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August 2006
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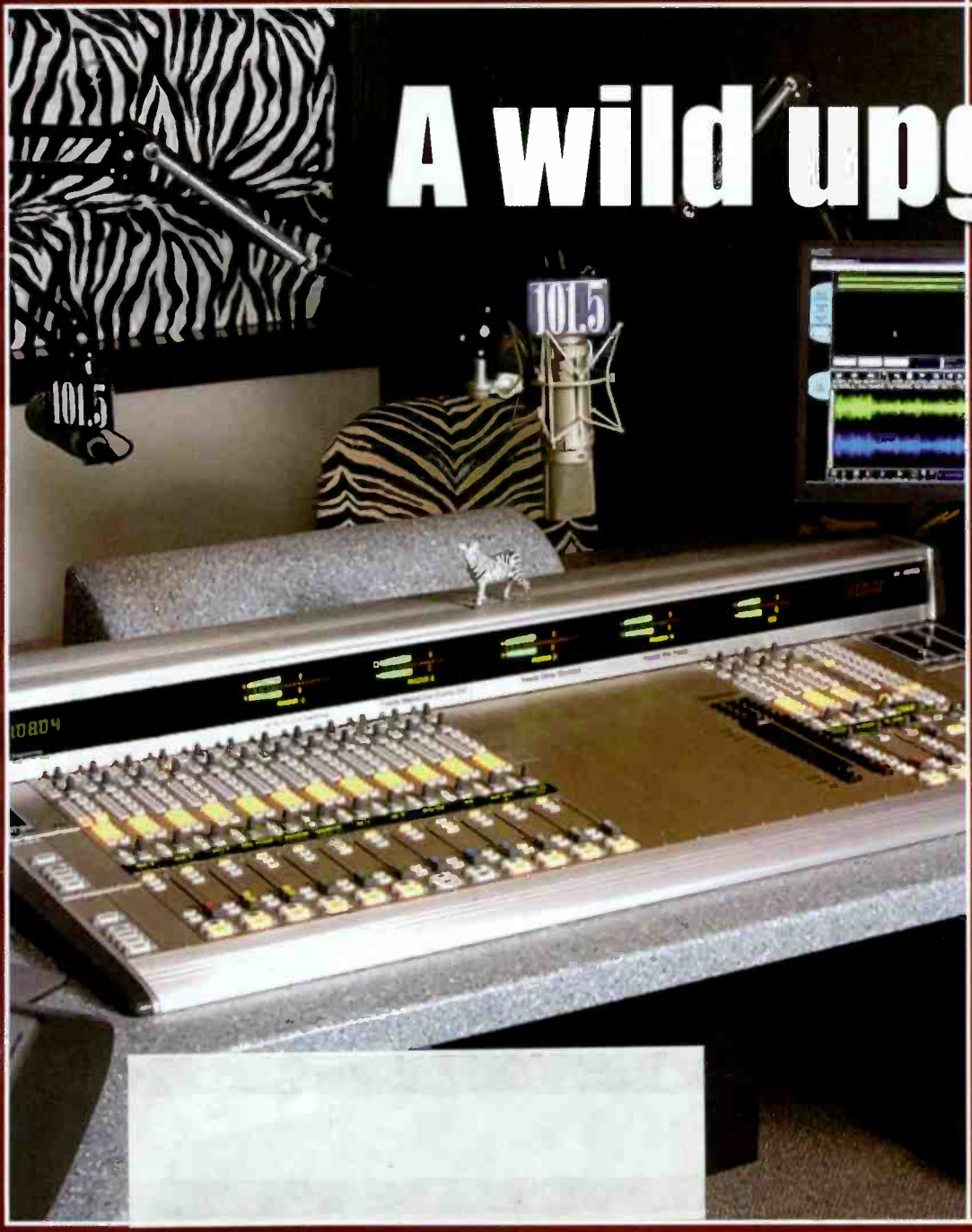

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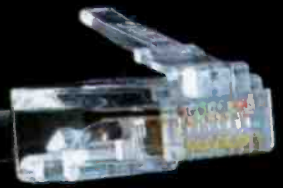

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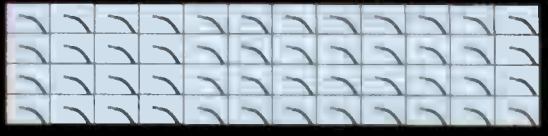

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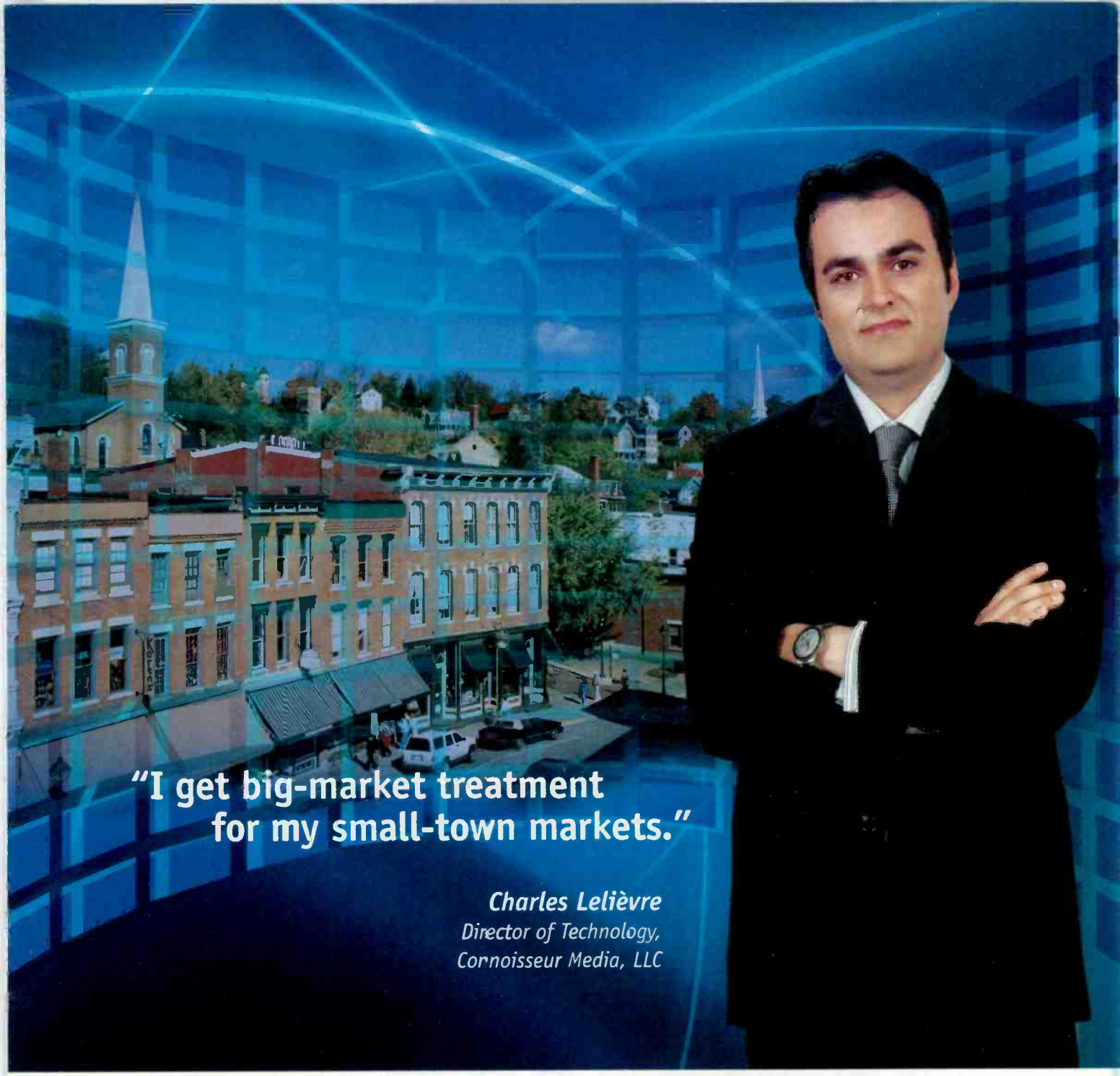

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ON THE COVER

Every radio has its own personallity, and the studios of each LFG station in Miami take this to an extreme. Photo by William P. Gaines. Cover design by Michael J. Knust.

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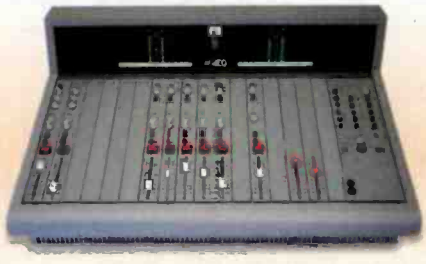

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Radio
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Currents Online

Selected headlines from the past month.

NAB Promotes Wharton to Executive VP

Wharton's duties will be expanded to include additional outreach and public policy advocacy to the national news media on behalf of broadcasters.

New HD Radio Ad Campaign Begins

The campaign promotes HD Radio as being "free, digital-quality radio programming" that offers "stations between the stations."

Exhibit Space Sells out for 2006 NAB Radio Show

More than 100 companies have reserved booth space at the convention this year.

Burns Appointed President of Crown Broadcast

Steven K. Burns has been appointed president for Crown Broadcast by the board of directors.

Vermont Public Radio Launches State's First HD Radio Signal

Vermont Public Radio's WVPR 89.5 became the first radio station in Vermont to begin broadcasting in HD Radio.

Terrestrial Radio Shows Well in New Music Discovery

A Bridge Ratings study of music consumers reflects continued satisfaction among a sample of 12 to 54-year-olds for the role terrestrial radio plays in new music discovery.

Site Features

The DAB Answer Series is Online

Each quarter, Insight to IBOC covers a specific aspect of digital audio broadcasting. The latest installment is in this issue. The complete content of each issue is available online as well.

Currents Online Weekly E-mail

Get the *Radio* magazine headlines delivered to your e-mail box every Monday morning. Subscribe today for the latest radio technology news and information.

Today in Radio History

Important dates that have shaped radio are available online. These dates are also listed on the 2006 Radio Industry Calendar.

Find that article

Each issue of *Radio* magazine is available online, and each article can be found several ways. Search by issue, topic, department or use the search window located on every page.

Technical Glossary

Need a reference for all the new technology terms?

