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The Radio Technology Leader
February 2001
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REMOTES
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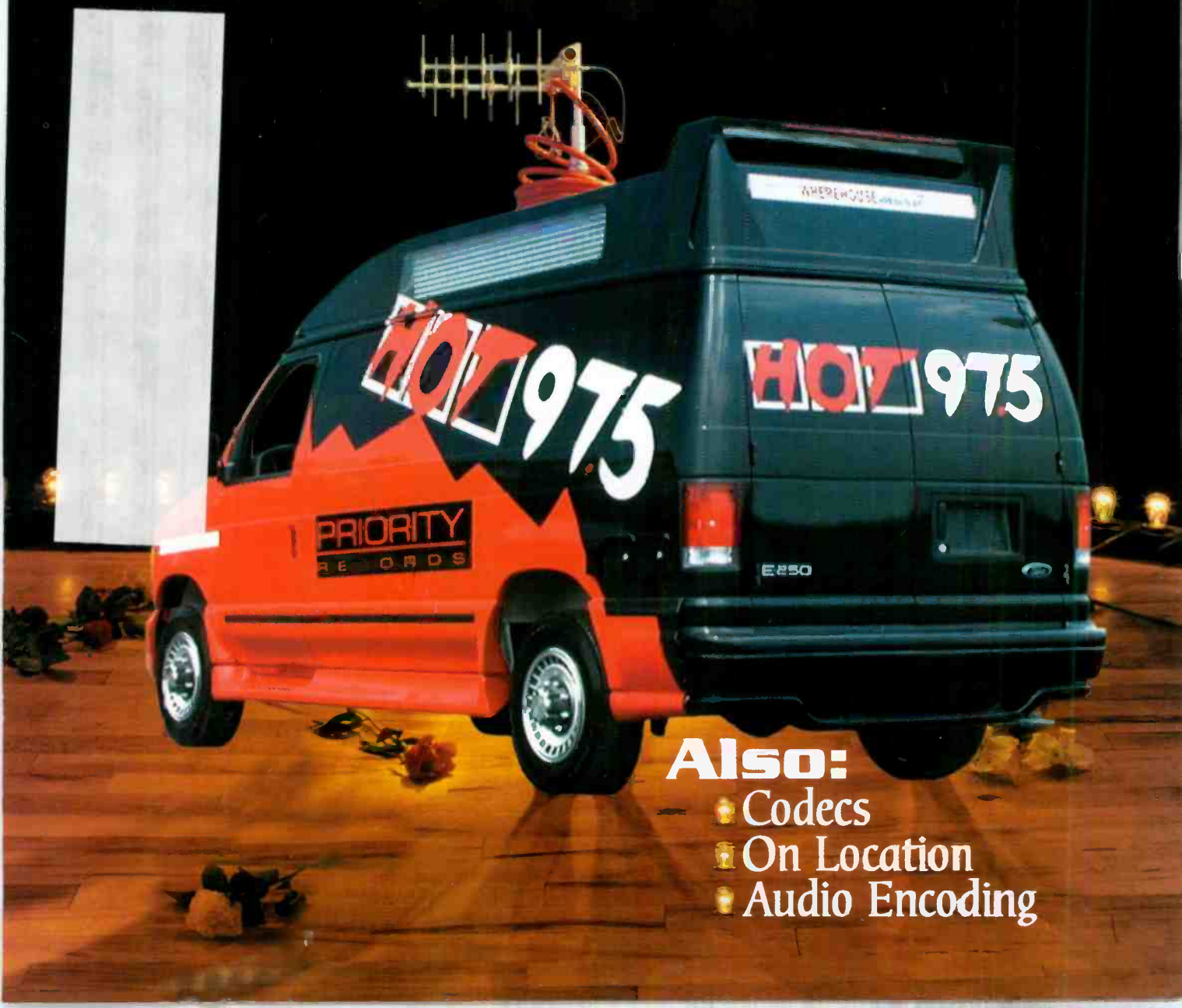

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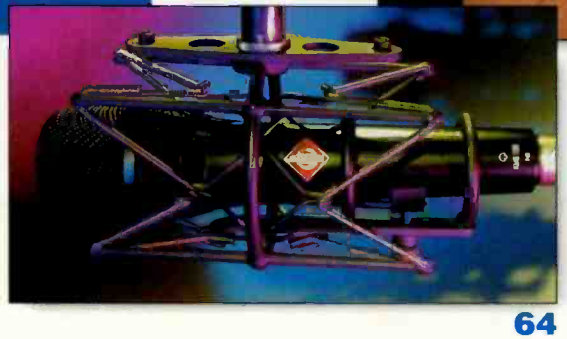

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ON THE COVER: From the footlights to the spotlights, great remotes require attention to the aural and visual details. Cover design by Michael J. Knust. Remote van photo by Brian Rideout and courtesy of Broadcast Products Inc.

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Viewpoint

The face of digital

I had a chance to attend the Consumer Electronics Show in Las Vegas in January. I normally don't attend this convention, but since I was there for an SBE executive committee meeting, I took in some of what was being offered at the show. In the short time I had to walk the show floor, and based on the reactions I was able to observe, I noticed four things: IBOC development is continuing, satellite radio is primed for a huge service launch, Internet radio appliances are getting noticed, and there are just not enough colored cellphone faceplates.

Of these observations, IBOC is probably your most direct concern. IBiquity Digital has been working hard to complete its work on a DAB system for the United States. Just before the show, iBiquity announced that it was filing additional test data to the FCC. While most broadcasters are interested in this news, most CES attendees were not. Granted, this convention caters to consumer equipment retailers and manufacturers and not those who will implement IBOC transmission technology. Several manufacturers had IBOC displays, but it was a little early for IBOC at the CES.

Meanwhile, in the XM and Sirius booths, there was plenty of foot traffic and excitement. IBiquity happened to be sandwiched between the aural festivities of the two satellite service providers. The displays from both sides were impressive, and there was a definite charge in the air.

Both S-DARS companies provided van tours to demonstrate their systems. While XM had not yet launched its first satellite, it did provide a listening tour with the five terrestrial repeaters installed around Las Vegas. Both demonstrations sounded very good, but I'm not sure everyone taking the test drive was fully aware of the technical feat that made these road tests possible. Currently, the services are being targeted at mobile users, but there was at least one receive-antenna manufacturer showing a prototype antenna for home installation.

I also attended the session on digital radio. The presentations did not provide any new information in general, but the attendees are on a different level of understanding than most broadcasters. There is definite confusion between IBOC and S-DARS and the roles of iBiquity, Sirius and XM. While I have been closely watching the DAB horizon for some time, I had to step back and watch how this very different group of visitors learned about the future of radio transmission. The major confusion was whether each company was a developer, a service provider, a programming developer or a hardware manufacturer. I still don't think everyone walked away with all the correct answers, but this is a new area for most of the CES attendees, and new methods require new thinking.

On the Internet radio side, the path blazed by Kerbango's Internet radio is being followed by other manufacturers. Other products, such as Part 15 transmitters for in-home rebroadcast, home networking systems and wireless Ethernet devices, are poised to continue the availability and practicality of Internet radio for home use—provided the music licensing issues are resolved.

The consumer market point of view of radio is that satellite radio is targeted at automobile listeners, and Internet radio is catering to home and office listeners. Soon we will see that line blurred as well. Meanwhile, terrestrial radio is still covering all the bases and will likely step up to the digital front very soon. The NAB convention is just around the corner, and the starring roles will be reassigned by the players already mentioned.

MY CES visit was brief this year. Maybe next time I will have more time to spend on the convention floor. Maybe then I'll find the perfect faceplate for my cellphone.

Chriss Scherer, editor
chriss_scherer@intertec.com

How will consumers embrace the digital radio future? Let us know what you think at beradio@intertec.com.

The costs of digital

By Jim Paluzzi, CBT

I always chuckle when I tell someone that I'm talking to them over a cellular telephone. Invariably, the person on the other end thinks that I'm lying. "You *can't* be on a cell phone," the caller will protest. "You sound too good!"

This is *not* a plug for some new digital telephone service. The reason I sound so good on my cell phone is that it is an *analog* cellular telephone, an old-fashioned analog phone, with few bells or whistles. No Web surfing on this phone; no stock quotes or e-mail, either. It's just a phone, and for this application, this old analog phone works great.

Why does my analog cell phone sound better than the high-tech digital cell phones that have replaced it in the marketplace? Surely, digital must be better, right?

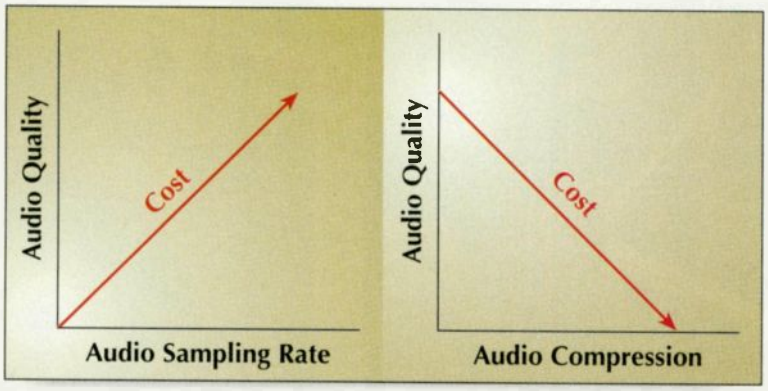


Figure 1. Audio quality (and consequently cost and storage space) increases as the sampling rate increases. Increased audio data compression requires less storage space and transmission bandwidth. However, audio quality will ultimately suffer as compression increases.

The digital phone could sound better than the analog phone. There is no reason why digital phone users should have to endure unnatural voice sounds, as well as that primitive delay (or latency) that makes you feel as though you are talking with someone from Mars rather than across town. Did you ever have that feeling that you and your caller should be saying "over" after you are finished speaking on a digital cell phone — just to prevent stepping over each other's words?

The reason digital cell phone audio sounds so poor is because the cell phone companies are stuffing *many* telephone calls into the same channel bandwidth formerly occupied by a single analog cell phone call. When you place more telephone calls into the same bandwidth, you can handle more users — and stand to make much more money. As long as most customers are willing to tolerate marginal audio quality and latency in return for more features (like free long distance or web surfing), the cell phone companies can sell more cell phone service to more customers, using the existing available bandwidth.

This cell phone scenario illustrates the issues we face as radio managers. We are often called upon to make major decisions regarding the acquisition of new technology for our stations. Whether the purchase in question is a new audio console, a new automation system, or a digital studio-to-transmitter link, the right answer does not always involve "going digital." Just as switching to a digital cell phone does not guarantee that you will sound better to your callers, purchasing digital broadcast equipment does not necessarily guarantee improved audio quality.

As a manager, make sure that any decision regarding the purchase of a new digital product is based on three factors: sampling rate, compression, and bandwidth. The major principle to keep in mind when evaluating these factors: *in the digital world, you cannot get something for nothing*. For every benefit, there is a tradeoff (and it is usually a capital or an operating expense).

Sampling rate

Digital audio is nothing more than a series of audio snapshots. In the visual world, you know that the more snapshots you take of a house that is for sale, the more accurately you will be able to represent that house to someone when you show those pictures later. Similarly, the more audio snapshots taken of an audio passage, the more accurate the reproduced sound. The number of audio snapshots in a second is the sampling rate, and in a perfect world, you want as many of them per second as possible.

The problem with audio using high sampling rates is that it takes either lots of bandwidth for transmission or lots of storage capacity to handle that sound (see Figure 1). Here comes our first tradeoff: do we cut back on the sampling rate, or do we pay more for additional bandwidth? There is another possibility: do we cheat?

Compression

There are many ways to explain audio compression. The simple one is that *compression is cheating*. Human hearing is imperfect, and we can eliminate a lot of audio data from a sound before the ear can detect the loss of quality. Accordingly, audio compression systems attempt to eliminate as much audio data as possible to save on

Managing Technology

bandwidth or storage requirements. (For more on perceptual audio encoding, see *How it Works* on page 50.) This is how digital cell phone services can squeeze so many more users into a bandwidth that can only accommodate a single analog user: telephone audio is compressed, and therefore, most of the audio quality is eliminated (see Figure 1). How far can you go in compressing broadcast audio?

To illustrate this compression problem, a national producer was uplinking a radio program from one city, using a compressed 128kb/s stereo satellite channel (a relatively small bandwidth for high quality audio). Several hours later, that program was time-shifted and uplinked on another compressed 128kb/s satellite channel from another city.

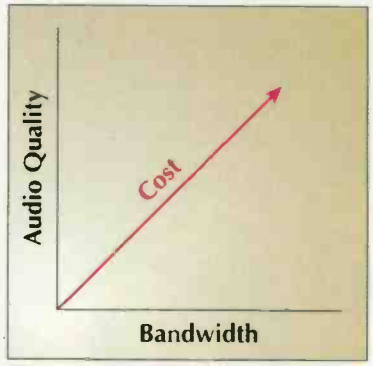


Figure 2. As the bandwidth of a transmitted signal increases, so does the potential for improved audio quality.

This double compressed audio signal sounded fine at stations using analog studio-to-transmitter links. However, at stations using digital STLs, the heavily compressed audio could not survive yet another digital process. As a result, listeners heard a hollow, swishy, otherworldly sound; the result of *digital artifacts*. Listeners know this problem as poor quality audio. The producer increased the satellite channel from 128kb/s to 256kb/s (at greater cost, of course) and the problem went away.

