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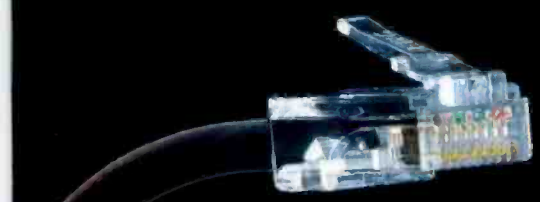

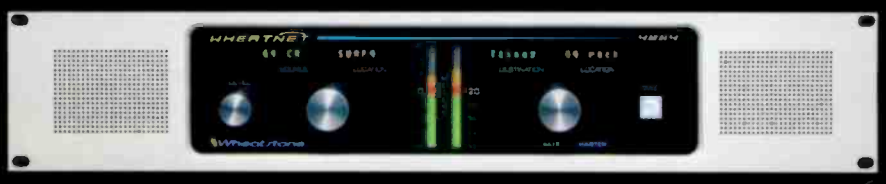

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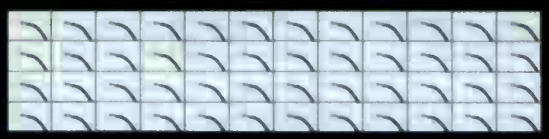

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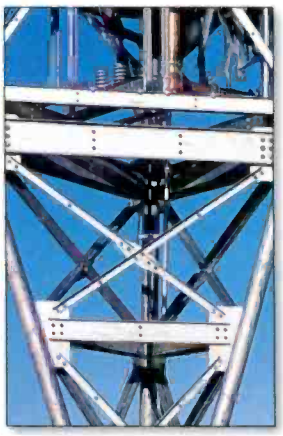

ON THE COVER:
A station's vertical real estate is one of its most valuable assets. Photo courtesy of Radian Communication Services. Cover design by Michael J. Knust.

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Currents Online

Selected headlines from the past month.

Cox Focus Groups Provide Insight to Multicast Tuning

The study shows that listeners would prefer to tune a new station at 120.7 instead of 100.7 HD2.

Translantech Adds Remote Features to Ariane Sequel

Translantech has updated the operating system of its Ariane Sequel to version 1.03, which also allows the unit to be accessed through a Windows remote-control application.

MSRC Releases Emergency Preparation Toolkit

The Model Vulnerability Assessment Checklists for radio, TV, cable operators and direct broadcast satellite operators are designed to assist broadcast outlets in preparing for emergencies.

Boston Acoustics Ships Recepter Radio HD

The compact, stereo radio receiver can tune HD Radio signals including multicast signals.

Day Sequerra Achieves Ibiquity Certification for Model M2

A *Radio* magazine NAB2005 Pick Hit award winner, the M2 HD Radio modulation monitor can also decode multicast signals.

Radio Alliance Created to Advance Rollout of HD Radio

Nine radio owners have partnered to accelerate the rollout of HD Radio by forming the HD Digital Radio Alliance.

Westwood One Promotes Trautmann to SVP

Conrad Trautmann, CPBE, is now the senior vice president of engineering and technology. He continues to oversee all day-to-day engineering and operations responsibilities and adds oversight of all information technology.

Site Features

Radio News Updated Every Day

Don't wait two weeks for the latest radio broadcast news and information; view it online every day in the *Radio* magazine Currents Online.

Currents Online Weekly E-mail

We can also send the week's headlines to you every Monday morning. Subscribe to the *Radio* magazine Currents Online Weekly E-mail.

2006 Buyers Guide

The print edition was included in the December issue of *Radio* magazine, now access the *Radio* magazine Buyers Guide online.

Today in Radio History

Important dates that have shaped radio are available online. These dates are also listed on the the 2005 Radio Industry Calendar.

Better late than never

On Dec. 6, a press conference was held to announce the formation of the HD Digital Radio Alliance. This group, a joint effort of Bonneville International, Citadel Broadcasting, Clear Channel Radio, Cumulus, Emmis Communications, Entercom, Greater Media and Infinity Broadcasting, was created to coordinate the rollout of HD Radio, including coordinating the formats on multicast channels. In addition, the group hopes to work with automotive receiver manufacturers to include HD Radio receivers in vehicles at reasonable price points, and to jointly market HD Radio with receiver manufacturers and retailers. Beasley joined the effort 10 days later.

To do this, the nine broadcasters have committed more than $200 million in commercial inventory on their own stations in 2006 to promote HD Radio and its multicast capability. The group will also work together to coordinate its multicast programming to provide a broader choice in each market. The alliance also announced that the multicast channels initially will be commercial-free so that they might attract a wider audience.

Naturally, the official press release was full of warm and fuzzy remarks about how exciting the announcement is. Unfortunately, the announcement comes late in the game. This effort should have been launched at least three years ago. The first official HD Radio receiver was sold on Jan. 6, 2004, in Cedar Rapids, IA. When that first radio was sold, consumers should have already been talking about HD Radio. Instead, I can walk into almost any consumer electronics store and get glassy-eyed stares when I ask for an HD Radio receiver. (What's worse is that in most cases I am told that I want a satellite radio receiver.)

The holiday season that is now behind us was the perfect opportunity for HD Radio to make its mark. I did not see a single mention of any HD Radio-capable device in any of the advertising flyers. I didn't hear about anyone wishing for an HD Radio receiver on the TV ads for Best Buy and Radio Shack. Feature-packed cell phones with media player capabilities, portable game consoles with media capabilities, and even simple media players were everywhere. Consumers have moved on while radio watched it all go by.

Terrestrial radio today needs to join the personal media revolution to stay competitive. Consumers are focused on the moment. Media players fit that perfectly. Radio is a long-haul commitment. When listeners tire of their preloaded playlists, they come back to radio. Unfortunately, these consumers do not have an HD Radio receiver to come back to.

The formation of the HD Digital Radio Alliance is a commendable effort. No one has done much to market HD Radio to the masses yet, so it's worth the effort. (Besides, the NAB is busy telling listeners that radio should be free. Unfortunately, too many consumers believe that free means "having no value.") If we're going to make something happen with HD Radio, this is our chance.

I urge the alliance to focus on marketing HD Radio, but break out of the safe confines of our own spaces. Devoting $200 million in station ad inventory isn't enough. Sure, run ads on the radio, but also run ads on TV, in the newspaper, in the movie theaters, on satellite radio, on portable games, via cell phones and anywhere else that a potential listener can be found. Effective marketing costs money, not unsold spots.

Satellite radio didn't promote itself solely through unsold inventory on its own channels. Terrestrial radio shouldn't rely solely on its own medium to create consumer desire for HD Radio.

On the hardware side, continue exploring the in-dash and tabletop radios, but also strike deals to have HD Radio tuners built into media players, cell phones and anything else that produces audio.

As I write this, the CES Convention is just days away. HD Radio is supposed to be featured by several exhibitors, and I'll be looking to see what kind of presence is provided.

