys and 8 percent for the online surveys.

The survey targeted three groups: station management, staff engineers and contract engineers. For analysis, each of these groups was broken down into one of two MSA rank groups: top 50 or below top 50. Response subcategories are delineated as follows: 391 station managers (101 top 50, 290 below top 50); 357 staff engineers (193 top 50, 164 below top 50); and 71 contract engineers (24 top 50, 47 below top 50).

The information gathered in this survey is intended to illustrate broad trends in the radio industry and is not meant to be used as the sole source for determining salaries. We recommend treating the data as a starting point for salary ranges. Factors like cost of living and the demand for a particular job are also important in determining the salary range for a position.

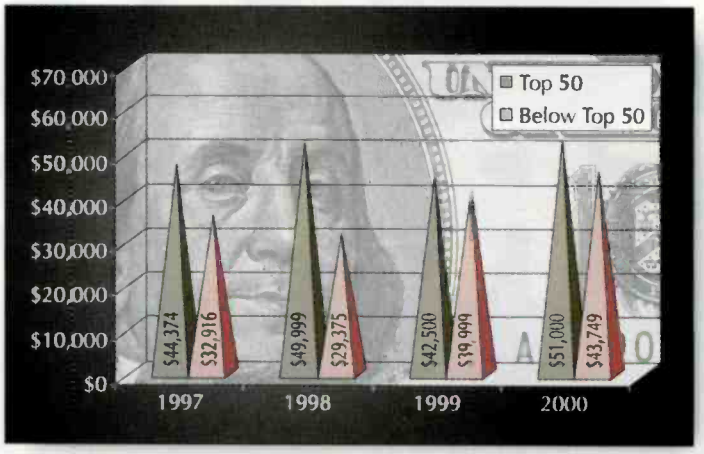

Figure 1. Estimated median salaries for station management.

The law of averages

Station management median salaries have increased in 2000 in both large and small markets. In 2000, the estimated median salary for station management is $51,000 for the top 50 market, compared with $42,500 for this market in 1999, an increase of 20 percent. The below top 50 market also saw a gain, though a more modest one.

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This group's median salary rose 9.4 percent, from $39,999 in 1999 to $43,749 in 2000. You will notice in Figure 1 that the median salary for the station managers in the top 50 group is about what it was in 1998, having recovered from its 1999 slump. In contrast, the below top 50 market has been rising steadily since 1998.

One word can be used to describe the salary trend for staff engineers over the last year: constant. Instead of seeing steady gains, the salaries for staff engineers have remained fairly even. In fact, these salaries have experienced a slight decline since 1999, falling from $59,444 to $57,894 for the top 50 group and from $42,500 to $39,230 for the below top 50 group (decreases of 2.6 percent and 7.7 percent, respectively). The steadfast nature of staff engineers' salaries has held true since 1997.

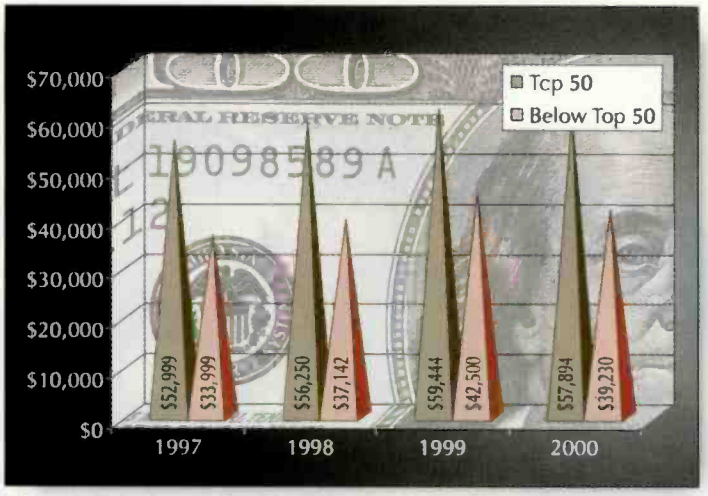

Figure 2. Estimated median salaries for staff engineers.

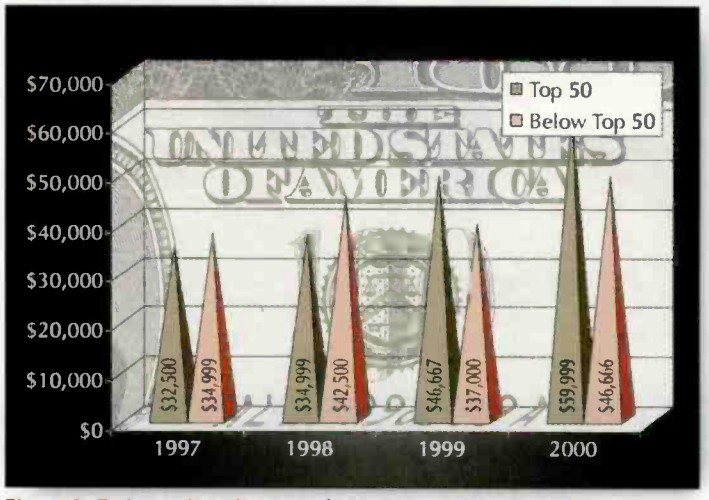

Figure 3. Estimated median salaries for contract engineers.

Growth from 1997 to 2000 has averaged a scant 2.3 percent per year for those in the top 50 market and a modest 3.9 percent for those in the below top 50 market. (See Figure 2 for more information on median salaries for staff engineers.)

Although the pay for some positions has held steady, others are experiencing quite a boom. Contract engineering salaries have, on average, increased 59 percent since 1997 (84.6 percent for the top 50 market; 33.3 percent for the below top 50 market). During the last year alone, salaries for the top 50 contract engineering market rose 29 percent, while the below top 50 market saw an enviable 26 percent median salary increase. For the below top 50 market, this year's upswing is mitigated to some extent by last year's 13 percent decline in pay (from $42,500 in 1998 to $37,000 in 1999). Because of this

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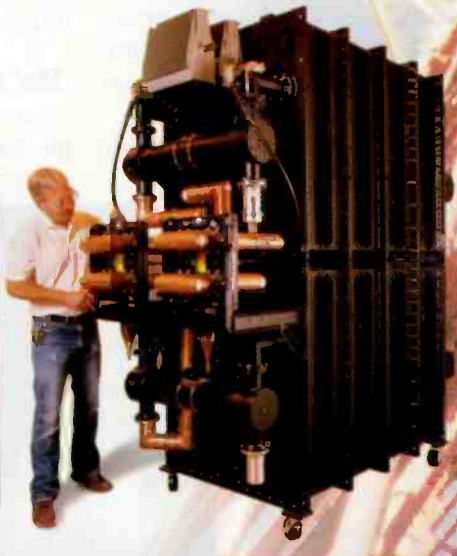

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2000 SALARY SURVEY

slump, the overall increase in earnings from 1998 to 2000 for the below top 50 market is a more equable 9.8 percent (see Figure 3). Top 50 contract engineers, in contrast, seem to have unbounded earnings potential. Their only constant has been an uncanny rise in pay since 1997.

To certify or not to certify?

We've come to a question engineers may pose from time to time: Does it pay to hold SBE certification? Looking to the oracle of the salary survey, the answer is an unequivocal "Yes." Not only has the number of SBE certified engineers increased, so have their salaries.