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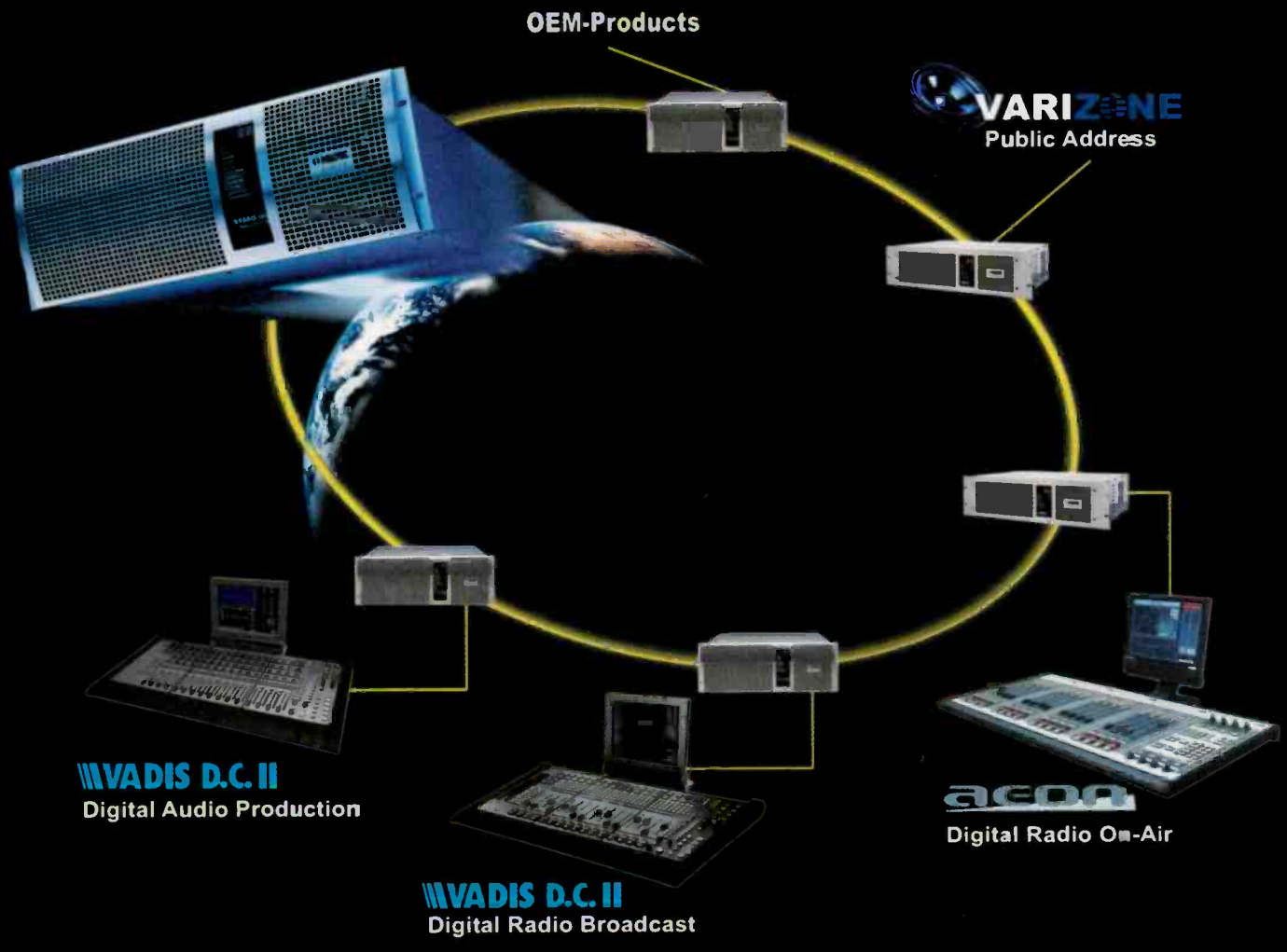

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Airways and airwaves

In June, the Federal Aviation Administration (FAA) issued a Notice of Proposed Rulemaking (NPRM) that on the surface appears to have a legitimate goal, but in reality could become a burden to most radio broadcasters if adopted. The NPRM seeks to change the name of a section of the FAA rules to Safe, Efficient Use and Preservation of the Navigable Airspace.

As you read the 73-page notice, you will see lots of explanatory language about FAA matters. This is certainly helpful to someone new to the FAA's procedures, but it makes it that much more difficult to weed through the notice to get to the meat. The summary notes that the goal of the proceeding is to add notification requirements and obstruction standards for electromagnetic interference and amend obstruction standards as well as some other elements that pertain to aviation.

What will likely catch your eye are the details surrounding the notification requirements relating to electromagnetic interference (EMI). The details are unveiled on page 18. The FAA wants radio spectrum users to notify the FAA for any new or modification of a building, antenna structure or any man-made structure that supports a radiating element in any of 13 frequency ranges. The frequencies range from 54MHz to 23.6GHz in the following blocks: 54 to 108MHz; 150 to 216MHz; 406 to 420MHz; 932 to 935/941MHz; 952 to 960MHz; 1,390 to 1,400MHz; 2,500 to 2,700MHz; 3,700 to 4,200MHz; 5,000 to 5,650MHz; 5,925 to 6,525MHz; 7,450 to 8,550MHz; 14.2 to 14.4GHz; and 21.2 to 23.6GHz.

Read the FAA NPRM

http://dmses.dot.gov/docimages/p86/406317.pdf

Submit comments

http://dms.dot.gov/submit

Required FAA notice would cover modifications to a tower or antenna, an increase in radiated power greater than 3dB, a change in authorized frequency and other facility modifications. The NPRM also requires that such notice must be filed at least 60 days in advance.

It's troubling that the FAA NPRM deals with EMI in a broad way, but this fits with how the FAA has always viewed spectrum issues.

Page eight of the NPRM notes that the FAA and the FCC already work together on aeronautical studies and adds that "if further coordination procedures are necessary, the agencies will develop them jointly." This has an encouraging sound to it, but the NPRM does not clearly detail how the FAA should be notified of the facility changes if the NPRM is enacted.

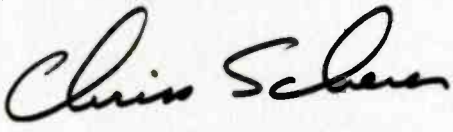
It makes sense to have the FAA and the FCC work together to ensure that broadcast and BAS spectrum users do not interfere with aviation, but this is best done through an intra-agency effort. Requiring spectrum users to file with two agencies for the same intended use is inefficient. The intra-agency aspect fits nicely with the government's paperwork reduction efforts. Unfortunately, the FAA and the FCC are not known for their cooperative efforts.

With the current FCC rules there can be long delays while the FCC makes its review of an application. Add the FAA element will only make this worse. If the FAA NPRM is enacted, realistic time periods for resolution must be stipulated. Likewise, the FAA needs to use realistic RF models to determine EMI.

Comments are due by Sept. 11 and can be submitted online. I urge you to read the NPRM and file comments.

Remembering history

It's been one year since the hurricanes tore through the Southeastern coastal states, and five years since 9/11. Despite the tragedy, these events held bright moments for broadcasting. Stations that stayed on the air or found ways to return to the air were able to inform listeners when Internet and phone service was gone. This is the power of radio.



Internet remotes... there's been talk.

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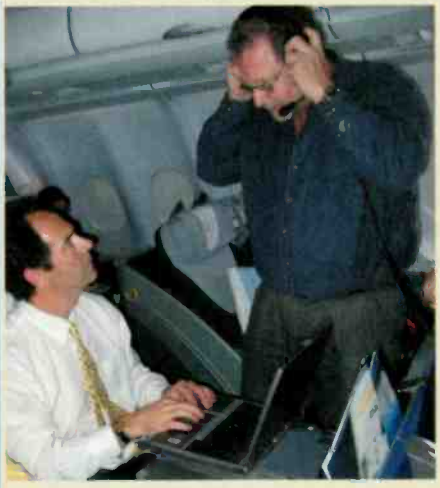

... successfully aired his three hour talk show from a commercial airplane [using ACCESS] at 37,000 feet on a regularly scheduled flight between Frankfurt, Germany and New York, US.

Peter Greenberg—Host of the syndicated radio program Travel Today

For the complete story visit http://remotebroadcasts.blogspot.com

Radio Free Asia—Live from the Himalayas

"The results [with ACCESS] were especially reliable considering that Dharamsala has one of most "problematic" Internet infrastructures that we have come across."

— David Baden, Chief Technology Officer Radio Free Asia

For the complete story visit http://remotebroadcasts.blogspot.com

Ski Mountain Remote

This picture, really demonstrates what ACCESS is about. This product truly has the ability to cut the wires.

For the complete story visit http://remotebroadcasts.blogspot.com

JAMN 94.5—Walk for Hunger

"ACCESS was used on the air exclusively for JAMN 94.5 at this one. It was all over EVDO with a tremendous amount of active cell phones in the area. The ACCESS was connected to the Verizon wireless Broadband...

For the complete story visit http://remotebroadcasts.blogspot.com

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Continuing education and certification

By Kevin McNamara, CNE

The title of this article might be a little misleading, in that I am not going to take any space to talk about specific courses and certifications you might consider; instead, I want to help you identify what your long-term career plan might be, and to motivate you to take the appropriate steps by gaining the necessary continuing education and certifications to achieve those goals.

In the February 2006 issue, I wrote about the "value-added engineer." I made a point that engineers need to gain professional certifications in as many disciplines as possible to ensure the credentials and skill sets necessary to carry them through their career and their life. I also pointed out that there are professional organizations created to support and enhance virtually every marketable skill and career path.

I believe that any continuing education path should serve two goals: to enhance skills and knowledge in your current career; and to gain knowledge and appropriate certifications and licenses that can be used, marketed and profited from, independent of your current career. In my mind the latter is the most important in the current economic climate. While these may have little to do with your current job, they could provide a viable income and alternate career path if necessary.

Furthering your own knowledge and abilities is part of furthering your career.

The reality check

Always evaluate yourself, not only for the short term (five years) but also the long term. Where do you want to be as retirement approaches? For previous generations, the common mindset was that you would stay in a particular occupation with the same employer for your entire career. It worked because employers in that day believed employees represented a valuable asset for the long-term success of a business and that it would be in their best interest to stay loyal to those individuals.

In the current environment where businesses are routinely sold or merged, that loyalty rarely exists.

Broadcasters, and particularly broadcast engineers, have witnessed mass lay-offs of seasoned engineers as a result of yet another merger. I make this point to stress that there is clearly a trend in the industry that will likely get worse as traditional broadcasters look for ways to reduce expenses to offset their revenue losses to new and emerging technologies.

This is not to say the broadcast engineer will disappear, but the role will take a different path and require skill sets well beyond that required of the traditional engineer. Look at any job description for a qualified broadcast engineer and it probably includes significant computer and networking experience. Yet I'm amazed at how many don't even ask for transmitter experience, a fundamental requirement for most engineers.

Ask yourself these questions:

- Are you happy with your salary? Is your yearly salary increase commensurate with your contribution and where you expect it to be?
- Does your employer support your growth? (pay for continuing education or seminars relevant to your job description)
- Do you always want to be on call 24/7?
- Is your quality of life what you expect it to be?
- Are you prepared if the lay-off notice arrives?
- Are you prepared or willing to move?
- If broadcast engineering were no longer a viable career option for you, what would be next?

What now?

One of my favorite quotes from Jack Welch is "If you don't control your destiny, someone else will." Numerous studies have indicated that some of the most stressful situations that employees experience are when any significant change is introduced within the organization, which isn't surprising because no one likes change. I would suggest change is positive and it ultimately provides you control your own destiny.

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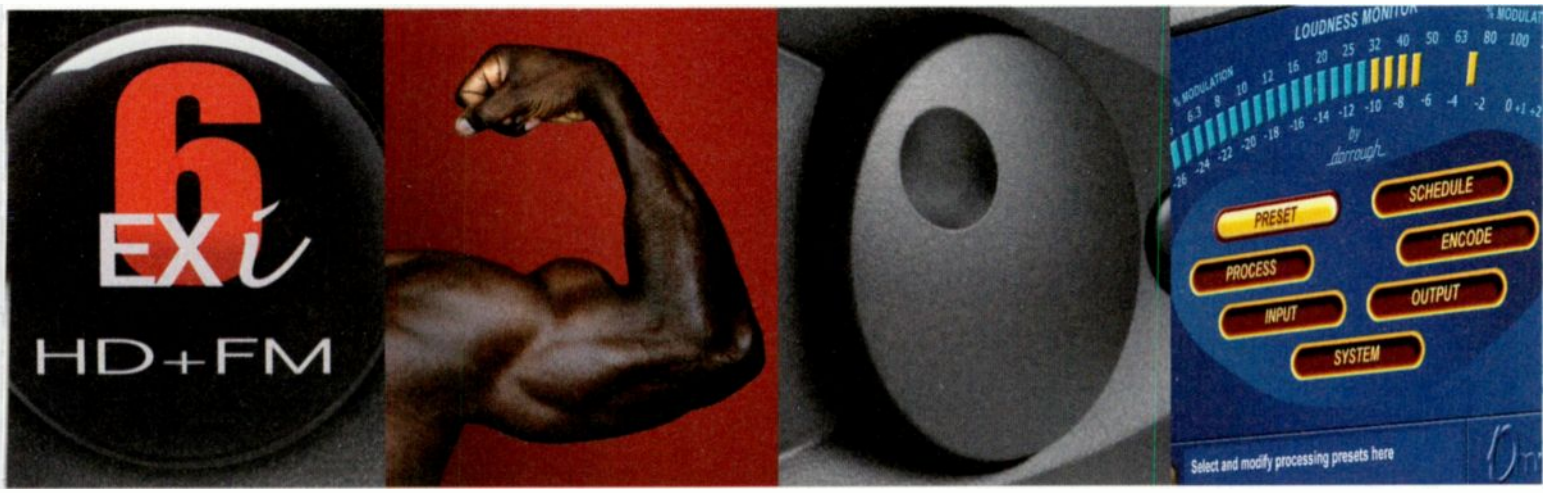
Important tips you should consider when choosing a certification path:

- Research classified job advertisements within industries that commonly use the service you are considering. Typically employers will list preferred certifications for the given position. This will give you a good indication of the weight a particular certification carries in the private sector.
- In some cases, there is more than one certification organization for a particular specialty. Understand which has the highest industry acceptance.
- Many certification organizations offer multiple paths/levels of specialties. You may choose to master all of them over time, but some of these paths might be in less demand and ultimately a waste of time and money.
- Several professional certification organizations maintain local chapters. Attend meetings as a guest at first. This allows you to network with people of similar interests. You can also learn a great deal about what you can expect in terms of future opportunities. Many of these groups also offer associate memberships that provide access to applicable trade magazines, shows and websites. As a bonus, many offer significantly reduced rates for books and courses.