If your station broadcasts news and information programming, where much of the audio has already been compressed (from ISDN, heavily compressed satellite or telephone feeds), you may be better off sticking with your present analog STL until compression technology improves.

Bandwidth

Just as there is only so much spectrum available for cellular telephone service, broadcasters have to live in a world of bandwidth limitations. A studio-to-transmitter link is limited as to how wide the channel can be. Similarly, there is a limit as to how much satellite spectrum you can purchase, how many T-1 digital circuits you can afford to lease, or how much you can invest in audio file storage capacity (see Figure 2).

Few customers would pay for a high-audio quality digital cell phone service that charged $400 a month for service. Similarly, few managers would pay $10,000 a month for a studio-to-transmitter link for their station. In the end, the decision must remain a tradeoff: how much compression must you accept for handling your audio with the amount of bandwidth (or hard drive storage) that you can afford to purchase to accommodate your desired sampling rate?

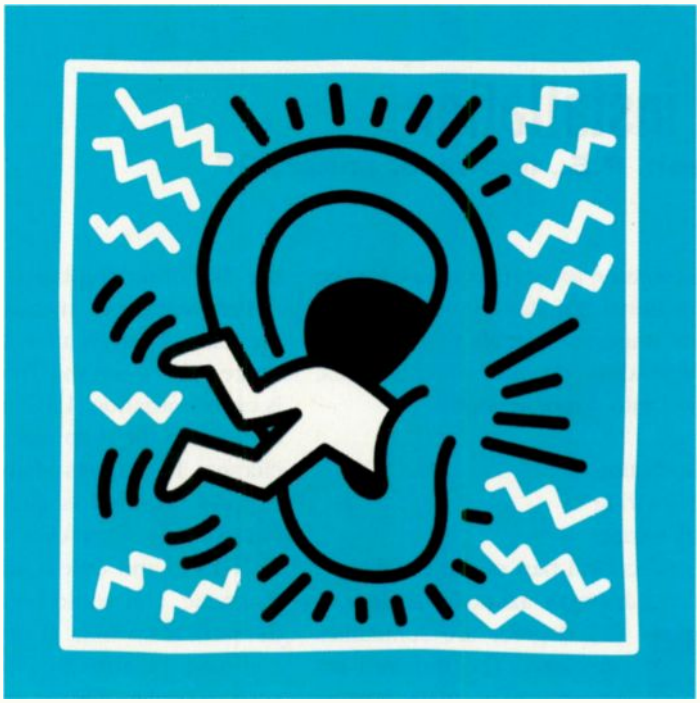
This digital tradeoff formula is a management issue and not merely a decision for the engineers. While one could easily infuse any of the above concepts with tons of technical complexity, the general concepts are simple, straightforward, and worth every minute of time that a manager can devote to better understand them.

Does it make sense to invest in upgrading your facilities to digital? Usually, the answer is yes. Why? Because, sometimes, going digital will improve the quality of your air sound; in other situations, digital technology may save you money. Rarely, however, will you accomplish both.

Jim Paluzzi, Ph. D., is general manager of Boise State Radio, Boise, ID, Professor of Broadcast Technology at Boise State University, and serves on the National Public Radio Board of Directors.

Managing Technology in April:
Engineering 101 for Managers

STUDER



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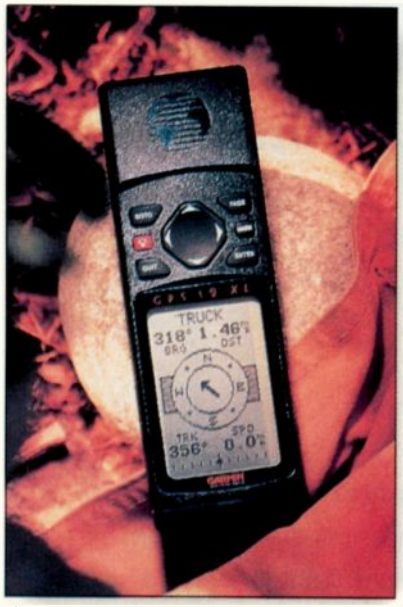
AM tower installation

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

If you have the good fortune to be responsible for the installation of a directional AM station, you will find that there are many important details that must be carefully planned. Depending on the circumstances, these may be combined into major groups.

- Antenna System
- Primary power distribution
- Installation (station) wiring
- Audio and ancilliary wiring

The most important and critical part of the installation is siting the towers. In critical arrays, azimuths as close as 0.5 degrees are sometimes involved. The required accuracy can normally only be provided by a professional civil engineer or surveyor. Any error in placing antenna bases is extremely costly to correct once the array is completed. Locating DA towers used to be akin to taking a sight in celestial or marine navigation, referencing the Pole Star and using involved math. No matter how the site is plotted, absolute accuracy is essential.



Handheld GPS units can be used to approximate a coordinate position.

The use of handheld GPS units is becoming very popular for tower siting; however, be sure that the model you use is referenced to the 1927 NAD. Many models use the new NAD and can be misleading. When siting a tower for an existing license, the surveyor will check your original site coordinates, and if necessary provide a corrected set of coordinates to file with the License Application Form.

When the consulting engineer modeled the antenna pattern, a point was selected to which all tower bearings are referenced. This is the reference tower. In the case of a simple two-tower array, there is only one tower bearing. In a multitower array there will be more. Every azimuth or bearing is measured from the *True North* Meridian, and tower spacing is measured from the reference tower and sometimes from others as well. Here also, absolute accuracy in spacing is essential. Azimuths are never measured from any meridian other than the True Meridian. Not observing this is certain to result in trouble.

Most surveyors measure from the Magnetic North Meridian. There is almost always a difference of several degrees between the True and Magnetic Meridians; this is called variation. USGS maps show the variation at the date when the map was printed and usually the rate of change. It changes slightly each year. Surveyors also express bearings as direction in one of the quadrants. For example, a surveyor would express a bearing of 015° as N-15-E, and unless otherwise specified, it would be magnetic, and could be as much as 5 or more degrees different from True. If you are working with a magnetic compass, be sure to avoid errors from nearby metals, such as poles, fences or chain lengths being used to measure radials.

It is essential that this point be completely clarified with the surveyor prior to commencing any layout work. When examining plats and site layouts and boundaries (which are measured from the Magnetic North Meridian) look for the meridian symbol. It is a vertical line representing north. If it has a full arrowhead, it is True, if only a half arrowhead, it is Magnetic. The Commission now requires a statement from a qualified surveyor certifying that the array coordinates and antenna layout angles agree with the Construction Permit values.

Coaxial cables

It is the usual practice to use sheathed, flexible transmission line between the phasor and ATUs. These line lengths will have been carefully considered by the consulting engineer when designing the phasing and ATU units. It is important to follow the lengths in the application. Any unapproved changes will probably put the pattern out of tolerance.

The choice of above-ground supported or buried coax is left to the engineer. Keep in mind that replacing a buried line often ruins the ground system.

The sampling lines should all have the same length to facilitate monitor calibration. These should be placed in a conduit and buried. To avoid errors due to erratic line changes, any excess line should be buried so that all parts of the line experience similar environmental conditions. The choice of current transformers or loops for detecting phase and current in the antennas depends on personal preferences, local conditions and tower height. I prefer current transformers safely ensconced in the ATU housing. The FCC also seems to prefer transformers.

On The Air

A Monthly Newsletter from Broadcast Software International Issue 1

Quote of the Month

"Wavestation has been running nonstop for nearly nine months. We are very happy."

John Spring
MedioFrame gmbh

Calendar

Feb 1st, WaveStation test has been running for 84 days without reboot or error.

Feb 7th-9th, WaveStation Weekend

Birthdays:
Feb 4th 1948 - Alice Cooper
Feb 4th 1947 - Dan Quayle

News

BSI Announces Ultimate Turnkey

The BSI Series 300 is a complete turnkey digital automation, VoiceTracking and production system for medium to large broadcast facilities. It is expandable, allowing you to easily add an unlimited number of additional Air Studio or Production Studio workstations. Digital hard drive automation, satellite interface, multi-studio VoiceTracking, 64-track production, backup, remote access and control are all included. A complete two-studio turnkey system, including both workstations, is only $26,999.

The Series 300 digital broadcast workstations are built around enterprise quality Dell PowerEdge 2450 components, AudioScience audio hardware and Microsoft Windows 2000 Pro. Each Series 300 system begins its life at Dell and then receives final assembly and testing at the BSI HQ in Eugene, Oregon.

This is a beautiful system with tremendous reliability, amazing capabilities and excellent specifications. From the Dell 2450 rack mount CPU to the high-resolution 18-inch flat screen monitors, this system is unmatched in technical capability and power-for-price. More than 36 gigabytes of hot-swappable hard drives and dual redundant power supplies mean downtime is virtually non-existent.

The Series 300 systems include BSI's WaveStation digital automation, WaveCart cart machine replacement,STINGER instant playback software, WebConnect Pro remote access program and the award-winning Cool Edit Pro 64-track digital editing software. Hardware accessories include the MixMax audio mixer/switcher and an Iomega JAZ drive. Users can also add additional Series 300 Production or Air Studio workstations as needed.

Tip

Macro Power

WaveStation does more than just play audio. Its macro language lets you command relays, mixes, ports and even run other applications. You can group macros along with audio in a cart to create complex sequences that look simple to the operator. For example, a cart called "GoToNet" could include a music fade, Legal ID and fade up network sequence. Carts can be randomized, nested and emailed.

User File

WYXI - Bob Ketchersid

Bob Ketchersid says, "WaveStation has really freed me." After 15 years at WYXI in Athens, Tennessee, Bob decided it was time to look into an automation system. He asked around and heard a lot of great things about BSI's $1499 WaveStation.

Bob now uses WaveStation in live-assist and automated modes, complete with satellite switching.

Bob also has great words about BSI's tech support team. "One time I left an emergency message at 1am. Leo called back within 5 minutes. He said 'Don't worry, we'll have you up and running in a couple of minutes'... And he did. They're great."

What does Bob have to say to anyone considering an automation system? "If you want to have a system that sounds like you actually have somebody running the board, at an economical price, that can do anything you could think of that you'd want something to be able to do, then WaveStation is the way to go," says Bob. "I've not seen any of the expensive systems do something that WaveStation can't do. We are very pleased. WaveStation has improved our on-air sound. It's saved us time and made us money."

Send us your User File story.

Other cable runs to the dog houses include electrical power for convenience use, security lighting and perhaps heat, and tower lighting if required. A multipair cable is often installed for communications, signaling, monitoring and ATU switching and condition reporting. These should also be in conduit for ease of replacement.

The ground system is a complex issue. For more information, see the April 1999 issue of *BE Radio* in part four of the antenna series.

Above-ground or below-ground cable installation is mostly a matter of personal preference.

Primary power system

Power utilities usually allow stations to either own the main transformer or just use it. If a stations owns the transformer, it can exclude other users from tapping into the transmitter's primary power circuit. This can avoid a heavy non-constant load from affecting primary power.

I always feel that the greater the distance that the line can be buried, the better it is for avoiding line surges. In any case, power from the transformer should come underground. Adequate surge protection is essential where it enters the transmitter building. Electrical power installations must contain a main disconnect switch to isolate circuits for servicing without endangering anyone.

If a standby generator is to be installed as part of the new facility, be sure that all the loads, including air conditioning, heat and ancillary equipment, are included in the power total. Ensure that the generator is checked out on full load as well as lower loads and is also exercised regularly for at least one hour each time.

The article that originally appeared as part of the antenna series on ground systems from the April 1999 issue of BE Radio *can be found on www.beradio.com. Follow the link to this article online. Click on* This Month in Print *and then* RF Engineering.

E-mail John at: batcom@bright.net.

Drive this...

Just as a car needs a reliable driver, so does every radio broadcast transmitter. The Crown FM series exciters, drivers and low power transmitters offer reliability unsurpassed throughout the world. Incorporating standard features as an integral part of all power levels, the quality in workmanship standard is consistent for all of Crown Broadcast products.

The exciter/driver model offers high reliability as an RF driver while maintaining the audio purity associated with FM broadcasting today. The internal low pass filter allows the exciter to be placed directly on-air in the event of a main transmitter failure.

Crown transmitters are stand alone low power units and can be configured with optional stereo generator and audio processor. Thousands of broaccasters around the world have come to appreciate the rugged, reliability of the Crown Broadcast line of transmitters.

So when making your decision on a new exciter, RF driver or low power transmitter, reliability should be at the top of your list. Crown Broadcast builds reliable transmitters from 1 watt to 2 kilowatts.

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Wireless LAN applications (part 2 of 2)

By Kevin McNamara, CNE

Last month we covered the basics of Wireless LANs (WLANs). This month we'll look at the three standards—Wi-fi, HomeRF and Bluetooth, as well as some applications.

Wi-Fi

Last month's discussion centered on the IEEE 802.11b standard also known as Wi-Fi. Yes, this means wireless fidelity. The organization responsible for certifying the interoperability of Wi-Fi devices is the Wireless Ethernet Compatibility Alliance (WECA). Its list of members includes Lucent, 3Com, Nortel, Cisco and a long list of other notables.

3Com's AirConnect adheres to the Wi-Fi standard.

But work is nearly complete on the next generation of Wi-Fi and, to make things interesting, there are two technologies vying for adoption of the Wi-Fi standards, 802.11b and HiperLAN2. Both technologies promise to deliver bandwidths of 54Mb/s using orthogonal frequency division multiplexing. The problem is that the 802.11b standard is favored in the United States and other parts of the world, while HiperLAN2 has found favor in Europe.