This year, 36 percent of engineers are SBE certified. This number is not as high as the 1997 figure of 41 percent, but it is up from last year's calculation of 34 percent and level with 1998 (see Figure 4). To break the figure down, 38 percent of contract engineers are certified, as are 36 percent of staff engineers.

This body of certified engineers is being rewarded for obtaining certification. SBE certified staff engineers earn 16 percent more than those who are not certified. The average earnings for staff engineers in the above and below top 50 markets is $48,285 (as derived from Figure 2). The median earnings for certified staff engineers for both market categories is $53,333, well above the average. Contract engineers fare the best in this category, too. Those who hold certification earn an incredible 55 percent more then their noncertified colleagues (see Figure 5).

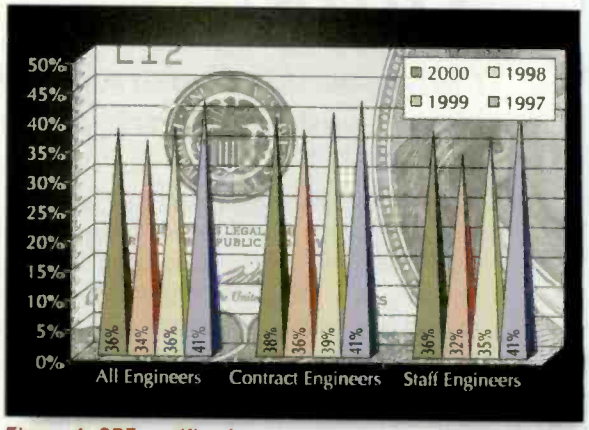

Figure 4. SBE certification.

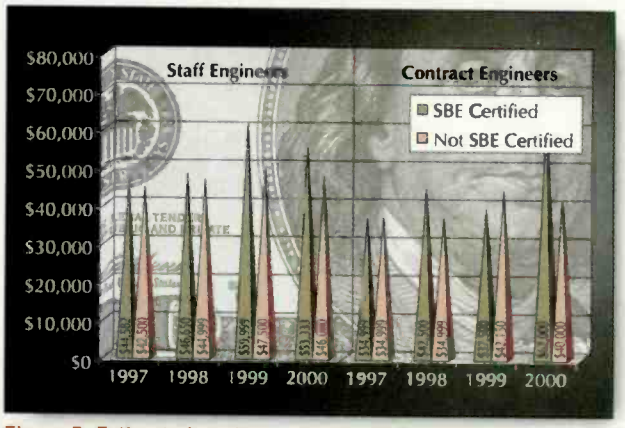

Figure 5. Estimated median salary by SBE certification.

Mo' money

Did you receive a salary increase in the last 12 months? That's what we

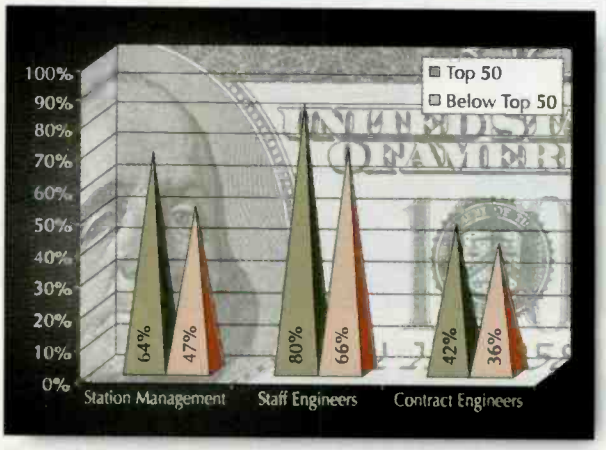

Figure 6. Respondents receiving salary increases.

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asked our respondents, and many answered "Yes." Though their increases were modest, staff engineers were the most likely to receive an increase. Eighty percent of those in the top 50 market and 66 percent of those in the below top 50 market got a raise within the year. Station management in the top 50 and below top 50 markets fared slightly worse. Sixty-four percent and 47 percent, respectively, received a raise. In this category, the contract engineer fares the worst: 42 percent of those in the top 50 market and 36 percent in the below top 50 market saw increases in their paychecks (see Figure 6).

Median salary increases were modest, ranging from 4 percent to 5 percent. Contract engineers and station management saw a median increase of 5 percent, while pay for staff engineers rose by 4 percent.

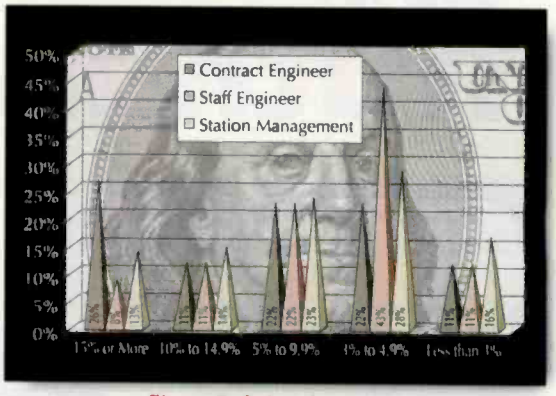

Figure 7. Salary Increases.

A clean, well-lighted place

We asked engineers what organizations are doing to attract new talent and retain existing staff. Items that topped the list include continuing education and training, a competitive salary and benefits, hiring additional personnel to reduce workload and offering an up-to-date, attractive work environment.

What comes across as a common theme is the fact that radio engineering is fast becoming an area of specialization that requires technical and computer savvy as well as design and management skills, all in addition to the ability to keep the station running on a day-to-day basis. As a result, employees are harder to find and keep, and more employers are doing what it takes to keep talented staff persons around. Sadly, we still received numerous write-in answers in which respondents indicated nothing was being done to attract new personnel. As one respondent put it, "Natural attrition is working."

The complete results of the 2000 BE Radio Salary Survey *are available for $50 each. E-mail beradio@intertec.com for more information or fill out the reader service card.*

See a sampling of write-in answers on the website. More information on Novell, NARET and Microsoft certification is available in the report.