Once you identify your path, determine what certifications or licenses are required. All of the recognized professional organizations support websites that provide detailed steps to obtaining certifications. In many cases, the certifying organization will require verification of educational or work experience as part of the certification process. There will also be costs associated with any required courses, the application and testing. Consider these costs an investment. Consult a tax professional to see if they qualify as a deduction. However, the certification process doesn't end with meeting all the requirements and approval of your application. Be aware of the continuing education courses prescribed to maintain your status.

Attending an association's local chapter meeting as a guest is an easy way to assess that group's offerings.

McNamara is president of Applied Wireless, Cape Coral, FL.



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A lot of muscle? You bet. No wonder the competition is running scared.

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XM and Sirius
experiencing regulatory problems

By Harry Martin

On May 22, 2006, XM Satellite Radio announced it would abandon its bid to acquire terrestrial Wireless Communications Service (WCS) frequencies due to failure to obtain FCC approval of the purchase. The WCS frequencies offered great promise to XM because the company could have provided broadcast-type local programming to 163 million people in the United States, including those in 15 of the top 20 markets in the country.

The NAB argued that XM should not be permitted to use the WCS frequencies to provide local radio programming and other specialized services on a market-by-market basis and sell them along with XM's satellite radio service. In its filings the NAB insisted that, before approving the purchase, the FCC must consider the harm that XM could cause to traditional local radio stations. The matter had been pending for more than a year when XM pulled the plug in May.

The radio industry has fought for years to try to stop XM from adding localized terrestrial radio service to its complement of national satellite channels. Initially, XM sought to construct a network of terrestrial repeaters, ostensibly to fill in reception holes in urban areas. Radio broadcasters fought this plan at the FCC, saying that XM would use the repeaters to offer local programming. Recognizing the harm that an XM local radio service could have on local radio, in 2001 the FCC granted XM special temporary authority for the repeaters with the condition that the temporary facilities be used only for simultaneous retransmission of XM's national satellite programming. With this avenue to local markets cut off, in July 2005, XM applied for FCC consent to acquire the terrestrial WCS frequencies.

Dateline

Oct. 2 is the deadline for radio stations in Iowa and Missouri to file their biennial ownership reports. Oct. 2 is the date on which radio stations in Alaska, Florida, Hawaii, Iowa, Missouri, Oregon, the Pacific Islands, Puerto Rico, the Virgin Islands and Washington must place their annual EEO reports in their public files and post them on their websites.

More problems for satellite radio

Interference to FM reception. There have been widespread complaints that some satellite radio receivers that use low-band FM frequencies to transmit the incoming satellite signal to on-board car radio receivers "bleed through" so that persons in nearby cars receive the signals intended for the subscriber's car radio. Bleed-through is caused when the FM signal intended for the on-board radio travels along the car radio's antenna connection wire and is broadcast from the receive antenna. Some car radios have been affected for one-quarter mile by such bleed-through. Local radio stations, including Christian stations sharing the satellite companies' receiver frequencies, have complained to the FCC about their listeners receiving sexually explicit or otherwise indecent programs.

XM says it has modified the mini-FM transmitters in its satellite receivers to minimize bleed through, but Sirius refuses to acknowledge that its receivers cause bleed-through problems. XM was forced to ask suppliers of some XM receiver models to suspend shipments in May after the FCC found the receivers were not in compliance with emission limits. As of mid-June, the FCC's test lab found that a new chip introduced by XM cured bleed-through by some of the company's receivers.

Demand for regulatory parity. In a recent letter to FCC Chairman Martin, the NAB pointed to the ubiquity of satellite radio programming as a result of promotion and marketing by XM and Sirius and that the satellite services for this reason should be made subject to the same regulatory scheme as broadcasters. For example, the NAB points out that satellite radios are available in cars from the major rental car companies. Also, satellite radios are installed in new cars at the factory, with car buyers receiving satellite radio programming for months without subscribing. Because this represents free distribution of the service the argument that the subscription model for the service should exempt it from content regulation, particularly the indecency rules, no longer has a legal basis.

FTC launches probe into XM marketing activities. XM reported receiving a letter from the Federal Trade Commission (FTC) in April informing it that the FTC is investigating whether XM's marketing activities, including billing and rebates, comply with federal laws, including the Telemarketing Sales Rule and the Truth In Lending Act.

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

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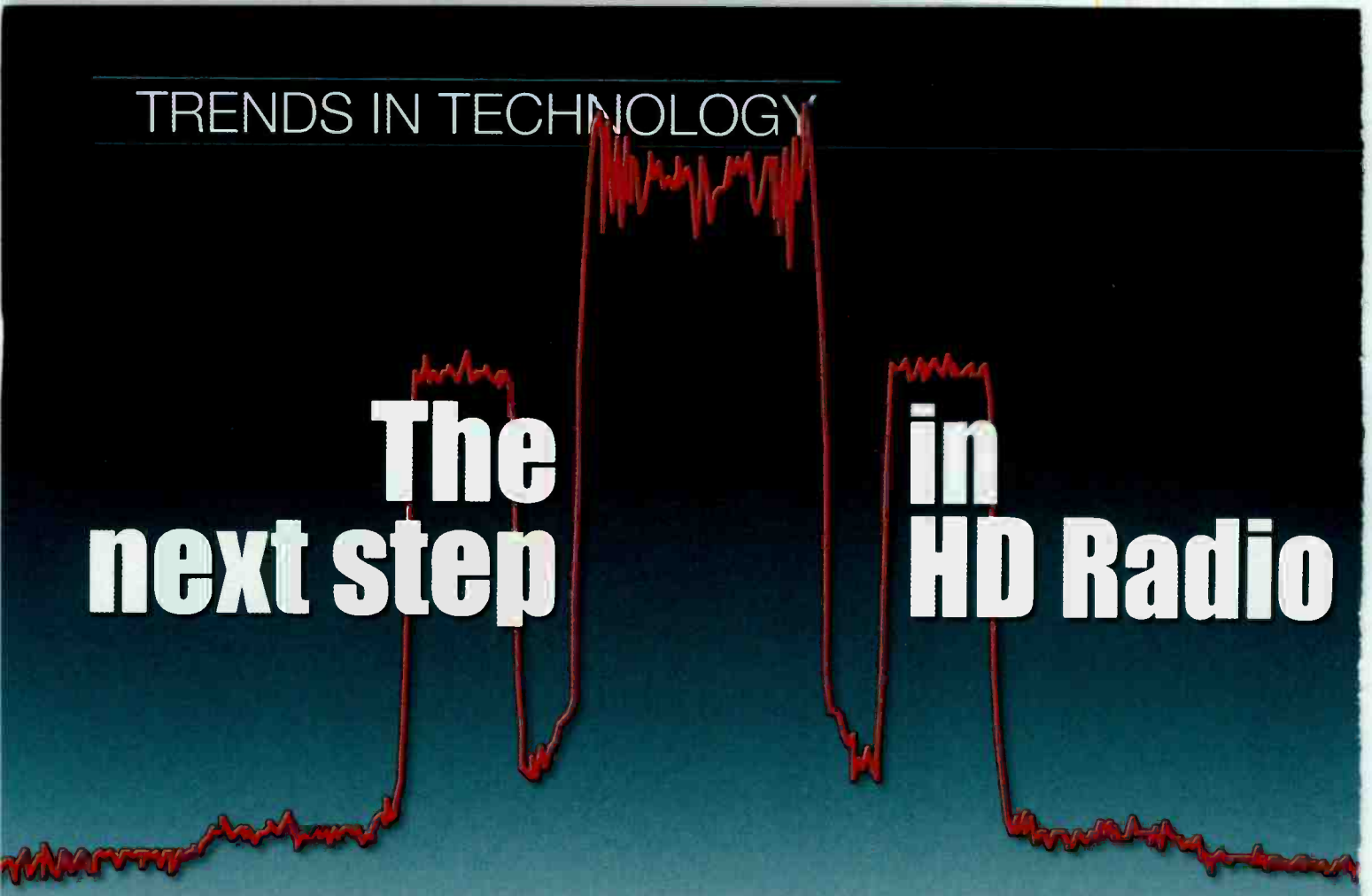

The next step in HD Radio

by Doug Irwin

Enhancements and refinements are all part of the technology's development.

In the intervening year since *Radio* magazine covered transmitters in the article titled *Clear Transmissions* in the July 2005 issue, much has happened with respect to RF transmission in our FM band, and in particular HD Radio. A year ago the coming killer app for HD Radio was going to be surround—but not much has happened on that front. However, HD Radio multicast has come into its own since then. This is a new technology that many believe to be the real killer app for HD Radio.

Living in Class C country and having become accustomed to using at least 35kW of RF (from one box), I find the rapid development of high-powered, vacuum tube, combined amplifiers to be of extreme interest. A year ago, Continental Electronics (CE) offered the only high-powered linear amp in its 816HD series. Evidently I'm not the only one interested in this technology, because Broadcast Electronics and Harris have stepped up development of their own vacuum tube, high-powered linear designs.

At NAB2005, the power limit of the Continental 816HD series was 20kW. At NAB2006, Continental's latest, most high-powered version on the convention floor was running into a test load to produce 25kW of analog and digital RF. One primary difference between this unit and last year's 20kW unit was the use of an external power supply, a simple way to limit the heat generated inside the main transmitter cabinet itself.

Mike Troje, sales manager of Continental Electronics, said that CE has its eye on even higher power. The key difference this time: water cooling. Don't let that scare you; UHF TV transmitters (among others) have used water cooling for years. This transmitter will use the Eimac 4CW30000A and makes use of a closed, purified water system. The tube anode will be attached to rubber hoses that make their way through the tube chimney. This tube still uses the same socket and cavity section that so many of us have become familiar with over the years. The power output of this transmitter, operating as a combined amplifier for analog and digital, is estimated to be

"We are very happy with our Logitek Mosaic.

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"Our experience with the three Logitek Consoles that we used for our broadcasts of the Olympics in Sydney, Salt Lake City, Athens and Torino built our confidence to purchase the new Mosaic for our NY Network sports studio. They are reliable, easy to set up and easy to reconfigure on the fly.

"The sports studio is the hub of all activity for our NCAA College basketball, NFL Football, NHL Hockey and all other sports broadcasts. It not only handles program audio, but also many IFB and intercom paths. We also have flexibility in our headphone monitoring that we never had before. Logitek's router based console has made frequent configuration changes easy with short notice. No more moving wires around. All of the routing changes are done by easy changes in the configuration software. Scene changes are fast and easy."

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Conrad Trautmann
SVP, Operations and Engineering
Westwood One • New York City

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Logitek Electronic Systems, Inc.
5622 Edgemoor • Houston, TX 77081
1.800.231.5870 713.664.4470
info@logitekaudio.com **www.logitekaudio.com**

The next step in HD Radio

between 28kW and 30kW.

