November 2001
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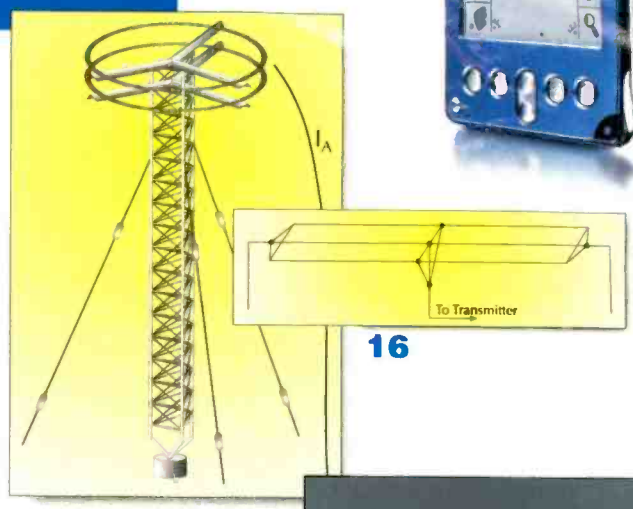
Contents

BE Radio
www.beradio.com
November 2001
Volume 7, Number 12

FEATURES

10

COLUMNS



16

24

DEPARTMENTS

40

ON THE COVER: Clean digital audio goes beneath the clean exterior. Photo of Q101 Chicago courtesy of RAM Broadcast Systems. Cover design by Michael J. Knust.

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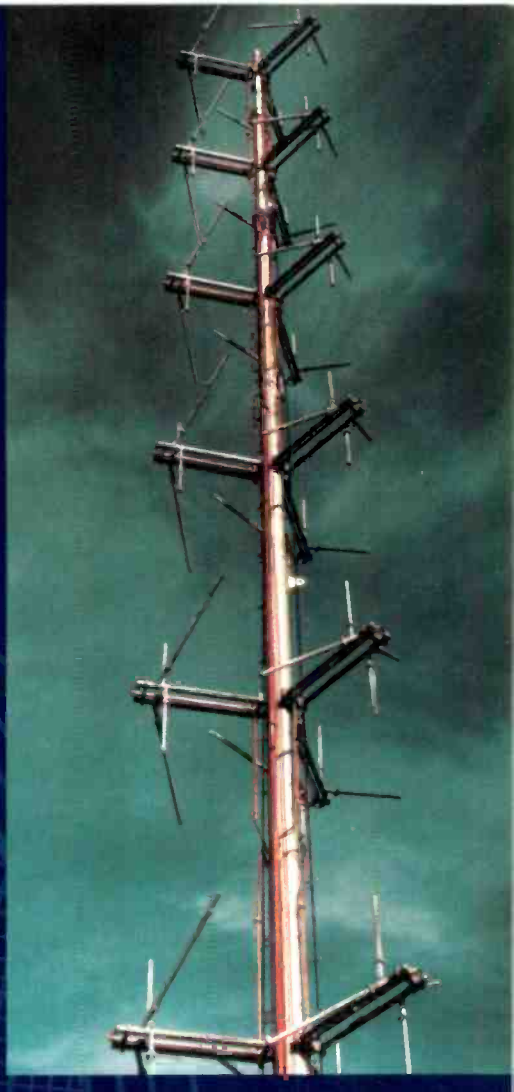

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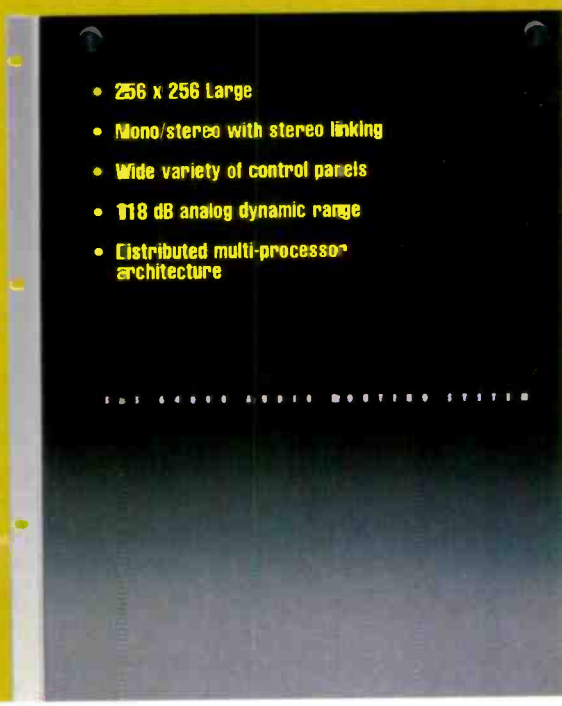
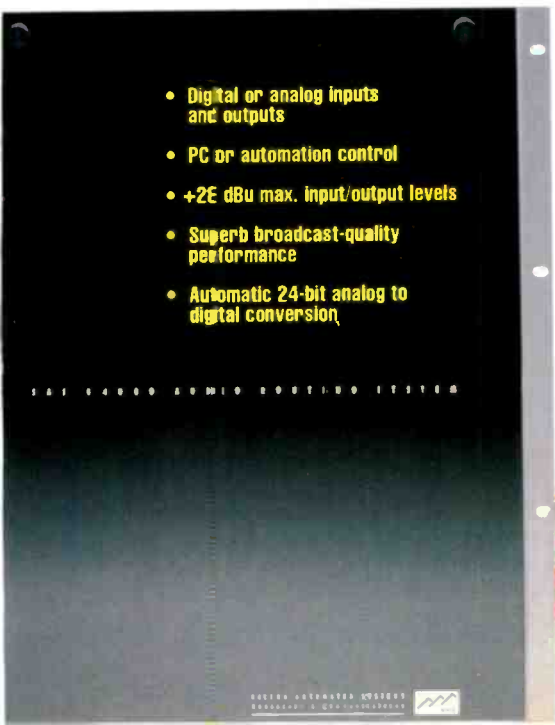


SAS64000 AUDIO ROUTING SYSTEM

OUTGOING



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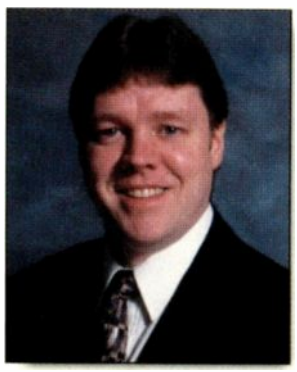
The show might go on

Last month I wrote about the role that traditional broadcasting played in relaying information when many newer technologies could not keep up with the events of September 11. Just days before that event, I was putting some thoughts together about another event that took place earlier that same month: the NAB Radio Show.

Conventions and conferences are a vital part of any industry. They provide an opportunity for the various sectors of that industry to gather and exchange ideas in both directions. Manufacturers and service providers learn the needs and desires of their customers, and the purchasers can comparison shop and learn about emerging technologies. A successful convention requires the presence of both parties combined with the services of the host. In the case of the NAB Radio Show, problems are on the rise.

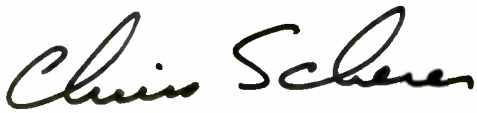


Like blaming the host for a bad party, it's easy to blame the NAB for the poor showing. The costs to exhibit continue to rise. The show attendance continues to drop. (The NAB needs to begin counting true attendance at the conventions and not just report the registered attendance. The real attendees are the tire-kicking public attending the sessions and planning equipment and service purchase decisions on the show floor, not the exhibitors, exhibitors' guests, show-floor visitors, working media and trade press, and more. At any given NAB convention over the past four years, I have held from three to as many as seven registrations because of my various affiliations. I should count only as one at the most.) The argument that a show attracts quality attendees and not just quantity only goes so far. At the rate things are going, the quantity of quality is dropping as well.

The NAB Radio Show has felt pressure since it returned after the demise of the World Media Expo. Smaller, regional shows are gaining in popularity and quality. Justifying a trip half a continent away is difficult when quality exhibits and sessions are being presented a few miles down the road. The cost to attend a regional show, both in travel and registration, is typically much lower if not free. Regional SBE conventions and state broadcast association conferences have grown, and ARMA has already held four conventions. Unfortunately, the ARMA convention scheduled for this month had to be canceled—which I attribute to the change in attitude towards flying, the state of the economy and the timing being so close to AES and several SBE regional conventions.

So what will save the NAB Radio show? I have heard some people speculate that the NAB wants to end the Radio Show completely. While it is not the profit center that the Spring convention is, it provides a value and service to the radio station members and radio equipment manufacturers and service providers.

All three sides need to rethink their portion of the Radio Show puzzle. Timing the event away from a federal holiday and controlling the costs to the exhibitors and attendees is a good start. Another step would be for stations and corporate owners to allow their employees to interact with others in their industry to learn and exchange ideas that will help the bottom line.



Chriss Scherer, editor
cscherer@primediabusiness.com

Streaming audio and more

The BE Radio website is a resource that you can use every day. We strive to make it valuable to you in many ways by providing the articles you find in each printed issue in an online form and as a searchable archive, by providing tools you can use in many ways including the Demo Room, the Engineer's Notebook and online radio stations ratings, and by presenting online-exclusive articles and information in the BE Radio Currents Online and the Studio Spotlight.

To bring you even more from our website, BE Radio has collaborated with SystemsStore Radio to provide a voice to the BE Radio Currents Online. Now you can listen to the latest radio technology headlines as part of the regular webcast from SystemsStore Radio at www.systemsstore.com. In addition to being broadcast throughout the day, the BE Radio Currents Online Webcast is also available on demand through the SystemsStore site.

The BE Radio editorial team and our contributors are active in radio, and now BE Radio is not only discussing Internet radio technology on a regular basis, we are actually working with it and creating it.