Chriss Scherer, editor
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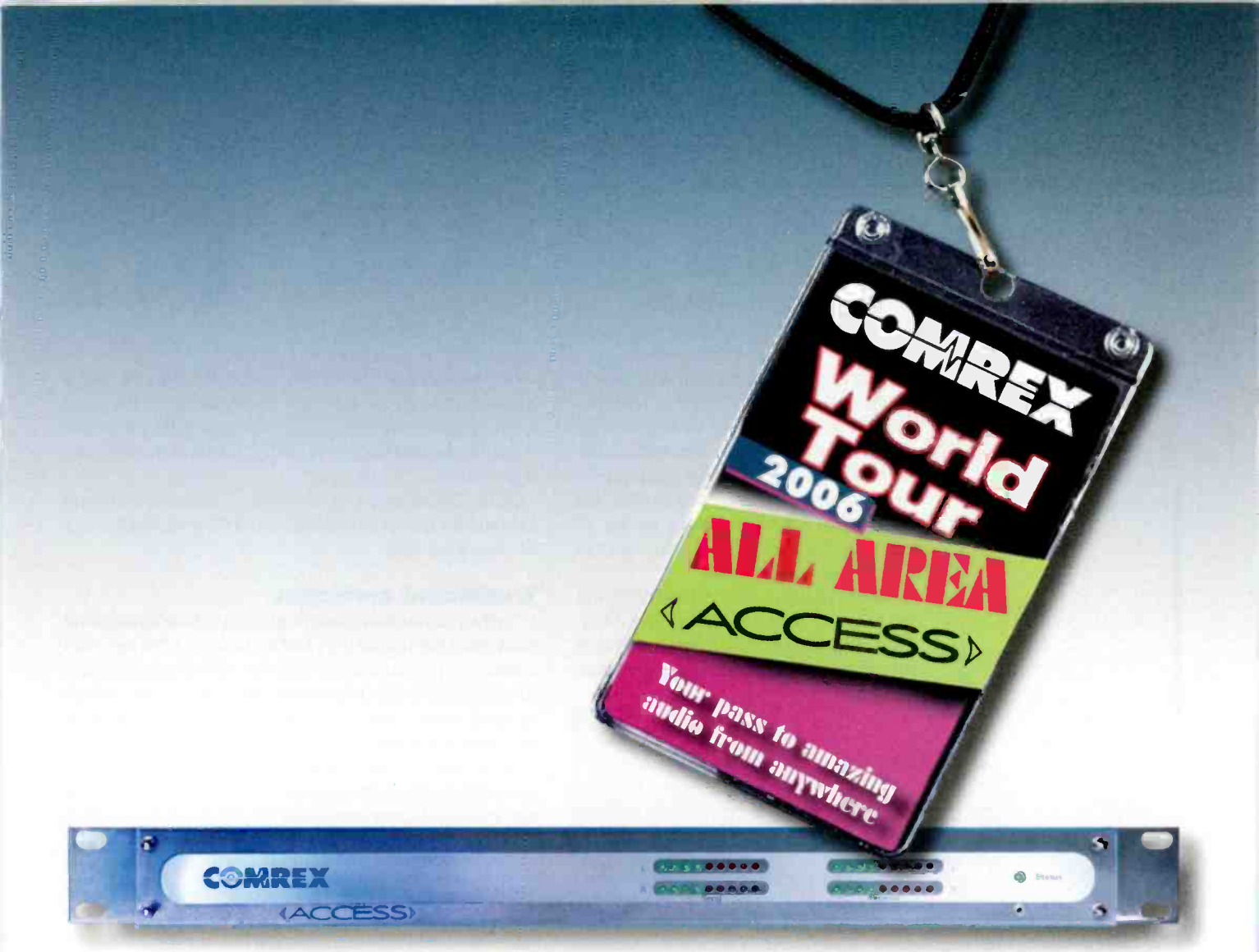

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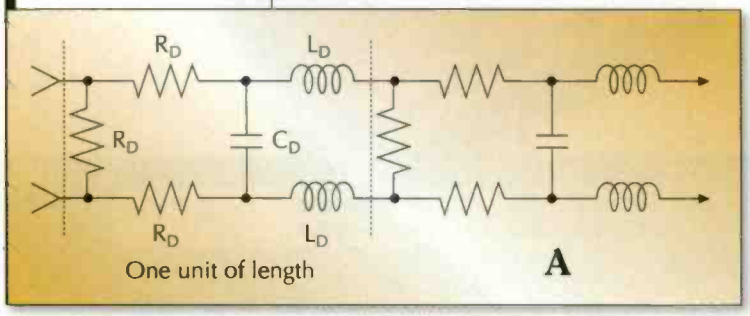
Transmission lines

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

For many engineers a transmission line is simply a piece of plumbing that is forgotten until something goes wrong, such as a burned bullet or some idiot with a rifle and a different kind of bullet punctures it. This is unfortunate because not only are transmission lines interesting pieces of equipment, but they are also critical pieces of transmitter installations.

Basically transmission lines are designed with only one purpose in mind. This designated purpose is to transmit power from a generator to a load with zero or minimum power loss. There are many types of transmission line such as for alternating current, direct current and RF. In this article we shall be concerned only with RF transmission lines. Waveguides, although doing the same job as "lines" operate with different rules and will not be covered here.



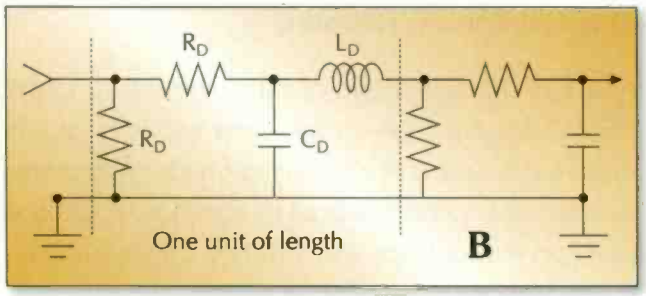


Figure 1. A transmission line can be electrically represented as a network of resistance, capacitance and inductance. The parameters R_D, L_D and C_D represent the distributed electrical values for each unit of length. Diagram A is a balanced line. Diagram B is an unbalanced line.

A transmission line cannot be described in a Gertrude Stein manner as "a transmission line is a transmission line, is a transmission line, is a transmission line...." It is far more than that. It can be a simple two-wire RF line, a balanced line or an unbalanced coaxial line. The most familiar type in use today is the coaxial line. This of course is an unbalanced line because the entire outer conductor is grounded.

DC transmission lines are generally controlled by Ohm's Law and the power and voltage requirements, and will not be discussed here.

Traditional concerns

For the average broadcast engineer's professional life he has to deal with capacitors and inductances that are often called "lumped constants." This means that the capacitive or inductive reactance is an entirely separate unit—either a capacitor or a coil and its effect is basically confined to one area of a circuit.

In the case of "lumped" individual units, stray capacity, inductance or leakage resistance occurs in the vicinity of the individual component and can be considered during the design of the circuit. In the case of a transmission line, which may be several hundred feet long, these effects are spread out over the whole transmission line and are known as distributed constants. Such values are more difficult to handle.

A transmission line is basically a network consisting of capacitance, inductance and resistance distributed throughout its length. The arithmetic values of these characteristics are described as x units of capacitance, inductance and resistance per unit length.

In most cases the broadcast engineer is not greatly or specifically concerned with these spread-out values. He selects his transmission line based on its characteristic impedance, propagation velocity, attenuation, frequency and power handling characteristics per unit length. The unit length can be any convenient measure; it is often a given in 100 feet units.

Transmission lines for ac and RF are governed by similar laws although the application is generally quite different. In low-frequency ac power transmission work the line length has little or no effect (because the wavelength is so large), and the voltage at the sending and will be about the same value as at the receiving end. Nevertheless long line effect must be considered in high power transmission. However, as the operating frequency increases the effects of various multiples of quarter wavelengths of line become extremely important. This will be discussed later.

The most familiar type of line in use today is the coaxial line. This of course is an unbalanced line because the outer conductor is grounded. Variations of coax line occur, such as dual coax line and triax. Triax is generally used for TV cameras to reduce the number of conductors in the studio lines and make them easier to handle. Dual coax is used

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The familiar twisted-pair is often used in audio work and is sometimes used in small transmitters to convey RF drive between stages. Old time hams will recall their use when hams built their own equipment. Today, small coaxial cable is used.

The basic requirement for efficient transmission line operation are absence of standing waves, line impedance properly matched to the transmitter and load impedance (antenna) and capable of carrying the required RF power without breaking down. Protection from mechanical damage by burial or adequate support is also required.

It is also important to ensure that all transmission lines feeding directional antennas have similar environmental conditions. This means that if part of one line is buried, a similar length is buried on all the other transmission lines to the array. This ensures the net all lines are affected in the same way by changing weather and temperature conditions.

The odd length

As the frequency increases to a point at which the transmission line length is equivalent to an appreciable portion of the wavelength, such as a quarter wave, strange things begin to happen. In most cases, the voltage at the receiving end is quite different from the voltage at the sending end.

A transmission line can transform impedances in the same fashion as a tee or a pi network. However, such results are not confined to RF operation alone and a 60 cycle line of sufficient length will exhibit the same kind of problems. Although the technique of handling such phenomena is the same as RF solutions, solutions to ac power line problems require physically larger equipment and larger electrical reactances.