Another major difference in the next generation of Wi-Fi is that it will operate in the unlicensed 5Ghz band, as opposed to the current 2.4GHz band.

HomeRF

Led by long-time wireless player Proxim, the HomeRF Consortium uses a technology called Shared Wireless Access Protocol (SWAP). HomeRF networks can support up to 127 nodes that can be a mixture of the following:

1) Connection point supporting voice and data services
2) Voice terminal supporting Time Division Multiple Access (TDMA) voice services.
3) Data Nodes supporting Collision Sense Multiple Access with Collision Avoidance (CSMA/CA) communication services to other nodes or base stations.
4) Voice and Data using a combination of the above services.

SWAP is oriented toward the home network market, as it supports not only data but also telephone voice channels; this is not surprising, since this technology is closely tied to that used in digital cordless telephones.

A HomeRF network requires a connection point that provides access to the Public Switched Telephone Network (PTSN), which can also be attached to a PC to provide enhanced voice and data services.

Bluetooth

Bluetooth takes a different approach. First, it is considered to be a Personal Area Network (PAN), in which systems are designed to work within only a 10 meter area. Second, it provides a comparatively low data throughput (<1Mb/s). A Bluetooth network, also called a Piconet, is comprised of eight nodes or fewer. This may seem restrictive to growth, but an unlimited number of Piconets can be combined in a larger network called a Scatternet. Bluetooth networks can be configured to be compatible with both Ethernet networks and the Mobile System for Mobile Communication (GSM), the leading standard used for digital mobile phones outside of the US.

Currently, the Bluetooth standard specifies operation on the unlicensed 2.4GHz band. Because these devices operate with such a low power level, they become subject to interference from local sources, such as microwave ovens, that typically operate at a frequency of 2.45GHz, the resonant frequency of water.

System Planning

Other than Bluetooth products, wireless LANs can operate at distances of over ten miles. Before you get too excited, let's discuss some of the technical aspects of deploying a wireless LAN. Last month I told you that a typical WLAN consists of an access point (AP) and Wireless Network Interface Card (WNIC). A few manufacturers also provide stand-alone wireless base stations, which are essentially Ethernet routers combined with a radio system.

As with mobile cellular telephone systems, there are two key factors that must be considered in planning a

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WLAN: capacity and coverage. Remember that each AP has limitations with respect to the number of users and the amount of traffic expected during peak usage times. It is important to verify these limitations for the particular AP that you choose. Determining the size of your intended coverage area is just as essential.

Your goal is to distribute as few users per AP as necessary. For example, users working in a hospital or manufacturing plant environment may be required to move from area to area regularly and need to stay connected, as opposed to a typical office where the users pretty much stay at the same desk all day. In the first example, it is necessary to understand where users may be at any given time; since users are generally moving, APs should be distributed throughout the facility. The second example provides a static scenario where users are fixed to a given area; in this case it might be necessary to use multiple APs within the subject space. In practice, it is possible to use up to 3 APs in close proximity. You will simply have to configure each AP for a different frequency range (or channel). The WNIC for each user should also be set to the desired channel and access code so that each AP will handle 1/3 of the total capacity.

Another approach is to use directional antennas on each AP, directed at specific areas. We recently installed a WLAN system for an ISP that wanted to provide high-speed data to customers in a small town. Using two APs, each connected to a high-gain sectoral antenna, we were able to provide adequate coverage to most of the town.

Applications

Aside from the need to be tethered to a wire, one advantage of WLANs is the ability to deploy or make changes quickly without the need to move or install cabling. Broadcast environments can benefit from WLANs beyond the traditional applications. Alternative uses include data links between studios and transmitters or other facilities, offsite data storage systems, telemetry links and remote PC links to the station during a remote. With stations being added and subtracted constantly, wouldn't it be nice to eliminate the extra aggravation of moving PCs around the facility?

While already at some major airports, expect to see wireless APs in other places such as hotels, train and bus stations, even inside commercial aircraft. The Starbucks coffee chain has just announced that it will install high-speed Internet access using 802.11b APs in 2,000 stores this year.

The cost of installing a wireless system has dropped to a point where traditional cabling may not make sense. This stuff is worth checking out.

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

All of the Networks articles have been approved by the SBE Certification Committee as suitable study material that may assist your preparation for the SBE Certified Broadcast Networking Technologist exam. Contact the SBE at (317) 253-1640 or go to www.sbe.org for more information on SBE Certification.

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Duopoly rule revisions proposed

By Harry Martin

The FCC has begun a rulemaking proceeding to revise the definition of radio market and/or the method of counting the number of stations in a market for purposes of its duopoly rule. This attempt to narrow the definition of a market and decrease the number of stations counted in a market will likely reduce the number of stations that can be commonly owned in many markets.

Arbitron Definition. The FCC outlined alternative proposals in lieu of the current contour overlap standard. One is to use Arbitron radio market definitions. The FCC noted that 850 counties, containing 80% of the US population, are included in Arbitron radio markets, while 2,250 counties are not in any Arbitron market. Arbitron market definitions, the FCC said, may best reflect the actual numbers of stations and how many stations an applicant would control in a market.

Alternatives. The following methods for defining radio markets and counting the stations within them are proposed in the FCC's notice:

- Counting against an applicant's ownership allowance any station it owned in a market that was included in determining how many stations were in the market.
- Excluding from the count of the number of stations in a market any stations owned by an applicant except the commonly owned stations that form the market.
- Counting as being in a market only those stations whose principal community contours overlap or intersect the overlap area of the principal city contours of the stations whose ownership is to be merged.
- Counting only those stations that overlap a certain percentage of the contour of one or more mutually overlapping station.

The Current Standards. Currently, the FCC defines a market as the area within the combined overlapping principal community contours of the stations that will be commonly owned. The number of stations in a market is determined by counting all the stations whose principal community contours overlap the principal community contour of any market-defining station. In determining the number of stations an owner is deemed to posess, the FCC counts only those stations whose principal community contours overlap that part of the market where the principal community contours of all the stations that define the market actually overlap. This difference between the method of counting the number of stations in a market and the method of counting the number of stations an entity owns in the market has led to greater aggregation of stations in some markets than some of the current FCC commissioners believe the law permits.

Interim Processing. The FCC will delay, until after new rules are adopted, action on all pending and future assignment and transfer applications where the method used to count the stations the applicants own in the market affects whether the applications can be granted. The FCC proposed not to apply counting methodology changes retroactively to existing ownership combinations, so existing owners would not be required to sell stations. However, owners of existing combinations that transgress any new rules may not be able to sell them to a new owner as a group.

The outcome of the market definition rulemaking may be affected by the transition to a Republican-controlled FCC. As the statements of Commissioners Powell (perhaps the new FCC Chairman) and Furchgott-Roth in the rulemaking make clear, Republican commissioners are highly unlikely to roll back ownership rule deregulation in any significant manner.

FCC fines tower owners

A Puerto Rico company has been fined $10,000 for failing to monitor lighting on its antenna structure. This situation involved a tower at a remote location where the licensee was unaware of the lighting outage. Rejecting the argument that the antenna's location did not allow it to be monitored regularly, the FCC noted that its rules require tower owners to "make an observation of the antenna structure's lights at least once every 24 hours either visually or by observing an automatic, properly maintained indicator."

The FCC also notified 21 antenna operators of violations of the antenna structure registration posting requirement, which requires antenna structure owners to post the FCC-issued antenna structure registration number in a conspicuous place near the base of the antenna structure. The FCC further requires that materials used to display this number must be (1) weather resistant and (2) of a sufficient size to be easily seen at the base of the antenna structure.

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

Dateline

On or before April 1, 2001, stations in the following states must file their biennial ownership reports with the FCC: Delaware, Indiana, Kentucky, Pennsylvania, Tennessee and Texas. Stations in the same states must place their first annual EEO Public File Reports in their public files, also on April 1.

April 10, 2001 is the deadline for all stations to place in their public files their issues/programs lists for January 1 to March 30.

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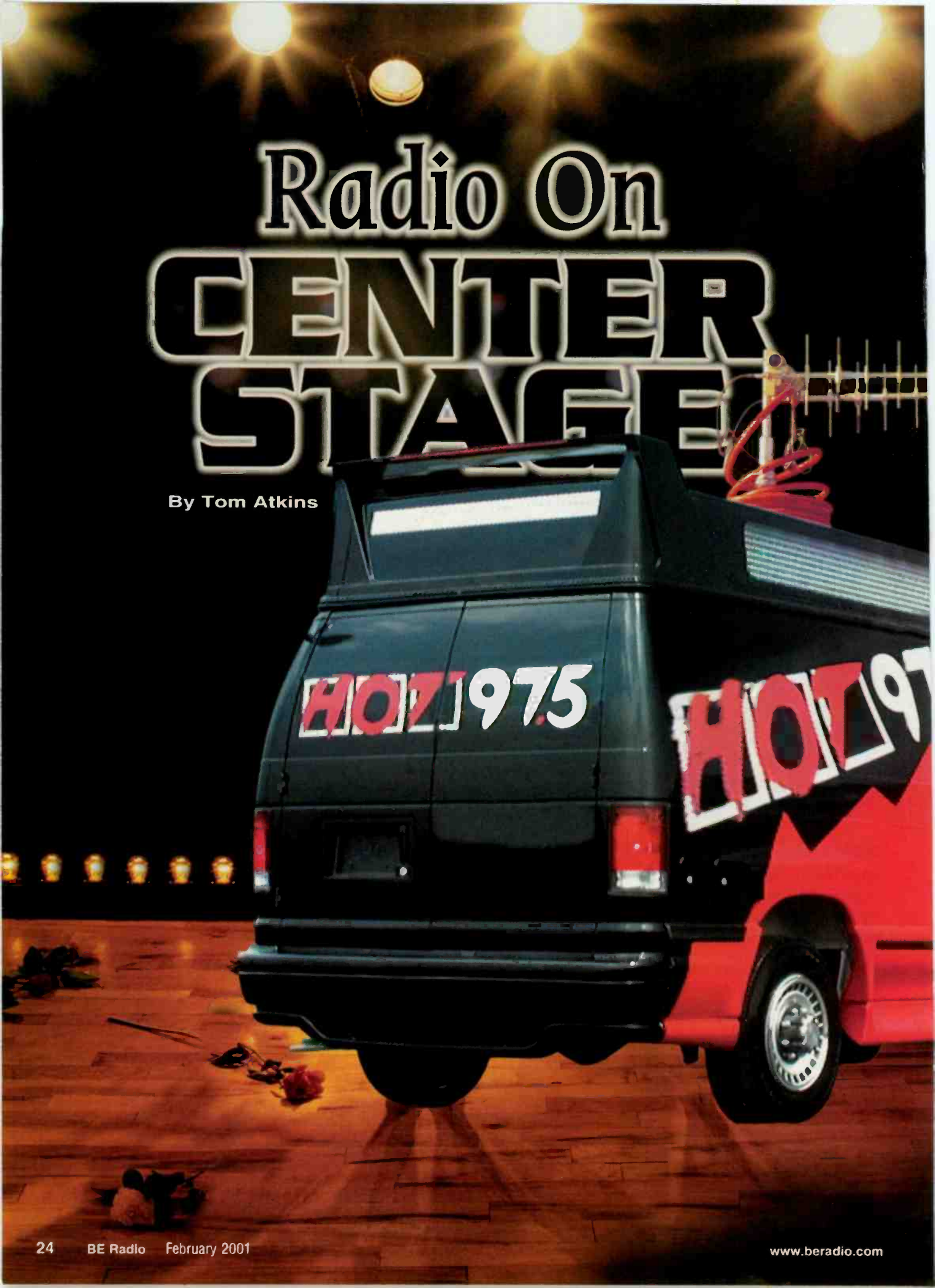
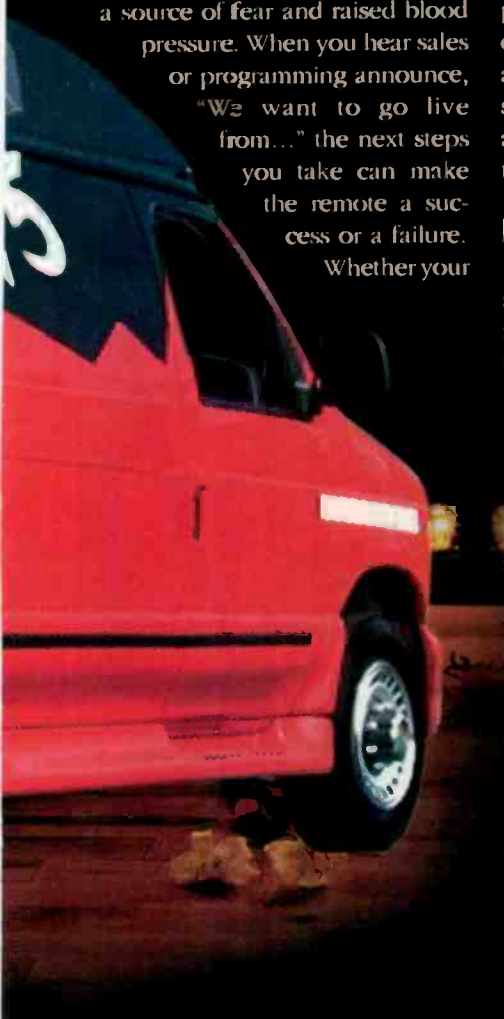
Radio On CENTER STAGE

By Tom Atkins



Leaving the comforts of the studio allows radio to shine in the limelight. Audio quality is important, but so is the physical presence of the station.