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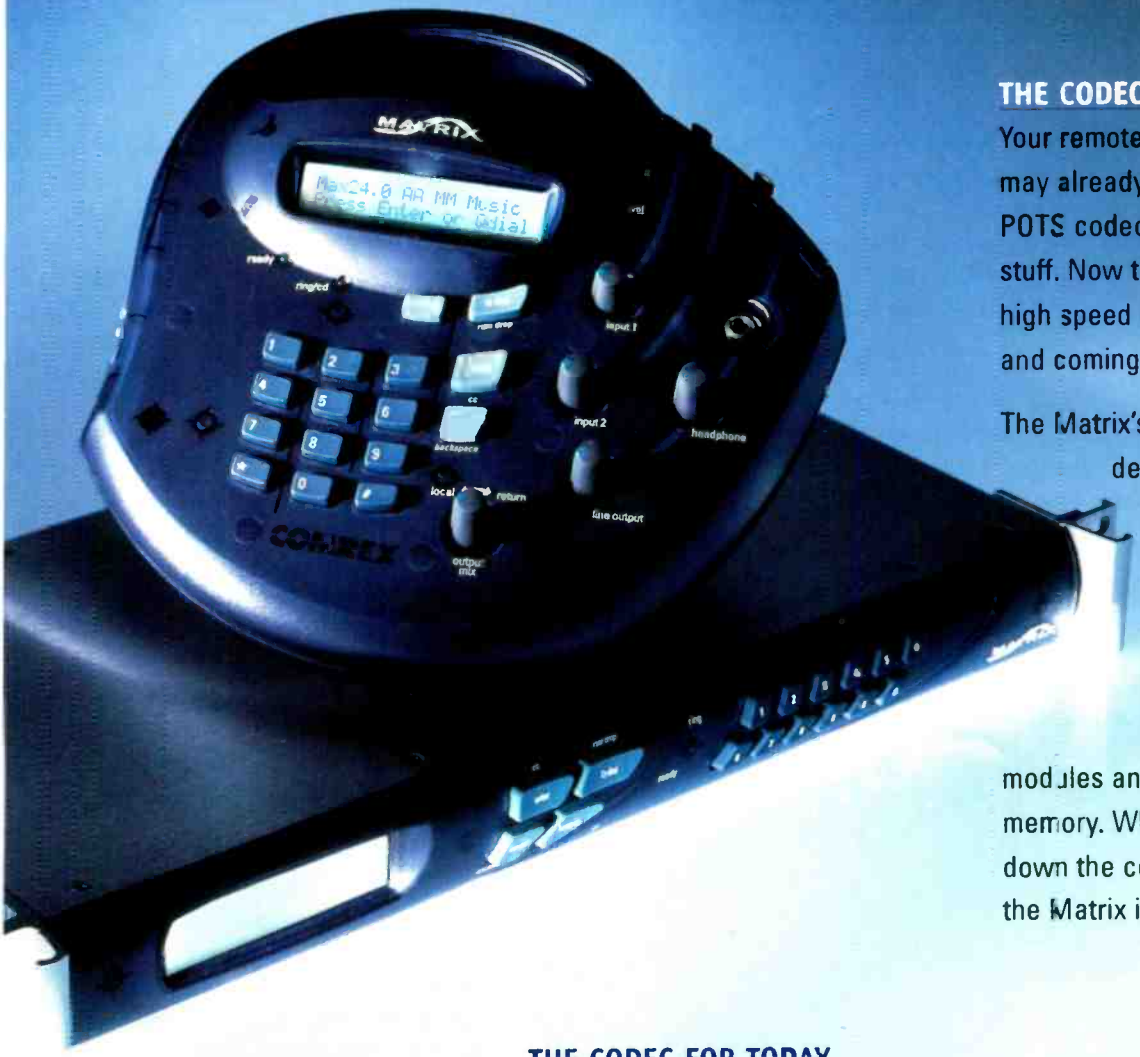

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- Layer III for 15 kHz at 64 kb/s
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Balancing your workload

By Mark Krieger, CBT

With all the hats contract engineers have to wear (and bear), it sometimes feels as if juggling is our primary occupation. This month we'll conclude our series on the business aspects of contract engineering by exploring some techniques that may help restore equilibrium to your demanding schedule.

Organization

Nothing is more essential to effective time and task management than having ready access to resources. After all, the art of organization is nothing more than arranging these things in such a way that you can find them quickly. For broadcast engineers, this particularly applies to information (contact information and reference sources), tools and parts.

In terms of day planning, contact information and record keeping, the advent of personal digital assistants (PDAs) and palm computers have made a huge difference in how much manageable information one person can carry around. When it comes to reference materials, such as catalogs, online or CD-ROMs are definitely the way to go.

PDAs and laptops have provided a simpler means of organizing and retrieving data such as parts lists, inventories and address books.

Many current equipment manuals are now available on CD-ROM as well, making the laptop PC an indispensable tool for information management in the field. As a complement, a decent document scanner along with a CD-ROM burner at the office will allow you to catalog many older schematics and drawings, allowing you to print copies wherever and whenever you need them. Add a digital camera, and you will have the ability to record, carry and reproduce a variety of image files to aid in later recall of exactly how things looked, were connected, or were arranged.

Tool and material management have also undergone some major changes in the last 10 years. Toolboxes and parts carriers have gotten larger, lighter, stronger, and much more versatile. In this sense, at least, organizing has never been easier.

Setting priorities

Good organization allows you to operate efficiently and productively, but it's really only half the battle. To budget your time most effectively, you need to take regular inventory of all the tasks facing you in order to develop and set a realistic set of priorities. Priorities are essential to the decision-making process because they largely dictate the order in which we process tasks.

Be sure, however, to be thorough when considering the task list. Some tasks *must* be accomplished before others take place or before others can be started. Thus, they must be assigned an even higher priority. The scientific treatment of this process is known as critical-path analysis, and it is widely used in industry to sort out just these kinds of issues. Flowcharting is one way to "map" priorities in a way that allows you to analyze detailed task lists while notating dates by or on which key steps must be taken.

While there are a number of software packages that allow you to do this, a pencil and pad can also effectively serve. Keep a copy of these charts and consult them regularly to keep them up to date.

Planning the logistics

Logistics, as any military planner will tell you, is a combination of science, hard work, and pure artistry. Logistics involves figuring out ways to shorten processes, eliminate duplication, and figure out how to kill two birds with the same proverbial stone.

Strike one, you're out.

A single bolt of lightning can throw you off the air for hours — even days.

Even if your grounding exceeds minimum requirements, you could be in for some major league problems. One New England TV station lost $140,000 in equipment costs, plus untold amounts in revenue, from lightning damage. A midwestern FM station was tossed off the air for several weeks, costing them thousands of dollars. And lightning doesn't affect just commercial stations. Virtually every transmission tower — whether for police and fire stations, 911 call centers or telecommunications — is at risk.

The only way to play it safe is to upgrade your grounding system to 1-5 ohm resistance, as recommended by IEEE. At a fraction of what it would cost to repair and replace damaged equipment, you can get a correctly sized, properly installed copper-based grounding system. It's what these two stations did. And lightning hasn't been a problem since.

Learn how to protect your station from striking out — get our Power Quality CD-ROM and case histories today. Call CDA at **888-480-4276**. Or visit us at ***http://powerquality.copper.org***.

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For example, let's say you get an emergency call to service a transmitter at a location that is a one-hour drive away. Before you go flying out the door, take just one minute to stop and consider if there might be any other tasks that involve travel in the same area, such as picking up parts or performing an inspection. This is where superior organization kicks in to help you to quickly find ways to double-up on non-productive drive times. By carefully planning efficient ways to deliver manpower and resources to the job, you'll find plenty of opportunities to save time and money. Equipment rentals and parts orders are just a couple of areas that often benefit from the conscientious application of this technique.

A scanner, CD burner and a digital camera can be valuable tools for effective organization and record keeping.

Serving your most important clients.

The ability to organize, prioritize and plan strategically is essential to freeing up our most irreplaceable resource: time. But equally important is the need to budget time to our most important clients, our loved ones and ourselves. A station owner I once worked for (now a multi-millionaire) once advised me to "always cut your own best deal", and I have tried to take his advice to heart. The point here is that human beings are high-maintenance items. You need to *make* time for your family, for exercise, for education and for play. These, after all, are the reasons we have careers to begin with, and to ignore them is akin to neglecting the foundation of a house while mending the roof.

We all have the need to work a sixty-hour week occasionally, but this should be the exception rather than the rule. If you find otherwise, you can rest assured that there is a problem somewhere. If this is the case, it's time to place finding and fixing it at the *top* of your priority list. That's what balance is all about.

Mark Krieger, BE Radio's consultant on contract engineering, can be reached at mkrieger@drfast.net. He is based in Cleveland.

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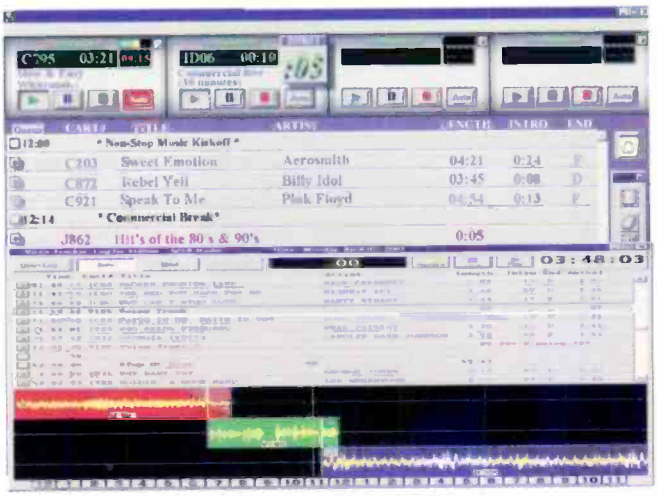

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The Web for profit

by John Caracciolo

As the economy continues its downturn, and radio revenue continues to decrease, station managers must use all their powers and all the tools at their disposal to increase the bottom line. Unfortunately, it now appears that the worst case is a reality, with even greater downside potential if future events cause greater disruption to the economy.

This is wartime economy, and broadcasters are the most negatively affected business. We are totally dependent on advertising and entertainment revenues for our livelihood. The advertising marketplace was already in a slight decline before the tragic events of September 11, but the incremental loss is staggering. Experts predict that total advertising spending for 2001 will be down more than 6 percent, with radio down more than 7.5 percent. In addition to the decline, most radio sales executives are reporting a feeling of awkwardness when discussing advertising with clients, and some clients are concerned that the public might perceive them as greedy or opportunistic for continuing to run a radio schedule. Today's broadcast manager is faced with the enormous task of maintaining profitability in a fragile economy and an unstable world. We must use every tool available to us.

Radio and the Internet compliment each other better than most other media combinations.

Let's go to the Net

The Internet is still in its shake-out stage. Gone are the days of projected budgets of seven figures for your web site. But the Web can still be a source of additional income for your broadcast station with very low overhead and costs.

At Jarad Broadcasting we use the radio stations to drive traffic to our site, but instead of site advertising, we are using a separate marketing concept that could survive on its own. By looking at the entire picture of our company rather than looking at the Web as a separate revenue business plan, we are using the Web as a profit line on our station's budget rather than a separate business budget.