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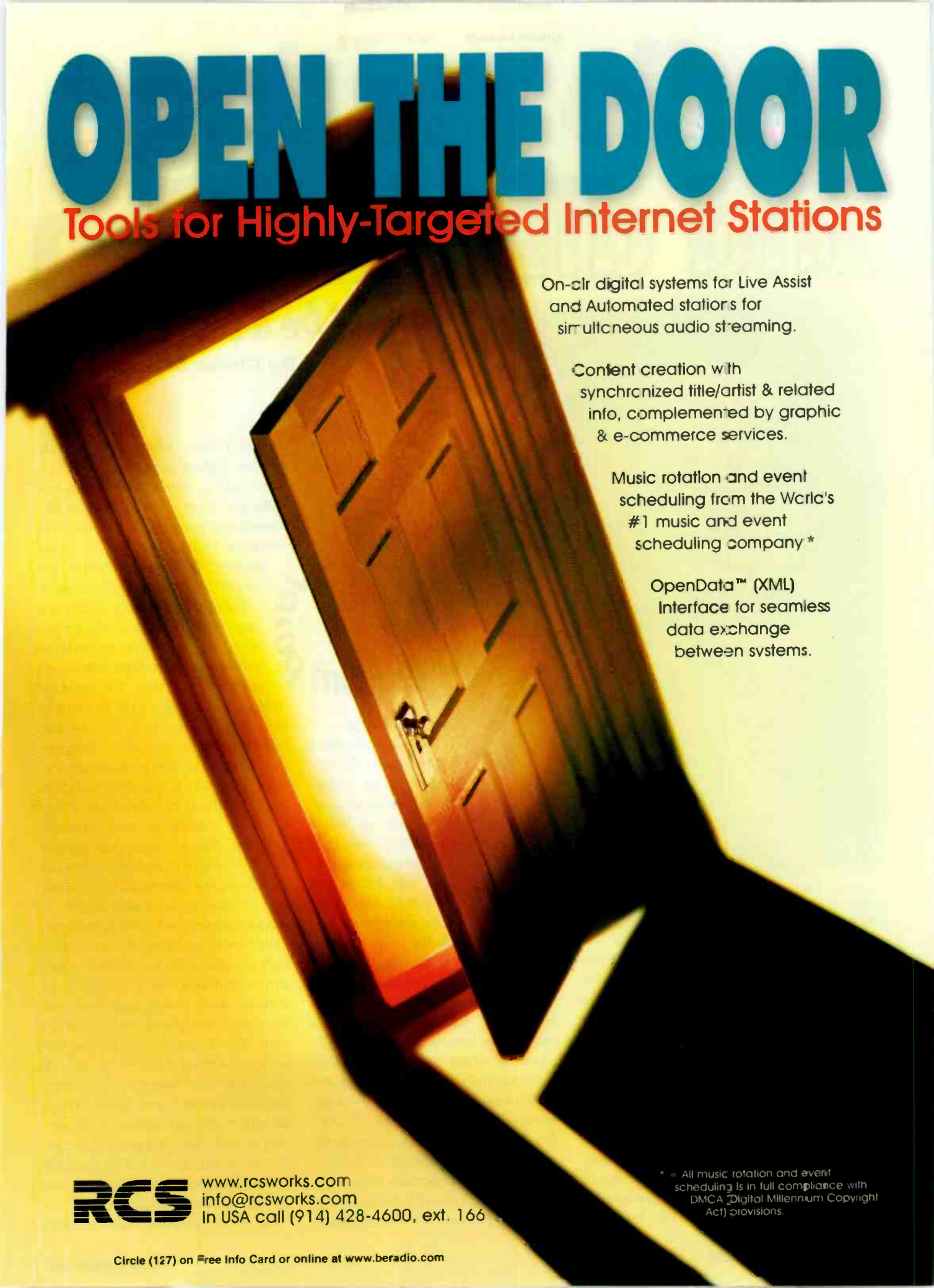

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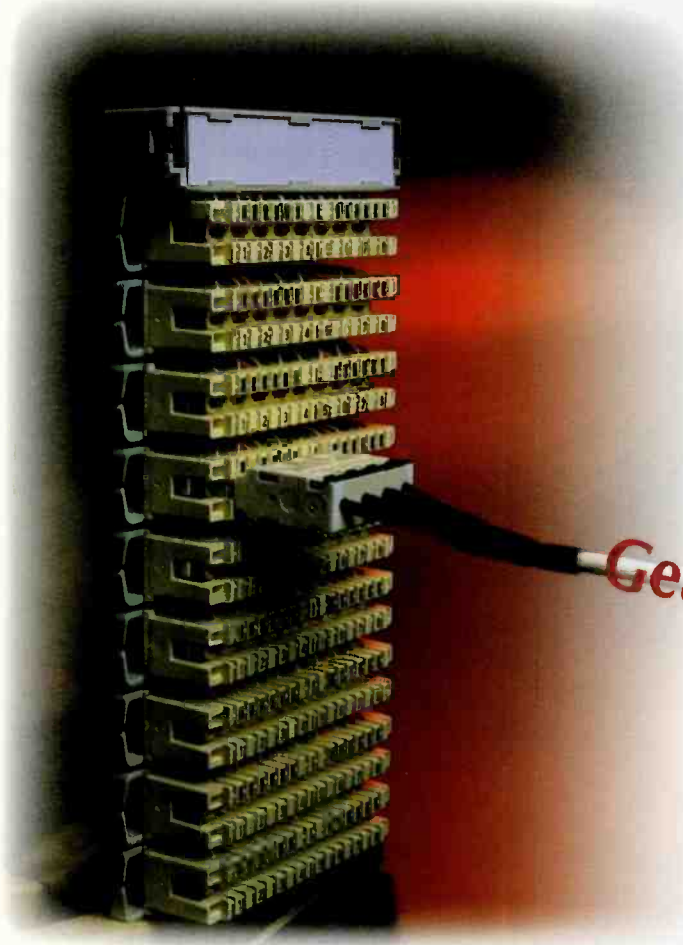
Audio routing and distribution

Getting from point A to point B may not be a straight line.

By Chriss Scherer, editor



The method of terminating punch blocks has improved, as has their performance. Shown is a Krone Series 2 block. A version is also available that will mount on a standard 66 block.

Even the simplest radio operation needs an established system for manipulating the flow of signals, whether those signals are maintained within a single room or shared throughout a multiple-studio facility. There are many ways to handle this routing, from basic wiring to fully integrated routing switchers.

Most facilities today have some combination of analog and digital sources. It is important to remember that analog wire is not good for digital applications, but digital wire is the best analog wire you can get.

There are two digital wiring-plan choices: balanced or unbalanced. Balanced digital signals will follow the AES-3 standard. Unbalanced digital signals will follow the AES-3ID standard. Your equipment will likely determine which you use. Converting from one format to another is not difficult, since the signals are identical. The difference is the characteristic impedance and voltage level (see Figures 1 & 2).

In cases where the equipment uses balanced and unbalanced signals, the choice may be determined by considerations specific to the type of cable, the connectors needed or the method of multiple termination. Coax is typically more expensive than twisted-pair wire. Cost and installation time also vary. Because of the proliferation of CAT-5 cable, twisted-pair currently has the highest penetration.

For cable connections between different parts of a facility, multiconductor cables are the obvious answer. Digital versions of twisted-pair and coaxial cables are available for any application.

Cable termination is a concern any time multiple conductor cables are used. For twisted-pair cables, insulation-displacing punch blocks are popular. The standard telephone-company style 66 block is by far the most common. They are also readily available and rather inexpensive. They work well in many applications if the wire is prepared and carefully punched into the fork. Other types are available as well: Northern Telecom offers a variation called a Bix block, Assembly Connection offers the FlexiBlock first introduced by Gentner, and German manufacturer Krone offers an updated punch-block variation.

Bix blocks and FlexiBlocks feature truly parallel forks so multiple wires can be punched onto the same point without them being squeezed out. They also work well with stranded wire. The Krone blocks fit into the same mounting bracket as the 66 block and offer twice as many connections in the same space. There are other improvements on the design as well. Other impact-style products are available, including the QCP connection from ADC, typically found on the company's patch bays.

The AES-3 standard calls for 110Ω

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cable with a tolerance of ±20 percent. This range is rather large by comparison, but it allows the cables to span from to 88Ω to 132Ω. CAT-5 cable, which is specified at 100Ω ±15Ω, falls almost completely within the range of the AES-3 standard. The low end of the CAT-5 specification is outside of the AES-3 range, but most quality CAT-5 cables will not be pushed to the limit's extremes. One product has gained considerable attention for its use of CAT-5 cabling for audio applications: the StudioHub from Radio Systems. Termination blocks, called hubs, can accept connections on RJ-45 connectors or 110-style punch terminals.