Remotes are something that most of us encounter over our careers in radio. Some take it in stride, others look at them as a source of fear and raised blood pressure. When you hear sales or programming announce, "We want to go live from..." the next steps you take can make the remote a success or a failure. Whether your format is CHR, news/talk, country, classical, or anything in-between, remotes can take on many forms. Some are simple, requiring a single microphone at the local taco joint. Others can be so involved that it takes days and a small army of engineers to setup. Flexibility from the equipment and the personnel involved is essential for a successful remote.



Remote vehicle photo by Brian Rideout, courtesy of Broadcast Products.

Real perspective

At our Buffalo, NY, cluster of radio stations, we complete around 700 remotes a year. Some stations may do more; many do less. However, there is a common goal that connects all remotes: to have a snafu-free remote that sounds as good as if it were done at the studios. We will look at what it takes to make a remote a technical success. Some remote aspects, such as elevating the RPU transmit antenna to clear ground obstructions, are obvious. Other aspects may be second nature, but an occasional review is always helpful.

First, the most important part of a successful remote is to have sufficient information. The second most important item is to have enough lead time to prepare. Establishing some rules is a good start. Meet with the general manager, program director, sales manager, news director and promotions director to set these guidelines. At our stations, we ask for written requests that have the exact location, address, phone number and contact person at the remote site. It is given to us with no less than a seven-day notice prior to the event. The information is then entered into a database, and a site survey is scheduled. After the site survey, any particulars about the site are entered into the database. This allows the on-site engineer to take a printed copy of the information about the remote. Upon completion of the remote, any additional helpful information is entered into the database in case we go to that location again. This eliminates the need for a complete site survey each time you go to the same car dealer.

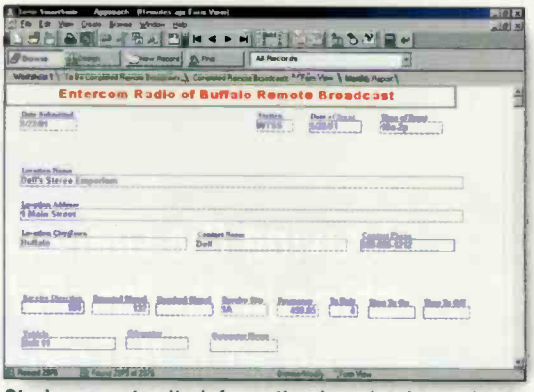
A relational database program, such as Lotus Approach or Microsoft Access, will provide the most flexibility in keeping an accurate database. Spreadsheet programs can also be used for basic database functions.

Some coworkers have asked why the seven-day notice is required, stating that they feel that remotes are the responsibility of the engineering department, and the staff should be ready at all times. The lead-time allows us to schedule the remote into an already hectic engineering schedule, and it enables the remote setup to better sell the image of the station. Sound quality is important, but the visual image on site properly sells the station's image. The only time we break the seven-day rule is for breaking news on the news/talk and sports station.

In setting up a remote, we all know that the signal has to get back to the station in one form or another. Today, there are a variety of ways to do this. RPU shots, ISDN codecs, and POTS codecs all provide nearly studio-quality or better.

Remotes by RF

Let's take a look at the RPU shot. Transmitting and receiving in the horizontal plane provides a good start in preventing *intermodulation* (also called intermod or IM). IM is the result of different frequencies interacting to create an undesired by-product. In congested areas, a horizontally polarized, directional receive antenna is also useful. In one of our installations, we use a Scala Paraflector with a heavy-duty rotor mounted on top of the STL tower at a transmitter site. The DC sample of the antenna direction and RPU receive signal strength are connected to the transmitter facility remote control so that the antenna can be remotely adjusted. We have used this directionality to set up two different remotes using the same frequency at the same time.



Storing remote site information in a database aids in preparing for previously visited locations.

A remote broadcast vehicle can serve as a moving billboard or a complete mobile studio.

The receiver signal strength indication is a valuable tool that should be used as much as possible. While an antenna can be aimed by reducing the hiss in the audio signal, more often than not, you are not obtaining an optimum signal. Most receivers provide a signal strength indication.

I have found audio noise reduction to be indispensable on RPU systems. Whether it is built into your RPU equipment or added as an outboard unit, you are bound to extend the

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reach of your RPU shot and make that remote sound closer to studio quality. We use dbx type II on our systems.

Wired for sound

If RPU is unavailable or impractical, telephone codecs are a good avenue. There are a variety of flavors in codecs, some of which have internal re-insertion of local audio for your mix-minus feeds from the station. If your codec happens not to have this feature, you can easily generate a local mix by using a headphone DA and the output of your mixer. Just make sure that when you mix the local audio with the mix-minus return you have some sort of a buffer amp in-between the two sources.

On Location

The January 2001 issue of *BE Radio* featured a Facility Showcase on the Entercom Buffalo facilities. The morning show of one of the stations, Kiss 98.5, wanted to broadcast live during the studio move. The old and new facilities were seven miles apart, so the morning show decided to ride a three-person bicycle from the old site to the new. Wireless communication was the only way this mobile remote would work.

The talent was equipped with wireless lavaliere mics and wireless IFB receivers. The remote truck followed the bicycle and handled the communication between the bike and the station. The IFB was sent to the van over a cell phone, and the remote audio was sent to the station using the RPU and an omni-directional antenna.

This will ensure that the mix-minus return does not feed back to the station. One of the more pronounced problems with ISDN codecs is the delay in the send and receive audio. It is particularly apparent on talk stations with live telephone calls. The conversations tend to get a bit disjointed. To minimize this and maintain quality, send audio from the remote codec

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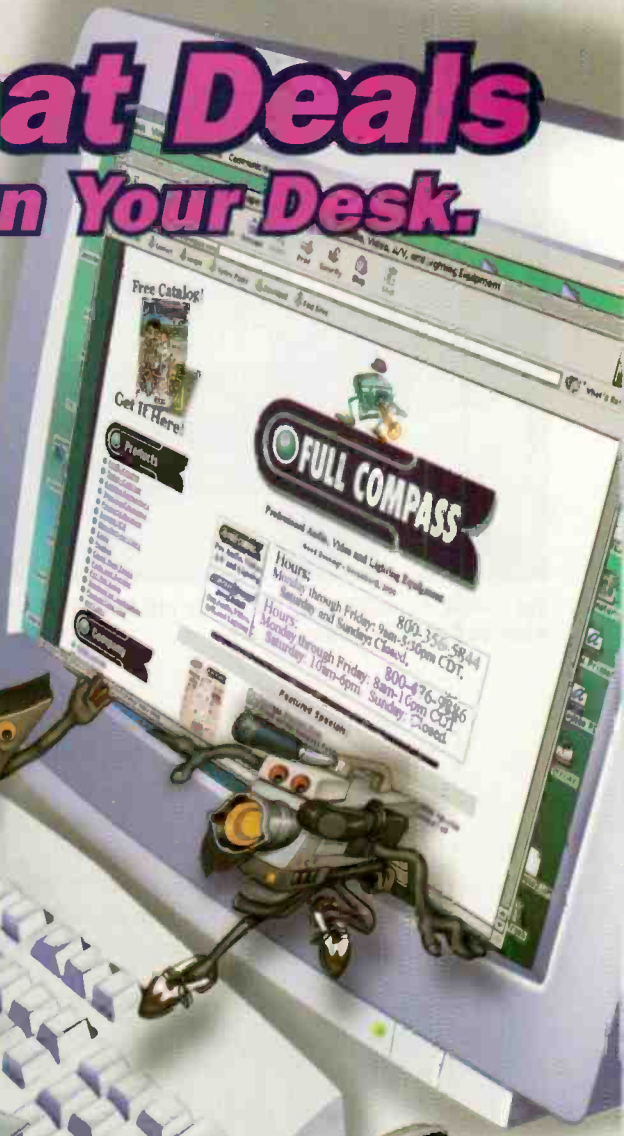

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Equipment reliability and flexibility are important when outfitting a remote vehicle.

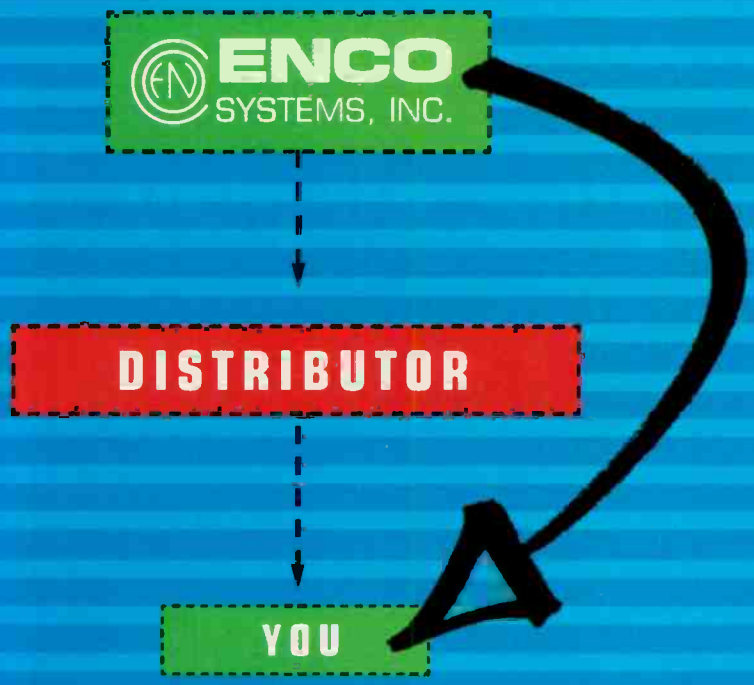
using a higher audio quality algorithm while receiving at the remote site with G.722.

POTS codecs have been a blessing where RPU or ISDN is not possible and near-studio quality is a must. However, using a POTS line presents some interesting challenges. Even though the codec is digital, the signal is carried via an analog network using modem tones. Depending on the phone company, the signal may be converted back to digital for fiber transmission and then back to analog for the last mile. These complex paths can limit the connect rate, which reduces the audio frequency response. We have had great success with using an NT-1 on an ISDN circuit at the studios. This provides a digital circuit from the telephone company, but the conversion is made at the studio, where we can still control the line lengths. This method has provided us with a one-level increase in connect rates and has also helped minimize dropouts.

Lightweight road cases make remote setups easier and faster so that only a few connections must be made in the field.

When connecting a POTS codec, use the shortest possible wire length to the jack to minimize noise pickup. It is better to run a longer audio cable from your mixer to the codec. Also be sure that the line you are using is clean and has no other connections to it. Someone picking up a telephone set on the same line will typically disconnect the POTS codec. (For more on codecs, see *Trends in Technology* on page 34.)

Eliminate the Middle Man.



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On site

Now that we have gotten the remote audio back to the station, let's take a look at the actual remote site and some of the extra tools that make a remote a success. Wireless microphones and IFB systems can enhance your broadcast with greater talent mobility. There are a wide variety of manufacturers and systems available.

A wireless IFB can be costly. If you are working on a budget, you can achieve good results with consumer 900MHz headphones. If your remote is an RPU shot, it is best to connect to the wireless equipment in the building from which the remote originates, rather than trying to receive the 50mW signal through concrete and steel at the RPU transmitter. This will also give you better range indoors. Most talents like to roam, and roam usually means further than you told them they could go. (For a look at an interesting roaming remote, see the *On Location* sidebar.)

A compliment of adapters, cables and tools are part of a remote survival kit.

Using a profanity delay is a complex undertaking in any studio. Using one during a remote can be even trickier. A pre-delay mix-minus feed needs to be sent to the remote site. This is not a great challenge when codecs are used, but, if an RPU is used, you will have to find some other means. FM subcarriers can provide an inexpensive way of getting the pre-delay audio out to the site. Another option is to use a dial-up telephone coupler with a cell phone. Most frequency extenders, which can enhance the audio being sent, work with cell phones.

Finally, a good arsenal of mic-to-line and line-to-mic adapters, balancing transformers, phase reversers and ground-lift adapters are a must, along with a good set of tools. There are times when a fast fix is needed to get the show on the air, and the right tools and adapters can save the day. Pre-made adapters are available, but you can also construct many of these in-house.

Tom Atkins is director of engineering for Entercom, Buffalo, NY.