Classified advertising

Classified advertising in our local paper is huge—more than $700,000 a week. Radio needs to get some of that money. Unfortunately, a byproduct of an economy like this is higher unemployment. Radio, and a creative radio spot, will drive your listeners to your classified Web page. Use the radio station's unused inventory to drive traffic to your website's classified page. Don't use the radio spot to sell, just use it to drive the listeners to the site. Produce a sixty-second spot that jumps out and moves listeners to log on. Make the spot a rotator that has the same copy, but change the tag line so every company that buys a classified Web spot is mentioned. You are selling a package deal. The key to the success of this program is a good high frequency radio schedule using your unused inventory. Use a large portion of your unused radio commercial inventory. Your big sell to the companies is the $50,000 radio package that you are going to invest into this project to insure that listeners will see their classified advertisement.

All you need is a classified Web listing and a radio schedule that brings them to the listing; newspapers can't do that. Newspaper classified ads are nothing more then a big list compiled in alphabetical order. No big sales pitch here, and nothing driving potential customers to look there unless they have to.

The classified Web page project is nothing more than a listing and creative written copy. Charge each company $750 for a full month, this is a fraction of the newspaper's price. Thirty companies and your unused radio inventory just added $22,500 to the bottom line for one month.

Take this idea one step further, and develop a Web page that lets potential job seekers list their qualification for free. Using an e-mail address for their contact information, you just added a public service spin to this project. Now in addition to a radio package driving traffic to a creative classified page, you are also providing companies with an e-mail data base of potential job-seekers.

Let's face it, newsprint cannot compete with this package. The simple use of unused radio inventory and creative selling can net your radio station more than $200,000 right to the bottom line. This is a simple, quick, inexpensive way of using your website for pure profit.

John Caraciolo is vice president and general manager of Jarad Broadcasting, Garden City, NY.

Top loading, part 1 of 2

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

Engineers charged with the job of designing a new AM transmitter facility nearly always try to plan for the tallest tower possible. This is not just an ego trip; it's because the taller the AM radiator, the higher the field strength developed in the listening area with a given power.

Years of experience in AM broadcasting have shown that a 90° tower is an easy value to work with; its efficiency factor meets the FCC's Rules minimum radiation requirements, and usually it is not exceptionally expensive to build.

A half-wave tower is almost ideal, but is much more expensive and requires twice as much ground space for the radials and ground system. Over the years we have found that for various reasons, some related to engineering, but more frequently based on nonsensical local zoning restrictions or available land area, it is not always possible to build a tower that is 90° tall. In the early days of roof-top antennas, a full 90° was also not always possible, and a number of those stations started with 100 watts on the high end of the AM band.

Although low frequencies were never used for broadcasting in the United States, they were very popular in broadcasting's early days. England, France, Poland and several other countries had transmitters in the range of 150kHz to 200kHz. That corresponds to about 6,000 feet for a full-wave antenna. These low frequencies resulted in excellent long-distance ground wave coverage and reduced high-angle radiation, and were generally used by government-controlled broadcasting systems.

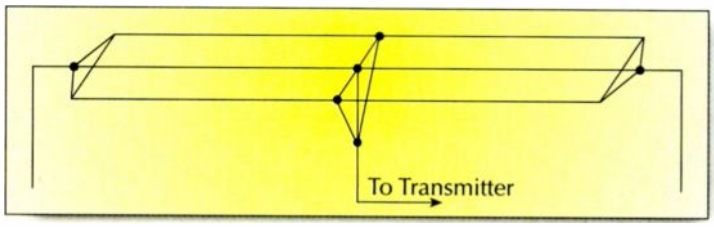

Figure 1. A flat top loadline uses the vertical lead as the radiator. The Tee top forms a capacitor to ground and top loads the antenna.

Even a quarter-wave tower was 1,500 feet high. This is not so unusual these days for TV or FM, but not many AM broadcasters wanted towers that tall or expensive. Therefore, considerable work was done to find a way of using these valuable low frequencies efficiently with shorter towers. It's interesting to note the definition of a small tower: a tower is small if its largest dimension is less than one-eighth of a wavelength. Antennas less than a quarter wavelength usually have capacitive reactance.

This early need to lengthen towers electrically led to the simple *flat-top* form of top loading. A flat top is created by connecting cables to the top of the tower like the top bar of the letter T, as in Figure 1. This type of construction was used more for frequencies of 100kHz or less. Broadcasters with government money used tall towers plus some form of top loading.

As the top loading increases, so does the impedance of the antenna. But after a certain point is reached, it begins to decrease. This is because the loading wires tend to shield the antenna, and the effective height is reduced.

This draws a parallel to the ground systems for a roof-top antenna. Because there usually was not enough room for long radials, the ground system for a roof-top antenna typically used a great deal of copper around the base of the tower. Sometimes it was necessary to use a counterpoise ground system to achieve the minimum required radiation efficiency. Often there were also related problems of unexpected reradiation at odd frequencies due to semiconductor effects in the ironwork of the buildings.

Coming up short

In the years before World War II, the need to use shorter antennas became more pressing, and many engineers began to give the matter serious attention. A short, vertical antenna suffers from a grave disadvantage. The base resistance is low and the reactance high, and high-angle radiation is also high. Thus, horizontal radiation efficiency is low. Radiation resistance consists of two major components. The first is the base resistance, which is determined by its length (height) and some physical features. The second is the I^2R loss from ground resistance, conductor resistance and associated connection and circuit resistances.

If the base operating resistance is 10Ω and the I^2R resistance is 4Ω, an operating current of 10 amps would lose 400W of power dissipation in useless resistance. In addition, the voltage across the base insulator could rise to high values.

Efforts to raise the base operating resistance to a reasonable value of 30Ω or more included a type of top loading in the form of a top hat (see Figure 2). This device took the form of a large aluminum structure, extending as much as ten feet or more in radius, mounted on the top of a short tower. It was connected directly on the top of the tower and served to increase the tower mass and electrical length. It was usually circular and sometimes had two layers or rings about 2 feet apart.

"Feature-rich and flexible"

Steve Runck of the Northwestern Radio Group has a lot to say about BSI's digital automation

August 22, 2001

When we started down the road with BSI's digital automation in 1996, our immediate need was for a good satellite controller. We also had been fighting to keep an old analog automation system on the air on our AM station. Today we use BSI's automation not only as a satellite controller, but also as our FM automation system.

We also use BSI's software to automate our AM schedule, including music on hard drive. We use a third system for satellite store-and-forward duties. The import routines make it a snap to integrate music and spots from your scheduling software with your BSI logs, and the voice-track editor's drag-and-drop capabilities make having a great hosted sound so easy that any jock will be able to quickly learn it.

The really great part about BSI's digital automation is that you can design as simple or complex of a system as you need in an economical, non-proprietary software and hardware environment. BSI's automation is so feature-rich and flexible that we will never run out of new possibilities for implementing our broadcasting mission. And if you really need a feature that's not already there, chances are good the BSI team will respond to that need in a future release.

Where we started with a single PC running BSI's digital automation, the Northwestern Radio Group now employs approximately 17 automation programs at our stations in the Upper Midwest and Florida. KFNW is now down to 12-hour days for manned operation, and our staff is finding more time to be creative, both in the production room and out in the community.

We always like to think we will never need tech support, but I've always been thankful for BSI's 24/7 commitment to us when we DO have a problem. I've even gotten some of those poor guys out of bed in the middle of the night, and they've always gotten us back up and running within a reasonable amount of time. They've even helped us when the problem was hardware-related, and not software.

Yes, we like BSI's digital automation too!

Steve Runck
Staff Engineer
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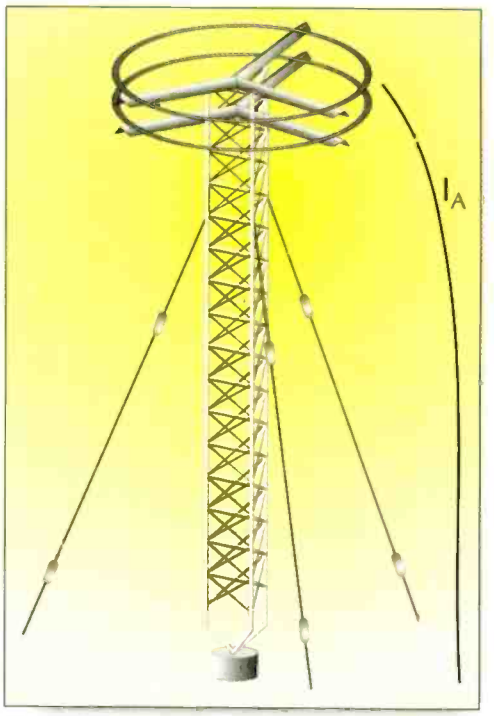

Figure 2. A top hat, a circular ring of metal, increases the capacity to ground and raises the operating impedance. Horizontal currents flowing in the top do not add much to the vertical radiation.

There are several ways of exciting a top-loaded antenna. Generally, the antenna is base fed in the usual way. The greatly increased capacity from tower top to ground reduces the negative reactance measured at the base, and large currents can flow into the top hat. Thus, the current in the tower will remain fairly constant and not reduce to zero as in the case of a regular quarter-wave tower, and the loaded tower's radiation resistance is raised.

A major objective of top loading is to raise the base operating resistance, but current distribution is also important. Sinusoidal current distribution is usually assumed in antenna work, but many times this is not the case, especially when using some forms of top loading.

A tower that is shorter than a quarter wavelength may be top loaded so that the current remains constant over most of the tower length. It can have up to four times the radiation resistance of a similar unloaded tower.

A problem with top-hat loading is susceptibility to wind damage and poor current distribution in the radiator; I once replaced a top hat, damaged by high winds, with a folded unipole. It was more economical and efficient to use a folded unipole[1]. Adding the top arms, standoff insulators and associated bottom ring was easier and less expensive than rebuilding the large aluminum top hat. The transmitter was also much happier with its broader bandwidth and lower Q antenna system.

An interesting variation in top hat loading was to insulate the hat from the tower, connect a tuning network between the hat and tower, and drive the antenna at the top. The coaxial line went up, insulated from the tower on the inside, and connected to the hat at the top. This will be discussed in the next part. Another method was shunt feeding, but this is rarely used in new stations today.

[1]During and immediately following WW2, very low frequencies (VLF), as low as 13kHz, became popular for military use. The late John Mullaney, P.E. did a lot of military work, including short-tower operation, and this led to the development of the folded unipole for commercial broadcast use.

E-mail John at batcom@bright.net.