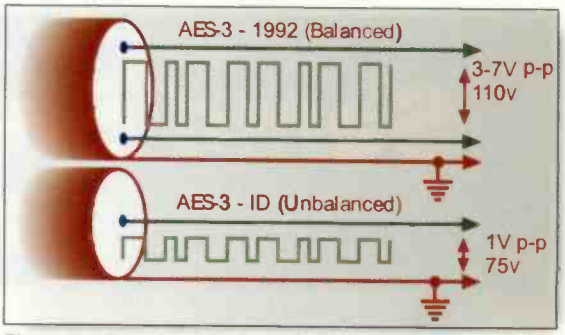

Figure 1. The AES-3 electrical characteristics. While the data itself is the same, the characteristic impedance and signal level are different.

Patch bays, once the prevailing method of signal routing, are being replaced by routing switchers. Despite being an older technology, patch bays still have practical uses.

More than just cable

The wiring is only part of an audio distribution system and offers point-to-point, usually fixed, connections. There are other devices that handle routing, switching and distribution.

Distribution amplifiers are used in many point-to-multipoint applications. Until the wide acceptance of routing switchers, DAs were the most common method of multiple routing. One drawback is that each connection requires its own discrete cable run. For sources that are shared throughout a facility, this can use a substantial amount of resources. Some application, however, are still best-served with DAs. Off-air monitor feeds are one example. Another application is a single tuner feeding multiple EAS decoders. In situations where the flexibility of switching is not required, a DA is an excellent choice. They are available

Do More, Spend Less

"Scott Studios Saves My Stations $45,000 per Year"

Doug Lane, owner and GM of WWDL (FM), WICK (AM) and WYCK (AM), Scranton and Wilkes Barre, PA says he "saves more than $45,000 per year with Scott Studios' Voice Trax automation. While the investment was major for a small family company like ours, *the pay back was fast and real*. And the savings are year after year after year.

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"We use several independent announcers to record Voice Trax for us, along with our regular staff. Even me! We operate both live assist and automation."

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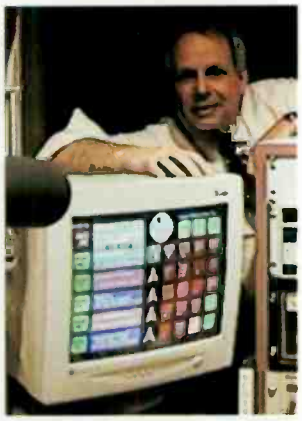

Doug Lane, Owner and GM, WWDL, WICK and WYCK, Wilkes-Barre and Scranton, PA

Doug's stations have used Scott Studios' Voice Trax systems for many years.

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After a year of trouble-free operation, Doug Lane says, "It was fun to get five calls at the studio over the Holidays from out of town PD's and GM's wanting to speak with me because they heard me 'on the air'. Guess what? I wasn't even there! They were amazed at our Voice Trax and Scott's accurate Time Checks too. Actually, they were 'very impressed'!

Doug is now installing Scott's automated temperature announcer. He says, "Scott's features are great. The savings are even better! I wouldn't want to run my stations without Scott Systems!"

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Audio routing and distribution

for analog and digital applications.

The oldest and most recognizable method of routing audio signals is the patch bay. This technology is still common in most facilities. Because they are passive, there is no chance of patch bays failing from an electrical problem. However, the patch bay is completely mechanical, which presents its own set of challenges.

Format	Cable Type	Impedance	Connectors	Amplitude
AES-3	Twisted-pair	110Ω	XLR	3-7V p-p
AES-3ID	Coax	75Ω	BNC	1X p-p

Figure 2. Comparison of AES-3 and AES-3ID standards

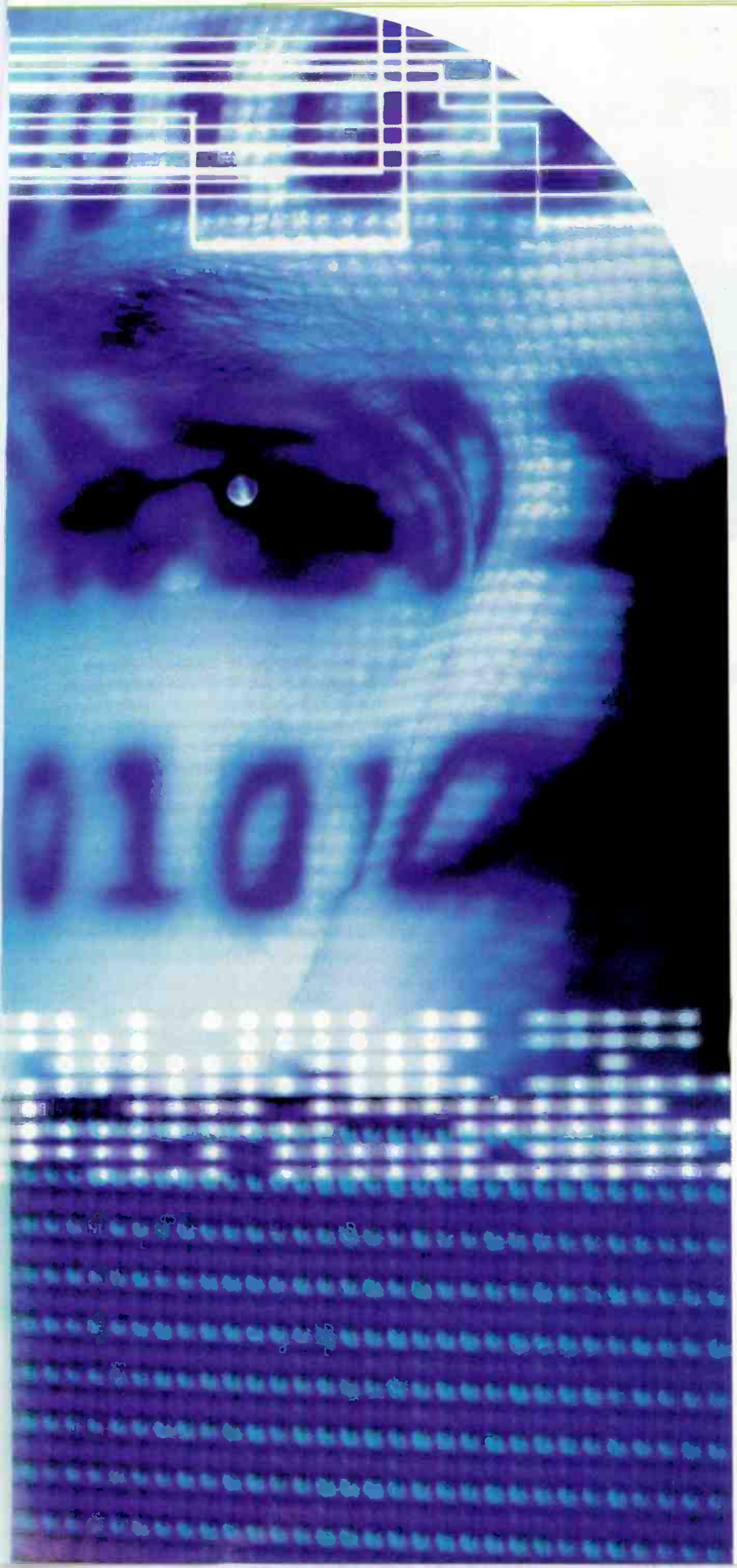
Patch bays are effective in smaller applications where routing requirements are minimal or are not routine. A patch bay can be set up to allow visualization of a linear path. This can make patching around a device easier than moving input and output cables on equipment or an elaborate switching arrangement.