In the world of transmission lines, quarter wave lines have many extremely useful properties. A transmission line that is not designed to be attenuating, and consists of an odd number of quarter wavelengths has the interesting faculty that an open circuit at the receiving end results in a short circuit at the transmitter and vice versa.

It was mentioned earlier in this article that a quarter-wave transmission line can be used as an impedance-changing device in RF work over a fairly narrow range of frequencies. Its characteristic impedance is designed to be the geometric mean between the transmitting and receiving ends. However, in most cases I have found a simpler to use a tee network.

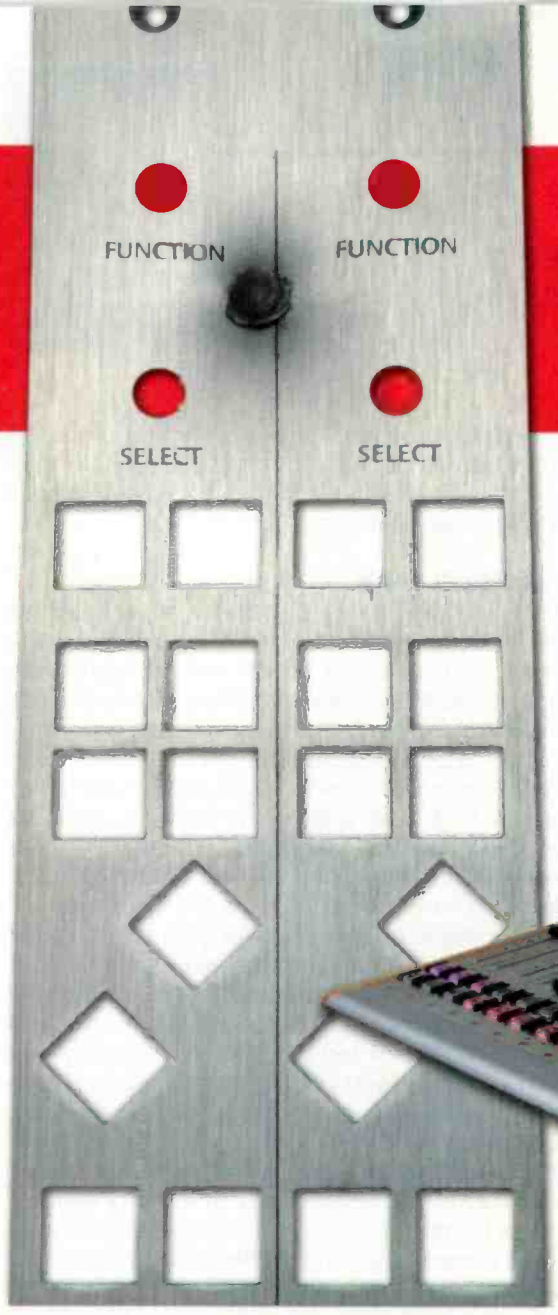
Another use for a quarter-wave line is transforming voltage to current or current voltage by a known relationship. This characteristic makes possible a measuring instrument that does not place an appreciable load on the circuit under measurement. An RF ammeter is connected directly across the end of a quarter-wave line. This short across the line results in an infinite impedance at the far end. The current in amps multiplied by the characteristic impedance of the line gives the voltage at the other end.

Lines with an even number of quarter waves i.e. half wave or more, and that are non-attenuating are useful to measure an impedance in an inaccessible location, such as up a tower. The unknown impedance is connected to one end of the line and measured in the usual way at the accessible end on the ground.

It is important that the line is exactly a multiple of half waves long. This is easily determined by shorting the far end and measuring the impedance on the bridge. This should, of course, be zero. If it is not zero there will be a purely resistive reading and a low impedance.

Transmission lines are quite tough and standup to weather. But vibration and swinging movements are not beneficial. Include regular inspection of lines along with your other routine equipment checks.

E-mail Battison at batcom@bright.net.



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Console Router Systems

FCC considers low-power AM

By Harry Martin

The FCC is considering the establishment of a new low power AM service. The agency received a petition for rulemaking asking that it authorize such a service, and the Commission was interested enough in the proposal to issue a notice asking for public comments. Here are some of the details:

Unlike LPFM, the LPAM proponents want the new service to be commercial.

Existing broadcasters would be ineligible to apply.

Local residence, at least initially, would be required.

Power levels of up to 100W, 24 hours per day are proposed.

Interference calculations would be made under existing AM allocation rules, but with a 100W application treated as one for 1kW.

The prospects of the Commission actually approving LPAM appear to be poor, but that is what many observers said about LPFM when it was first proposed in the late 1990s.

Despite considerable opposition to the concept, the FCC created the LPFM service in January 2000. LPFM is subject to many limitations besides those on power. LPFM stations must operate non-commercially. They must be owned by an organization with ties to the community. Any organization can own, at most, only one LPFM station. LPFM stations cannot be sold.

Perhaps recognizing these realities, some of the promoters of LPFM have now returned to the Commission with LPAM—a service that would not be shackled with the restrictions that apply to LPFM.

Supporters say that low power commercial AM stations would create a middle ground between mom-and-pop local stations and the super-sized, rigorously formatted group owned outlets. Cheap commercials from businesses otherwise priced out of advertising on regular stations would support the service. LPAM supporters say the service would reinvigorate locally focused programming and encourage innovation.

The proposal would permit ownership nationwide of as many as 12 LPFM stations by one individual or entity nationwide, but owners would be permitted only one such station per market. Unlike, LPFM, LPAM stations could be bought and sold.

A difficult task

LPAM proponents are likely to have a long and difficult struggle. Existing full-service AM operators, who already face serious congestion in the AM band, will insist that the technical specifications for any LPAM service be carefully devised and closely enforced to ensure protection of their signals. (The LPAM proposal is notably short on technical details.) And most local broadcasters are expected to take exception to the notion that some local advertisers are being priced out of the radio market. While the LPAM proponents claim that that is the case, they offer no empirical evidence of a commercial niche for the new stations.

Another obstacle is that the LPAM proponents request that the new service somehow be made exempt to auction processing. The proponents want selections among mutually exclusive applicants through a point system similar to that used for NCE-FM and LPFM. But this scheme would require an amendment to the Communications Act, which now provides that all commercial spectra must be awarded through auctions.

Still, the LPAM idea has been placed on the table, which means the FCC is interested enough in the proposal to consider it further. The same type of initiatives ultimately resulted in the creation of the LPFM service. It could happen again.

Martin is immediate-past president of the Federal Communications Bar Association and a member of Fletcher, Heald & Hildreth, Arlington, VA. E-mail martin@fhhlaw.com.

Dateline:

Feb. 1 is the deadline for radio stations, LPFM stations and FM translators in Arkansas, Louisiana and Mississipppi to file their 2006 license renewal applications. Radio stations must file their EEO program reports and biennial ownership reports with their renewals. Feb. 1 also is the deadline for in Arkansas, Louisiana and Mississippi to file their biennial ownership reports.

Radio stations in Delaware and Pennsylvania must begin their renewal pre-filing announcements on Feb. 1, looking forward to an April 1, 2006, renewal application filing date.

Feb. 1 is the deadline for radio stations in Arkansas, Kansas, Louisiana, Mississippi, Oklahoma, Nebraska, New Jersey and New York to place their annual EEO reports in their public files and post them on their websites.

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"The jocks took to the new board like fish to water. Show Profiles are their favorite part, since they can all have custom board setups. Some like their headphone levels blasting, some don't. Some like the mic on the left side, others on the right. I've got one guy who brings in his vinyl records every week for an oldies show; he's the only one who uses the turntables but when he loads his profile, they're ready to go.

"There were a few little bugs, but we had the very first surface! Axia support gave us new software right away and our problems were solved. Two years later, I'm more impressed than ever. I recommend Axia one-hundred percent.

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— Marc Johnson, Chief Engineer, WEGL-FM
Auburn University, Auburn, Alabama

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The vertical Challenge

Revision G creates a buzz in the tower market.

by David Nicholson and William A. Griswold Jr., PE, SE

Revision G of the TIA-222 standard—the document that defines the industry-accepted practices and minimum standards for the design of steel antenna-supporting towers—has just been released by the Telecommunications Industries Association (TIA). Revision G is the first modification to the standard in nearly a decade. As broadcasters rush to prepare for adoption of the new standard, the time is ripe to step back to consider the state of the radio tower industry and the effect Revision G will have on it.