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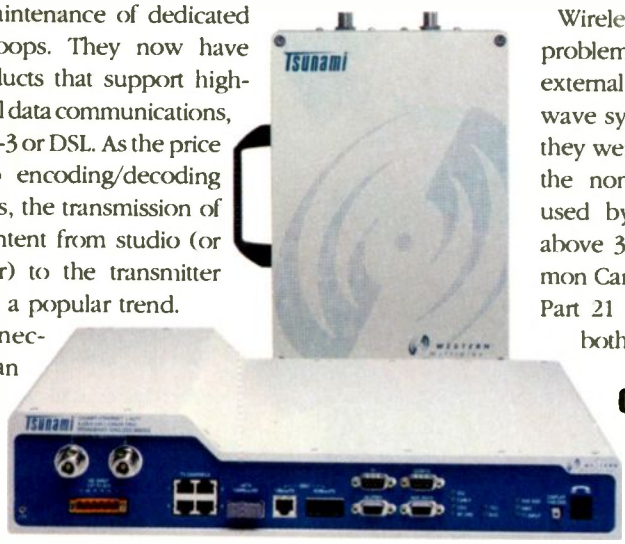
License-free facility interconnection

By Kevin McNamara, CNE

What happened to the days where getting audio to the transmitter site was just a matter of ordering one or two equalized audio loops? Simple point-to-point audio paths have become complex networks joining multiple studio facilities and transmitter sites, sometimes spread over a large area. Local telephone companies have all but eliminated departments that specialized in the creation and maintenance of dedicated analog audio loops. They now have specialized products that support high-bandwidth digital data communications, such as DS-1, DS-3 or DSL. As the price of digital audio encoding/decoding equipment drops, the transmission of digital audio content from studio (or satellite provider) to the transmitter site is becoming a popular trend.



Wireless links can use either frequency-hopping spread spectrum (FHSS) or direct-sequence spread spectrum (DSSS). The FCC is currently considering the use of other modulation schemes.

This interconnection of facilities can be extended beyond transporting digital program material. Properly designed networks can also extend access to a central Local Area Network (LAN) from connected remote facilities, thus creating a Wide Area Network (WAN). Many digital telephone switches can also be extended to remote facilities.

Wired or wireless?

Delivering digital audio between two points can be accomplished in either of two methods: wired or wireless.

Most local telephone companies have invested in upgrading their infrastructure to increase their data communications abilities. The problem is that, while high bandwidth data communications products are widely available in most major cites and, to some extent, the suburbs surrounding those cities, they can be expensive. The recurring monthly expenses for these services vary by region depending on the specific transport method (DS-1, DS-3, etc), distance, Inter/Intra LATA issues, length of contract and the Quality of Service (QOS) agreement chosen (i.e. how much down-time is permitted.) In addition, you may be charged for rental of the terminal equipment on one or both ends. The real cost that you might incur, however, is that which may be required to bring service into a building that does not have suitable copper cable pairs or fiber nearby. In that situation, costs for utility construction may run into the tens or hundreds of thousands of dollars, not to mention such possible problems as the need to get municipal approvals and obtain easement rights with other landlords. In data communication terms this is called *the last mile problem.*

Wireless radio systems eliminate many of these problems with only line of sight and a place to mount external antennas. While wideband wireless microwave systems have been in use for about 60 years, they were expensive and difficult to license. Most of the non-broadcast licensed microwave spectrum used by private and common carriers operated above 3GHz and was regulated by the FCC. Common Carrier microwave operators were regulated by Part 21 and private operators by Part 94. In 1996, both were consolidated into a single Part 101.

Other uses

Although the use of these frequencies was not intended for broadcast STL/TSL applications, the commission may grant such use providing a proper application and technical documentation in support of the non-conforming use.

Unlicensed microwave radio systems became possible in 1997 when the FCC revised certain rules in Part 15 to allow point-to-point and point-to-multipoint communications using a variety of modulation schemes, including spread spectrum. The FCC permits this operation within three bands: 902 MHz to 928MHz, 2400MHz to 2483.5MHz and 5725 MHz to 5758MHz. These frequencies were used exclusively for Industrial Medical and Scientific applications, also called the ISM bands.

The ISM bands currently host a variety of wireless applications that are gaining in popularity, such as 802.11 and Bluetooth, which permit short-range wireless Ethernet connectivity. Several manufacturers are producing high quality radio systems that permit the reliable transmission of wide-band duplex data for several miles over a properly engineered link.

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

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Mass Media Bureau out

By Harry Martin

As part of Chairman Powell's efforts to reform the FCC, the Mass Media Bureau, which handles all radio and television matters, will be merged into the Cable Services Bureau, which handles all cable matters, to form a new *Media Bureau*. The Media Bureau will handle AM, FM, LPFM, TV, LPTV, cable policy, EEO, political programming, and DBS (Direct Broadcast Satellite) post-licensing policy. DBS licensing will remain with the International Bureau. MMDS will be moved to the Wireless Telecommunications Bureau.

Within the Media Bureau there will be a separate Office of Broadcast License Policy, responsible for licensing functions. Under the Office of Broadcast License Policy will be an Audio Division (radio) and Video Division (TV and cable). The Media Bureau will also have a Policy Division, Engineering Division and Industry Analysis Division.

It will be several months before the merger is implemented. The newly appointed chief of the Cable Services Bureau, Kenneth Ferree, will be chief of the new Media Bureau. The current chief of the Mass Media Bureau, Roy Stewart, is expected to play a key role in the new bureau. Roy Stewart has emphasized that radio and television issues will receive the same priority in the Media Bureau that they currently receive in the existing Mass Media Bureau.

Dateline

On or before December 1, radio stations in the following states must file their biennial ownership reports: Alabama, Colorado, Connecticut, Georgia, Maine, Massachusetts, Minnesota, Montana, New Hampshire, North Dakota, Rhode Island, South Dakota and Vermont.

Recent FCC forfeitures

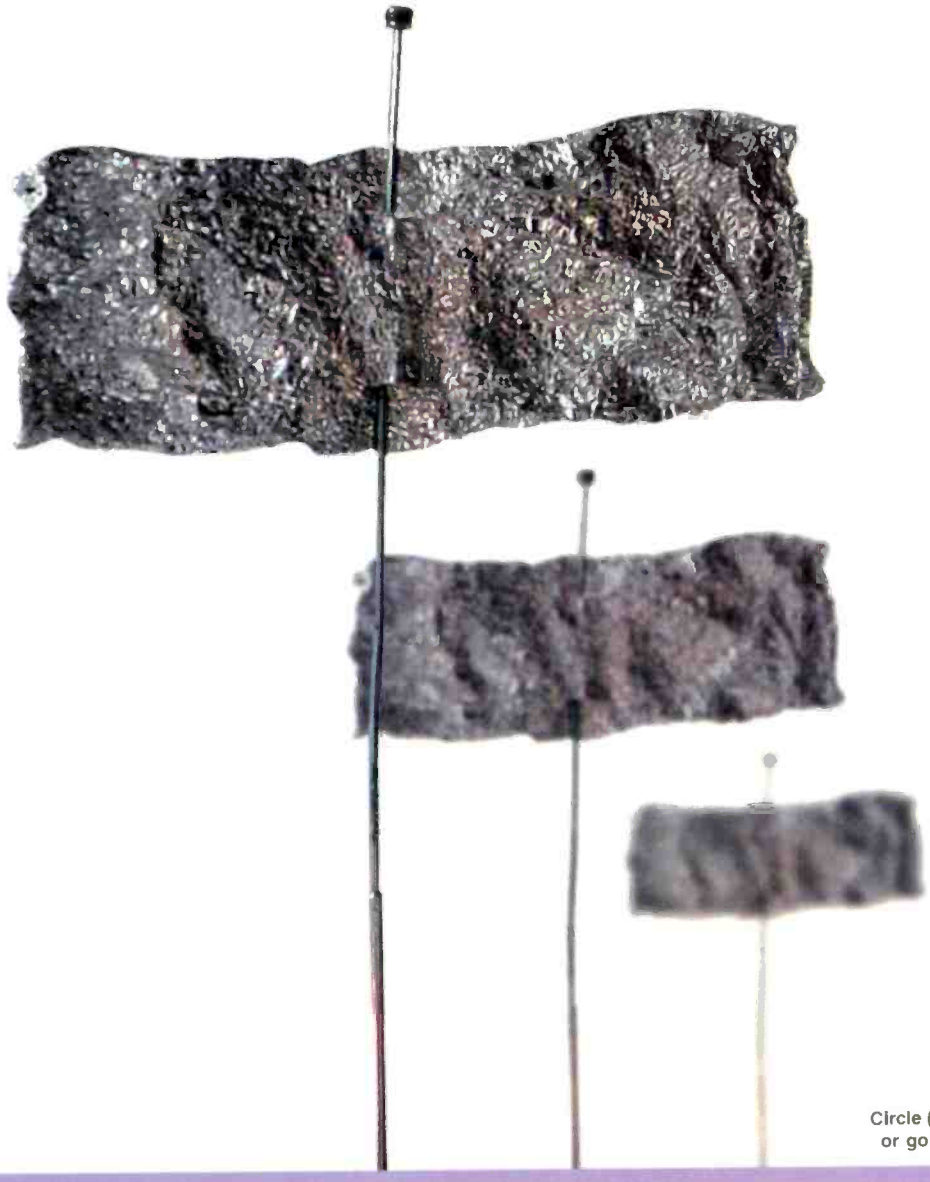
EAS rule violations have resulted in fines ranging from $3,000 to more than $21,000. Various violations included failure to maintain a log of signals from the emergency-notifying source and leaving EAS equipment unplugged. For national security reasons and to avoid FCC fines, these rules must be followed.

A pirate FM operator in Richmond, VA, has been convicted on four criminal counts related to transmissions of radio communications without a license. The pirate faces sentencing in December and could be imprisoned for up to one year and fined $100,000. The culprit had been warned to cease operations by the FCC and the federal courts.

An AM station was fined $4,000 for failing to respond to FCC correspondence. The licensee argued that the FCC was without "moral authority" to impose such fines because the agency often fails to meet its own deadlines. The FCC, acting on statutory authority, dismissed the defense as frivolous and upheld the $4,000 fine.

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

...still running THIS???



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Keeping DIGITAL Clean

By Chriss Scherer, editor

Digital audio requires greater attention to signal quality, but it's more than just a wave of the hand.

Digital audio has provided radio with a means to deliver a higher-quality sound without requiring significant additional cost. It was quickly learned that digital was a different world than the analog domain it slowly replaced. The promise of a signal free from the customary obstacles associated with analog circuitry and transmission was not the holy grail it was expected to be. In the end, we traded concerns over noise floor and distortion for jitter and bit-error rate.