Most larger facilities use a routing switcher as the main means of audio routing. The hardware cost and setup may appear to be costly, but changes and additions to the wiring plan are simplified, and additional switching capability can be easily added.

Newer audio console designs have taken the routing-switcher idea to a new level. Two approaches are now available. The first brings the power of the controllers to the console surface. This allows the selected audio source name to be displayed on the console. Multiple source selections can be programmed into the console. Furthering this idea, the console surface itself can become a router controller. Rather than bringing all of the audio sources from the routing selector in the rack room to the studio and then back to the rack room, the console surface acts much like a computer keyboard. No audio, with the possible exception of monitor feeds, passes through the console surface.

New console designs have integrated routing functions as part of the console, whether it is displaying router data, like the Wheatstone D-700, or acting as a control surface for an audio engine, like the Audiotronics NuStar 4.0.

Photo page 54 courtesy of Sierra Automated Systems and KABC.



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The portable people meter

By Chriss Scherer, editor

A new way to track listening.

Forget the paper and pencil, the research on a more accurate ratings method continues.

For years, radio ratings have rested on the paper forms listeners complete. Stations have built advertising rates and made plans based on these ratings reports. There is, however, a certain amount of built-in error with this method. A listener may not always have the reporting form, called a diary, handy. Some listeners also do a great deal of station hopping in search of suitable listening. Completely accurate listening diaries are atypical. Arbitron has acknowledged that the existing method is not perfect and has begun work on a more reliable, modern system: the *personal people meter (PPM)*.

Technical overview

In 1992, the personal people meter project was started to make it easier to track the media choices of survey participants. The goal was to have an automatic measurement system that required no user intervention beyond carrying a monitoring device the size of a standard pager.

Electronic metering systems have been considered in other media. An example in television is a device that monitors which channel is being viewed. The goal of the PPM project is to develop a system that tracks the listening habits of a person rather than tracking the devices themselves.

During PPM's eight years of development, there have been two field tests in Manchester, England. These tests took place at the end of 1998 and the end of 1999/beginning of 2000. The field trials had more than 200,000 encoder hours of operation in the U.K. The first test had a sample base of 50 participants. The second test used 300 participants. The researchers received favorable results and have decided to bring field tests to the U.S.

In the fourth quarter of this year, field tests will begin in the Philadelphia market. At this time, the participating stations have not been determined, but Arbitron reports that, among station managers and programmers, interest is high. The participating stations will likely be determined at the end of the summer.

The field tests will come in two phases. The initial deployment will use 300 meters in Wilmington, DE, part of the Philadelphia metro ratings area. Late in 2001, Arbitron plans to begin increasing the sample to cover the entire Philadelphia market.

Station equipment

Participating radio stations will install a device called a *studio-grade encod-*

Photo: The complete system, showing the SGE, PPM, base station and hub. The SGE shown here is an older, 4RU version.

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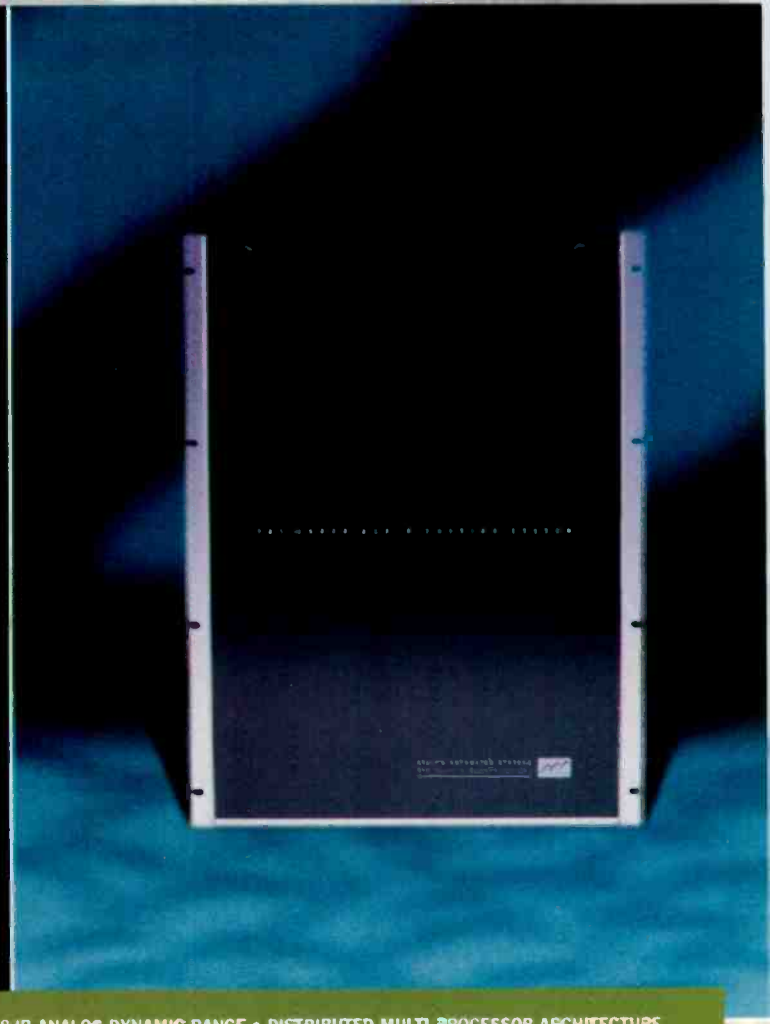

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BROADCAST & COMMUNICATIONS

Another first: Arbitron *Internet Listening Study*

By Dana Martin, associate editor

The first undertaking of its kind, the Arbitron *Internet Listening Study I: Radio in a new media world*, was completed in October 1999. The survey provides multiple insights into current and future online listening trends. The complete study is available online at www.arbitron.com/studies1.htm#ils1. Three other Internet studies — *Internet Listening Study II: Radio and e-commerce*, *Internet Study III: Broadcasters vs. webcasters: Which business model will win?* and *Internet Study IV: The buying power of "streamies"* — are also available at the above site.

The listening study identifies several challenges for radio. Among these are the fact that Internet users spend 12 percent less time listening to the radio. Further, 25 percent of Americans are interested in the concept of digital satellite radio, and 17 percent of Americans feel their local radio options do not match their musical tastes.

On the plus side, radio stations stand to profit from the Internet, as long as they play their cards right. First, webcasting will likely boost at-work listenership. Second, online listening could actually enhance the number of hours listeners tune in a particular station: The survey shows that most Americans want to listen online to the same station they tune in on traditional appliances.

But online listenership won't come easy. You can't simply replicate your programming on the Net, at least not if you want to keep up with Internet-savvy listeners. This audience wants all of the perks that come with online listening. These include access to information on products and services that the radio station advertises, advertising coupons (40 percent of respondents showed an interest in this form of e-commerce), and local shopping information. Nearly half of all listeners are interested in buying products and services from a station's site. Besides being convenient for listeners, these elements will also help the station make money and enhance its relationships with advertisers.

6.1 meter
4.5 meter
3.8 met.
3.1 meter
2.8 meter
2.4 meter
2.0 meter
1.8 meter
1.2 meter
1.0 meter
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The portable people meter

er (SGE) in their audio chains. The SGE inserts an inaudible signal into the audio path. This encoded signal is then received and decoded by either a studio-grade decoder or a PPM.