New tower construction has increased in 2005. Much of this activity can be attributed to the introduction of new technologies in radio and other transmission markets. Cell phone carriers are increasing bandwidth and speed with the rollout of advanced wireless technologies that enable feature-rich services, TV broadcasters are shifting from analog to digital transmission and radio broadcasters are implementing HD Radio.

With all these technology upgrades converging at one time, there is a lot of capital investment flowing into tower construction and modification. That makes the timing of Revision G particularly critical, because the code uses a new set of calculations that primarily affects the required strength of a new tower—and thus its cost—and the remaining capacity of existing structures.

Note that all existing towers are grandfathered, so even if they fall short of Revision G guidelines, they will not be required to catch up. Changes to an existing tower's structure or the addition of antennas that increase its load, however, will require full agreement with Revision G.

The good news for radio broadcasters is that they're likely to have a relatively easy time adopting Revision G, as replacing analog antennas with new digital antennas that are often smaller and lighter rarely adds to a tower's load. In addition, the long-time practice of maintaining a backup radio antenna has made it easy for stations to use that spot on the tower for HD Radio broadcasts without having to make room for a new antenna. While this is good news, it doesn't mean that radio broadcasters won't feel the effects of Revision G.

Revision G is the seventh revision to the TIA-222 standard first published in 1949, which provides guidelines for tower design, fabrication, installation of new towers, mapping (measuring) and modifications of existing towers, and maintenance—basically covering a tower's life from cradle to grave.

Each revision updates the original standard with new and improved calculations—and the lessons learned from failure. Revision C was the first to consider tower height and geographical location in wind load ratings. Revision D introduced a new wind speed calculation and Revision E added county-level detail to the wind-loading map. Revision F, which was adopted in 1996, introduced ice loading to the mix.

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The vertical Challenge

But none of these revisions compare to the magnitude of Revision G. While it was approved on Aug. 2 by a coalition of structural engineers, fabricators and contractors, the committee pushed for and won a delayed effective date of Jan. 1, 2006, for the new standard. The unusual five-month discrepancy in date was designed to provide a head start with the new guidelines, giving tower manufacturers and broadcasters more time to prepare for the adoption of such a complete change in philosophy.

A new tower philosophy

One of the most novel changes made in Revision G was the introduction of three factors that take into account the role each tower plays in the community as well as its physical and environmental surroundings. These new calculations mean that some broadcasters will be affected by Revision G more than others, in large part depending on the location of their tower sites.

The first factor, dubbed the Importance Factor, takes into account the nearby population density as well as the functional importance of the tower itself. The idea is to adjust the design of the tower according to the degree of human or collateral damage that could occur should the tower collapse. A tower that supports several radio stations and is located in a densely populated area will have more stringent design requirements than one that is located in the middle of a field—even if the two towers are of the same height. Also, towers that are used for essential law enforcement or emergency response functions must be able to survive a bigger beating.

photo courtesy of Dielectric

The Revision G standard includes important considerations for new tower construction.

Revision G also analyzes a tower's Exposure Category and Topographic Category, which together encompass the structure's "environmental loads." An analysis of a tower's exposure factor will involve consideration of the regional climate, obstructions such as trees and buildings and the proximity to open water. Topographic categories encompass atomospheric conditions related to the position of the tower in relation to the elevation of the land around it.

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www.aphex.com

Genuine APHEX

The nuts and bolts

Revision G is now in line with the 2002 version of the International Building Code (IBC). It also brings the United States in line with the rest of the world in terms of tower building codes. One way it does this is in the new approach it takes to measuring the various stresses placed on a tower. Under Revision G, towers are analyzed under four specific types of loading: wind, ice, environmental and seismic.

Environmental and seismic loading are new considerations, but the old factors (wind and ice) are being looked at differently. Tower stresses were previously analyzed under the allowable stress design (ASD) model, which has been replaced in Revision G with the load resistance factor design (LRFD) model.

In terms of wind speed, the ASD model bases its calculations on the fastest mile speed — essentially averaging how long it takes a mile-long column of air to pass a given point. The ASD method can fail to differentiate between a day of hard gusts cutting through relative calm and a day of steadily moving air, even though the gusty day poses a much greater risk for tower collapse.

The LRFD model, on the other hand, looks at the fastest wind speed during a three-second interval. This method, which doesn't average away the fastest bursts, provides a more accurate wind speed profile around the country. It is the American Weather Service's preferred method, and because that is the source of wind speeds for tower design calculations, it was appropriate to update the TIA-222 standard to match it.

Agreement with the American Weather Service's wind speed measurement methodology was one of the reasons behind the switch from the ASD model in Revision F (and earlier) and the LRFD model in Revision G. Another was because the American Institute of Steel Construction (AISC) and the American Concrete Institute (ACI) also support it. The latter adopted the LRFD method of calculating stress in 1971, and the AISC wanted to use a similar system—in fact, its new manual includes both calculation models. Steel and concrete are key ingredients of tower construction, so there are clear advantages to everyone using the same calculation methods.

Ice calculations requirements were added in Revision F, but Revision G changes their usage considerably. In Revision F, the formation of ice was considered to be equal at the bottom of a tower and at the top, while in reality ice build-up can be much thicker around a tower's pinnacle. Some tall tower collapses in recent years can be attributed to unequal ice buildup.

Bottom line tower design

While it's tempting to assume that Revision G will result in heavier, more expensive towers because of these more stringent guidelines, that isn't necessarily the case. Such an effect is most likely to occur in

More online

ERI has provided a list of the top 10 maintenance problems at tower sites. Access this article online at beradio.com.

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20
15 1/2
10
5

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northern states and mountainous areas, where ice and wind loading tend to be greatest, and in more populous regions that rank high on the Importance Factor. However, Revision G can actually result in lighter, cheaper towers in warmer areas, in places with less wind and in rural areas.

Big towers—in general, those over 1,000 feet tall—may grow proportionately more expensive to build under Revision G than smaller towers. This is primarily due to the new ice load calculations that take height into consideration, and to the fact that they carry a greater load.

Regardless of the height of the tower, the new revision makes the bidding process a bit more challenging for manufacturers. While previously they may have been able to give a single, height-based bid that could be applicable for many different sites, it's now crucial for the broadcaster to provide specific details for every intended site to get an accurate manufacturing estimate.

Choices in towers and rigging

While we've focused primarily on the design implication of Revision G, the new standards apply to the installation of towers as well. As such, the choice of a rigging company may be more crucial than ever.

The 1,000-foot point for tower height is a milestone of sorts in that tower rigging companies generally require larger, more capable equipment with longer winch cabling. Thus, it is usually the larger, better-known rigging companies that are called to raise tall towers. But for smaller towers, there are usually several companies available in any given market. Smaller rigging companies may be more price-competitive, they might be able to start work sooner, and their crews may be more familiar with the terrain and environment unique to their locale.

Because of the expense of moving heavy equipment and work crews, riggers local to a tower site—"local" usually being within a one-state radius—are usually hired to perform the work. When selecting a rigger, price is certainly a motivating factor, but disaster threatens those who make it their primary factor.

As common sense suggests, experience and knowledge really must come first. Assembling a tower isn't rocket science, but a successful installation requires the intelligence to follow blueprints carefully and a deep familiarity with best practices and building codes (now including Revision G). Riggers should be fully insured and in compliance with OSHA, which may insist on additional safety measures that drive up costs, but ultimately can save lives.

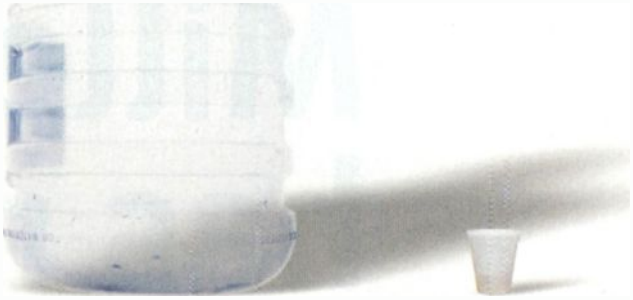
New developments in tower design include frequency-matched towers. With these advanced structures, the spacing of the interlaced steel where the antenna attaches to the tower is matched to the same spacing on the antenna, creating an integration between the two that optimizes the operation of the antenna. Dielectric Communications has developed its frequency-matched, FM-branded towers.