When several basic rules are followed, analog is easy. It is also forgiving. Analog has a graceful point of failure. As signal degrades, our ears can usually provide clues that something is wrong.

On the other hand, digital signals make their way through the path, gracefully overcoming changes in impedance, capacitance, bit errors and noise. Through the most analog-challenged circumstances, digital continues to sound as good as it always does—that is until the degradation is so severe that the signal disappears completely.

The nature of digital audio is to provide a signal unimpaired by the transmission medium. Analog signals are an inseparable part of their medium. Digital signals ride the transmission medium, almost without regard for its flaws. As noise increases, impedance changes, capacitance varies, the integrity of the digital signal suffers, but in many cases, the error correction allows the signal to be reconstructed at the receive end. As error correction works harder to fill in the missing pieces, it eventually reaches a threshold where it cannot put it back together. In this case, the signal mutes. The point where this occurs is referred to as the digital cliff. For all the robust properties that make digital stand over analog, digital signals still require careful attention to many of the same physical and electronic aspects.

Avoid the fall

Some potential digital pitfalls cross physical and electronic concerns. The most basic step in preserving the integrity of digital signals is to use the proper wire. Most facilities distribute digital signals that are defined by the AES3 standard. There are other formats, such as S/PDIF, but these are rarely used widely in a facility.

The AES3 audio standard defines a stereo signal carried over a single pathway. This pathway can be a balanced or unbalanced signal. The balanced signal requires a twisted pair cable with a characteristic impedance of 110Ω, ±20%. The unbalanced standard, referred to as AES3-ID, requires a coaxial cable with a characteristic impedance of 75Ω. Because 75Ω coaxial cable is commonly used for RF applications, and RF requires a high level of consistency, cabling is usually not a major concern.

Because AES3 uses twisted-pair wire, it is easy to try to get by with traditional analog twisted-pair wire. This works for short cable runs, but the impedance mismatch is severe, and problems are likely to occur.

Ideally, AES3 wire should be used. Facility wiring systems also exist that use CAT5 cable. The CAT5 Ethernet standard calls for a characteristic impedance of 100Ω, ±15Ω. This results in a range of 85Ω to 115Ω. Compare this to the AES3 extremes of

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Zephyr Xstream. Sometimes the sequel is even better than the original.

Telos

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Keeping DIGITAL Clean

88Ω to 132Ω. Except for the very low end, the CAT5 range falls within the AES3 standard. If CAT5 cable is used for AES3 audio, it is a good idea to use a CAT5 cable with a tighter impedance tolerance. A range of ±7Ω works well.

Digital audio test equipment is required to properly evaluate digital signals.

Because an AES3 signal has more in common with an RF signal than a DC signal, connectors, terminations and splices are important. The best rule is to keep these to a minimum. When some type of physical connection must be made, keep the wire twisted until the very end to minimize the change. Some connectors and punch blocks are designed to meet the rigid AES3 standards. Likewise, tighter-tolerance CAT5 hardware can also be used reliably.

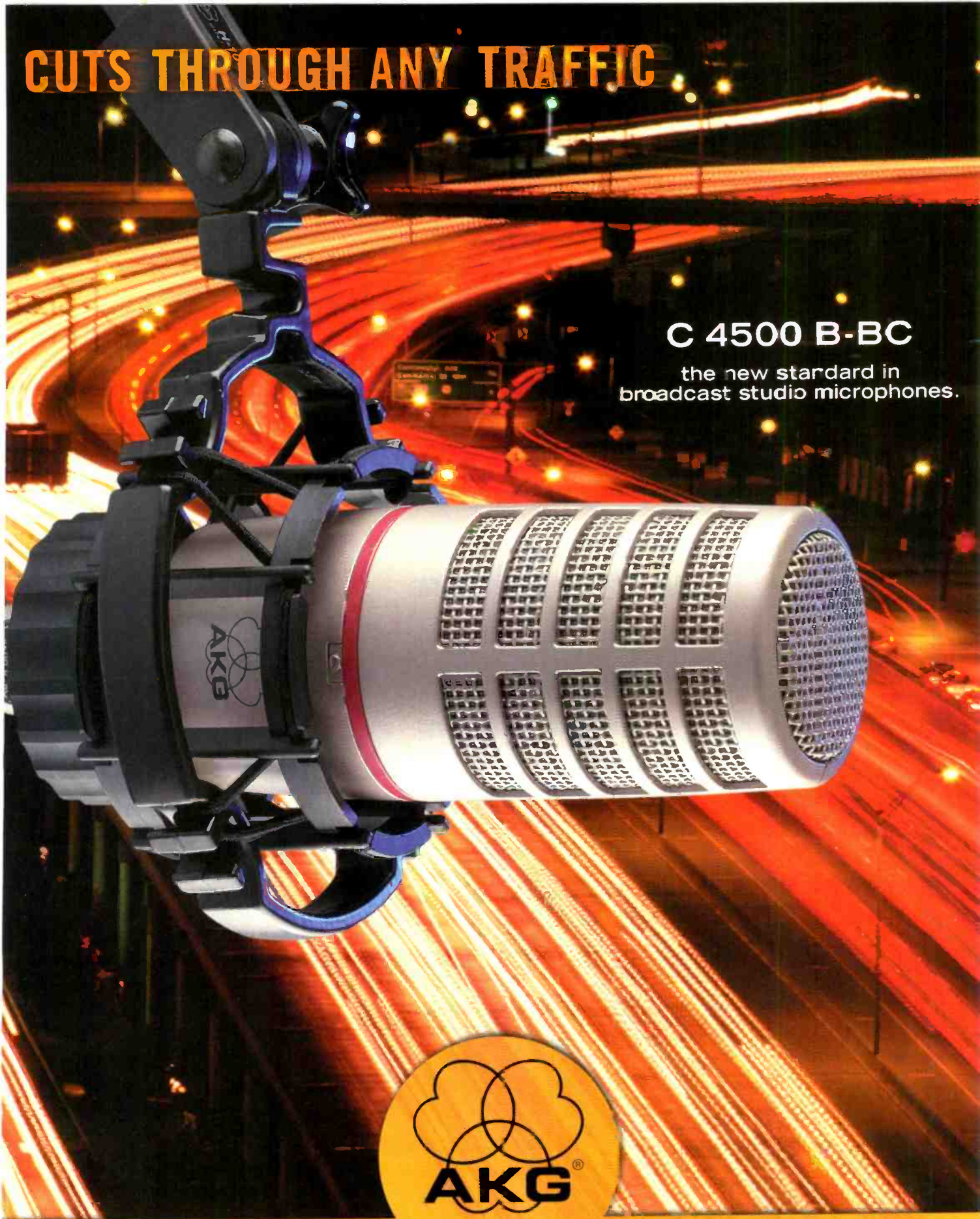
Change for the worse

A common feature of many digital audio devices is sample-rate conversion. This allows various sample rates to be interchanged between devices without the need to manually set each input and output to a specific rate. Regardless of the simplicity, a facility should choose a single sample rate and use it as much as possible. Typically, the rate is chosen by using the most commonly used sample rate of the equipment. Since lower sample rates result in smaller files, lower rates such as 32kHz or 44.1kHz are chosen over 48kHz. 96kHz is being used in many recording studios, but because of radio's bandwidth limitations, 32kHz, 44.1kHz and 48kHz are the most common.

Ideally, a master clock reference is used within a facility, and all the devices are synchronized to it. This eliminates the need for each device to reclock the incoming signal. There is little loss when a signal is reclocked at the same sampling rate, but there are significant concerns when a signal undergoes a downward sample-rate conversion.

When a signal is downconverted, for example, from 44.1kHz to 32kHz, the audio energy between 32 and 44.1 must be removed or *aliasing* will occur. A filter is used to remove these components. This necessary filtering can cause additional problems in that signal overshoots can result from the ringing of the filter. The complete discussion of this topic situation can easily become quite involved, but in general, it is best to avoid any downconversions when possible.

Another potential source of



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unwanted digital noise can be introduced by switching digital signals. When signals are mixed, the clock references are tied together. Some digital audio switchers perform a hard swich from source to source. If this switch is made and the two sources are not synchronized, there will likely be a click or pop during the transition. Ideally, a switch such as this is only done with synchronized signals and during a point where the signal crosses the zero-voltage reference. In most cases, the delay of a single frame or two is not a problem.

Audio coding and data reduction

Non-data-reduced or uncompressed audio provides the cleanest method of capturing digital audio. The AES3 standard defines the parameters for this coding method. In most cases, simply converting an audio signal to digital is not the only concern. A complete digital audio system covers not only the audio signal, but also its storage and transmission. Because of these issues, various methods of reducing the required storage space or transmission bandwidth have been developed.

The audio on a CD, sampled at 4.1kHz with a 16-bit resolution, requires about 10MB of storage space and 1.4Mb/s of transmission bandwidth for every stereo minute. For a very high quality 96kHz/24-bit signal, about

Handheld testers are ideal for field use or for quickly checking signals.

33MB of storage space and 4.5Mb/s of transmission bandwidth is required per stereo minute. With files sizes such as this, disk space and transmission bandwidth requirement would be out of control.

To reduce the storage or bandwidth requirements, data-reduction algorithms can be applied to the digital signal. Some of the algorithms more commonly used include G.722, APT-x, MPEG-1 Layer II (MP2), MPEG-1 Layer III (MP3), MPEG-2 AAC, ATRAC and PAC. These algorithms function by trading file size for some reduction in audio quality. The key is that the trade-off is not noticeable. The debate between the appropriate use of APT-x, MP2, MP3 or AAC can become a heated one. Choosing the algorithm for a given situation should be done by considering the source material and the individual settings of the encoder. The final choice will be based on how the resulting audio sounds to you.

When coding algorithms were first introduced, there was considerable discussion about the effects of passing a signal through several codecs. Some demonstrations showed that the resulting audio after just a few

Manager's Perspective: Keeping Digital Clean

by Jim Paluzzi, CBT

A quality digital installation requires more than good equipment. Too often, managers believe the actual installation and interconnection of this equipment is a mere formality. Keeping digital clean means that managers must pay as much attention to installing their station's cabling and connectors as a great chef would spend attending to raw food and its preparation.

Keep these two principles in mind, and you will go far in keeping your digital signals loud and clean:

1. Embrace open architecture. No one can predict the kinds of broadcast equipment that you will be using in the next decade, so be sure to install cable that can handle all types of signals—both analog and digital. This method costs more in the short term, which is why superior managers insist on this approach.