The inaudible codes are within the audio range and are created by using an Arbitron-patented psychoacoustic masking methodology called *critical band encoding technology (CBET)*. ID codes are only inserted when program audio is present. The design goal of the system is to insert the codes without affecting the quality of the transmitted audio signal. The encoding and decoding process was developed by Arbitron with the assistance of Lockheed Martin.

The encoded data stream will only contain station information for the first Philadelphia tests. Multiple levels of encoding are being considered but will not be used in the version being tested. The capability exists to include additional data, such as time and date stamping and station programming information. It will be determined later what information would best be to include in the data stream for the final system.

The SGE can interface to balanced analog audio, AES-3 or AES-3ID signal paths. The SGE is placed in the audio chain based on the criteria outlined in an installation manual prepared by Arbitron. Ideally, the SGE is installed as the last element in the signal path, after any compression or equalization. The tests in England and at the Maryland facility show that the encoding also works with aggressive processing.

In the analog audio SGE, program audio goes through a passive summing network in which the code is added, without A/D or D/A conversion. The digital audio SGE passes the AES format signal through a *first in, first out (FIFO)* process, where the code is added in the digital domain without any conversion to analog.

The base station recharges the PPM and downloads its data.

The system delay for both units is a constant 20.833µs. Bypass circuitry uses a power-off relay that completely bypasses the SGE circuitry.

The encoder is installed at the distribution source. The 19-inch rack unit provides continuous, real-time stereo encoding of program material as it is broadcast. This equipment is self-monitoring to ensure continuous op-

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The portable people meter

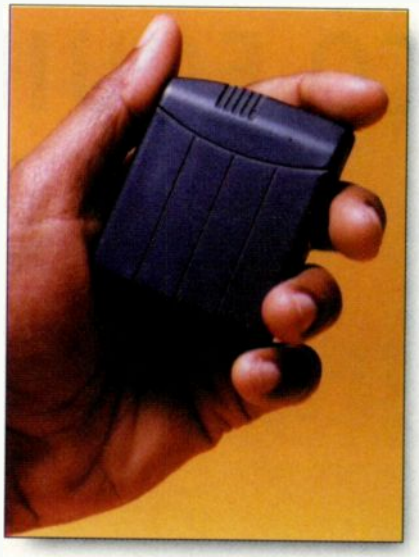
eration and noninterference with the broadcast. Arbitron is currently designing a multichannel unit for applications such as cable television and satellite radio systems to avoid the need to install large numbers of encoders to handle all available channels.

The system has been tested with and will work on AM, FM and Internet audio paths. It has also been tested with TV audio. A joint agreement between Arbitron and Nielsen will also make the system available for television use.

For the listener

The PPM detects and processes acoustic signals and identifies codes from any audio source encoded with the SGE. Detecting these codes allows identification of the source of the signals. These PPM units detect and record the station identifier and the time the listener was exposed to the media source. This information is gathered and processed by Arbitron to produce the ratings results.

The PPM is a pager-sized device worn by a survey participant throughout the day. It automatically detects inaudible codes that radio, television and cable providers embed into the audio portion of their programming using encoders provided by Arbitron.



About the size of a pager, the PPM is designed so participants can easily carry them all day.

The PPM itself contains a sensitive pickup device and DSP decoder to analyze the received audio and detect the ID codes. The unit has enough memory to store at least one day of event codes. It operates on a rechargeable battery with a charge capacity for at least one day of operation.

To prevent a user from falsifying readings, the PPM is equipped with a motion detector. A green LED indicates activity. This motion detector helps ensure that a survey participant is indeed wearing the PPM during the day. The motion detector can sense the slightest movement. Motion detection is performed over an interval of time rather than instant-by-instant.

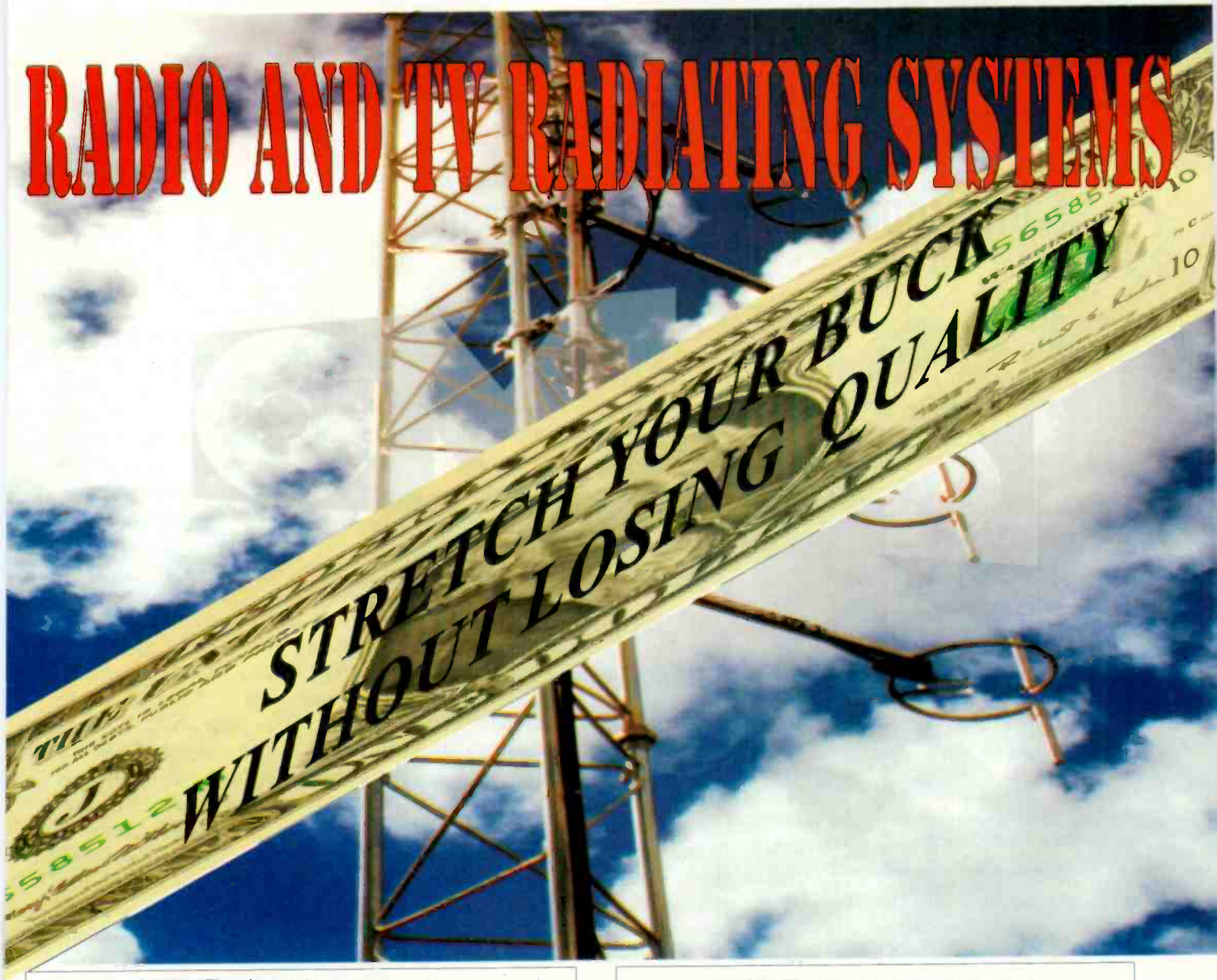
At the end of the day, the survey participant places the PPM in the base station, which extracts the recorded data (identification codes and motion data) and passes it on to the household hub through household wiring. The hub then sends all of the data to the Arbitron central computer system over the telephone line. The base station also recharges the device. Both the base unit and the hub have been designed for ease of installation and ease of use. To further simplify using the PPM, survey participants are given three simple instructions: Take your meter with you, keep the green light on and recharge your meter at bedtime.