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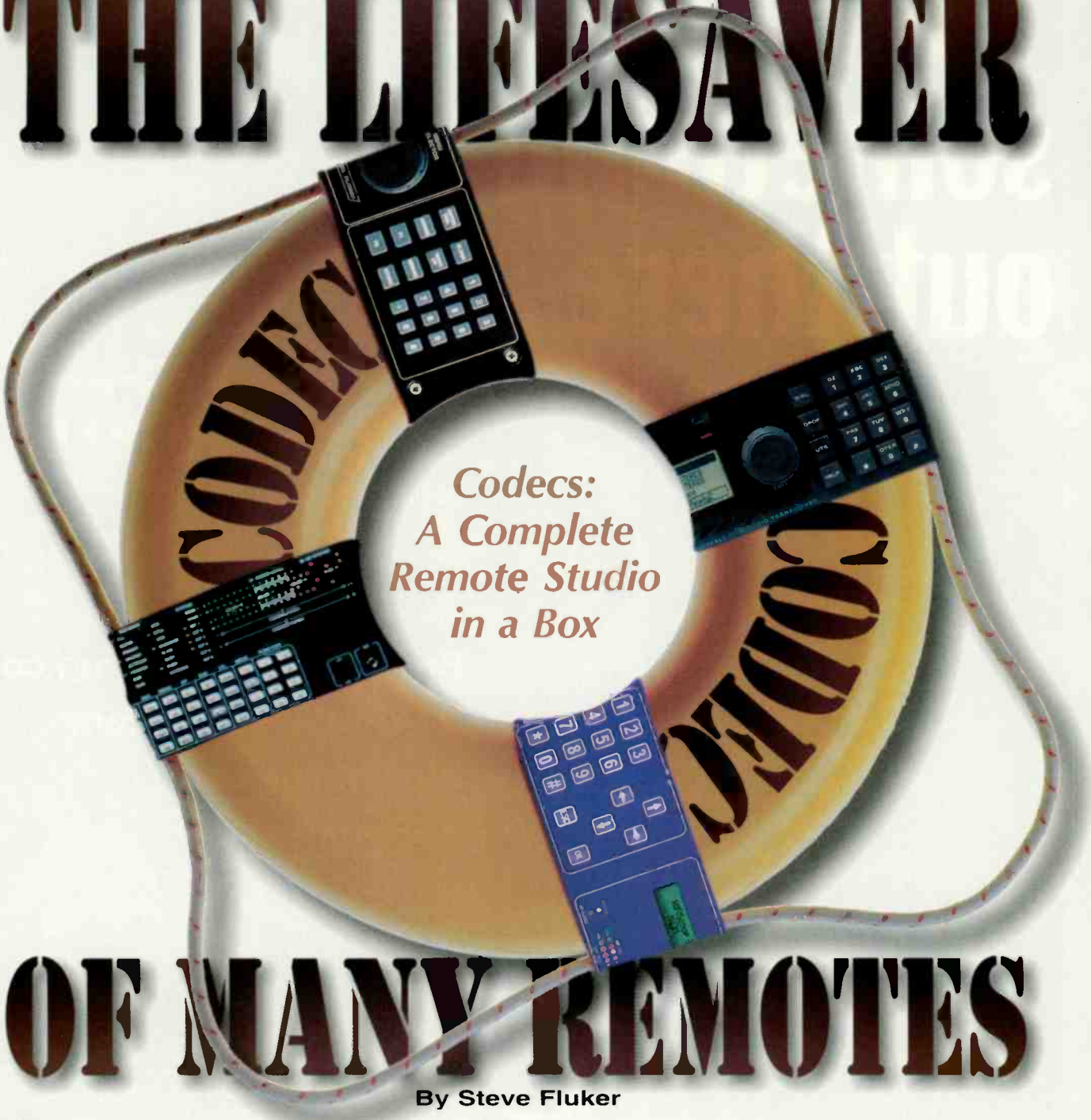


Codecs: A Complete Remote Studio in a Box

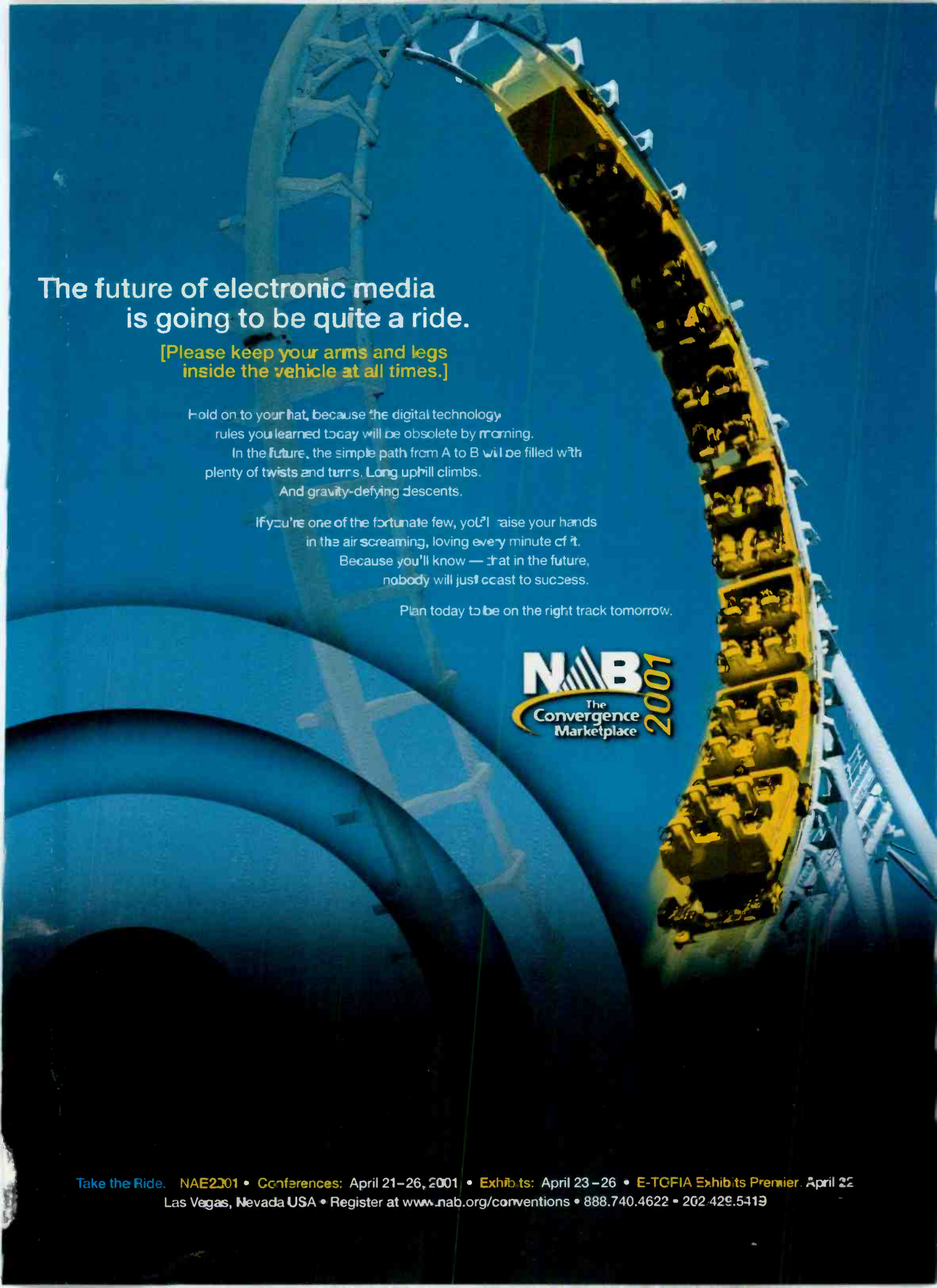
OF MANY REMOTES

By Steve Fluker

Remote broadcasts for radio stations have always been challenging. It's easy to show up at a location on time. Fancy promotional aids such as prize wheels, large inflatable balloons and logos, vans, trailers and booths make the appearance look great, but getting quality sound on the air is a different story. Are you in range for the remote-pickup transmitter? Will another station be on your frequency and cause interference? Can you park the van in a location where you can put the mast up without fear of trees or powerlines overhead? Can you get the antenna above the roof of the building? These questions are always overlooked when a broadcast is booked. For the engineer, there is always that uneasy feeling when rolling up to a remote broadcast location that the station has never been to before. Sometimes it's just not possible to check out every location prior to a show. Most times, the engineer is able to pull it off, but every now and then, it just won't happen. As a fall back, the station would have to do the broadcast on a telephone line, or worse yet, with a cell phone. Equalizers and frequency extenders have been used to try to make telephone remotes sound better, but they can only do so much.

Codecs to the rescue

Now that we are in the digital age, the solutions have not only become easier, but have become the norm. Codecs (from *co*der/*dec*oder) are used to convert audio to digital data and send it over telephone lines to be decoded at the studio for broadcast. Complex algorithms are used to compress the amount of data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before sending to increase the quality of the audio. With the newest revisions of these codecs, it is possible to get a single channel of audio up to 15kHz in bandwidth over a standard dial-up telephone line, commonly referred to as POTS (plain old telephone service) or PSTN (public switched telephone network) lines. This is amazing when you realize that, by feeding a normal analog signal down the same line, you can only achieve an average of 3.5kHz of bandwidth. Most of the remote broadcast transmitters can only broadcast with a bandwidth of 7.5kHz, which, when you get a good signal, sounds great for voice. As if this weren't enough, not only do you get this quality of audio to the studio, but you also get another channel of equal quality back from the studio to the remote site. This provides a built-in talkback circuit without using expensive two-way radios or running up the cell phone costs.

When even higher quality is needed, such as for stereo music, you can use a codec designed for high-speed ISDN phone circuits. Using MPEG algorithms such as Layer II or Layer III, some of these codecs can send 20kHz stereo audio across the country or across the world. These ISDN codecs are great for stations that want to broadcast live music from any remote location with ISDN service. The down side of these codecs is that the ISDN phone lines are not as readily available and can sometimes take as much as 30 days of lead time for installation. Cost can be an issue as well, especially if it is for a one-time-only show. One advantage to POTS codecs is that standard phone lines are usually already available at most locations and

Codecs are typically more mobile than their RF counterparts and can simplify equipment setups. Remotes originating from regularly occurring locations become plug-in-and-go installations.

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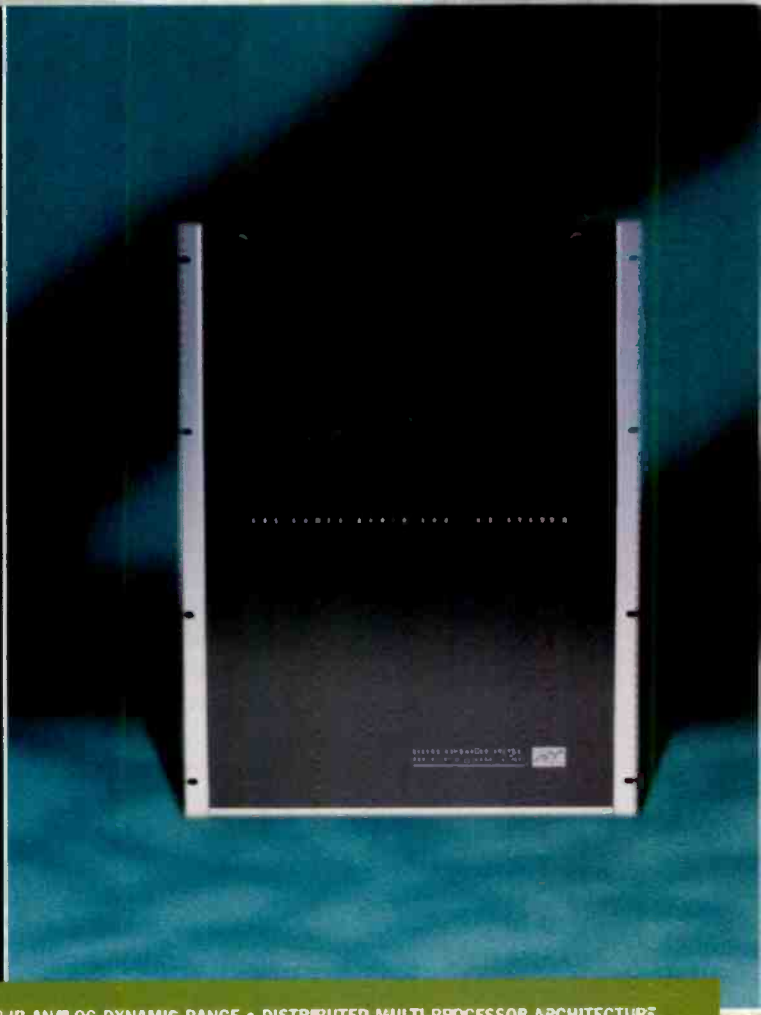

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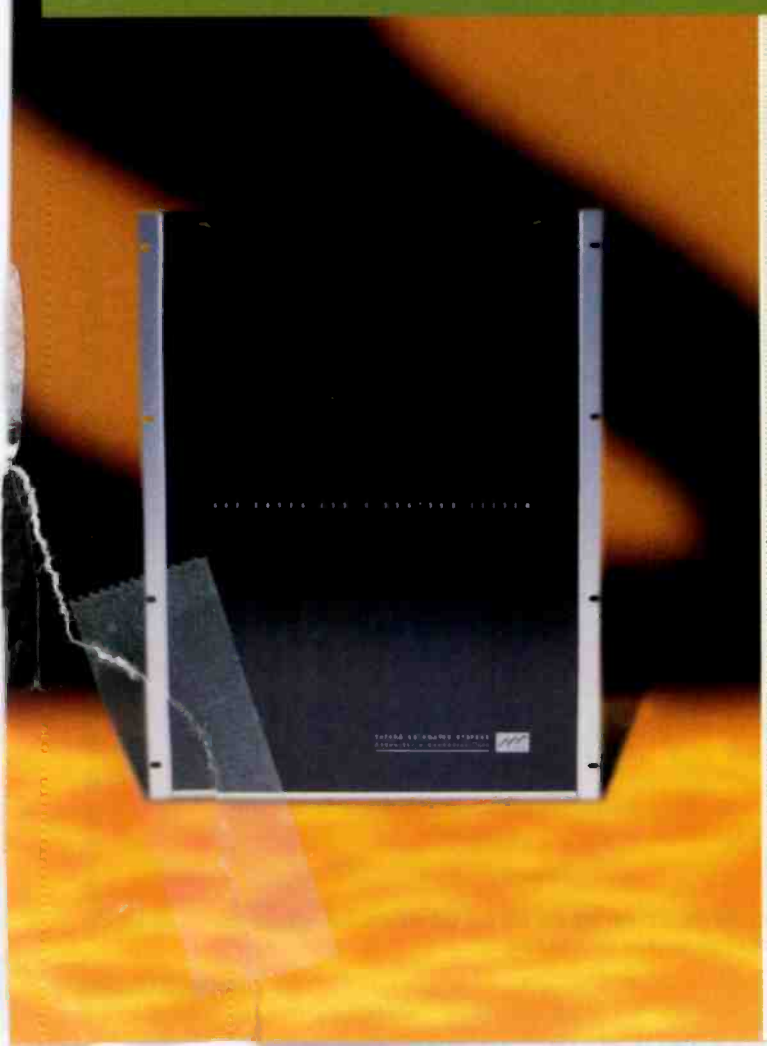

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SAS

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ready to plug in a codec for use.