2. Double the installation time. Ever heard the words, "Why can't they just work faster?" Any cable installer can work faster. However, faster rarely means better. A kinked cable and a poorly fitted connector—pulled together under deadline—may indeed work *at first*. However, we rarely get the second chance of hearing a digital signal degrade gradually (in time to fix the problem). With digital signals, we are more likely to experience the "cliff effect," where now you hear it—and then you don't.

Jim Paluzzi is professor of broadcast technology at Boise State University, and serves as general manager for Boise State Radio.

cascaded conversions had little resemblance to the original source. Fortunately, most algorithms have improved, but the same care should still be taken to minimize the number of conversions being made.

Proving performance

While digital audio has easily provided a cleaner signal from start to finish, one obstacle has been in assessing its quality. Clipping onto a signal and listening to it is not possible with a telephone butt set. The new digital equivalent is needed. Analog audio could be evaluated with butt sets, oscilloscopes and distortion analyzers. Digital audio has its equivalents, but instead of confirming signal to noise and harmonic distortion, we now measure for bit-error rate and jitter.

Tools to evaluate the physical medium are still required. Because most of the media used for digital audio came from the computer industry, cable checkers and hard drive diagnostic tools have become regular tools.

Fortunately, by planning the system carefully and using the proper equipment, maintaining high quality digital audio can be easy.

Learn more about evaluating perceptual audio encoding online. Look for the sidebar article to this story online.

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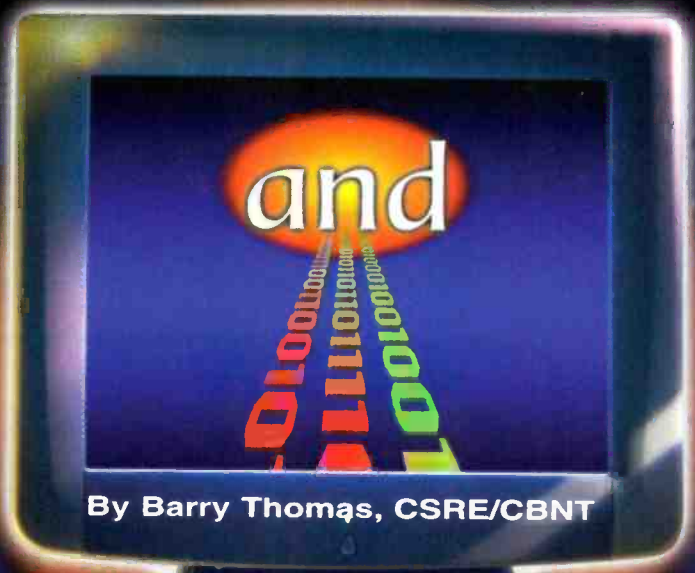
Audio Storage and Delivery Systems



By Barry Thomas, CSRE/CBNT

Deciding to use a computer-based audio storage and delivery system is easy. Choosing which one is right for your station is another matter.

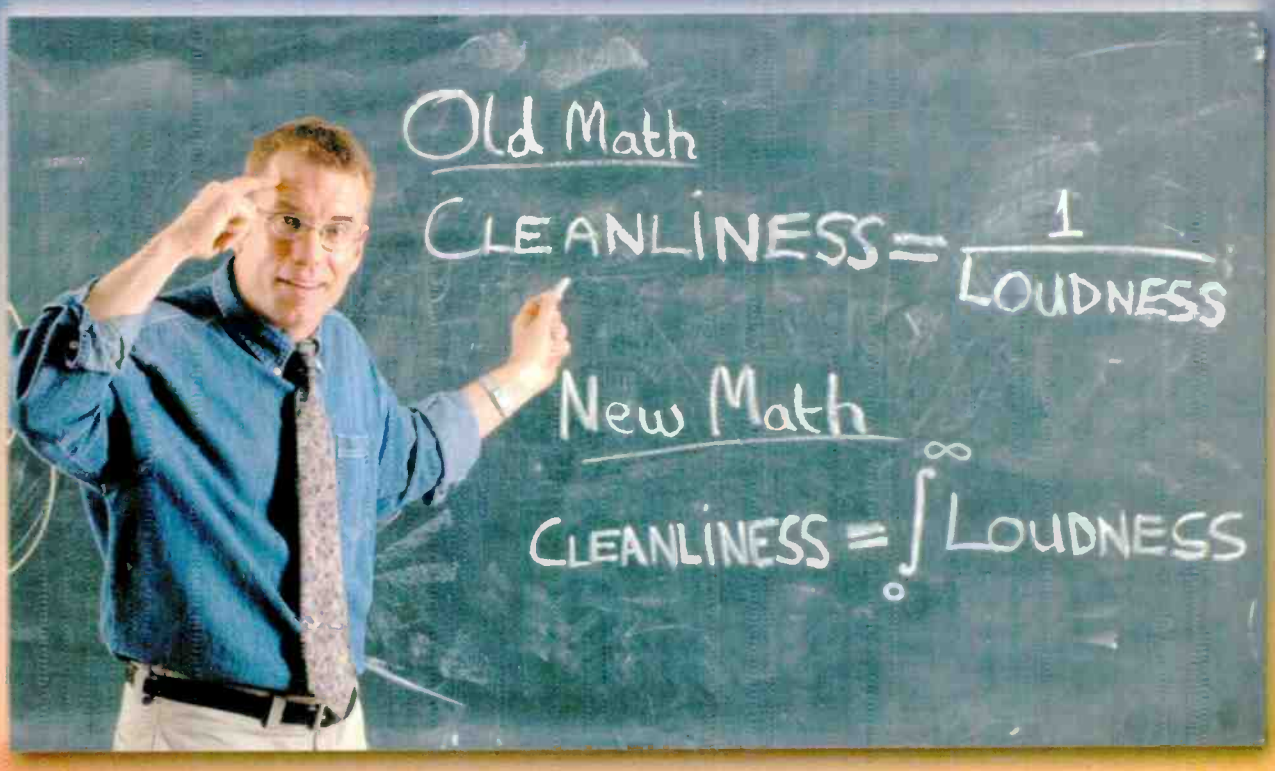
It's gotten to the point where I'm horrified to see a cart machine in use at a radio station. Just about every feature we have appreciated in the broadcast cartridge has been replaced by a more flexible and better-sounding alternative. The economics are such that a digital delivery system is not only preferred but is necessary for the efficient operation of a radio station.

The most important function of a standard digital audio delivery system is spot and music playback. Systems built around this function are typically the centerpiece of modern studio operations. Most systems offer options or features to accommodate on-the-fly playback of elements like beds, jingles, bits, etc., but most are designed to simplify the core studio operation and offer greater reliability. Each system is unique and is adjusted to match a station's specific needs and the talent's requirements. For this reason, there are no solutions that would apply everywhere. System design, installation, and execution depends on the expertise of people who know the operation to select the appropriate system and adapt tools and modules available in a given brand of system. As the station engineering manager, you are in the most unique position to perform these tasks and release the potential of new technology.

Recent developments in audio and data delivery have put pressure on suppliers of delivery systems to expand their options and interconnectivity to accommodate audio streaming, spot insertion, and interactivity. Many systems offer control and voice tracking from remote locations like affiliated stations or remote broadcast sites. Most companies now offer, or are working on, solutions for these issues and much more.

It's fortunate that there is a wide variety of choices available with a wide range of features and price points. You should be able to find everything you need for your station through these companies and even discover new ways to make your life easier. The list of systems outlined here is comprehensive but not complete. You should contact the manufacturers or your broadcast equipment supplier for more information.

Process This!



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Audio storage and delivery systems

Enco

www.enco.com

DADPro

Audio Hardware: Antex, Digigram, Soundblaster

OS: MS Windows 98/NT

Network OS/Protocol: MS TCP/IP

DADPro uses a workstation platform with a variety of on-screen windows that can be tailored for users' needs. Player windows allow live assist or fully automated modes and transparent transition between modes, with support of crossfaded or overlapped segue transitions, voice tracks, and automatic spot rotations. Some of the players can be user-customized cart walls or instant-play hot buttons. The recorder windows can be used for automatic phone recording, editing and automated/unattended network feed acquisition. The system can use the Orban AirTime Brick control surfaces. Control of external gear is achieved using serial communications or a GPI interface. Enco provides graphic two-track waveform editing and a separate multichannel editor. File import from popular editing software is supported.

MediaTouch

www.imediatouch.com

iMediaTouch

Audio Hardware: Antex, Standard Pro Audio Cards, Soundblaster

OS: MS Windows NT/2000

Network OS/Protocol: MS TCP/IP

The company's products are designed to allow remote operation of automation system from remote and/or multiple locations. MediaTouch software programs have codecs by QDesign (MP2), Fraunhoffer (MP3), Microsoft (ADPCM & Windows WMA) and PCM. All formats can be played in overlaps simultaneously, regardless of audio card capability. MediaTouch touch-screen interfaces are designed to reduce or eliminate the mouse pointer table chase and increase the speed and efficiency of live-assist operations.

Arrakis

www.arrakis-systems.com

Digilink Free

Digilink DL4-MAX

Audio Hardware: Any Windows-compliant hardware

OS: MS Windows 98/NT/2000/ME

Digilink Free is suited for stations using automation for fully automated and live-assist operation. The DL4-Max system is based on the DL4-Max engine, a self-contained on-air and production system with 210 hours of audio storage. Networking is not supported. Stations must supply one Windows PC for production and one PC for on-air.

Prophet Systems

www.prophetsys.com

NexGen

Audio Hardware: Proprietary

OS: Microsoft Windows NT/2000

Network OS/Protocol: MS TCP/IP

Prophet has a long history of offering automation systems. NexGen is designed to offer extensive tools for

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companies who are consolidating operations and voice tracking or fully-automating their stations. Prophet's WAN-casting system allows stations to share and use system data and audio between interconnected sites.

Broadcast Electronics

www.audiovault.com

Vault2/VaultXpress

Audio Hardware: Standard Pro Audio Cards, SoundBlaster

OS: Windows NT, 2000

Network OS/Protocol: Microsoft Netbui/TCP/IP

Broadcast Electronics offers and supports the original AudioVault systems, updated to support Windows 2000. In Vault2 and VaultXpress, Broadcast Electronics employs the AVAir and AVRecord user interfaces but has replaced the AV100 cards with industry-standard audio cards including the SoundBlaster.