The hub has an LCD screen that can display simple instructions and system status information as well as giving the survey participant feedback. A point system has been developed to track how long the PPM was in motion during the day. These points are used to determine the incentive paid to respondents.

Arbitron recently built a critical listening room to be used in the development of the next generation of audio encoders for the PPM system. It is housed in Arbitron's research and technology center in Columbia, MD. The PPM project is a work in progress, and this listening room is another step in perfecting the system.

Thanks to Thom Mocarsky, vice president of communications, and Dave Forr, manager of encoding operations for Arbitron for their assistance in preparing this article.

RADIO AND TV RADIATING SYSTEMS



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Field Report: Prime Image Cash

By Doug Irwin

Cash is a self-contained, single rack-unit device that serves one purpose: to squeeze *X* plus *Y* minutes of program in to *Z* minutes of real time. The point, of course, is to allow for more commercial time during a program of known length. The unit accomplishes this by way of a proprietary time-compression algorithm that does not change the pitch of its output. Specific parameters (*original program time*, referred to above as *X*; and *insert time*, referred to above as *Y*) are preprogrammed into the unit (resulting in total running time, *Z*).

Performance at a glance

- Easy-to-use front-panel controls
- RS-232 and external tally remote control
- Single rack unit, self-contained
- XLR balanced ins and outs
- Increases commercial inventory

When activated, by either the front-panel controls or the remote control, the output of the unit will be silent for the entire insert time. After the insert time has passed, the time-compressed program appears at the output of the device. Cash can be installed either on the input side of the console, in series with the program source that will be time-compressed, or on the output side of the console. Both input and output connections are XLR balanced.

Installation

With a typical broadcast console, Cash would be fairly easy to install and operate simply by making use of the remote controls and tally outputs from the console. Figure 1 shows a simple installation. The program one source feeds the commercial material that will be added to the hour. This material is routed to the transmitter via one input of a downstream mixer or router. The program two source is the audio to be time-compressed. This source is routed through the unit and then into the second input of the downstream mixer or router.

Figure 2 shows the timing of remote-control pulses used to start the two program sources as well as the time-compression function of the unit. The operator can press one button that has three, one-shot outputs: one that starts the program-one source, one that starts the program-two source and one that starts the time-compression operation.

The hold function is quite easy to use as well (see Figure 3 for an illustration of how to do this). When the operator plays commercials during the show, the tally output of the module through which the commercial material is playing can be used to generate a hold closure to ground on the unit's remote-control connector. While the hold contact is pulled down, the unit will suspend the time-compression function, allowing, for example, 30-second spots to come out of the unit at 30 seconds in length.

The most critical aspect in the use of Cash is that of time. The user must know the exact length of the material that will be compressed as well as that of the material to be added. Otherwise, there will be awful-sounding collisions in the combined program at or near the end of the insert period. For this reason, the Cash is ideally suited for use when the exact length of the program material is known in advance.

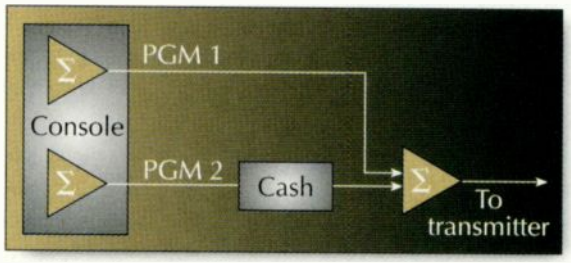

Figure 1. A basic installation using two output buses.

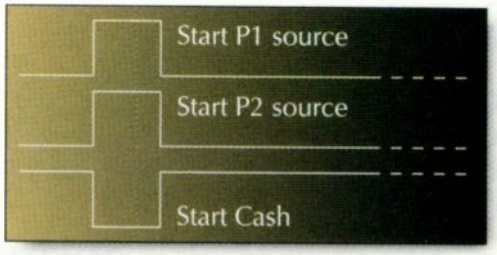

Figure 2. A single tally command can be used to start the three events for using Cash.

On-air

Typically, Cash installations are in-studio, where the front panel is accessible to the operator. The remote controls referred to above are accessible via a DB9 connector on the rear panel of the unit. Cash can also be programmed and controlled via the RS-232 connector on the rear panel using the rackmount remote control the manufacturer offers.

Some time prior to the beginning of a program, the operator enters the *program time* (the known length of the program that will be time-compressed)

and the *insert time* (the known length of the material that will be added). Additionally, the amount of *hold time* anticipated should be entered in the unit. This figure is needed so the unit will be able to perform the necessary amount of time-compression in the time allotted, which is the program time minus the hold time and the insert time.

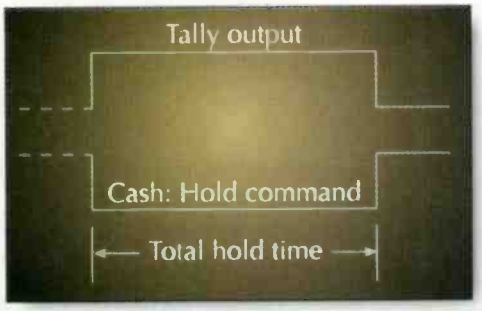

Figure 3. The hold command will suspend the time-squeeze operation.

A simple example is in order. If the program time is 58 minutes, then the operator programs this number into Cash via the front-panel pushbuttons and the control knob. Further, if the time to be inserted is 2 minutes, the operator uses the front-panel buttons and the single control knob to set that parameter. Finally, the hold time is entered in a similar fashion. Cash has four available presets, all accessible via the DB9 remote control, so that (up to) four sets of parameters can be preprogrammed and used over and over again.

Overall performance

For music, any *Q factor* (i.e., quality factor) lower than 81 is unacceptable. The effect you will notice is an audible increase in the tempo as well as what can best be described as wandering in the tempo. At Q levels of 89 and higher, I did not perceive that the unit was working at all.

You can definitely get away with more when running plain speech through the Cash. I found that the quality of the output was still acceptable when using Cash to "add" 10 percent to the program in question (i.e., the ratio of insert time divided by program time is 0.1).

Overall, I am impressed with the construction of Cash. The enclosure is made of thick steel, and the manual is concise yet thorough. If you want to be a hero to your station's sales management, Cash warrants your immediate attention.

Doug Irwin is director of engineering services for the AMFM cluster in San Francisco.

Note: This Field Report was prepared by using the unit offline. Audio sources for the evaluation included music and speech from recorded and off-air sources.