Harris has introduced the HT/HD+ transmitter, which is a linearized, vacuum tube, combined amplifier based on the HT35 single tube FM transmitter. The published spec for this transmitter has an upper power limit of 22kW, but Harris said that there is ongoing development of this transmitter, and higher power levels may well be realized in the near future. This transmitter is also sold in a dual-transmitter-with-combiner package, thus allowing for 44kW of analog and digital RF. With all the talk about high-powered amplifiers, we should not forget that Harris has its line of solid-state combined amplifiers, such as the Z16HD+, that also can be doubled with a combiner, for a total of 16kW of analog and digital power.

Broadcast Electronics is working on its own version of the high-powered, vacuum tube, combined amplifier, but was not willing to

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Resource Guide

Manufacturers of transmitters, antennas and RF accessories

HD Radio transmitters

Armstrong Transmitter
315-673-1269
www.armstrongtx.com

Bext
619-239-8462
www.bext.com

Broadcast Electronics
217-224-9600
www.bdcast.com

Continental Electronics
800-733-5011
www.contelec.com

Crown Broadcast
800-262-8919
www.crownbroadcast.com

Fanfare
716-683-5451
www.fanfare.com

Harris
800-622-0022
www.broadcast.harris.com

Nautel
207-947-8200
www.nautel.com

Antennas

Armstrong Transmitter
315-673-1269
www.armstrongtx.com

Bext
619-239-8462
www.bext.com

Dielectric Communications
800-341-9678
www.dielectric.com

ERI-Electronics Research
812-925-6000
www.ERIinc.com

Jampro Antennas
916-383-1177
www.jampro.com

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go in to details when I made contact at the beginning of July. The company's highest-powered solid-state transmitter is the FMI-1405, which will generate 14kW of analog and digital RF and thus 28kW total for a combined pair.

Nautel's highest power (completely solid-state) transmitter to date is the V10d, which is rated for 8kW of analog and digital RF. Add a combiner and you're up to 16kW of RF; not bad for a 100V power supply.

In the sky

Perhaps I got a little ahead of myself in talking about transmitters, though. You will base your transmitter purchase on how much TPO you need, and that is based on the antenna being used. Let's take a look at what is available, specifically for the accommodation of analog and digital, from the major antenna manufacturers.

Shively and Dielectric offer interleaved antenna designs. Dielectrc's HDR+ series of interleaved antennas provides several advantages (though they are not advantages in every situation) such as using little additional tower space (as opposed to a completely separate antenna) and high isolation between the antenna used for the analog transmission and that used for the digital transmission—due to opposite circularity (one being right hand, and the other being left hand). Because the antenna elements are similar and located on the same tower element, the azimuth patterns will effectively be identical. The other simple advantage to using a separate antenna—though in this case interleaved—is a high level of redundancy.

ERI has taken a different approach by offering its Lynx dual-input FM antenna. With two inputs (one being $3^1/_8$ and the other $1^5/_8$) some redundancy is built in to the system. All elements of the Lynx radiate the analog and digital signals, and with what ERI calls a controlled mounting configuration, about 30dB of isolation between the analog and digital inputs can be achieved. It is important to eliminate analog RF from returning to the digital transmitter and possibly generating and subsequently radiating intermodulation products, and vice versa.

Jampro offers an extensive line of dual-input antennas that are well suited for analog and digital use. The Jampro Dual-Input HD antenna offers separate and isolated inputs, thus providing a high level of redundancy. This is a high-power system-handling ERP levels up to 100kW. Jampro also offers the JADP-HD, which is an antenna array composed of dual-input, wideband elements that excite a cavity-backed resonator. Like the Jampro Dual-Input HD, all the elements in the JADP-HD are driven by the analog and digital signals.

Resource Guide

Antennas (cont.)

OMB America
800-662-4872
www.omb.com

Propagation Systems
814-472-5540
www.psibroadcast.com

RFS Broadcast
877-737 9675
www.rfsworld.com

Shively Labs
888-SHIVELY
www.shively.com

Superior Broadcast Products
800-279-3326
www.superiorbroadcast.com

SWR
800-762-7743
www.swr-rf.com

RF Accessories

Altronic Research
800-482-5623
www.altronic.com

Andrew
800-DIAL-4-RF
www.andrew.com

Bird Electronic
440-519-2062
www.bird-electronic.com

Coaxial Dynamics
800-COAXIAL
www.coaxial.com

Comet North America
513-831-5000
www.cometnorthamericc.com

Dielectric
800-341-9678
www.dielectric.com

Electro Impulse Lab
732-776-5800
www.electroimpulse.com

ERI-Electronics Research
812-925-6000
www.ERIinc.com

Focus on multicast

No matter how you chose to get an IBOC signal on the air, it's likely at this point that you want to be able to transmit HD multicast signals. The four transmitter manufacturers mentioned previously provide the equipment necessary to do that. The current method for generating the various HD Radio signals relies on the exgine architecture. (Exgine is a contraction of exciter and engine.) The exgine operation was discussed in the May 2006 Insight to IBOC supplement in *Radio* magazine, but there are five basic elements of the system: the importer (used to generate a data stream that corresponds to the secondary program service, also known to many as HD-2); the exporter, which generates a data stream that corresponds to the main program service, otherwise commonly known as HD-1, and also combines the SPS (via communication with the importer via TCP) and MPS, along with other data, in to a common data stream sent to your transmitter via UDP; an STL that can carry UDP; and finally the linearized amplifier and antenna that radiate the IBOC carriers.

Broadcast Electronics' legacy HD Radio system can be converted to the exgine architecture. The FSI-10 receives a card upgrade, and is then known as the XPI-10, and thereafter lives at the studio location. Its function is then that of the exporter. The HD Radio exciter also receives

Resource Guide

Jampro Antennas
916-383-1177
www.jampro.com

Micro Communications (MCI)
800-545-0608
www.mcibroadcast.com

Myat
201-767-5380
www.myat.com

RFS Broadcast
877-737 9675
www.rfsworld.com

Rymsa
+34-91-876-0680
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a card upgrade, afterward taking on some of the exgine functionality. The XPI-10 will then send the entire data package as UDP from the studio location up to the transmitter site. This simplifies installation dramatically. The exgine architecture is standard now with all HD Radio transmitters from BE.

Nautel's implementation of the exgine architecture makes use of its IPR importer and its XPR exporter. Continental Electronics is currently supplying the Nautel system to its customers that want to use the exgine architecture with Continental HD Radio transmitters.

Harris now makes use of the exgine architecture as well. Its system is called HDX and comprises the HDE-100 exporter, along with the Flexstar FM + HD exciter. The Flexstar has added features such as built-in SCA and RBDS generators and can accept analog, AES or even composite inputs. It comes with an internal harmonic filter should you want to use it in stand-alone transmitter applications. (LPFMs take note.)

A missing piece of the HD Radio puzzle concerns boosters and translators. Creating an HD Radio signal from the ground up for these facilities has its own challenges, and at NAB2006 we saw a practical solution introduced. Instead of generating the signal locally, one approach is to receive the datastream and retransmit it without decoding and demodulating it. The Armstrong TRX-HD series accomplishes this in one unit. Similarly, Crown and Fanfare have teamed to provide a similar system.

This year's advances in broadcast transmitter technology are almost wholly done in conjunction with HD Radio. Early adopters have learned a lot and the trails are already blazed for those just gaining interest in HD Radio and multicast. It's easier than ever to jump on the HD Radio bandwagon.

Irwin is director of engineering at Clear Channel, Seattle.

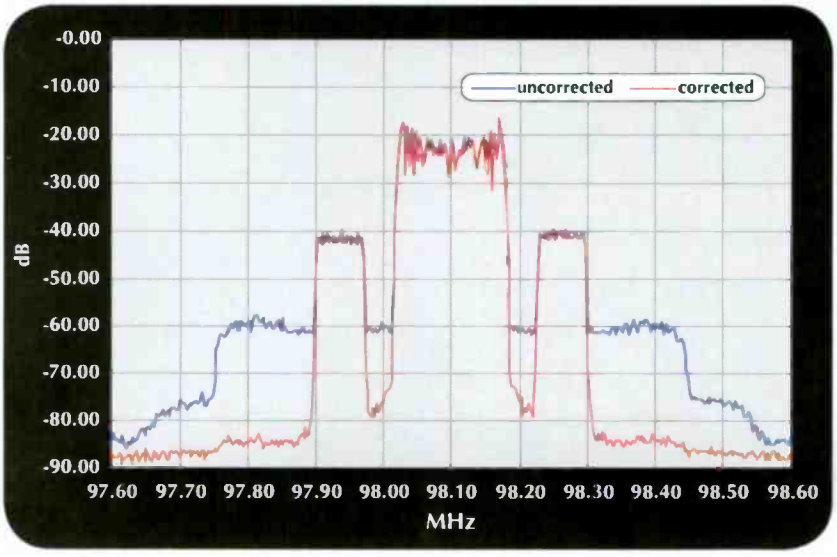
Insight to IBOC
August 2006 Part of the *Radio* magazine DAB Answer Series

Transmission precorrection

Helping IBOC meet the mask

By Doug Irwin

One of the great ironies in broadcast engineering is that we all grew accustomed to generating large of amounts of linearly modulated RF with amplifiers that were themselves very non-linear—whether it was a class-C vacuum tube amplifier in an FM transmitter, an AM transmitter full of switch-mode amplifiers or even the final amp in a high-level plate-modulated rig. Now that digital modulation has become so important, our amplifiers have to be linear.



Precorrection helps HD Radio transmissions meet the FCC spectrum mask.

Because digital modulation depends not only on the amplitude but also the phase of the modulated carrier, linearity in amplitude and phase response are vitally important in RF amplification of digitally modulated signals. After all, the receiver and demodulator need to be able to "understand" what is transmitted, so that the bit-error rate (BER) is low enough to provide good digital data out of the system. That can't happen if the relative amplitude and phase of the transmitted signal are blurred by amplitude and phase distortions in the transmitter itself.

If the overall efficiency of the system were no issue, you could just run a class A amplifier having great linearity, but low efficiency. This is just not practical in most cases because the amount of RF typically needed would necessitate larger amplifiers, and thus larger power supplies, and thus a greater need for electricity. An effective compromise is a class AB amplifier—much better efficiency and linearity that is not that far off from that of a class A amplifier.

The task of going digital

By Jeff Smith, CEA CBNT

It was shaping up to be a typical NAB trip this past April when Tony Gervasi, senior VP of engineering and technology for Nassau Broadcasting, received a call asking if it would be possible to install HD Radio with a multicast signal on WFKB, Boyertown, PA. He was also asked if it could be done in 45 days. Never being one to step back from a challenge and knowing the capabilities of the Nassau engineering department, he said yes.

The new equipment is delivered.