Nicholson is director of tower operations for Dielectric Communications, and Griswold is president and chief engineer of IETS.

Multicasting.

It's like trying to fit —

well, you know.



Management has decided to multicast. Which seems like a terrific idea — until you consider just how little bandwidth each channel will get. How will the sound of your station(s) survive these shrinking bitrates? Omnia can help.

New Omnia Multicast with SENSUS™ restores the fullness and depth that bit-reduction steals. Our DSP gurus teamed up with the codec experts at Telos (the folks who introduced broadcasters to MP3 and MPEG AAC). Together, they developed a unique suite of tools to pre-condition audio for HD Radio™ multicasting.

Omnia Multicast with SENSUS codec conditioning, Omnia Bass Management system and distributed look-ahead limiter significantly improves the sound of HD multicast and other bit-reduced streams.

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FACILITY SHOWCASE

Building the new while maintaining the old MPR rebuilds

By Doug Thompson

New studios. It sounds like a lot of work, but what an opportunity. When Minnesota Public Radio (MPR) first considered expanding its building, the first thing that came to mind was all of the work it would take to replace studios that were already working pretty well—or were they? The possibilities then began to surface: we could fix all those things that we didn't like about the present studios and incorporate the things we've learned about studio construction since building them. We could take advantage of new and innovative technologies to accommodate program changes much easier and faster. We could even free ourselves from all of that old unused wire that was somehow never removed when it was no longer needed.

In early 2003, the new building plan was evolving to the point where MPR engineering began looking into how we would build and outfit the new facility. The organization decided to add on to our existing building, which introduced some real challenges by maintaining the live on-air facility while constructing studios at the same time and in the same place. This had the advantage of saving us time because we did not have to trek across town to work on the new facility.

It was easy to see that managing a project of this magnitude was going to be a time- and resource-consuming task. We decided to appoint one of our own staff as the studio project leader so that we not only had someone already familiar with our operation to pull the necessary resources together, but also to track the many facets of the project to keep it on time and on budget.

Our project leader first established a studio design group that included participants from multiple departments, providing a variety of input and viewpoints so that we would accurately assess the design requirements. The next task was to develop a project

job list and timeline, breaking it down into manageable tasks and establishing dependencies so that we could identify high risk areas. Risk was defined as a higher level of uncertainty about the amount of time a particular job might take, the amount of money it might cost and the lack of knowledge that we already possessed about the task or technology. By beginning the high-risk parts of the project early, we could better anticipate and recover from events that did not go the way we expected.

How much space?

One of the planning issues that received a fair amount of attention was deciding on the size of the studios. Our present on-air studios were a bit tight (constrained by the location of the floor columns), and our production studios were about the right size but not laid out well for on-air work. We decided to hire a space planning consultant to help us. Northeastern Communication Concepts in New York helped us size the rooms and layout the furniture, based on information gained from interviews with the people who would use them. The rooms were also sized to work acoustically well.

The studio design group then studied many of the console/router systems that were available so we could make an informed decision.

Building the new while maintaining the old
MPR rebuilds

We sent requests for proposals to a number of equipment vendors and then matched the requirements we collected internally with the products offered. From the responses, we chose four manufacturers to come to MPR and give a presentation to our staffs on their systems. We diagrammed each system so we knew what was needed to meet our requirements, using each particular type of equipment. From the on-site demonstrations and questions that we asked we eventually narrowed the field to a finalist. This was not an easy task because we found several different and acceptable architectures that would serve our needs.

Based on our research, we focused on a system that none of us had seen before, the Axia Livewire system, which distributes audio via IP. We favored this technology because it gave us more flexibility in how we designed our system layout, better growth potential and offered a number of solutions for related parts of the project like house monitoring and feeding audio to locations other than studios.

Our senior design engineer then began the arduous task of diagramming our current systems so that the new designs could work harmoniously with the existing infrastructure that we intended to keep. Then we began building the transition plan that we would need to keep our four full-time services and multiple nationally distributed programs live and on-air during the project. Also, with a well-laid plan, we were able to give clear direction to the outside labor we hired to help us. The diagrams and drawings we prepared helped them come up to speed quickly and their time was well spent getting tasks completed without a lot of hand-holding.

Coordinated effort

Next was the job of coordinating with the building construction group so that we were not in each other's way, or holding each other up. We were fortunate to have hired an accommodating contractor who worked with us every step of the way—and he communicated well too. This proved to be an important aspect of the project, because even though we planned everything, things varied from what we had on paper. Because of the good relationship with the builder we were able to quickly work through issues that came up and move on to the next task.

Studio-to-studio wiring is primarily CAT-6e cable, which was installed by the same contractor who installed the computer network and phone wiring in the building. The contractor terminated the cables and tested them for us so that we could make the cross-connections. The Axia system requires far less actual wiring than with non-router-based systems, so more of our time was spent programming the audio input and output nodes. Axia helped with this task, and after several programming sessions, our staff was pretty good at the system setup. We intended from the start that we would be involved in setting up the Axia network because we would have to maintain it. This process resulted in something of a hands-on school in our own facility.

The Axia system has proven to be flexible and adaptable. We have worked closely with Axia to fine-tune the Element console, and in the process we were able to have the company develop some valuable features for us. For example, we use a ready-take permissioning system to switch studios when various program services need to change locations or when we need to combine staff (at night for

e are seven control rooms like this one in the new facility.

instance). We are able to handle this from within the control surface, making it much simpler than using outboard add-on systems. We also needed a way to send EAS tests from the active studio to the correct program feeds. Axia helped us once again with a one-button method that is smart enough to know which studio the test is coming from and to which services it is to be broadcast.

Necessity of invention

I mentioned earlier that we wanted to incorporate some innovative ideas where it made sense to do so. One idea began from the realization of how many discrete clocks and timers we would need. We decided to display the information as a series of counters on a video screen mounted in the studios where everyone could see it. We then realized that we had other information that the announcer needed to see, so we built various messaging capabilities into the displays as well. Added to those needs were the building entrance door cameras and even cable TV, and we had just created what we now call the multi-image display. This has become one of the focal points in the studios because of the amount of information we are able to display in one location.

In the past, MPR has used an RF-based, in-house monitoring system that delivered multi-channel audio to each desk via dedicated coax. This was replaced by Axia's Iplay, which delivers full-bandwidth, on-demand audio to each desktop via the computer network that is already in place.

The next step for the facility will be to transition the operation

Equipment List

AKG K240 headphones
Amco FX series and CQ series racks
Axia Element surfaces and nodes
Belden Cable
Benchmark HP2 headphone amps
Clark Cable
Clearcom intercom
custom metal work by Wireworks
Denon DN-C680 CD players
Electro-Voice RE20 mics
Englewoodworks furniture
ESE ES-185A/12, ES-150, ES-289
Fanfare FT-1AP
Genelec 8020A,8030A,8040A, 7050B,7060A
Heil mic booms
HHB 830+ CD-RW
Middle Atlantic rack panels and shelves
Moseley Starlink
Musicam Prima LT
NEC LCD displays (15", 32", 40")
Popless mic pop screens
Tascam CD450 CD players
Telos 2101 phone system
Telos Zephyr and Zephyr Xstream
TFT 911 EAS

Building the new while maintaining the old
MPR rebuilds

from playing audio from CDs to a computer audio storage and playback system.

In retrospect, we're confident that the decisions we made throughout this project related to the equipment and systems we chose to use were well informed. That is saying a lot after close to three years of dreaming, planning, wiring and trouble-shooting. We initially felt that we may have been spending more time than we should seeking advice from and running options past people who would be using the studios, but it has paid off with few surprises and an excited and embracing air staff.

Each production studio can accommodate two people. There are 10 of these studios in the new MPR facility.