Broadcast Software International

www.bsiusa.com

Simian Automation

Wavecart Digital Cart Replacement

Webconnect Pro System remote control and notification

Stinger Instant Audio player

Audio Hardware: Audioscience, SoundBlaster

OS: MS Windows 95, 98, NT, 2000

Network OS/Protocol: Microsoft TCP/IP

BSI offers Stinger, an automation and cart replacement/instant audio product. Companion products use standard PC hardware and the Audioscience audio adapters. The Simian automation system manages satellite operation playback, live assist and background recording.

Computer Concepts Corporation

www.ccc-dcs.com

Maestro

Audio Hardware: Audioscience, Digigram, Standard Pro Audio Cards

OS: MS Windows NT

Newwork OS: Novell

The Computer Concepts system is designed to work directly with the company's Visual Traffic system but can interface with scheduling and traffic with minor effort.

Smarts Broadcast

www.smartsbroadcast.com

www.onairusa.com

Smartcaster

RadioSuite HD

Operating System: DOS/Windows/Linux

Network OS: TCP/IP or LANTastic

The Smartcaster digital audio system is designed to interface with the Smarts traffic and billing system and the Smarts Digital Program Director (DPD) music scheduling system. The critical parts of the Smartcaster system are based on DOS, but system control and the user interfaces are Windows-based. Smarts has purchased On Air Digital, which offers a Linux-Base digital audio system. The On Air Digital RadioSuite HD system has been successful in use by stations running music or live-assist formats.

Audio storage and delivery systems

RCS

www.rcsworks.com

Master Control

Audio Hardware: Standard Pro Audio Cards, Soundblaster

OS: MCDos

Network OS/Protocol: Novell

RCS offers standard software for music and promo scheduling with Selector and Linker. Master Control is the companion automation product with integration into all RCS products. There are interfaces for all popular traffic software via XML or ASCII.

Netia Digital Audio

www.netia.fr

Radio-Assist 7

Audio Hardware: Digigram

OS: Microsoft Windows NT

Network OS/Protocol: MS TCP/IP

The system can interface to ENPS, the Associated Press' news processing system. It is now possible to associate audio and text for editing on a single screen with database links. The system's latest software offers many possibilities for console integration through the use of highly configurable GPI I/Os. Relay orders with applications for multicasting, can be inserted.

Dalet Digital Media Systems USA

www.dalet.com

DaletPlus

Audio Hardware: Antex

OS: MS Windows

Network OS/Protocol: MS TCP/IP

Dalet's system supports a multimedia environment. The Multimedia scheduler provides scheduling capability for radio and associated media. Dalet holds to a "produce once, broadcast many" approach, allowing the company's radio broadcast system to integrate with its audio production, digital content management, news and playback systems.

Cartworks/dbm Systems

www.cartworks.com

CartWorks

Audio Hardware: Audioscience

OS: MS Windows 98/2000 Pro

Network OS/Protocol: MS TCP/IP

Cartworks uses individual PC workstations for live assist, voice tracking and satellite automation. Audio from home computers, professional digital audio workstations, the Internet or most any source can be played without conversion. The system supports Standard Microsoft WAV, MPEG, and other digital audio formats.

IBM/Jutel Oy

www.jutel.fi

RadioMan

Audio Hardware: Digigram/IBM

OS: UNIX/MS Windows NT

Network OS/Protocol: IBM TCP/IP

RadioMan is designed for collaborative operation. Multiple station

departments can be working with files simultaneously. RadioMan is designed to be a complete automation solution and encompasses a vast array of products for scheduling, editing, Internet and digital broadcasting, data transmission, and file management.

LPB

www.lpbinc.com

Webjockey

Salsa (DOS & Windows)

Audio Hardware: Standard Pro Audio Cards, Soundblaster

OS: MS Windows 98

LPB's Webjocky is designed as a cart replacement solution for stations with limited budgets, webcasters or LPFM operators and supports MP3 and WAV file playback, includes a 36-key instant player, and offers on-air, next and played LED indicators, on-screen faders, and individual muting for each channel. Salsa, a larger-scale automation system, offers GPI controls, event scheduling, news and traffic as available options.

Scott Studios

www.scottstudios.com

SS32

Audio Hardware: Audioscience

OS: MS Windows 2000

Network OS/Protocol: MS TCP/IP

The SS32 products offer configurable user interfaces designed by DJs. Voice tracking, newsroom software and a phone call recorder are available. The system is designed to integrate with such production software as Audicy, Sound Forge and CoolEdit. Audio cuts can be accessed using a cart wall screen, which is accessible remotely. Scott integrates with many traffic and music software systems and offers methods for Internet ad substitution that work with its on-air systems.

Register Data Systems

www.registerdata.com

The Phantom

Audio Hardware: AudioScience, Antex

OS: DOS

Network OS/Protocol: Snap Server

Based on an open system architecture, the Phantom can record audio feeds while playing back and switch to external feeds. Information is displayed concisely with pull-down menus to guide users. Schedules can be loaded for times years in the future. Audio files can be retimed to fit set windows.

Barry Thomas is chief technology officer of Stratos Audio Inc. and a contract engineer in the Los Angeles area.

New Products

By Cindy Holst, associate editor

Handheld LAN analyzer

Fluke Networks

NetTool: This product combines cable, network and desktop testing functionality into a single unit. NetTool includes a cable-testing capability, eliminating the need for a separate basic cable tester. The unit monitors network health for full-duplex connections. NetTool features individual frame counts for the desktop and network conversations. The device shows protocol mismatches between the PC and the network, and identifies unwanted protocols. NetTool displays advertised speed, duplex capability and final link configuration. The standard NetTool tester provides single-ended testing of cable and desktop-to-network connectivity. The inline model allows users to eavesdrop on the PC-to-hub link pulse negotiation process. Both models feature flash ROM technology for software upgrades.

DEMO ROOM

800-28-FLUKE; fax 425-446-5019
www.flukenetworks.com; info@flukenetworks.com
Circle (251) on Free Info Card
or go to www.beradio.com

Monitor speaker

Yamaha

MSP3: The MSP3 is a two-way powered speaker system designed to provide high quality monitoring for a home studio, computer-based recording systems, personal computers and music keyboards. Features include a 4 inch woofer

housed in a bass reflex design cabinet, a 3/4" dome tweeter and 20W of output power. Each cabinet contains balanced XLR connectors, 1/4" phone jacks and RCA connectors, plus trim switches and full magnetic shielding.

714-522-9011; fax 714-522-9522
www.yamaha.com/proaudio
Circle (261) on Free Info Card
or go to www.beradio.com

Multiple processor system
TC Electronic

DB-8: Keep production simple and fast using the stereo upconvert facility of DB-8. Disable upconversion when transmitting, leaving only loudness control and limiting in the signal path. The 48-bit processing of DB-8 ensures pristine audio quality under all conditions. DB-8 features true loudness and multiband processing, consistent level control across programs and maximum speech intelligibility. The unit offers 8×Mono, 4×Stereo and 5.1 combinations, and format conversion and flexible routing. The DB-8 allows intersample accurate limiting for maximum sound quality from compression codecs. In addition, DB-8 offers silent update delay adjustments in combination with other processing.

805-373-1828; fax 805-379-2648
www.tcelectronic.com
info@tcelectronic.com
Circle (259) on Free Info Card
or go to www.beradio.com

Digital audio workstation
Sonic Sense

Sonicorder: A custom integration of recording software, soundcard, and configuration of high-quality laptop computers prepared to fit each recordist's needs. Including a maximum capacity hard-drive and an optimized build of Windows, Sonicorder is changing the way audio material can be recorded outside of studio walls. Sonicorder customized laptops are prepared with proper settings to assure that your important recordings are as safe on the computer as they ever could have been on tape. The Sonicorder system is offered on machines that have been tested extensively. Additionally, for those interested in having their own laptops prepared for field recording, Sonic Sense offers customization services.

877-324-4463; fax 303-753-0817
www.sonicsense.com
Circle (257) on Free Info Card
or go to www.beradio.com

New Products

Digital audio console
Wheatstone

▼ **D-5000:** The console's modular design allows users to hot-swap all modules for on-air servicing. Features include a traditional user interface, four stereo mix buses and fexible mainframe layout options. The unit is available with up to 26 input modules. Inputs can be field-converted from analog to digital (and back) through a simple daughter-card change. Users have a choice of 32, 44.1 or 48kHz console clock rates.

The serial port allows true integration with routers and automation systems. Also included is a dedicated phone module with DSP generated MXM; two modules can be combined for up to four MXM sends. All channel fader, display and switch settings are addressable via the serial port for remote control and router/automation communication. Exclusive VDIP software allows configuration with a laptop PC. Once configured, the console runs standalone.

252-638-7000; fax 252-637-1285
www.wheatstone.com; sales@wheatstone.com
Circle (260) on Free Info Card or go to www.beradio.com

New Products

Broadcast audio processor
Omnia

▲ **Omnia-6:** A broadcast audio processor using a 96kHz sampling rate and 24-bit resolution, Omnia-6 features five bands of AGC (Automatic Gain Control), six bands of limiting and a user-adjustable crossover network. Omnia-6 is DAB ready and ITU BS 412 compliant. Other features include remote control via modem, RS-232 or TCP/IP and built-in Omnia SPACE-EFX stereo enhancement. Omnia-6 offers preset storage using PCMCIA cards (up to 30 presets per card).

216-241-3343; fax 216-241-4103
www.omniaaudio.com info@omniaaudio.com
Circle (254) on Free Info Card
or go to www.beradio.com

New Products

Studio furniture line
Middle Atlantic Products

MultiDesk Video: This furniture line is made up of a variety of modular desks, overbridge and side-bay systems that can be customized to suit the individual needs of any application. Each MDV system has been designed with proper ergonomics at the forefront and features a graphite top and sturdy steel-tube legs. Any of the six models in the MDV line can be combined to allow the user to personalize their workspace to meet their specific requirements. Users can choose from two styles of corner desks or a straight desk and build upon each with a four-rackspace overbridge, connecting wedge and 12-space side rack. In addition, a caster kit is available to add wheels to each side rack.

973-839-1011; fax 973-839-1976
www.middleatlantic.com; sales@middleatlantic.com
Circle (252) on Free Info Card or go to www.beradio.com

New Products

Software remote control

Statmon Technologies

Statmon EMS: The software platform of this device enables the networking, monitoring and remote control of any device, and any quantity, in any network. Features of the unit include real-time command recognition and status updates; global computer network management; full event logging; real-time Internet access to data, control functions and monitoring of mission-critical systems; automation; and fail-safe problem solving abilities. The EMS also offers assurance against system downtime and is fully scalable and customizable. Emergency alarms are available via telephone, e-mail and wireless devices. The system uses off-the-shelf hardware and software in conjunction with a standard personal computer, notebook, pocket computer, or other handheld computerized device. The UIF 2 interface system is also available from Statmon Technologies.