Immediately Gervasi and I sat down with vendors to form a plan. We selected a major broadcast supplier and integrator to supply most of the equipment and decided that split-level combing would be used. This would allow Nassau to continue to use its main Continental 316R transmitter and add a new solid-state hybrid transmitter capable of transmitting an analog only, digital only or hybrid signal. Nassau also decided to use the Dielectric Dibrid IBOC combiner. This combiner allows for hot

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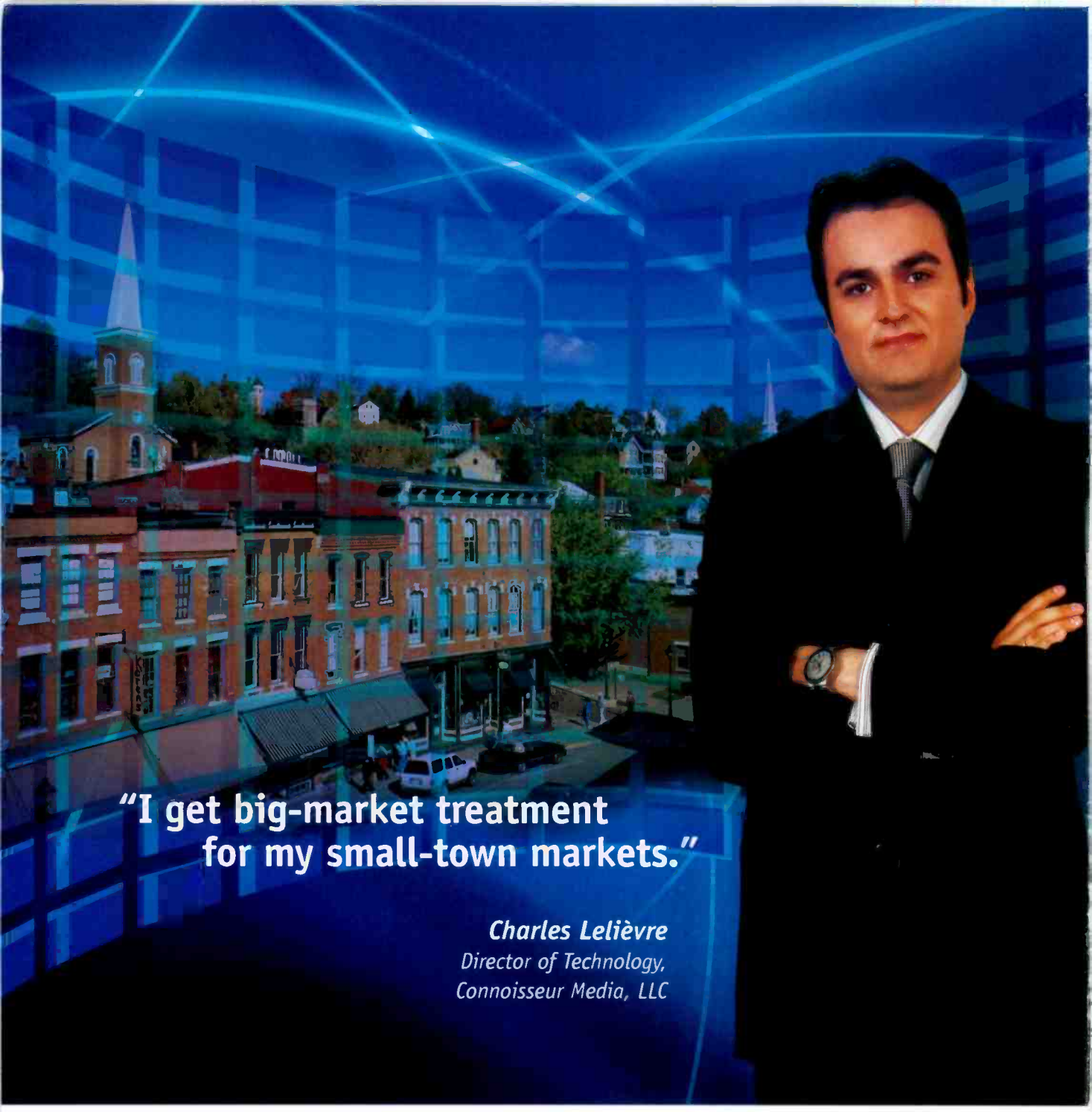
A special supplement to
Radio
THE RADIO TECHNOLOGY LEADER



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Precorrection

But even with better efficiency, we still need the ability to transmit a non-blurred signal—one that can be decoded with a low BER on the receiver end. When multiple carriers are transmitted at the same time—as in the case of HD Radio—then the non-linearities in the amplifier lead to spectral regrowth. Spectral regrowth is the generation of intermodulation products that effectively give the digitally modulated carrier much greater bandwidth than it would have if the amplifier were completely linear.

If you consider a digitally modulated RF signal that needs to propagate through a bandpass filter as part of a combiner, for example, then another set of complications can arise. Ibiquity specifies system gain flatness of ±0.5dB with differential group delay of less than 600nS (±200kHz from the center frequency of the system). If the filter section is too narrow, or if it is tuned such that there is a gradient (time vs. frequency) in the time it takes for RF to pass through the filter, the digital modulation can be blurred and limit the BER at the receive end, and even cut back the effective coverage of the digital signal.

A technique called precorrection can be used in the RF amplifier to counteract the effects of a bandpass filter, or to minimize the effects of regrowth while maximizing the efficiency of the amplifier itself.

Put into action

For its digital transmitters, Nautel has developed a precorrection system called pre-equalization. The advantages the company points to in its methodology relate not only to the digital modulation, but also the analog modulation as well.

Let's go back to the bandpass filter example. There are two characteristics of the analog signal that can be degraded by the filter section (or the tuning of the filter section) itself: the synchronous AM noise and the stereo separation. These can easily be measured. If you consider the hybrid signal—an analog FM carrier plus the digital carriers as one package—you must also consider the possible amplitude anomalies impressed upon the digital carriers as they propagate through the system. Nautel's system works by building a digital finite impulse response (FIR) filter that has an equal and opposite characteristic to that of the bandpass filter. The analog modulating signal and the I&Q baseband are added together and run through this filter. After upconversion to the carrier frequency they are amplified up to the necessary RF level. The predistortion added by the FIR effectively cancels out that which is impressed upon the RF signal as it passes through the filter section.

Harris has its version, known as real-time adaptive correction (RTAC) that uses the technology that Harris developed for DTV transmitters. RTAC is used to simultaneously correct for linear (time and amplitude) dis-

switching between the transmitters, which allowed Nassau to use the new hybrid transmitter as a backup analog transmitter if necessary.

The order was finalized and a delivery date of June 12 was set for the equipment to be delivered to the transmitter site. It was critical for the equipment to arrive by this date, because a firm on-air date of June 22 was set for the new HD Radio configuration. Unfortunately, the supplier missed the delivery date and only a partial order arrived nearly 36 hours late. The remainder of the equipment did not arrive until June 17—five days after the promised delivery date. This created a serious issue for the Nassau six-man staff but the engineering team persevered in its effort to complete the project on time.

Time to begin

With all the equipment finally on site, the team began installing nearly 80 feet of Myat 3⅛" rigid line and 20 elbows. Included in the install of the new transmission line were three Bird BPME series power monitors and an Electro Impluse 10kW reject load. The Bird meters provide an IP connection to remotely monitor power at certain points in the air chain.

The hybrid transmitter is set into place.

While this was going on at the transmitter site, engineers were also busy installing the HD Importer and Exporter and audio processing equipment at the studio site. An Omnia EXI HD+FM was chosen for the main processing. This provided the delay necessary for the digital signal to be handled in the processor. By delaying the audio here it allows the analog portion of the signal to not pass through the exporter, which in turn helps to keep the analog FM signal on the air in the event the Exporter needs to be rebooted. Gervasi chose an Orban Optimod 6200 to process the HD2 signal, which is a simulcast of the WBYN-AM Christian format. Also installed at the transmitter and studio sites were Audio Design Associates HD Pro Tuners. These tuners monitor the analog, HD1 and HD2 signals in one unit with balanced XLR and AES/EBU outputs.

The Moseley Starlink SL9003Q with the LAN option was used as the STL. This allowed for the analog signal as well as the UDP traffic for the digital signal to be sent using one device. Once the audio

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Image credits:
Page1 - Spectrum diagram courtesy of Harris Broadcast.

The *DAB Answer Series* is an ongoing series of supplements that covers the technology of digital audio broadcasting.

Open Mic
Putting surround on the air

It was announced at NAB2006 that WZLX in Boston, a CBS station, would transmit its classic rock programming in MPEG Surround beginning in mid-August. We talked to Denny Sanders, general manager of Telos-Omnia-Axia about the idea and what the station has to do to make it happen.

Radio: *How much of the station's library has been converted/upgraded to surround?*

DS: About 10 to 15 percent of the titles on the WZLX main playlist are available in authentic, discrete surround versions. However, the real amount of airtime that discrete surround music will be heard is probably more than that, since many of the famous hot rotation classics are available in 5.1 surround.

Radio: *Where did the surround content come from?*

DS: Most music is commonly available and more is released every week. Many longform concert DVDs already have the soundtrack in discrete 5.1 surround, so there is a wealth of material there. Recordings not yet released in discrete 5.1 surround will be heard in an emulated surround version for now, with discrete surround versions to follow as released. The emulation technique that we will use is a Fraunhofer development, and is created for each title separately for maximum integrity. Station imaging, bumpers, promos and some commercials will also be produced in discrete surround as well.

Radio: *Who encoded all the music into the MPEG Surround format for storage?*

DS: We are doing it for WZLX by duplicating the station's library on a second hard drive, replacing titles with discrete surround (or emulated) versions, and then swapping hard drives. This technique is actually 5.1 + 2. The original two-track version remains intact for stereo playout, sidestepping the challenges of collapsing multi-channel down to stereo or mono.

Radio: *There are no radios capable of playing the MPEG Surround format. Why is WZLX undertaking this project?*

DS: Paul Donovan (CBS VP engineering) and Joe Soucise (WZLX chief engineer) heard our demonstration some months ago and were intrigued. WZLX was a pioneer in the Classic Rock format, just celebrating 20 years as America's pre-eminent classic rock station, so it is only natural that this anniversary period is marked with another pioneering effort. Also, Boston is a tech center, so it was a fit for us to be able to have Bose, Boston Acoustics, Genelec, Tivoli and others in the region able to access the off-air broadcasts and hopefully give us their feedback. Genelec is providing the speakers for all of the studios at WZLX. There will be a limited amount of specially modified receivers for initial demonstration and evaluation, but it will be a while before off-the-shelf receivers are available. However, if all goes as planned, WZLX will offer the service via a 5.1 surround Internet stream for initial consumption.

Precorrection

tortions and nonlinear (AM-AM and AM-PM) distortions in the RF amplifier. The amplitude linearity distortion (AM-AM) becomes more pronounced near the amplifier's saturation point; and so by minimizing its effects you can effectively increase the amplifiers output level and utilization (vs. a reference distortion amount). The phase linearity (AM-PM) distortion causes spectral regrowth; and so by minimizing both types of distortion, the hybrid signal from the amplifier can be made to fit the FCC's spectral mask requirements.

RTAC can also be used to minimize "memory effects" that can be found in a vacuum-tube type amplifier (such as that caused by energy storage in the tuned circuits) and likewise in tuned filter sections, such as a bandpass filter. This memory effect causes the shape of the nonlinearities to continuously change with the data states being transmitted. RTAC adaptive precorrection continuously changes the shape of the precorrection curves from one data state to the next to correct memory effects.

Broadcast Electronics uses what it calls static DSP precorrection in its amplifier systems. The necessary precorrection to counter the effects of amplitude non-linearity, as well as phase non-linearity, are added to the system by way of DSP. Subsequent changes necessitated by changes in temperature or VSWR are also calculated ahead of time, and factored into the precorrection applied to the transmitter to optimize performance by the DSP. Memory-effects (such as the slew rate of a HV power supply in a vacuum tube transmitter) can also be effectively deleted by use of the same DSP.

Whether known as pre-equalization (in the case of Nautel), real-time adaptive precorrection (in the case of Harris), or static precorrection (in the case of BE), these design techniques provide greatly improved performance in terms of amplifier efficiency, spectral efficiency, efficacy of the IBOC transmission itself, and last but not least, the quality of the good old fashioned analog signal.

Irwin is director of engineering at Clear Channel, Seattle.

HD RADIO?

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Dave Chancey 805 968 9621
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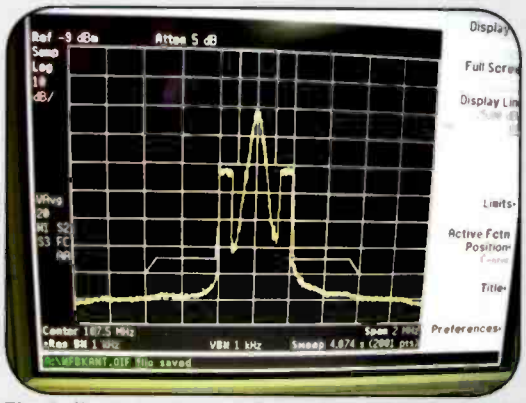
Going digital

continued from page 3

at the transmitter it is fed into an exciter that powers the Continental and the new hybrid HD Radio transmitter. With split-level combining we were able to reduce the TPO of the Continental from 20kW to 16.5kW. The new hybrid transmitter made up the difference by producing 3.5kW of analog power and 800W of digital power. The two transmitters, when combined using the Dielectric Dibrid, create the power needed for WFKB.