One of the more valuable aspects of the project that contributed to its success was the great cooperation and contribution between various departments within MPR. Our IT department ironed out a lot of the tricky networking issues and helped us develop custom software for the multi-image displays, as well as integrated our phone system into the new Axia surfaces. Our operations department provided a wealth of practical and hands-on input into our designs and ergonomic layout, the testing and troubleshooting of our initial installations, the training of announcers and air staff and handled the moving and upgrading of our Pro Tools systems. Our programming department contributed to the initial planning sessions and worked its busy scheduled around our construction requirements so that we didn't interrupt any of the program services that we produce. And, our engineering department served as the hub for the planning, design, coordination and installation of the new studios, pulling together the necessary expertise and resources to bring this project to a successful close.

We will probably iron out minor bugs for a few more months, and then we expect the people that use the facilities to begin coming up even with more ideas for improving the operation as they become comfortable with their new tools and systems.

Thompson is director of engineering for Minnesota Public Radio, St. Paul, MN.

Facility Focus
the technology behind MPR

Heil PL-2T Topless Boom

The PL-2T provides silent movement with a secure and steady mount. Using a system of balanced internal springs instead of outboard springs, this boom handles microphones that weigh up to 3.5 pounds. The mic cable can be installed without removing the connectors. A cover conceals a hollow channel through which the microphone cable can be fed. The PL-2T comes with the standard C clamp mount that can be mounted to a surface up to 1.5" thick. Other mounting bases are available, including a tabletop mount, a flush tabletop mount, a riser stand and a wall mount. All the mounts use a brass insert for smooth and quiet operation. The threaded chrome mic stem can be locked into position to suit the exact type of microphone or shock mount.

www.heilsound.com
618-257-3000

Moseley Starlink

From MPR's studio base in St. Paul multiple Starlink 950 MHz and Starlink T1 systems are used to distribute programming to the local stations of KSJN, KNOW and KCMP. MPR uses combinations of two- and four-channel Starlinks with T1 back-ups configured in 44.1kHz uncompressed/linear mode. Lanlink 900Ds are also use to provide full-duplex IP and RS-232 circuits between KSJN and KNOW.

www.moseleysb.com
805-968-9621

Musicam USA CDQ Prima

Minnesota Public Radio relies on a number of codecs to send and receive audio, and the CDQ Prima 220 is one of the most heavily used codecs in the rack. Providing connectivity via ISDN, satellite, E1, T1 and dedicated lines, the Prima 220 provides a 20kHz stereo path using CCS Musicam enhanced compatible Layer II or Layer III. G.722 is also available. Multiple ISDN lines can be used in tandem to provide up to a 384kb/s path. The 220 also supports multiple ancillary data streams and includes built-in automatic smart features, such as one-touch auto dialing, dial on audio/hang up on silence, automatic bit-rate and algorithm detection and automatic reconnect. MPR also uses Prima 120s and a Prima LT.

www.musicamusa.com
732-739-5600

Genelec 8020A and 7050B

Congratulations to Minnesota Public Radio having just completed an exciting new production facility. As part of the new facility for audio playback purposes, Genelec 8000 bi-amp monitors and 7000 Series subwoofers were chosen to fill 19 new production rooms with accurate Genelec monitoring. Among the chosen models were 8020A and 7050B going into 10 new edit suites, 8030A and 7050B into new music suites and 8040A and 7060A into a new CMS control room. The new 8000 MDE (Minimum Diffraction Enclosure) models offer the latest in Genelec monitoring technology. The overall goal in the development of the 8000 bi-amp and 7000 subwoofer series were to greatly reduce all types of distortion, improve linearity in overall frequency response, and provide an unfailing consistency between models.

www.genelec.com
508-652-0900

Field Report

25-Seven Systems Audio Time Manager

By John Rigg

We've all heard this happen, breaking news events are unfolding and the station is airing a commercial. The choices aren't good: dump out of current programming or wait for a break and risk missing the next big event on air. Why not give the station and the air staff another choice? Finish the current event and then go to the breaking news in its entirety. Leaving the current program abruptly is not graceful and certainly not professional. Leaving a commercial in progress is definitely costly. Waiting for a press conference to begin is capable of putting your listeners to sleep or worse, they will switch stations. Usually, there's no need to carry the first words at a press conference, the sound technician asking "can everybody hear me?" Now, you don't have to. 25-Seven Systems has manipulated the concept of time and has rearranged the way live events unfold. If you can grasp the bucket theory of a digital delay, you will see the ATM is a refinement on that technology and several new applications of a sometimes confusing process.

Performance at a glance

- Simple operation
- Adds time to audio programs
- Variable time compression ratios
- Self-synchronizing to external clock
- Ramp-down transitions
- Remote controllable

Audio is stored in a 15-minute continuous buffer capable of playback at any time while the recording process continues. The buffer of the ATM can be played out 20 percent faster than it was stored. The full 15-minute buffer now takes only 12 minutes to play back, and this can be done while the ATM continues to record. Before the sales department reads this and sells that extra time, realistically we have found play-out should be limited to about 10 percent, which is the equivalent of six minutes inserted per hour.

Time saver

Installation of the system is straightforward, audio in, audio out and an Ethernet interface for the time sync and remote capabilities. Once installed, the operators acclimated quickly and were running in just a few minutes. We use our ATM strictly for press conferences and other live feeds that don't occur on our clock.

All of us have all fallen in love with the concept of time shifting our favorite TV programs. So much so that Tivo is now part of our vocabulary. I like to think of the ATM as an audio Tivo on steroids. The system allows us to absorb the few seconds or minutes of dead time before a press conference and allows for a more graceful exit when the conference ends. Record the press conference and not miss a beat of on-air time. Begin a recording and while that recording continues, start the playback in real time or faster. In a recent instance, we used the ATM at the start of a press conference while we were still airing a commercial. The commercial ended naturally and playback from the ATM began. We were 45 seconds into the press conference and started play out. With 45 seconds in the buffer and the output set at a 10 percent faster rate, we caught up with the live press conference in about 450 seconds (7.5 minutes; this info is all on its front-panel display). Once caught up, we switched to the live feed of the press conference. This all sounded so natural no one noticed. The commercial aired, the entire press conference aired and we were done with the event at the same time we would have finished without the ATM.

To aid this process the ATM displays the current time, the amount of audio stored in the buffer, the compression rate and the time expected to rejoin live programming. You can speed up or slow down the play-out to accomplish the required "out time" while the ATM is recording and playing. When the buffer is empty the unit loops the audio through the box. Conceivably, the system could be left in the air chain. The sound quality is superb, with no change in pitch and no audible artifacts, even at 10 percent compression. The changes are perceptible only when the same non-compressed material is played side by side.

Timing and more

The system features selectable analog and digital inputs and analog and digital outputs. A TCP/IP connection, configurable GPI/O and a serial connection are included

The rear panel of the ATM.

on the back chassis. One big plus about the included Web interface is that there's no need to dig through countless menus, the ATM's Web interface looks exactly like the front panel. Internet connectivity allows synchronization to the time server of your choosing, just enter the IP address.

We've fed ours to and from our router for added flexibility and have control of the front panel via the Web interface. During the hours of the day when our station is automated and the ATM is idle, the production department wanted in on the act. The ATMs Web interface comes in handy for those times when standing next to the box isn't practical. One useful application is commercial production that arrives somewhat longer than 60 seconds. This can now be dubbed to exactly 60 seconds, on the fly, without a calculator. Record the spot into the ATM's buffer and set the playback for exactly 60 seconds. No more trying to edit that 62 second spot into a 60 second avail. Many popular software editors have a time compression feature, but I have found that most do not sound good. Some software editors simply change the play out rate and do nothing to restore the original pitch.

There are audio samples on 25-Seven's website that are useful. The site also shows various connection scenarios for use in satellite delivered programming and automation integration. The ATM can ingest the satellite program, store the network cues and then play out with the cue location adjusted to fit the exact placement in the original program. The cues are imported and exported through the GPI/O interface so they operate just like the contact closures you now use for automation.

Rigg is engineering supervisor for KFMB AM & FM in San Diego.