Opening doors

Codecs have become widely accepted, and sales of units is growing rapidly. More manufacturers are jumping on the technology and putting their systems on the market. To make these units more attractive to the consumer, the manufacturers are coming up with a variety of innovative features to sell. The winners are the radio stations. At first, stations had to choose between POTS or ISDN codecs, and if they had a need for both types of service, they had to purchase two systems, one for each type of line. Newer codecs incorporate the ability to connect to either type of line. Some can select the type of line by plugging in different modules, and some have the ability to interface to either type of line built in. There are even codecs that can now take up to three ISDN lines in one unit to allow feeds to multiple locations simultaneously. The same piece of equipment can now be used for every day remotes and also for the more complex stereo broadcasts when the best quality is needed. This makes setup easier for non-technical staff since they don't have to learn how to use different types of units.

For increased transmision bandwidth, some codecs can bond multiple ISDN lines together.

Even though phone lines are just about everywhere, you can still run into occasions where lines aren't available, such as in a park, on the beach, or when you just need to be more mobile. For a news station, the news doesn't always happen in an office building. Up until now, these broadcasts would still require the old RPU transmitter with a mast on the van. Codec manufacturers have addressed this issue, and a few companies have introduced units that can connect to cell phones. Due to the low data rate available on most cell phones, the codec can only connect to the new GSM types of service. As this technology grows, so will the versatility of the broadcast. For truly mobile applications, many offer battery operation, some using lightweight AA batteries.

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Other power configurations contact OMB America

FM Antennas
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MP-1	$250	0.6Kw
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MP2-4	$1,820	2Kw
MP3-5	$2,270	3Kw
MP3-6	$2,740	3kw

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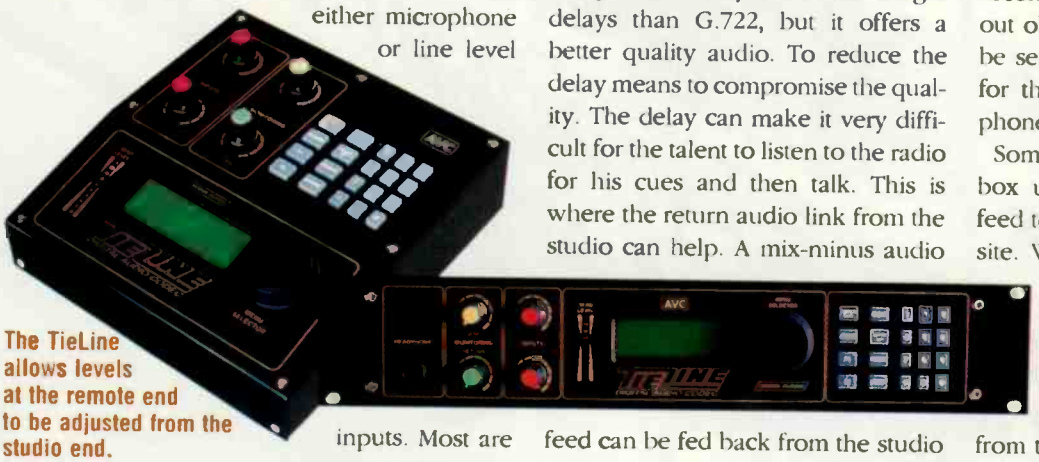
Compact studios in one box

Today's codecs are packing more and more features into compact and lightweight boxes. Many of the systems on the market now have built-in mixers with multiple inputs. Some are selectable for either microphone or line level inputs. Most are even now incorporating headphone amplifiers with multiple outputs, each with their own volume controls built in.



The TieLine allows levels at the remote end to be adjusted from the studio end.

One of the problems with using codecs, as with any other digital audio system, is a delay factor. It takes time for the audio to be converted to digital, transmitted, then received and decoded again. The amount of time delay varies greatly depending on the method of data compression. Layer III has longer delays than G.722, but it offers a better quality audio. To reduce the delay means to compromise the quality. The delay can make it very difficult for the talent to listen to the radio for his cues and then talk. This is where the return audio link from the studio can help. A mix-minus audio feed can be fed back from the studio to the remote location via the codec. At the remote site, the talent will listen to this audio feed to get his cues. When he begins to talk, he will not hear his voice coming from the studio, nor over the air, but rather will mix his local microphone with the feed from the studio. Many of the codecs on the market have this mix ability built right in. It is especially important when taking a talk radio show on the road. When a seven-second delay is used on the air to edit out obscenities, pre-delay audio can be sent back to the remote location for the talk show host to hear the phone callers and commercial breaks.

Some of these complete studio-in-a-box units even have an output to feed to a sound system at the remote site. When you are having troubles with reception of the radio station inside of a building, or outside of your coverage area, or if the delay is bothering the host, you can take this output from the codec to directly feed your PA sound system to play the station. Just like the headphone outputs, you can mix the audio from the studio with the local sources. This is great to reduce feedback. You can also turn

up the station louder at the remote without fear of the on-air audio processing grabbing the audio and causing more feedback. Simply show up to the remote with the codec, a microphone, headphones, amp and speakers, and you're running.

More features

As usual, the more we get, the more we want, and the codec manufacturers are not disappointing us. Some codecs will pass contact closures from a remote site to the studio site. This will allow the talent at the remote to start his own commercial break when he's ready, instead of relying on calling ahead and giving the board operator an outcue for which to listen. Some offer multiple closures to allow the talent to have even more control and interface with computer audio storage systems. Since this is digital technology with no interference noises in the background, the talent can simply mute his microphone at the remote site when he's not on the air, use the remote closures, and run the show from the remote site without the use of a control board operator

To be in complete contact, many of the codecs also provide a data channel to connect to a PC. Messages can be typed back and forth between the studio and remote location such as names and locations of phone callers, what song is coming up next, even e-mail messages. This

For flexibility, most codecs offer multiple encoding algorithms and some have the ability to automatically detect which algorithm is being used.

is possible with both the ISDN and POTS lines, without suffering loss of audio quality. On POTS lines, data connections of up to 9.6kb/s can be achieved simultaneously with the audio.

One of the more sophisticated units on the market now even allows control of the remote codec from the studio end, or from yet another location. By connecting a computer to the studio end unit, the board operator can use software to connect to the remote site, turn microphones on and off, adjust levels, and even troubleshoot minor problems. If a microphone is plugged into a line input, the change can be made remotely. This is great for broadcasts where an engineer isn't available, or for church broadcasts where nobody is needed. This same computer can monitor the connection quality of the line on a graph for diagnostics at a later time. There are even some third party companies now writing software to control codecs remotely by computer, and even through the Internet. Many of the codecs can be pre-programmed

by the engineer at the studio before sending it out, so that one touch of a button at the remote will set up the parameters properly, and even dial the phone number of the station.

With so many options available, what happens when you need to do a broadcast but can't get an ISDN line, or a good quality connection on a POTS line? This can be the case when sending a reporter overseas to a war zone, or to a less technically advanced nation. You might also be looking to do an interview at a concert with an artist or some of the fans in a crowd where you don't have a phone line. Once again, one of the manufacturers is thinking about this. One of the newest units on the market now has the ability to record and store nearly ten minutes of audio digitally, then send the data back to the studio on a POTS line when available, or at whatever data rate is available. While the broadcast will not be live, it does give the highest quality possible audio with even the poorest quality phone line—giving your station the edge on the competition.

An integrated mixer provides an easy method to setting up a remote broadcast.

Avoid obsolescence

With features changing rapidly, it's important to shop before buying. Look at what's available, and pick the features you need. To help protect your investment from becoming outdated, manufacturers are building their systems with the ability to be upgraded. Some use plug-in modules, not unlike video games, which will continue to be developed in the future to keep up with technology. Since codecs are basically computers and modems, many are now including RS-232 data ports, which can be connected to computers and even the Internet to allow new revisions and upgrades to be downloaded. I think it's safe to say that we have only scratched the surface of this technology. Codecs are popping up everywhere now—from nightclubs to car dealer broadcasts, to overseas news coverage. They are even being used in emergencies to back up STL links. They are rapidly changing the way we do business, and for the better. With a little imagination, you'll find ways to use them to increase revenue, and make the old dreaded remote broadcasts easier than ever, and as we come up with new ideas, the manufacturers will come up with the solutions.

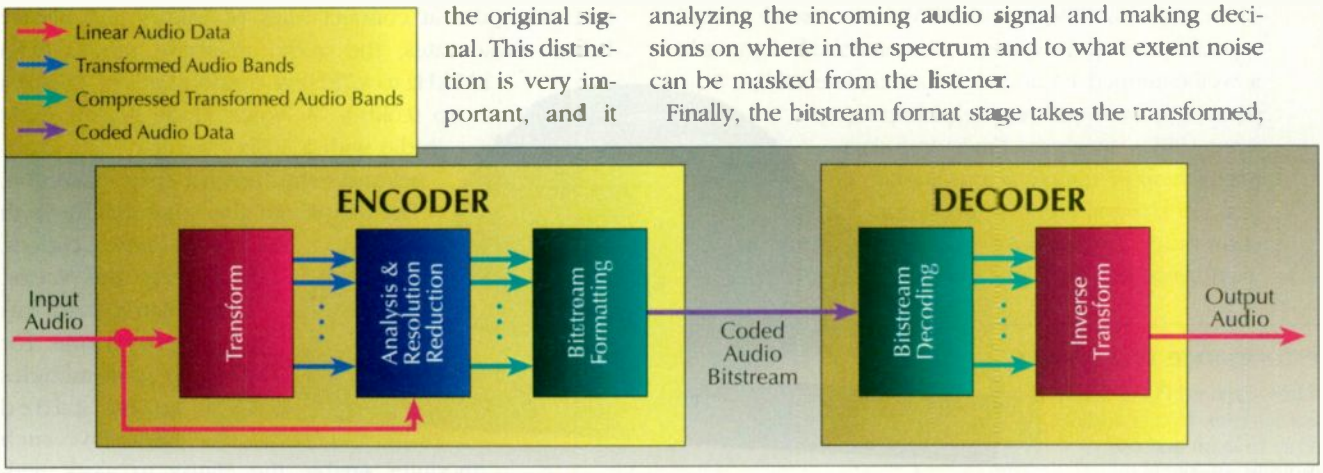
Steve Fluker is director of engineering of Cox Radio, Orlando.

Perceptual audio coding

By Kevin Nosé

Chances are very good that you have been exposed to the artifacts of perceptual audio coding without even knowing it.

Perceptual audio coding, in a general sense, is a method for reducing the amount of data required to represent a digital audio signal. The method is inherently lossy, and causes the reconstructed signal to bear a certain amount of noise that would easily fall within the range of human hearing if analyzed alone. However, perceptual audio coding specifically creates noise that falls outside the range of human perception when heard in the context of the original signal. This distinction is very important, and it sets perceptual audio coding schemes apart from other schemes, such as u-law or ADPCM, that don't take advantage of human hearing limitations.



The idea behind perceptual audio coding is that the presence of certain auditory stimuli can influence the brain's ability to perceive certain other stimuli. Put simply, some sounds can drown out, or mask, other ones. A coding process can take advantage of this by not encoding those aspects of the audio signal that would be masked from the listener. Several coding schemes today make use of this premise, including MPEG layers 1-3 and AAC, Microsoft's Windows Media Audio, Lucent's PAC, ATRAC (used for minidiscs), and some of RealNetwork's Real Audio codecs.

The figure shows the key components of a single channel perceptual audio coding chain. In the encoder, the incoming audio signal is broken down into multiple bands across the frequency spectrum by a transform process. Once transformed, the data contained within each band can be treated independently, allowing individual bands to be represented with varying degrees of resolution. When resolution is reduced in a particular band, the amount of quantization noise will increase around that band's corresponding part of the audio spectrum. An inverse transform is performed in the decoder to combine the multiple bands and restore the audio signal. In the case where no resolution is removed from any band, the transform/inverse transform process is ideally lossless.

After the transform, each band in the encoder is restricted to an appropriate amount of resolution to satisfy the target coded bit-rate while maintaining as much detail in key bands as possible. The encoder is constantly analyzing the incoming audio signal and making decisions on where in the spectrum and to what extent noise can be masked from the listener.

Finally, the bitstream format stage takes the transformed, minimized data and assembles it into a bitstream that the decoder can understand. Additional information is included with the audio data at this stage that identifies the bitstream as a specific type with specific operating parameters, such as sample rate and bit-rate. The bitstream formatting and decoding stages can also make use of various error detection and correction techniques if necessary.