The Agilent spectrum analyzer shows that the hybrid HD Radio signal easily fits the spectrum mask.

Nassau chose the Dibrid combiner because it features multiple modes and allows for hot switching. Mode one combines the two transmitters' analog and digital signals with 4.5dB loss. Mode two routes the Continental to the antenna. Mode three routes the hybrid transmitter to the antenna and mode four combines the full power of both transmitters with a 10dB loss. The Dibrid rejects any excess power to the 10kW Electro Impulse convection-cooled reject load.

Nassau's engineering team successfully turned on the digital signal on June 22, even with the shipment delays. The new digital signal was monitored and tested using an Agilent E4402B spectrum analyzer and shown to fit perfectly within the Ibiquity HD Radio mask.

With the WFKB signal now on the air in HD Radio and sister station WBYN-AM on the HD2 signal, it is Nassau's goal to spread the word about HD Radio in the Reading, PA, area. To that end Nassau has purchased 200 Boston Acoustic Recepter Radios from BGS to distribute to listeners. Nassau hopes that by being the first HD Radio signal on the air in Reading that the WFKB classic hits audience and the WBYN Christian audience will be better served and enjoy the listening experience.

Smith is director of broadcast systems, Nassau Broadcasting Partners.

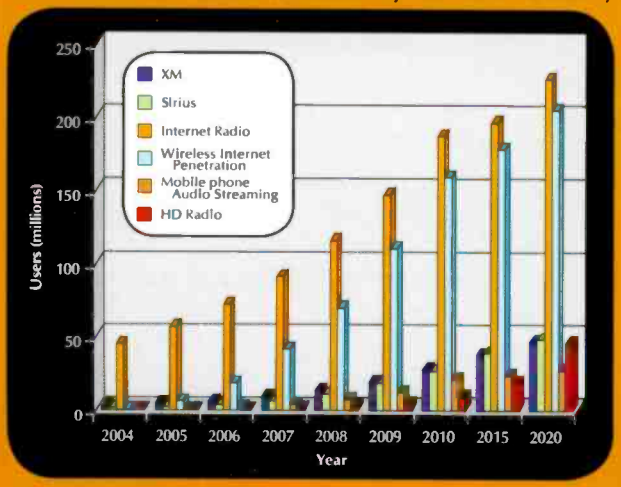
Sample and Hold

The growth of digital media

By Chriss Scherer, editor

Digital radio isn't the only digital medium offered to consumers. Satellite radio, cell phones and the Internet are also delivering digital media to the same listener base. Projections show steady growth of all the sectors, with Internet radio and wireless Internet access making the biggest advances.

The success of HD Radio has a slower expectation. While the two satellite radio providers are expected to draw 15 million listeners by the end of 2007, HD Radio is not expected to exceed that number until sometime after 2010. The promise of HD Radio shows a quicker rise closer to 2020 when usage of XM, Sirius and HD Radio are expected to be about equal.



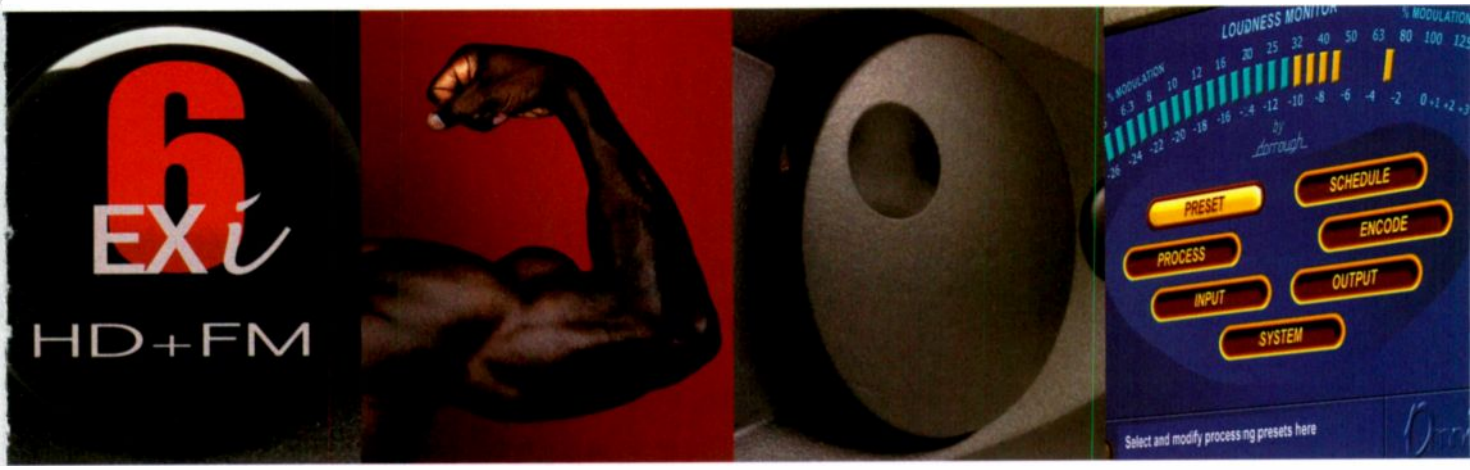
Content delivery by cell phone providers shows a gradual increase that stays well ahead of HD Radio until about the year 2017.

The big winner is Internet radio—particularly with wireless Internet delivery. The study shows that usage of HD Radio in the year 2020 will just exceed the usage of Internet radio from 2004.

This data assumes that no other technology will be introduced, and it is taking for granted that survey respondents view the potential technology of 2020 in terms of 2006 understanding.

It appears that the more promising course for digital delivery of audio entertainment is not through traditional terrestrial means, including HD Radio, but rather through Internet and the ever-increasing proliferation of wireless Internet access.

Source: Bridge Ratings. Sample: 3,200 persons 18+; random digit phone dialing and mall intercepts. Los Angeles; Portland OR; Dallas, Phoenix, New York, Boston, Washington, DC; Miami-Ft. Lauderdale; Burlington, VT; Denver.



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Omnia-6 is the standard by which all other processors are measured. In the last few years, thousands of leading stations in the world's top markets have upgraded to Omnia. In fact, Omnia-6 has been so successful that some competitors have just given up; others are mere shadows of their former selves.

So why do broadcasters love Omnia-6? The *sound*. The clean, pure, crystal-clear sound (bone-shakingly loud, if you want) that's become the choice of #1-rated stations in New York, Los Angeles, Tokyo, Paris, London, Rome, Sydney and Beijing. The other guys tried to match its winning sound... and failed. So they've settled instead for trying to copy its innovative features.

Features that Omnia pioneered — like dual, simultaneous processing paths for HD Radio™ and conventional FM at no extra cost. The world's first non-aliasing digital clipping system, with composite clipping for the ultimate in competitive loudness. The high-precision Multi-Band Look-Ahead Limiter (invented by Omnia) for perfect HD Radio processing. The six-band limiter for conventional FM, with adjustable crossovers for surgically-precise control over your signature sound. An integrated Dorrough™ Loudness Meter. And of course, the groundbreaking 96 kHz, 24-bit platform that delivers full 20 kHz bandwidth for HD Radio broadcasts. Always innovating.

Which is why the **new Omnia-6-EX*i*** makes perfect sense. With **integral HD Radio Diversity Delay** that helps digital broadcasters eliminate analog connections to the HD exciter, ensuring independent analog and digital program streams. And the exclusive new **LoIMD Clipper** that actually **suppresses intermodulation distortion** to deliver audio that's cleaner, clearer and more detailed than ever — no matter how aggressive your processing. (If you already own an Omnia-6, don't worry – there's a low-cost upgrade to give your processor full-fledged Omnia-6EX*i* power.)

A lot of muscle? You bet. No wonder the competition is running scared.

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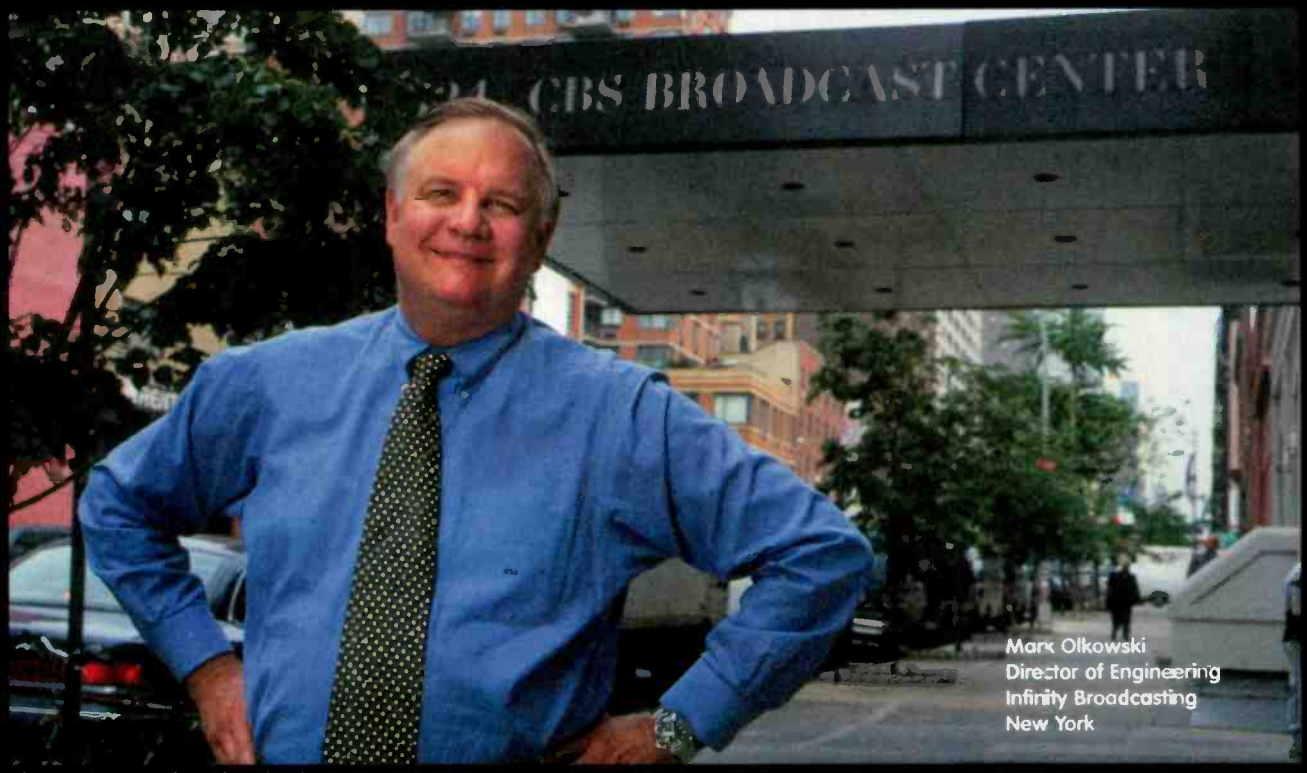

photo credit: Joan Ford Photography

STUDIOHUB+ CASTING CALL

"Back in the winter of '99, when I first knew we were going to relocate WCBS from Blackrock to West 57th Street Broadcast Center, we began our search for new digital technologies."

"I first saw StudioHub down at the Radio Show and was really intrigued by it. It appeared that it would save us a lot of time in construction and building and then again in the future with troubleshooting and station upgrades."

"Back in the old days we would build conventional analog radio stations that were hardwired—and you never had the ability to make any changes. And of course in our business, there are always changes. StudioHub is the product that allows you to make changes on the fly."

"One of the important new things we've done here at WCBS, is audio streaming. Millions of people log into our audio stream and we were able to do that very easily with StudioHub. If we had to do this wiring by hand, it would have taken a lot longer."

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Don't Settle for

For 20 years, this Miami facility had served its tenants well, but by 2000 the studios were showing their age.