25-Seven Systems

P 888-257-2578
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W www.25-seven.com
E info@25-seven.com

Editor's note: *Field Reports are an exclusive* Radio *magazine feature for radio broadcasters. Each report is prepared by well-qualified staff at a radio station, production facility or consulting company.*

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New Products

By Kari Taylor, senior associate editor

www.beradio.com

Portable recorder
AEQ

PAW 120: Built on the DR 100, which received a Pick Hit Award from *Radio* magazine at NAB2005, the PAW 120 features a built-in speaker, aluminum case and a dual-color LED display. The unit operates on two AA batteries batteries. It records and edits linear PCM and MPEG compressed audio, supports the BWF file format, and stores audio to an internal 512MB flash memory. It has a built-in microphone and accepts a mono or stereo external microphone while providing phantom power. An AGC and voice-activated recording can be switched on or off.

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

Digital audio processor
Vorsis

AP3: The 1RU, two-channel/stereo audio processor provides an array of analog/digital inputs and outputs, four-band parametric EQ, three-band compressor, and tunable filters along with overall AGC, limiting and expansion. All settings can be stored and replayed as password-protected presets. The front-panel display includes input, output and gain reduction meters. Remote monitoring and operational control is possible using Ethernet-enabled GUI software.

252-638-7000; fax 252-635-4857
www.vorsis.com; sales@vorsis.com

Composite-to-discrete converter
Broadcast Tools

CSD-1: This unit converts a composite stereo signal into discrete left and right balanced outputs. Features include twin BNC input connectors, multi-turn input level control, twin power connectors allowing four units to be driven off of one power supply, front-panel output trimmers, stereo and power LEDs and plug-in Euroblock output connectors. The unit is powered by a surge-protected, internal bipolar 12Vdc power supply.

877-250-5575; fax 360-854-9479
www.broadcasttools.com; bti@broadcasttools.com

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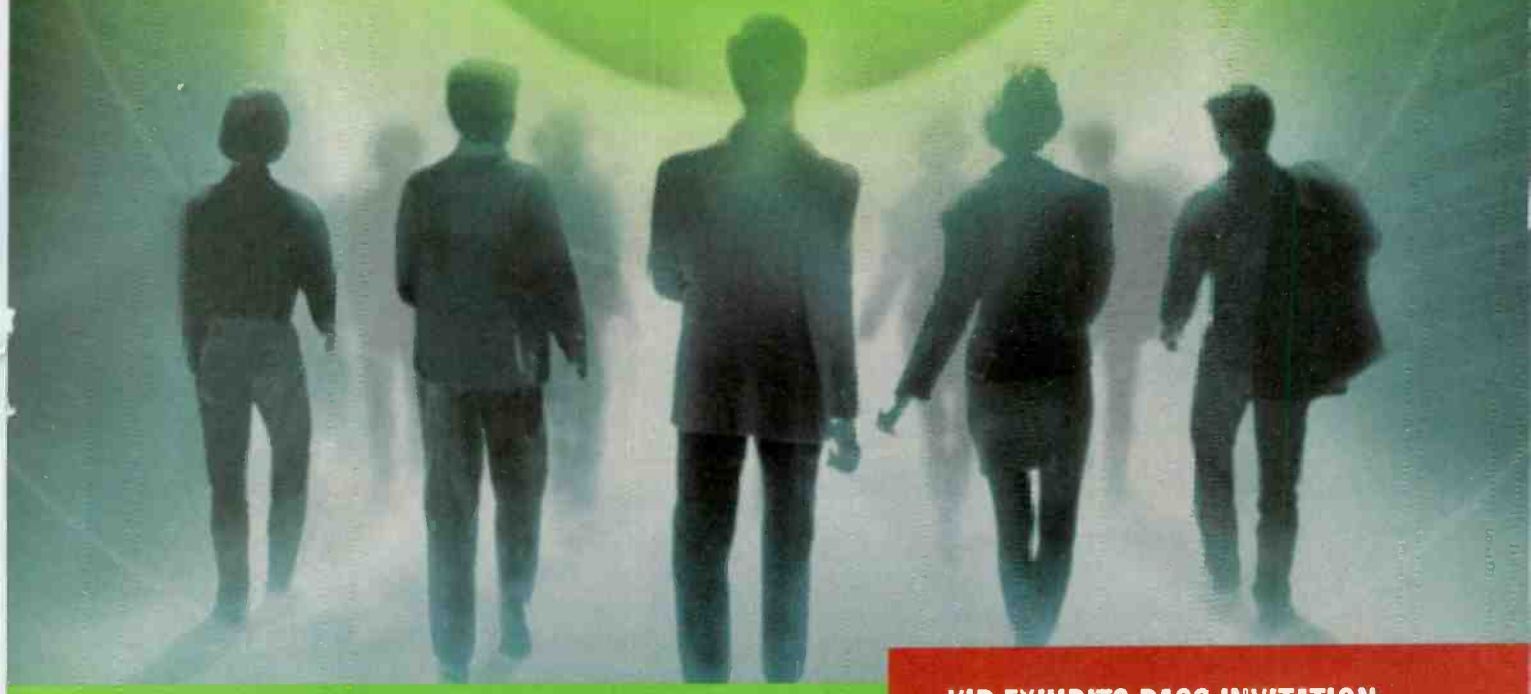

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330-686-2600; fax 330-686-0719
www.audio-technica.com; pro@atus.com

FM broadcast processor
Broadcast Warehouse

DSPX Mini: The DSPX Mini is based on the original DSPX and the six- band DSP Xtra. The mini follows the original DSPX with a 4+4 AGC and limiter processing architecture but with a slightly cut back feature set. The unit does not offer the analog and digital audio outputs, but has a stereo encoder. The unit maintains stereo separation in excess of 75dB.

+44 208 5409992; fax +44 208 5409994
www.broadcastwarehouse.com; info@broadcastwarehouse.com

Portable mixers
Studiomaster

CX, CX3: These 1RU mixers feature 12 inputs, including four balanced XLR/phono jacks for mics or line level equipment. Both models feature stereo output with LED metering, master volume control, and two-band EQ and level controls for each input. The CX3 has a DSP section that includes a variety of delays, reverbs and effects. All inputs have access to a pair of pre- and post-fader auxiliary sends. The stereo output features LED metering, master level control and balanced XLR and phono connectors.

714-998-2102; fax 714-998-2086
www.studiomaster.com; us-info@studiomaster.com

Upgrades and Updates

Translantech has updated the operating system of its Ariane Sequel to version 1.03 to enhance the unit's operation through a Windows remote-control application. The Remote Windows Application provides access to the Ariane Sequel's settings, and it replicates the front-panel display. (www.translantech.com)...**Digidesign** is shipping Pro Tools 7 software for Pro Tools|HD and Pro Tools LE systems. The update delivers many new features and enhancements such as expanded recording and editing capabilities for audio and MIDI, added mixing power and flexibility, and improved ease of use. (www.digidesign.com)...**D.A.V.I.D. Systems** has added Emergency Alert System (EAS) support to its program-associated data (PAD) functionality, allowing stations to display EAS alerts as text on RBDS and HD Radio receivers and on their websites. The new EAS Listener connects to EAS receivers via RS-232 and monitors for incoming alerts. (www.latitude-edition.com)...**Day Sequerra** has received Ibiquity certification for its M2 HD Radio modulation monitor. The M2 monitors AM, FM and HD Radio signals, including multicast signals. It also received a *Radio* magazine Pick Hit award at NAB2005. (www.daysequerra.com) ■

CD players
Tascam

CD-01U, CD-01U Pro: These professional CD players occupy 1RU. Available in two versions, the Pro version adds balanced analog and digital outputs to the unbalanced audio and S/PDIF optical connector provision. Both models have an RS-232 control port for external programming. The Pro version also adds a DB15 connector for parallel machine control. Each features MP3 playback, 20-second shock protection and pitch controls (±12.5 percent). Discs are inserted through a slot-loading CD transport. Three playback modes (repeat, single-play and program), a call function to return to the last playback start point, auto ready and auto cue functions, and a wireless remote control round out the feature set.