310-440-8053; fax 310-278-6585
www.statmon.com; info@statmon.com

Circle (258) on Free Info Card or go to www.beradio.com

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Editor – Chriss Scherer, CSRE, *cscherer@primediabusiness.com*
Technical Editor, RF – John Battison, P.E., *batcom@bright.net*
Associate Editor – Cindy Holst, *cholst@primediabusiness.com*
Contributing Editor – Skip Pizzi, *beradio@primediabusiness.com*
Sr. Art Director – Michael J. Knust, *mknust@primediabusiness.com*
Assoc. Art Director – Robin Morsbach, *rmorsbach@primediabusiness.com*

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Publisher – Dennis Triola, *dtriola@primediabusiness.com*
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Sales Offices

NATIONAL SALES DIRECTOR
Steven Bell
9800 Metcalf Avenue
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Arrakis Systems	40	133	970-224-2248	www.arrakis-systems.com
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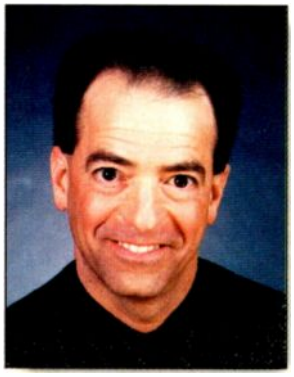
Class of service

By Skip Pizzi, contributing editor

When radio technologists think of signal quality, the first things that come to mind are frequency response, noise and distortion. By and large, progress in these areas has been something to be proud of throughout our careers, and the future looks likely to bring more of the same.

But can this also be said for the rest of the radio team? Is the quality of the *content* that our radio signals deliver tracking the same trend? While broadcast engineers have consistently done more with less, the content side seems to consistently do less with more. Consolidation has pushed profits up, but the variety and depth of material broadcast on the radio have not followed suit (at least on *commercial* radio—more on this in a moment).



Narrowing interests

Events of the recent past have made obvious the lack of in-depth news content. Anything besides network-provided headlines at the top of the hour is rare. Local news is already extinct in many markets, and unlike other media, no one has praised commercial radio for shining in the face of adversity lately. Following 9/11, the morning zoos barely took a day off, and soon went back to work with just a couple of new pincushions to poke. Perhaps this creates a sense of stability and comfort that helps some Americans get back to normal, but it's a far cry from the call of public service that radio used to answer loudly.

In a longer view, commercial radio has essentially dropped the entire genre of classical music, along with the quintessential American art form of jazz. (For the few who may be unclear, the Smooth Jazz format does not replace jazz, but rather is the current incarnation of the Easy Listening format, which is itself another victim of recently narrowed offerings.) Even sports have become an endangered species, difficult to find or receive adequately in many cases. When they are heard, the quality of presenters is often second-tier, and the audio quality nearly telephonic.

The quest for maximized profit seems to have driven radio almost universally toward the lowest common denominator of content. While there's nothing wrong with the motivation, the metric of audience size seems to have overwhelmed any other element of brand-building such as quality of service, community connection, local enterprise and good will. Those who live in major markets may not have experienced the full impact of this trend, but likely will, as those in smaller markets have for some time.

The FM dial resembles an airline seat map, with public stations inhabiting the front end of the dial, and commercial stations filling up the higher numbered rows behind.

Migrating down the dial

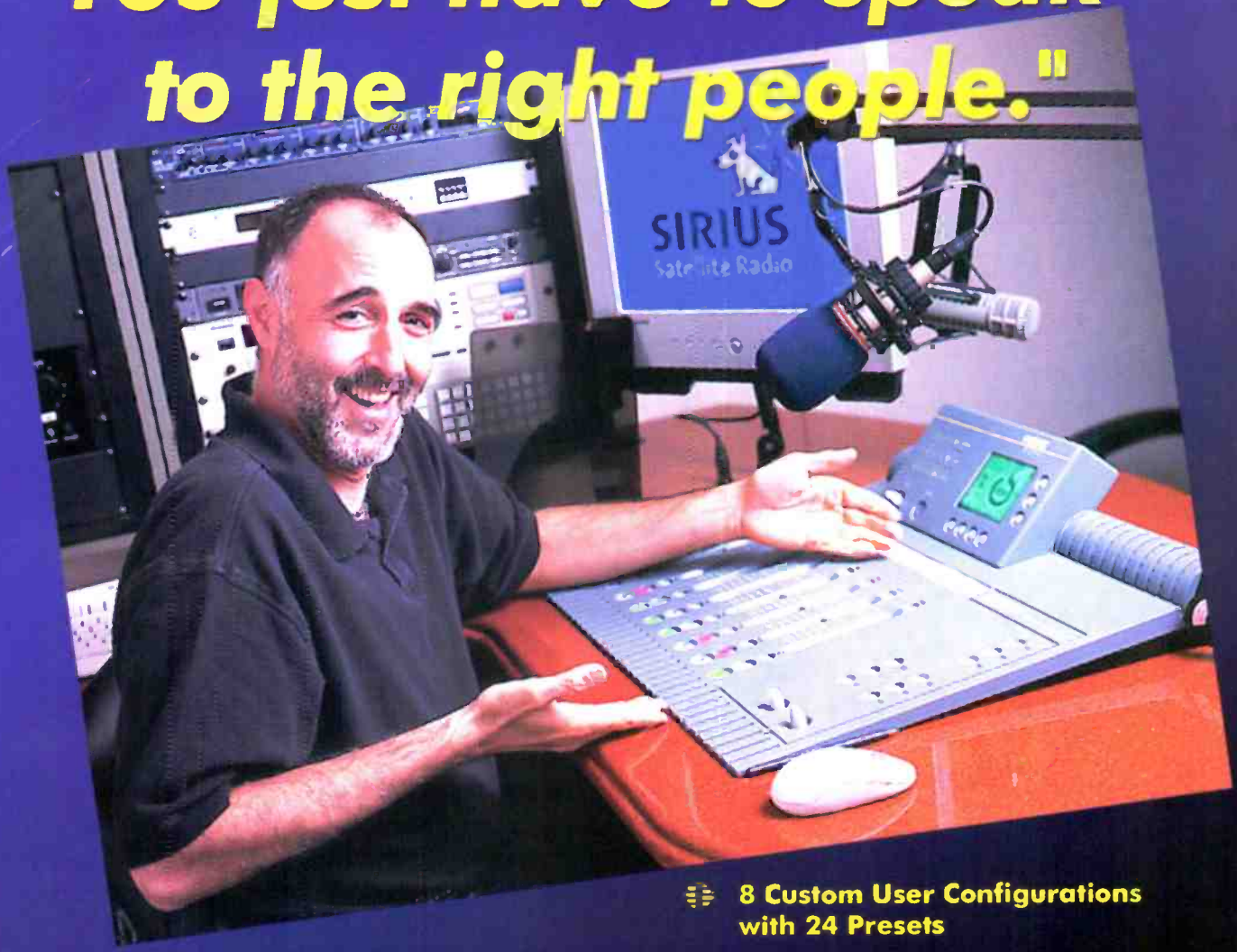
Much of the content that has departed from the commercial band has found its way to public radio. This is ostensibly due to the different business model found there, in which such premium content motivates listeners to contribute voluntarily to defray stations' expenses. Yet in recent years, public radio has been successful in developing its own form of advertiser support. (Referred to as *underwriting*, some consider these tantamount to low-key commercials, but in fact FCC regulations tightly control the content of these spots.)

Meanwhile, audience growth rates among public stations have lately far exceeded those of commercial radio, and although the aggregate numbers remain far smaller, public radio continues to attract desirable demographics. The graying of the boomers only adds strength to this enterprise. For this reason, many businesses now include a public radio buy as a prime component of their media portfolios.

A good analogy for this trend can be found in the travel business. The higher class of fare in the front cabin appeals to a small but affluent consumer sector, while the mainstream public flies coach. Extending the metaphor, the FM dial resembles an airline seat map, with most of the public stations inhabiting the small, reserved non-commercial band at the front end of the dial, and commercial stations filling up the bulk of the higher numbered rows behind. Moving down the dial is like walking up the aisle—except for the critically important distinctions that in an airplane all the seats are owned by the same operator, and in radio there is no shortage of seats in either cabin.

There are notable exceptions to these generalities, of course: Commercial radio still has its share of bright stars doing excellent work, and public radio still has plenty of rough edges. But the trend described here is inexorable, and given the exigencies of the current economy, it is unlikely that any reversal will occur. Coexistence will continue, but meanwhile, how many more listeners will choose to upgrade?

"You just have to speak to the right people."



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"This board is an 11! Even though the faders only go to 10..." *Lenny Bloch, Program Manager, Sirius Satellite Radio*

KLOTZ DIGITAL's Paradigm sets the new digital audio standard for radio on-air consoles. Easily integrated into your existing control room/facility, this compact and durable 24 input console boasts more features than any other in its price range! Expandable to 48 inputs, the Paradigm digital console provides operators with a standard and intuitive control surface and offers the ultimate in flexibility and digital audio quality. That's why the most sophisticated and technologically advanced facilities throughout the world choose KLOTZ DIGITAL.

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- *SERIAL CONTROL AND DISPLAY WITH WHEATSTONE CONSOLES*

THE 2001 MAKES AUDIO NETWORKING PRACTICAL. It's simple to install, easy to learn, and certain to reduce system costs. Compact enough for small applications, yet stackable for tremendous growth potential, it's design consists of 7"rackmount digital routing cages, each capable of handling 512 simultaneous audio channels on its backplane.

Units can be stacked to suit particular card complements (analog or digital input and output cards or optical network cards) but more significantly cages can be separated by great distances and network their audio through either bidirectional fiberoptic links or a single CAT-5 wire. ONE INTERCONNECT DOES IT ALL: 64 channels of simultaneous bidirectional digital audio, intercage communication, X-Y controller commands plus auxiliary RS-232 data streams. This single interconnect between your studio and central rackroom can save you tens if not hundreds of thousands of feet of wire in a typical installation.

The 2001's graphic based setup software is intuitive and easy to use, with all the authorization and security levels you could want. And of course we have a full complement of control panels and PC applications to choose from—all designed for straightforward operation and a rapid learning curve.

With 25 years of experience, Wheatstone has the infrastructure in place to help you build your OWN infrastructure. Contact us for answers.

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.

Wheatstone Corporation
tel 252-638-7000/fax 252-635-4857/sales@wheatstone.com
www.wheatstone.com