By Gary Blau

The facilitiy for the Lincoln Financial Group's Miami stations was an older one, originally built in 1980. At the time it was intended to house two stations, but now handles three with its eight sub-divided studios. Built the old fashioned way with Bob Hansen acoustic design, floating floors, box-within-a-box isolation, redundant HVAC and isolated UPS tech power, it was done right. The wiring was multi-pair cables and 66 punch blocks. The consoles were the original Ward-Beck analog models and were suffering from Schadow switch disease among other geriatric maladies. They served us well, but now they were maintenance money pits. The time had come for a makeover.

We would not be able to simply replace everything all at once because the cost would be prohibitive and we still needed to operate the stations in the same space in the meantime. So, we embarked on a plan to upgrade all the rooms over a few years, renovating one or two rooms per year. This allowed us to focus on each room with a great deal of individual attention without disrupting current operations or strangling the life out of our capital budget. We began in 2000 and finished the last of eight rooms in December 2005.

A few key decisions were made early in the process. The first decision related to style and function. The second was determining the best technical choice for the heart of daily operations: the audio consoles. We began the process by identifying which rooms had the greater need and priority in refurbishment. This would drive our schedule during the next few years. An important aspect of this was involving the programming and operations departments in the process. When the station across the hall is getting its room rebuilt, the other guy is going to feel neglected unless he knows what the big picture plan is because he had a hand in crafting it.

The initial steps

Before making equipment decisions, we had to determine how the newly rebuilt rooms should work, feel and look. Our three stations are proud of the fact that they each have strong identities in the market, are active in the community and are staffed with actual live people producing live radio. In an age where canned, automated McRadio is produced in look-alike radio factories seems to be the norm, we wanted to emphasize what we think is not only a unique feel-good experience for our listeners and employees, but also a competitive advantage.

We decided to craft each room by how the room would be used most effectively by our teammates who would have to work in them. The end result was eight rooms with eight layouts, color schemes and personalities. All the rooms had to be able to function as an on-air or production studio if the future required it. Some are stand-up; some are sit-down. All have style, but function came first.

Central to the design process was involving a top-notch custom studio cabinet and furniture manufacturer throughout the multi-year process. We worked closely with Mager Systems in Phoenix, AZ, to develop each room's furniture design and layout, and solve some of the challenges that appeared. We also chose Mager's furniture because of the lumber components and build quality, and solid surface countertops that can be maintained into the future against scratches, unlike laminate.

Senior Engineer John Morris, who built the original facility in 1980, worked in Autocad LT to design the various room layouts, then worked with Mager and our operations personnel to be certain we had all the details covered. Morris' planning at this stage was vital to ensure fatal flaws were not overlooked and that the rooms would satisfy the end users.

Throughout the past 20 years a lot of equipment was replaced as technology changed, but the old furniture remained, looking shabby and not optimized for new needs. This is typical in that the last item considered in a studio project, as well as the last item that's ever replaced, always seems to be the furniture. Changing studio furniture is usually a disruptive undertaking so most people put it off or just live with what they have. Over time this tends to devolve into a less than attractive, sometimes even embarrassing, facility. Usually all the design effort and money is already spent on hardware with furniture being almost an afterthough. By then the decision is reduced to a commodity pricing exercise.

The fact is, you're going to be living with your studio furniture longer than almost every piece of equipment in the room, including the console. It's the one item that's going to receive the greatest abuse and still be expected to perform and look good. Suffice it to say that consideration of furniture design and construction is just as important as any other technical item in a facility.

Once we had our room functions and needs decided we

McRadio

looked at equipment. When the project began in 2000 the console market was still in transition. Router-based consoles were just coming out and choice was limited to a small number of models. We wanted a console that could be used as a stand-alone as well as integrate with a router. We did not want or need to rebuild the entire audio infrastructure of the facility at the same time. We wanted to be able to incorporate such a router-based backbone at our leisure in the future.

For our first rooms we chose the Wheatstone D-5000 for its simplicity of operation and capability of working with the then-new router whenever we were ready for it. Midway through our multi-year process a corporate decision was made to standardize on Harris consoles, causing us to finish the remaining projects with five more Harris BMX Digital consoles. This decision worked in our favor as we ended up with extremely capable consoles, and because we had not yet purchased a router to replace our trusty SAS 32000 there was no harm done. When the need arises we can easily incorporate the Harris Vistamax router system.

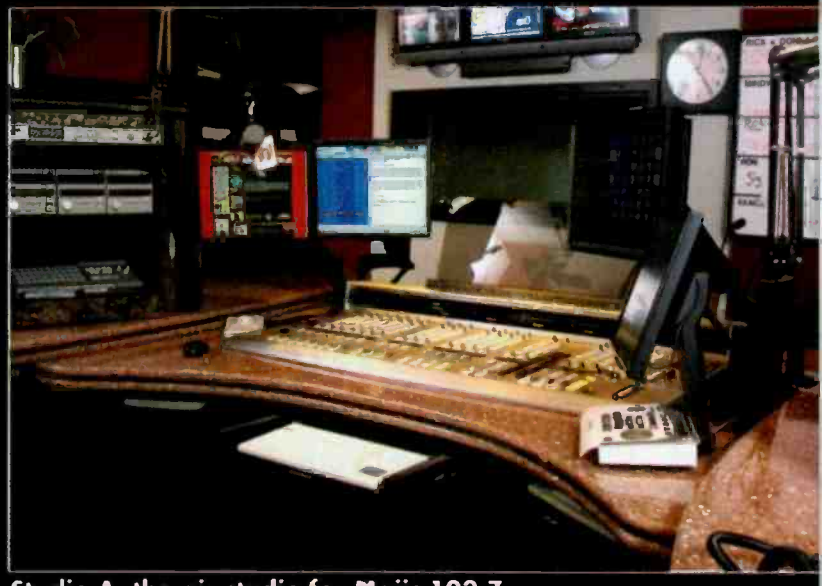
A little ingenuity

Because we had to fit everything into existing building space and room sizes, we had to create a few solutions. One is the need for significant numbers of computers in the studios. Our main distribution frame (MDF) room is a small one built before PCs were invented and when the biggest items to accommodate were patch bays and distribution amplifiers. There simply was no room to install dozens of PCs in a centralized fashion as is the common approach today.

In each studio we had to fit four to six computers for the Mediatouch automation, Vox Pro and Pro Tools audio editing, Metro Source news, Telos call screening, weather radar and utility PCs for Web browsing. Mager designed custom computer cabinets in each room, inventing pull-out rotating mounting brackets that allow full access to all computer connections for servicing. This eliminates the need to crawl into a cabinet to reach the rear of the computer. We also routed a tap of low-velocity cool air from each room's air conditioning feed into the cabinets to keep the machines at reasonable temperatures. Otherwise, placing multiple machines into a closed cabinet will eventually cause thermal problems. This is especially important with today's hot-running CPUs that will overheat quickly if not ventilated.

Some of the other unique things that Mager created for us were custom mic boom risers that mount into Ergotron mounting bases, custom solid-surface console end bells, and contactless touch switch guest mic controls built into the solid-surface counters.

Studio G, the air studio for 101.5 Lite FM


Studio A, the air studio for Majic 102.7


Control Room D, the control room for 790 the Ticket

Don't Settle for McRadio

We also standardized on a shallow, wall-mounted, floor-to-ceiling wiring and punch block cabinet for each room. This lets older guys with bad knees easily work on the wiring in each room without resorting to crawling into a cabinet or taking Oxycontin. All of the console inputs and outputs, including control wiring, are brought out to high density

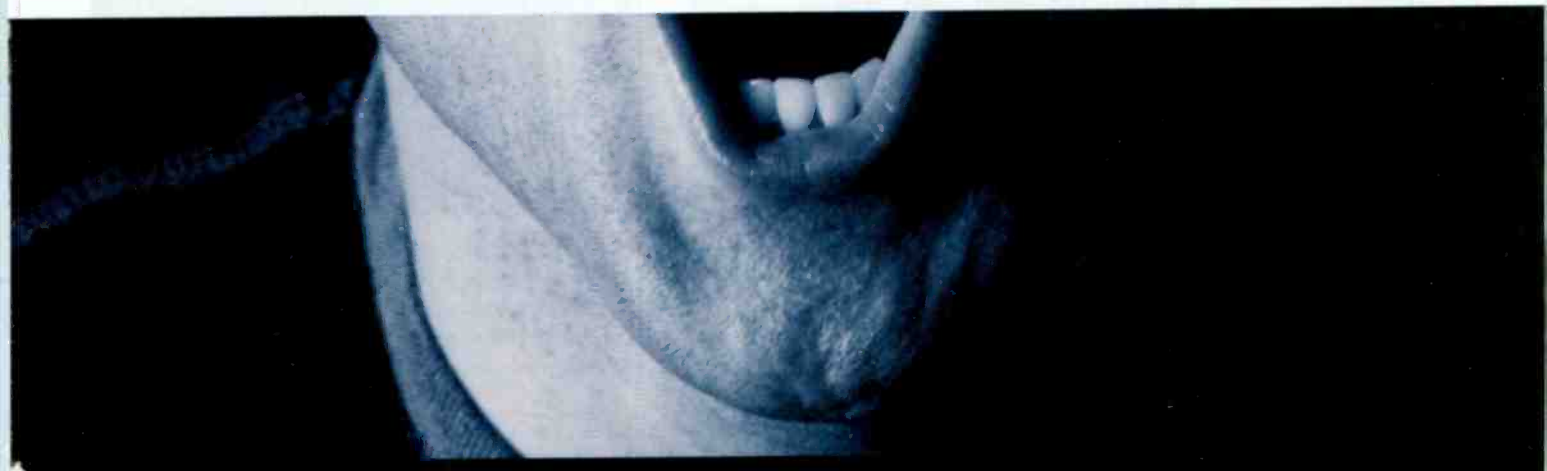
Production Studio C serves Majic 102.7.

Production Studio P is used by 790 the Ticket.

Bix blocks, and all cross connects are completed inside the cabinet, making future changes easy.

The final room, finished last December, was the Majic 102.7 air studio, which we wanted to make special for the people who patiently waited until last to get theirs. Because the station regularly has guests during the Rick Shaw morning show, we had to provide talent and guest space, as well as make the room more functional for the rest of the day. Our solution was a motorized turret for the morning show that houses the telephone and headphone controls, clock and timer. This can be lowered for the rest of the day to reclaim needed countertop space.

SANITIZED FOR YOUR PROTECTION



SOME WORDS SHOULD BE OBSCENE AND NOT HEARD

Eventide Broadcast Delays are designed to keep profanity off your air, and angry listeners, embarrassed advertisers, and the FCC off your back. We invented the obscenity delay and have a solution for stations large and small that provides up to 80 seconds of the highest quality revenue and license-protecting delay.

Our new HD compatible BD600, 24-bit delay, comes standard with AES/EBU, and provides up to 80 seconds of memory — twice as much as other delays. There are fully adjustable Delay and Dump functions, and a Sneeze function which "edits" audio entering the delay, allowing the host to sneeze, cough, or make a short comment without being heard on air.

The BD600 offers two different methods of delay buildup and reduction: Eventide's catch-up and catch-down system, and an exclusive fast-entry-and-exit feature which allows starting a broadcast with the delay already built up to a safe amount and ending it with a rapid reduction of delay.

For HD, the BD600 offers MicroPrecision Delay™ mode which allows up to 10 seconds of delay to be adjusted in real time in 100 nanosecond increments. This is useful for synchronizing analog and digital signals while on-air, without audible artifacts, to maintain a seamless user experience.

Whatever your size, whatever your format, you can't expect to protect the integrity of your air and the foundation of your business without an Eventide Broadcast Delay in your rack.

Eventide

HD COMPATIBLE

Don't Settle for McRadio

This pull-out bracket from Mager Systems allows easy access to the PCs.

The punch blocks are mounted in a cabinet that is easy to access.