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

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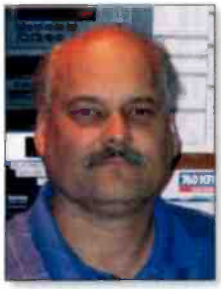
Contributor Pro-file

Meet the professionals who write for Radio magazine.
This month: Field Report, page 34.



John Rigg
Engineering Supervisor
KFMB-AM/FM
San Diego

Rigg's broadcasting career began in 1978 with Pacific Telephone installing broadcast audio and video circuits. He later took on engineering duties for KKLQ-AM/FM San Diego and then joined KFMB-AM/FM/TV in 1994. From 1999 to 2004 he operated a Ku uplink and handled remote RF work. He returned to his radio roots and became the engineering supervisor for the KFMB radio stations in 2004.

Radio
THE RADIO TECHNOLOGY LEADER

Written by radio professionals
Written for radio professionals

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POSTMASTER: Send address changes to *Radio* magazine, P.O. Box 2100, Skokie, IL 60076-7800 USA.

Sign Off

By Kari Taylor, senior associate editor

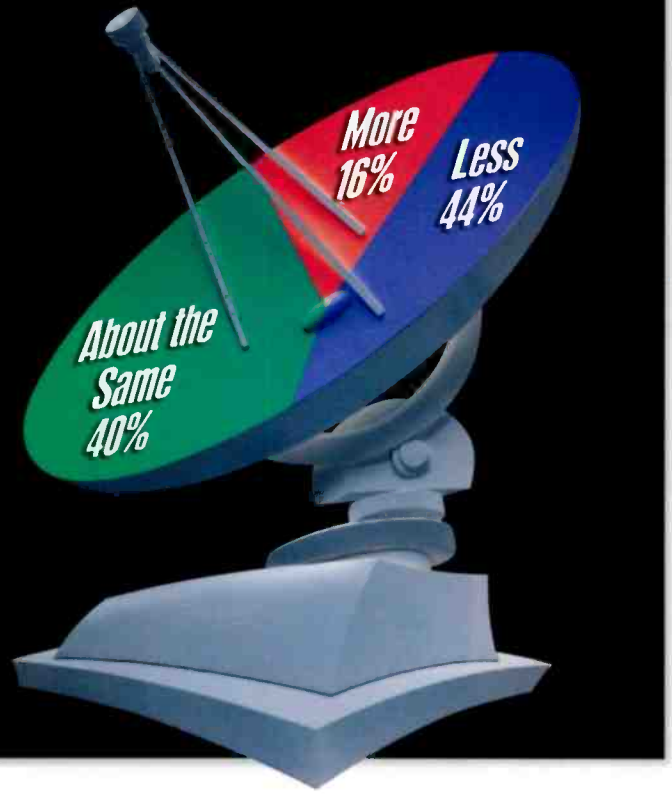
www.beradio.com

Do you remember?

In 1981, Audio & Design manufactured a line of compressors and limiters with adjustable attack, release and ratio as well as stereo coupling, side chain access and soft knee slopes at the threshold of compression. The Gemini Easy Rider offered two full-function channels. The Ex-press Limiter controlled stereo mixes and could be configured for FM broadcast operations. The Vocal Stresser combined a Compex limiter with four bands of sweepable EQ. The original Compex limiter featured separate compression, limiting and expansion facilities. And for special applications, the Voice-Over limiter automatically maintained a pre-established music-to-voice ratio. The Selective limiter controlled level in one frequency region without modulating the rest of the program.

Sample and Hold

How much time do you spend listening to broadcast radio after purchasing a subscription to satellite radio?



Source: Paragon Media Strategies, New Media Listening Habits: Are they affecting broadcast radio? August 2005.

That was then

Radio enthusiast and Cincinnati businessman Powel Crosley Jr. began broadcasting on WLW with 200W on 710 AM in 1922. Common program offerings were singers, piano and organ music, swimming lessons and guitar lessons. Local actors performed dramatic readings and scripts from plays. No commercial time was sold until 1926 and program schedules weren't developed until after 1923.

By 1930 transcription machines and turntables with electronic pickups were standard equipment. Microphones were placed on the stage or suspended over an audience for laughter and applause during programs.

WLW improved its facilities over the years, and by the 1950s had moved to Crosley Square in Cincinnati. In this 1957 photo, Bill Myers is working in WLW's Studio G control room at Crosley Square.

Source: Stepping out in Cincinnati by Allen Singer, copyright 2005.

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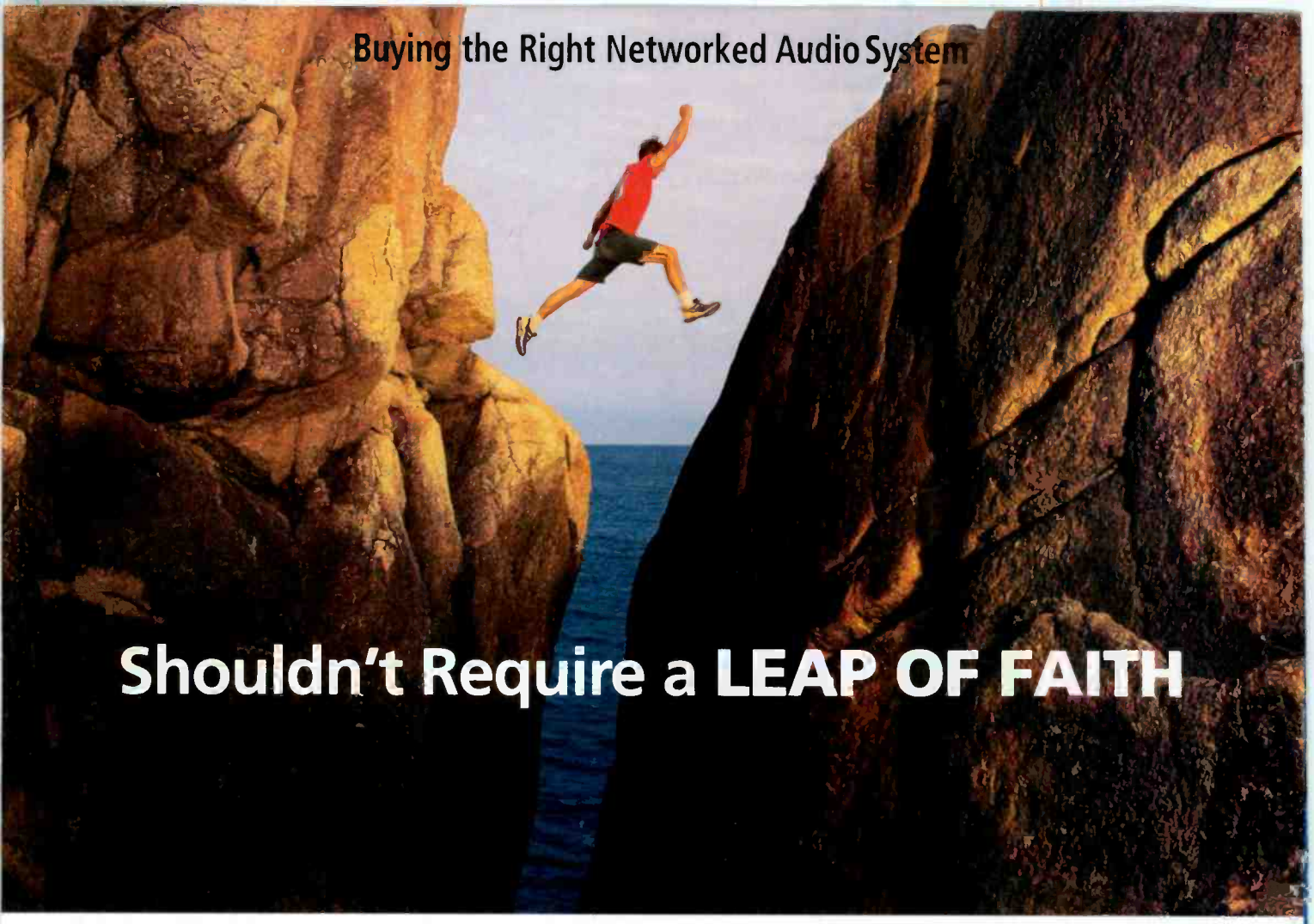

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