The effectiveness of a perceptual coding scheme depends on how accurately it can match the perceptual limitations of human hearing, but it will also depend on having enough transmission bandwidth to support all the detail that the human sense of hearing is capable of perceiving. Thanks to the promise of ever-improving bandwidths, this will be less of an issue in the future, and perceptual audio codecs can continue to be the highest quality lossy transmission scheme you've never noticed.

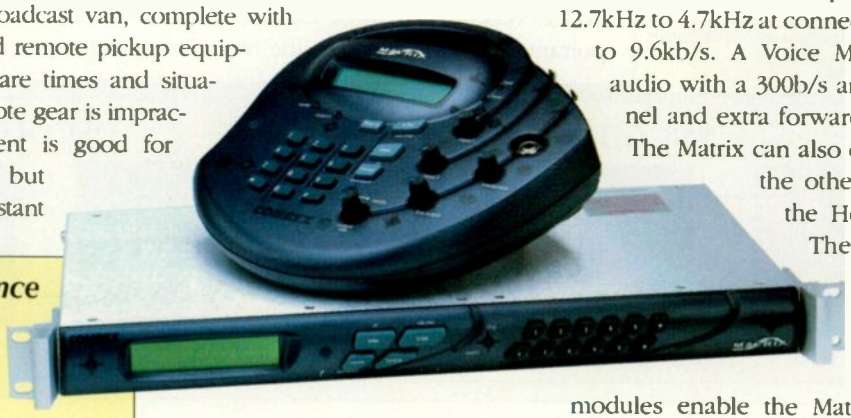
Kevin Nosé is president and director of engineering of NeoSonic Industries, Cleveland.

Comrex Matrix

By John Diamantis

Transmitting audio via telephone circuits has been a necessity in radio for quite some time. In the beginning, radio used plain old telephone service and a plain old telephone. It was fast, cheap, easy, and sounded awful. The next step up was conditioned, or equalized, lines. This worked fine while the phone company had technicians that knew how to set them up and they cost only $125 to install. If you can even get one today, install prices are about $1,500 to $2,500 for a single line. Not very cost effective for a quick remote from the local Donut Hut.

Our stations, WBQB and WFVA, are remote intensive, especially during the spring and summer. Although we have a well-equipped broadcast van, complete with pneumatic mast and remote pickup equipment (RPU), there are times and situations where RF remote gear is impractical. RPU equipment is good for short-range work, but interference is a constant problem, especially in metro areas. It also requires a crew with the technical savvy to operate the equipment. Plus, it's often tough to get a clean signal out of malls and other large venues.



Performance at a glance

- Uses standard POTS lines
- Full-duplex 15kHz audio
- Easy to learn and use
- Built-in mixer
- Up to 7 hours operation on battery
- Clear, concise manual

With our stations' desire to do remotes beyond the range of our current RPU system, I wanted a device that could be setup easily, give us excellent audio quality, and minimize operational cost. After some investigating, I decided to try one of the POTS codecs. Our FM station had a contest coming up that required a live remote broadcast for five straight days, twenty-four hours per day. I felt that a week-long remote with limited technical staff on hand would be a trial by fire for any device. I contacted Comrex and described my situation. The company was very receptive to the idea of putting the Matrix to the test.

The Comrex Matrix is a single-line POTS codec that provides 15kHz, full-duplex (simultaneous send and receive) audio at connect rates of 24kb/s and above. Below these rates, the audio response ranges from 12.7kHz to 4.7kHz at connect rates of 21.6kb/s to 9.6kb/s. A Voice Mode allows 7kHz audio with a 300b/s ancillary data channel and extra forward error correction. The Matrix can also communicate with the other Comrex codecs, the Hotline and Vector. The Matrix also has provisions for plug-in modules to be added later. Two such modules enable the Matrix to work with ISDN lines, and GSM wireless services.

Data Rate (kb/s)	Vector Mode	Hotline Mode
9.6	5kHz	n/a
12	6kHz	4.5kHz
14.4	7kHz	5.4kHz
16.8	7kHz	5.6kHz
19.2	11kHz	5.8kHz
21.6	12kHz	6.5kHz
24	15kHz	7kHz
26.4	15kHz	8kHz
28.8	15kHz	8.6kHz
31.2	15kHz	9.3kHz
33.6	15kHz	10kHz

The various audio bandwidths based on operating modes and connection rates.

Get up and go

The Matrix is easy to set up. The studio end requires a telephone line and a connection to the console or switcher. A return audio path should be connected as well. This return feed should be a mix-minus of the remote signal, as the encoding/decoding and transmission process takes about 100ms. Off-air monitoring at the remote site will be disconcerting, especially to the talent, because of the audio delay.

At the remote end, the portable unit has provisions for mixing two audio sources. One is switchable between mic and line, the other is mic only. There is a line out for connection to a PA or personal monitor device, plus a headphone jack. This is an adjustable combination of the mix-minus feed provided by the studio and the local audio sources, so those at the remote site can hear themselves in real time. A tally closure can be triggered by the user at either end, and can be used for cueing or remotely starting an event.

The Matrix also has a unique feature called Store and

Forward, which allows you to record an audio feed up to nearly ten minutes and then send it via a low-speed circuit that won't allow real-time codec use.

Dialing from either end is possible with the number being held in the #1 memory position for easy redial. The well-written manual also suggests that if your connection is enabled for more than a couple of hours, you should renegotiate it to allow the modems to adapt to changing line characteristics. This is good advice, because if the unit at either end detects a change, it will automatically activate renegotiation, which shuts down the audio for about 10 seconds. According to Murphy's Law, chances are good that this will happen in the middle of a break during a busy morning show. I put together a quick one sheet for the air staff describing the operation of the Matrix in brief, and how to renegotiate every two hours with the one button command. Since doing this, we have had no further unexpected outages.

During initial setup, I added two RF filters to the studio phone line, because the close proximity of our AM stations' transmitter prevented the Matrix from working properly. Although the manual does not recommend connection through a PBX or phone system switch, I tested the portable end through our phone system. Surprisingly, I routinely obtained a solid 14.4kb/s connection, with occasional 19.2kb/s connections. These results were good enough to have been used on air if needed, but other situations could be different.

Data Rate (kb/s)	G.722	Turbo G.722	Layer III
56/64	7.5kHz	n/a	15kHz
112/128	n/a	15kHz	n/a
Coding Delay	6ms	6ms	300ms

Comparison of audio coding delays for encoding algorithms based on connection rates and frequency response.

During the continuous 100-hour remote broadcast, we experienced no problems with the Matrix. Everyone was very impressed with the audio quality, especially considering it uses a regular phone line. The return station audio especially sounded good. Plus, it was very easy to use. The proof of our satisfaction is that we've already ordered our own Matrix system from Comrex.

John Diamantis is chief engineer of WBQB and WFVA in Fredericksburg, VA.

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New Products

Catalog
LEDtronics

LED lamp catalog: The catalog includes dimensional data, illustrations, specifications and applications. Cross-reference tables for incandescent lamps accompany each LED lamp listing. A comprehensive reference chart shows the available LED hues, wavelengths, forward voltages, intensities, viewing angles and dye materials. This publication may be viewed online or downloaded as a self-extracting .zip file at www.led.net/downloads/bsd.pdf. The miniature-based LED lamps catalog is free for qualified customers. Contact LEDtronics and request data sheet log UT005.

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High-torque turntable
Gemini Sound Products

PT-2400: Features of this turntable include high-torque direct-drive professional turntable with quartz lock; a large LCD display showing: speed, pitch & platter direction; locking platter reverse button located in battle position; a 3-speed design: 33, 45 and 78 RPM; ±10% pitch control; up to 7 grams of tone arm pressure; pop-up target light; anti-skate adjustment; strobe illuminator; soft-touch start/stop button; removable headshell and a dust cover. The unit is 115V/230V switchable. Also available is the PT-2410 with translucent finish.

732-969-9000; fax 732-969-9090; www.geminidj.com; sales@geminidj.com
Circle (255) on Free Info Card or go to www.beradio.com

New Products

Wireless telephone adapter
JK Audio

◀ **Dapter One:** This little black box converts the 2.5mm headset jack on your cell phone to a modular jack. This RJ-11 jack connects directly to any JK Audio RemoteMix series mixer. You will continue to use your wireless phone to dial or answer the call, but will use the microphone and headphones plugged into your RemoteMix during the call. Daptor One does not require any batteries or power supply. It contains a mini hybrid circuit that converts the earpiece and microphone signals into a balanced RJ-11 phone line signal. Mic signals from the RemoteMix are sent into the wireless phone, while the earpiece signals from the wireless phone are sent into the RemoteMix Headphones. The hybrid circuit minimizes crosstalk between transmit and receive.

800-552-8346; fax 815-786-8502
www.jkaudio.com; info@jkaudio.com
Circle (256) on Free Info Card or go to www.beradio.com

Internet communication program
ITXC

Push To Talk: This program offers three different types of communication: talking over the Internet, over the phone, or communicating via text chat. Website visitors choose the most appropriate option. Two-line users can use the Call Me Now option and recive a call back from the agent at the phone number they provide. One-line users with a multimedia PC can click on Talk Over the Internet, and their phone will behave like two, allowing consumers to continue browsing the Internet while talking to an agent. One-line users who do not own a multimedia PC can click Text Chat and use their keyboard.

609-750-3333; fax 609-419-1511
www.itxc.com; pr@itxc.com
Circle (267) on Free Info Card or go to www.beradio.com

Multichannel audio and data transmission system
Otari

▲ **LightWinder:** Consists of two to 16 mainframes, each holding two to eight modules. Modules can be custom configured. Features can be controlled and monitored by LightView software. Video link option allows for broadcast-quality transmission of NTSC and PAL video.

800-877-0577; fax 818-594-7208
www.otari.com;sales@otari.com
Circle (260) on Free Info Card or go to www.beradio.com

Online network
StageSmart.com

▲ **StageSmart.com:** An interactive service that connects the audio professional with a national network of thousands of independent pro audio retailers, and a database of available pro audio gear from a variety of manufacturers, StageSmart.com opens up the national pro audio equipment marketplace to dealers who might not have the physical or financial resources or Web E-tailing skills to market their company on a nationwide level. Moreover, if you are a retailer trying to build your online store, you can do so with the domain name of your choice with StageSmart.com's customized web site design resources.

415-643-7000; fax 415-206-7370
www.stagesmart.com; info@stagesmart.com
Circle (262) on Free Info Card or go to www.beradio.com

New Products

FM transmitter
Marti Electronics

◀ **PNP-150:** This Plug N Play device uses the latest in RF technology coupled with proven exciter technology. The exciter portion of the transmitter is digital and takes advantage of recent advances in DSP speed and efficiency. The PNP-150 offers customers a built-in stereo generator and audio processor and accepts analog or digital audio input from an STL, ISDN or direct feed. The digital input is AES/EBU, SPDIF, TOSLINK, and analog input is composite or left and right audio. The unit is full remote-control ready, rack mountable or suitable for tabletop operation, and offers up to 150 watts into 1.5:1 VSWR.

817-645-9163; fax 817-641-3869; www.martielectronics.com; martl@flash.net

Circle (266) on Free Info Card or go to www.beradio.com

Rack enclosures
BGW

RN Series: This series features a fully welded construction, a removable top and bottom rear plates for cable pass through, 14-guage steel tops and bottoms, 16-guage steel single piece sides, 11-guage steel where rail brackets are welded to sides, 2 pairs of 11-guage, 10-32 threaded rackrail, abundant cable lacing points, adjustable or fixed rail mounting positions and a black textured powder coat finish.

800-468-2677; fax 310-676-6713;
www.bgw.com;sales@bgw.com

Circle (253) on Free Info Card or go to www.beradio.com

Vacuum tube microphone preamplifier
Universal Audio

2-610: A two-channel tube microphone preamplifier based on the Universal Audio 610 modular console, the Universal Audio 2-610 is a tool for tracking that can be used in conjunction with a compressor. Features include two channels of tube pre-amplification; microphone (female XLR), balanced line (female XLR) and unbalanced line/instrument (¼" jack) (DI) inputs; and balanced line (female XLR) outputs. Front panel controls include input select, variable gain/input feedback control, output level control, HF shelf EQ, LF shelf EQ, polarity reverse swtich and 48V phantom power.

831-454-0630; fax 831-454-0689
www.uaudio.com; info@uaudio.com

Circle (264) on Free Info Card
or go to www.beradio.com

Spectrum analyzer
Belar

▲ **CSA-1:** May be used to view the real-time spectrum of a wide variety of input signals, for AM, FM, TV and audio frequencies. Equipped with 2MHz RF/IF, 150kHz wide-band composite, and 24kHz L/R audio inputs (analog or digital), the CSA-1 is a value, compact, and accurate FFT (fast fourier transform) analyzer. Featuring an adjustable 120dB dynamic range, the CSA-1 resolves to 0.1dB accuracy. Linear (percent) and dB scales, infinite peak hold, peak hold, average display or real time are all user selectable. As are sum and/or difference of L/R analog or digital inputs. Completing the package are a vacuum fluorescent 256×64 display and an on-screen cursor that permits direct reading of any frequency or amplitude.