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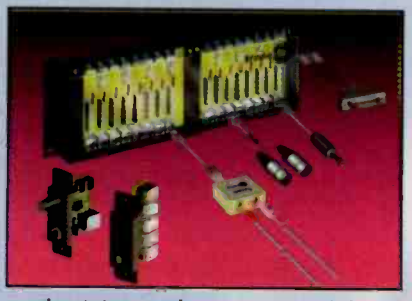

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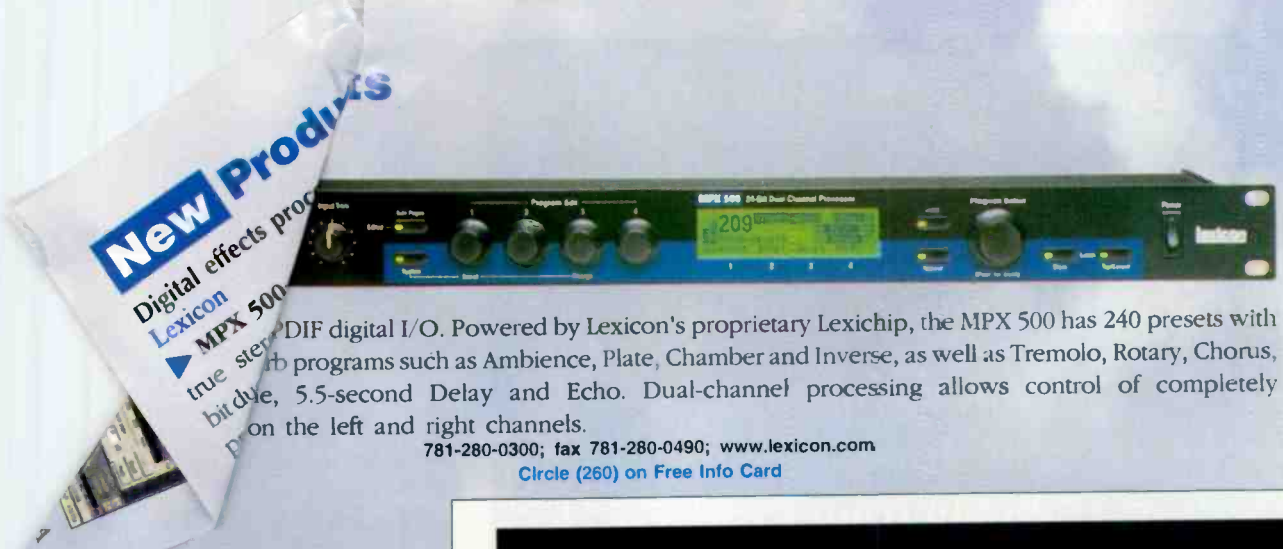

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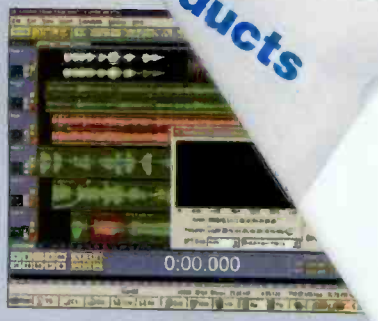

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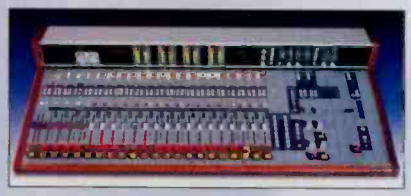

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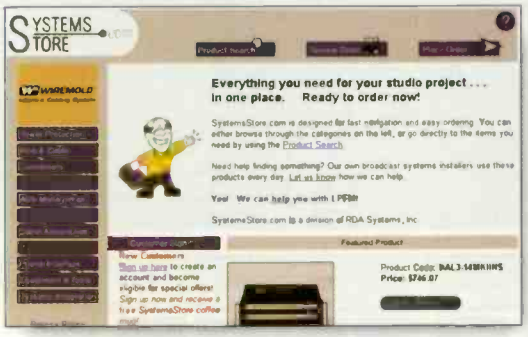

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Clayton McMillan
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Living on the edge

By Skip Pizzi, executive editor

Today's DSL lines and cable modems may soon be joined by broadband wireless services. As home networks penetrate domestic media systems, broadband connectivity demands will soar, with multiple streaming-media offerings simultaneously delivered to different receivers around the house via broadband — or so the hype tells us.

There are no problems with this scenario at the consumer end. Such systems are working relatively well already and will only improve over time. Nor is there any insurmountable difficulty at the streaming source, as some broadcasters are already aware. Each content provider must simply scale up to the demand required, using decentralized hosting resources (to avoid the clogging of a single site). Rather, the ultimate technical obstacle to a broadband streaming-media future is the Internet itself. Using even the rosiest projections of capacity growth, the Internet will have difficulty supporting a widespread, broadband streaming-media future.

Using even the rosiest projections of capacity growth, the Internet will have difficulty supporting a widespread, broadband streaming-media future.

Assume that a CD-quality audio service requires a 100kb/s stream and that a popular, globally accessible stream of this quality may attract 100,000 simultaneous users. The 10Gb/s of resulting traffic from this service alone would occupy more than 5 percent of the entire Internet backbone. Today's state-of-the-art long-haul connections (OC-192) are nearing the edge of optical physics and are not likely to be pushed much further. Even allowing for some growth if a single, popular channel takes up anywhere close to 5 percent of the Internet's capacity, the broadband promise of a nearly infinite number of high-quality media channels will certainly be hard to realize.

Promises, promises

Observers of streaming media might ask, "What about Multicast IP?" Although a worthy concept, Multicast IP never worked well outside of a LAN, and its replicating servers could not be implemented across *National Access Points (NAPs)* — the Internet gateways, or *peering points*, between large service providers' physical networks. This severely limited its effectiveness and, although it could reduce bandwidth requirements at the last mile, Multicast IP is now considered a nearly defunct concept.

Others might question how important it is to bridge these gateways. After all, aren't most users connected to just a handful of dominant service providers and therefore sitting inside network boundaries where such choke points will not affect them? Surprisingly, this is not the case. If you measure Internet traffic by the bit, not by the user, no single network is dominant. In fact, only 10 networks worldwide carry more than 1 percent of Internet traffic on a given day, with the biggest networks carrying only 6 percent of the total Internet traffic. The rest of the traffic is spread across hundreds of other, smaller networks. This implies that the vast majority of traffic crosses through peering points between networks. These peering points and the Internet backbone itself are significant obstacles to an unfettered broadband streaming-media future.

Solutions

Several companies have begun addressing this problem, proposing edge servers as a solution. Simply stated, streaming-media content providers would deliver their content via dedicated connections to host servers that lie as close to the user as possible. Thus, the first and last miles of the broadband path are connected via a route that bypasses the Internet's congested gateways and long-haul paths.

Both terrestrial and satellite paths have been proposed for these discrete routes, but the solution is not easy to implement. Experts estimate that as many as 10,000 to 15,000 edge servers would have to be placed among ISPs worldwide for maximum effectiveness. These servers would then have to be reliably fed with content, effectively managed/routed/load-balanced and adequately maintained — no small feat.

These basic architectures seem strangely familiar: central content depots feeding thousands of distributed outlets via dedicated paths. Perhaps the hierarchical broadcast distribution model isn't as archaic as some Net-gurus have pronounced it. The ultimate solution to broadband streaming media may take elements from both old and new models, applying the intelligence of virtual data-piping algorithms to more traditional physical distribution methods. Nevertheless, broadcasters should take note: There may soon be an edge-service provider on your vendor list.

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