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

Circle (252) on Free Info Card or go to www.beradio.com

Reader Feedback

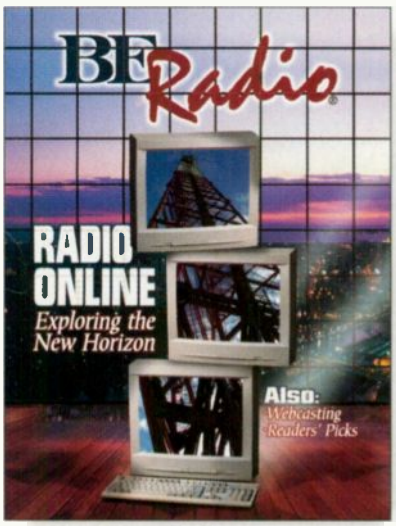
Internet radio plans

Thanks for the article about online radio in the December 2000 issue. We've been providing our audio service online for more than three years. While we begin planning a new building, we wonder what the predictions are for additional program streams. Will most radio stations be providing just a single Internet program stream? If stations will provide more than one stream, will those streams be live 24/7?

We are wrestling with the question of how much additional studio space to provide in our building for second, third or more streams.

Rob Lorei
news and public affairs director
WMNF-FM
Tampa

Stations will likely add more streams as streaming becomes profitable. Without the limitation of a license, the Internet is an open market. As encoding algorithms improve and available bandwidth increases, audio quality will also increase. We already see several companies marketing ad insertion tools to create extra revenue from an established stream. Storage space and adding an automation system workstation is also comparatively inexpensive, so I don't see anything to prevent radio stations from becoming Internet network entertainment providers.

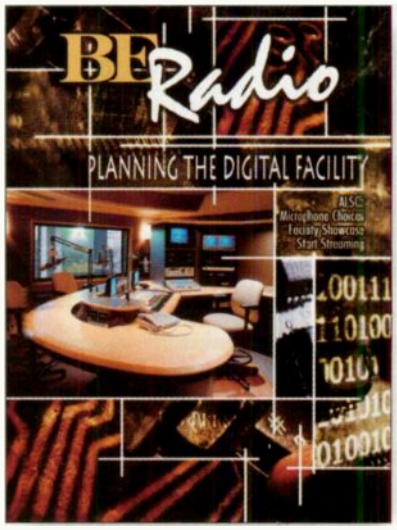


Some of these additional streams may be 24/7, others may be segmented like a dayparted station. The choice will be up to the station who will become a stream provider. If an audience demands a 24/7 format, provide it. Stations could also provide specials online, such as concerts and interviews.

Planning additional space is a great idea. How much space you will need is not easily answered. The type of format and method of preparation will determine that. I hope this helps some, but I think you'll be blazing your own trail on most of this.

Chriss Scherer
editor

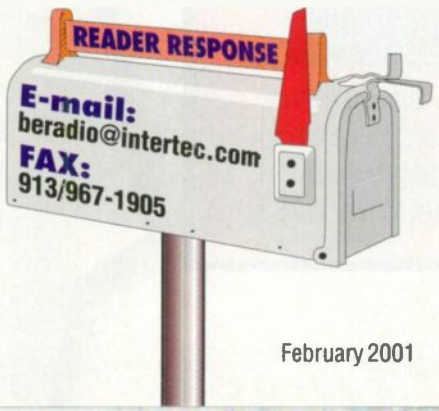
No future



Bravo! I agree 100% with everything you said in the January 2001 Viewpoint titled *One Year Later*. The entire LPFM issue is a joke. Most of the existing illegal operators are in populated areas, and the LPFM allotments don't even come close to these same areas. How the FCC thinks that the LPFM allotments will alleviate pirates is a mystery to me.

Most of the places that they have shoe-horned openings are in such sparsely populated areas that the licensees will not be able to gather the needed support to keep them running. I expect that most will be completely automated facilities—and that does nothing to make them *community* radio stations with live jocks and live commentary on local issues.

John Arndt, CSRE
engineer
Greater Philadelphia Radio Group
Bala Cynwyd, PA



BE Radio GALLERY

BE Radio

Find the mic sweepstakes

Every 2000 cover of BE Radio magazine has a microphone image on it like these.

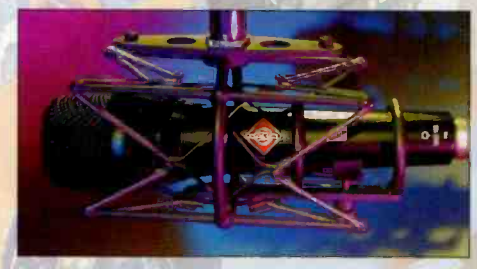
Some of them were rather obvious; some were not. BE Radio asked if you could find them all. Here's where they are:

January:	The far right digit of the red digital clock on the far left
February:	In place of the rear door handle of the van
March:	Part of the mic stand in the lower right hand square
April:	In the center of the head, just above the "a" in BE Radio
May:	On the computer screen on the far left
June:	Near the base of the chess piece
July:	The "CONF" button on the telephone
August:	The upper left socket of the AC extension cord
September:	In the center of the cover, inside the center hole of the CD
October:	There are five mics hidden in the trees at the bottom of the cover, two to the left of the tower and three to the right (only one needed to be correctly identified).
November:	In the string of 1s and 0s in the center of the cover
December:	On the river, in the lowest right complete window frame, to the right of the center monitor.

Several entries had the correct location for all 12 covers. A random drawing was held from these entries, and the winner of the Neuman KMS 105 microphone is:

Philip E. Galasso

WRAT
Point Pleasant, NJ



Congratulations!

Be sure to keep all of your issues of BE Radio for the year 2001, because the mic image will also appear on them. Look in the December 2001 issue for details on the next sweepstakes.

BE Radio

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John Battison, P.E., CPBE, *Technical Editor, RF*
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ART

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Editorial and Advertising: 9800 Metcalf, Overland Park, KS 66212-2215. Phone: 913-341-1300; Edit. Fax: 913-967-1905. Advt. Fax: 913-967-1904.

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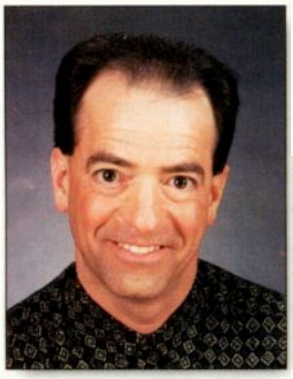
Killing the killer ap

By Skip Pizzi, contributing editor

The US transition to digital broadcasting is in trouble. It's probably not news to you that both the TV and radio conversions to digital transmission are mired in confusion and conflict. North American DTV has a format standard that is dying on the vine. The United States doesn't have a DAB format standard, nor even any spectrum to work with. This is certainly not the future that anyone would have predicted for broadcasting a decade ago. So what happened?

The answer lies in the well-known contextual shift that has made broadcasting no longer the sole electronic transmission medium. Broadcasters can't dictate new directions to consumers and expect them to follow willingly anymore. What if you had a new format and nobody came? We're witnessing a real outcome of that hypothetical question in the United States today.



Inconceivable as it may seem to some veteran broadcasters, spectacular failures are in progress for systems that were once considered natural digital heirs to the analog throne. The spoils of the digital age seem about to slip through broadcasters' fingers into the ready hands of new competitors.

What went wrong?

Beyond metaphor, the hard facts are equally disconcerting: For U.S. DTV, numerous improper assumptions, flawed tests and general hubris have led to its current predicament. In hindsight, this is inexcusable, because all odds were in that industry's favor. At least U.S. radio had a tougher environment that it can blame for its current difficulties: The distraction of IBOC, the cleverly politicked emergence of S-DARS, and the concurrent DTV spectrum grab all kept terrestrial radio from obtaining new allocations for digital services. U.S. radio broadcasters are now left hoping against hope for an IBOC deliverance. It is shocking that an industry as powerful as American radio has been reduced to awaiting a *deus ex machina* breakthrough to salvage its future.

The United States' only real success in digital broadcasting so far has been in satellite television. This has raised the stakes on whether satellite radio can equal that performance. If so, it does not bode well for the local broadcast station's future in the digital world.

Someone has to say it: maybe traditional broadcasting should just stay analog, and let digital media transmission happen in the IP domain, or a similar format created specifically for packetized, unidirectional, multichannel delivery. The idea of an individual waveform transmitter per broadcast service made sense in the analog broadcasting age, when there was really no other practical alternative. It doesn't automatically apply as the most appropriate or cost-effective method in the digital age, given the other methods available.

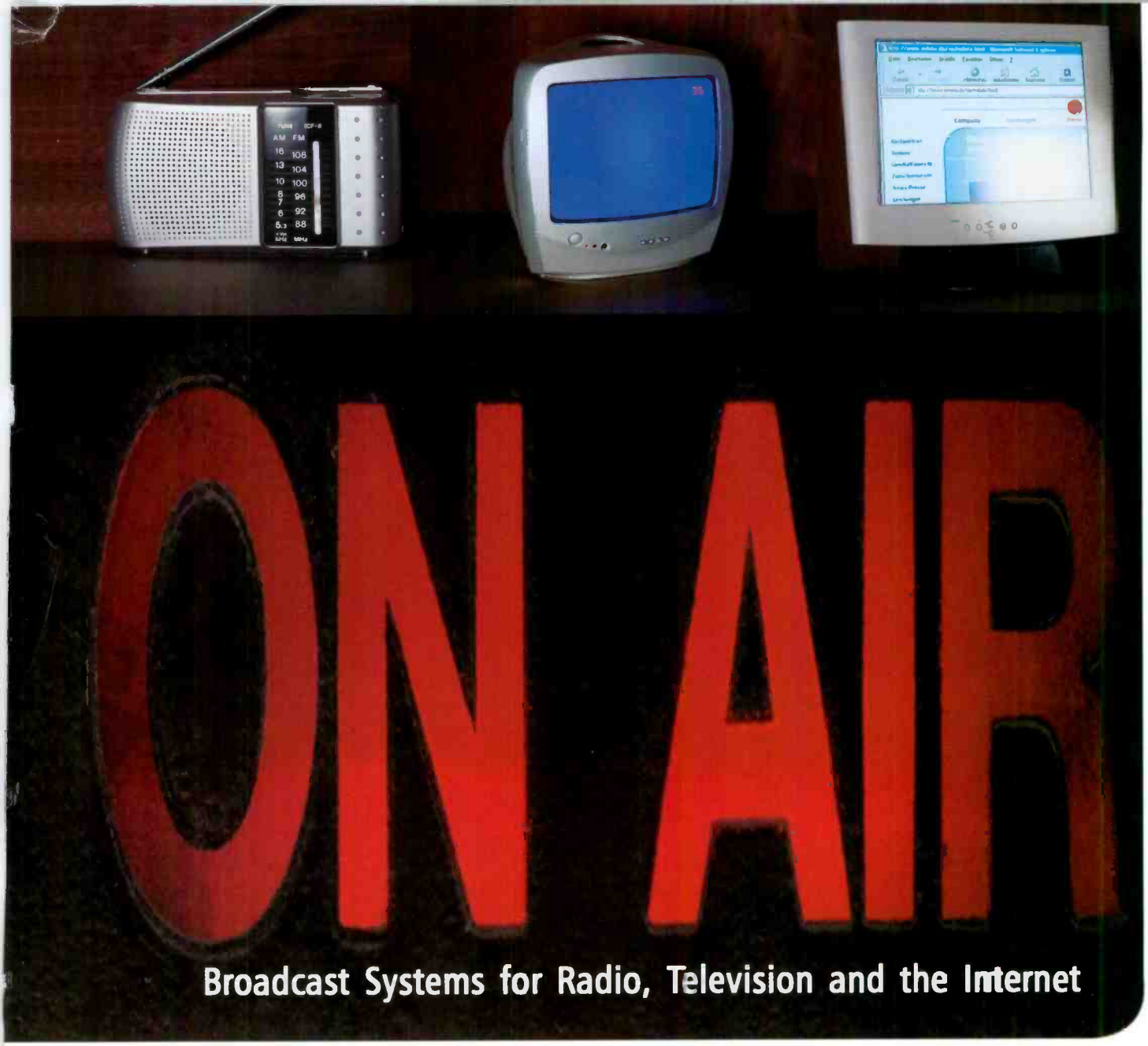
Someone has to say it: maybe traditional broadcasting should just stay analog.

Note that this is not a question of content but rather of service. Just because a service is multiplexed and delivered via satellite doesn't mean it can't include local content, as recent trends in satellite TV have shown. This implies that local broadcasters' days are not necessarily numbered. On the contrary, there is a strong need for some local content in all broadcast services, and no one is better suited to provide this than today's terrestrial broadcasters. But if these operators persist in the notion that transition to the next generation of their businesses involves only a transmitter transplant, they may soon join the annals of American scientific history.

Next steps

Trends in the growth of the web are obvious: broadband, wireless, satellite, edge servers—all of which have been discussed on these pages (and will continue to be). Perhaps even more important is the trend towards embedded devices as media platforms. The potential combined impact of these developments could be enormous, ultimately dislodging conventional broadcasting as the primary media delivery system for consumers.

Of course, such projections can be just as wrong as the last decade's forecasts for digital broadcasting have proven to be. As with any paradigm shift, many divergent functions all have to align in phase, and new standards will have to propagate quickly. Because the standards-setting process is also different in the Internet environment than it is in the broadcast space, this actually has a good likelihood of happening. It's a new media world, and broadcasters need to adapt to it. The advantage of holding a scarce resource isn't enough anymore. Without these adjustments, broadcasters threaten the very lifeblood of their phenomenally successful industry.



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