Equipment List

360 System Shortcut, Instant Replay
Bix blocks
Digidesign Digi-002 Pro Tools LE
E-V RE20
Harris BMX Digital
HHB CDR-850Plus
Mager Systems studio furniture and cabinets
Marantz PMD570
Neumann U87 condenser mics
OMT Imedialogger, Imediatouch
Rode Broadcaster
SAS 32000 intercom and router
Sony CDR-W88
Tascam CD-RW2000
Telos Profiler, Direct Interface Module, Delta, Zephyr Xstream
Tieline Commander G3 POTS/IP codecs
Vox Pro v4
Wheatstone D5000

The end result of our slow but steady project is we're in good shape for the next decade and beyond with studios that are unique, functional, versatile, stylish and built like a tank. It's a facility with a strong sense of personality that we are proud of.

Blau is director of engineering for Lincoln Financial Group's Miami stations. Photos by William P. Gaines.

The technology behind LFG Miami

Tascam CD-RW2000

The CD-RW2000 is the most advanced stand-alone CD recorder available. It's made for professional use with a host of desirable features. The production staff will appreciate comprehensive audio I/O, word sync input, call function for checking play cues, digital gain adjustment and digital fade in and fade out. A RAM buffer is included to ensure tight ID markers, and the SCMS code can be set via the user menu on the CD-RW2000. Digital gain adjustment allows the user to boost level adjustments without going back to the analog source, and the adjustable auto cue function lets one locate right to the start of actual audio, rather than the track ID.

www.tascam.com
323-727-7666

SAS Rubicon SL

Based on the Rubicon, the flagship radio broadcast console control surface from SAS, the Rubicon SL offers a reduced feature set than its big brother, but still includes the same look and feel from the same rugged components. Rubicon and SL surfaces can co-exist in the same console/router system. The SL provides full router source select, four mix buses, an unlimited number of automatic mix-minus buses, mode, pan/balance, and IFB/talkback on each input module. The surface works in a networked system with a 32KD router or stand-alone with a RIOGrande mixer/router. Frequently used controls are always right at hand, while multi-function control system provides quick access to deeper capabilities as they are needed. The modular surface is available in frame sizes from eight to 40 modules.

www.sasaudio.com
818-840-6749

Harris BMX Digital

The BMX Digital offers broadcasters flexibility with a modular design implementing four program, four utility and two send buses, each with digital and analog outputs. Modules are hot swappable. Up to six mix-minus outputs are supported with automatic online/offline switching. To reduce cabling complexity and costs, the BMX Digital interfaces to the VistaMax audio management system, transferring 64 input and output channels over a single CAT5 cable. Networked or local sources are dialed up on each fader using an alpha-numeric display. Session files retain the complete console setup and are stored in the BMX Digital or they can be transferred over a LAN via FTP.

www.broadcast.harris.com
800-622-0022

Tieline Commander G3

A wired and wireless IP, POTS, ISDN and X.21 network codec, the Commander G3 features two expansion slots that accept a choice of hardware and software modules. (IP audio engine now included for free with POTS allows users to connect to wired IP connections via DSL, cable and T1 for up to 25kHz audio.) Combinations of modules provide wireless 15kHz mono or stereo over high-speed cellular data networks; 15kHz mono, dual mono and stereo over POTS; mono/stereo over ISDN; GSM wireless to landline and mono/stereo audio over IP and data networks. The unit also offers simultaneous off-air communications over POTS, ISDN or GSM networks in addition to the main program channel. A digital audio matrix router in each codec configures profiles such as mono, stereo, live off-air communications with the program channel, dual mono, cue, intercom and bonded mono configurations.

www.tieline.com
888-211-6989

Watch

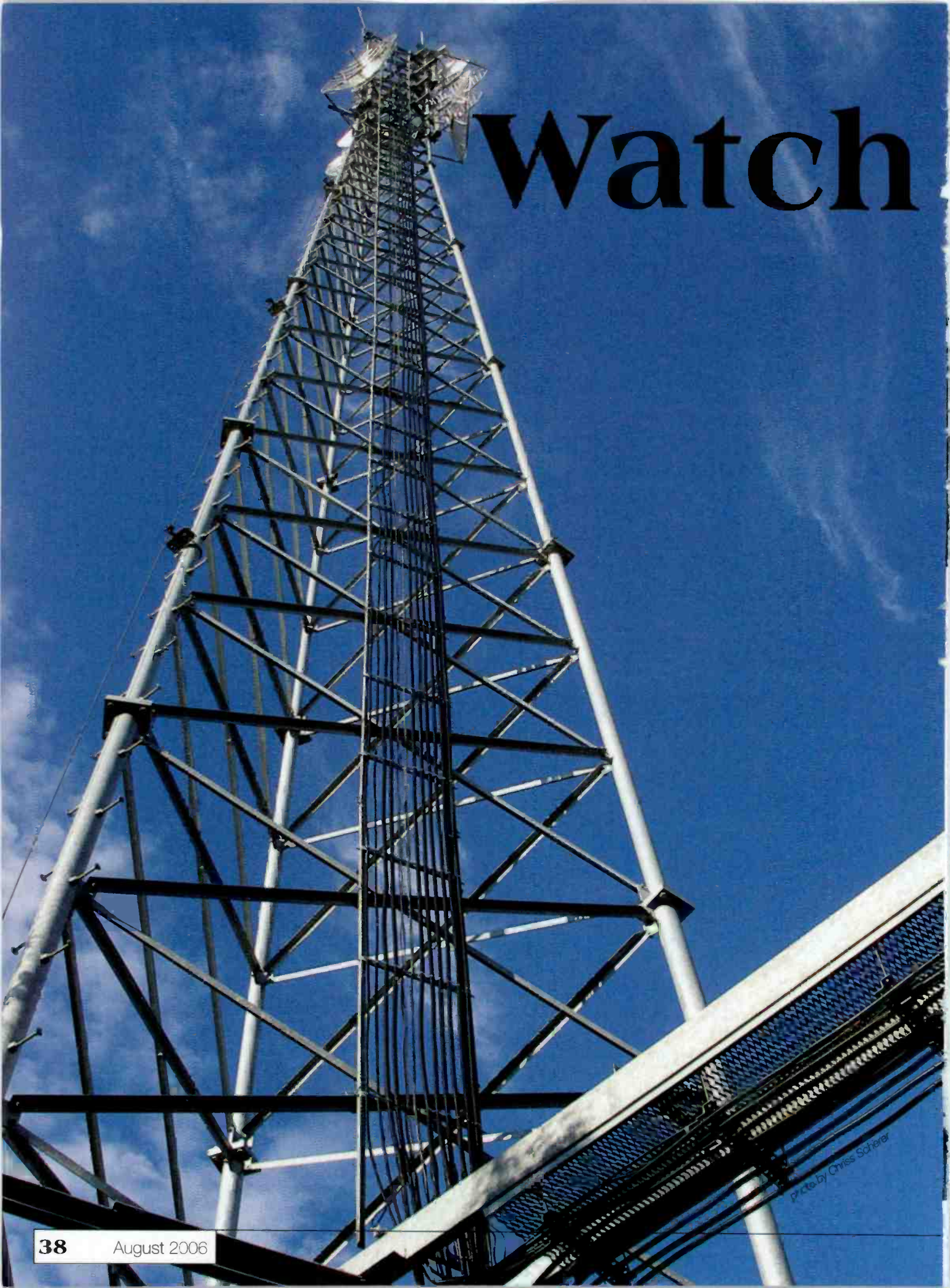


Photo by Chriss Scherer

that line

Some insight into coaxial transmission line maintenance

By Rolin Lintag, CSTE

A station's transmission line is an important, yet often neglected, part of the RF system. Most stations take it for granted until a catastrophe happens requiring a significant capital expense for its replacement. The lack of proactive preventive maintenance for transmission lines will almost always result in expensive replacements in due time. The quality and efficiency of the RF transmission can be adversely affected when the transmission line system is not at its best. This becomes more critical as stations move into digital operation, requiring better average power handling and uniform bandwidth response. Therefore, it is important to include transmission lines in the preventive maintenance program.

A transmission line serves as the conduit for RF power flow from the transmitter to the antenna. It is supposed to deliver, without any alterations, all the RF power from the transmitter to the antenna. However, real-world installations are not perfect. Some of the power is lost and the RF signal can be altered even before it reaches the antenna. The amount of power loss and RF signal alteration depends on a number of factors. The important factors that characterize its effectiveness in accomplishing this function are VSWR that shows the impedance mismatch along the line; frequency response that may alter the desired bandwidth of transmission; and losses due to cable attenuation and the lack of mechanical (hence electrical, too) integrity along the line.

Watch that line

Temperature and weather

Coaxial lines—or any metal for that matter—expand when the weather is hot and contract when the weather is cold. To make matters worse, a differential in expansion occurs between the inner and the outer conductors. An adequate provision for this expansion and contraction should be implemented in a rigid coaxial cable installation to prevent undue mechanical stress on its components. This is one reason why a minimum horizontal run for a rigid coaxial line is recommended by the cable manufacturer to accommodate changes in vertical length due to temperature variations. Suspension hangers and connectors allow small movements on the horizontal line while keeping good electrical contact on connectors and flanges. The bullets on flanges keep these movements from causing undue mechanical stress while maintaining the required impedance. Routine maintenance involving visual inspections of the flanges, connectors and hangers needs to be done at regular intervals depending on the age of the system. Replace inner conductor components or even line sections as needed.

Cable connections must be weatherproofed when they are exposed to the weather. Use rubber tape for type N and smaller connectors if it will be exposed to the sun and rain. Moisture inside the connectors can cause corrosion and drastically

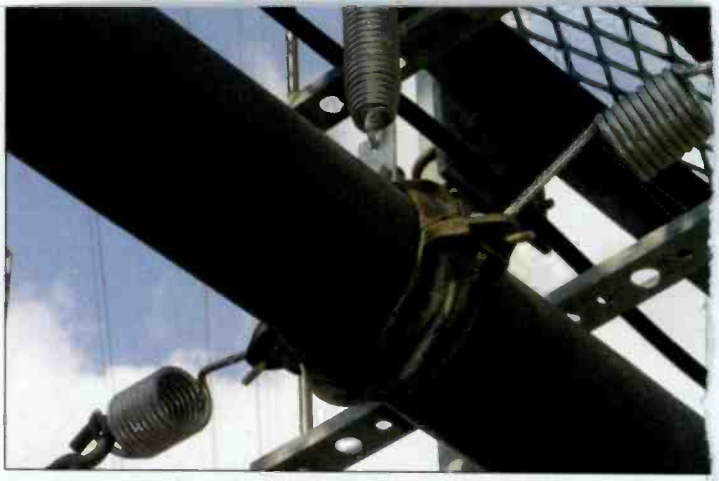


Figure 1. Regular line inspection includes a check of the line hangers and mounts.

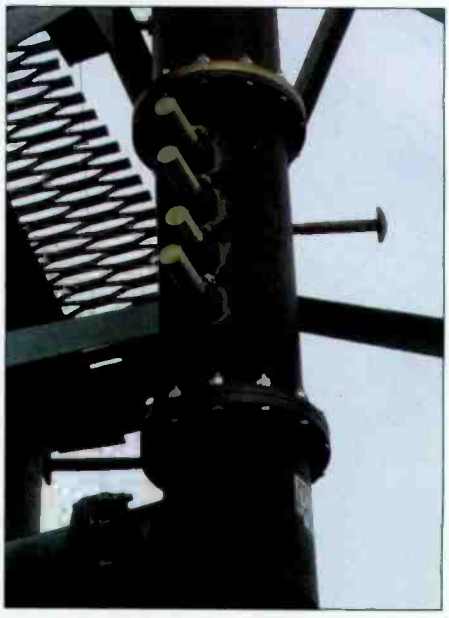


Figure 2. Matching sections can also be a source of air leaks. Ensure proper impedance match at this point at least once a year.

degrade their performance. The problem manifests itself as excessive loss of power on the line or even a burn-out for high-power applications.

Air pressurization of air dielectric cables increases the breakdown voltage between the inner conductor and the shield. This breakdown voltage is directly proportional to the power handling of the cable. This means that the better the air pressurization, the better the power handling of the cable. The air that is pumped into the coax cable should be dry. Inspect the dehydration or pressurization equipment and its ability to remove moisture as part of the preventive maintenance program.

Installation and use

Grounding the coaxial shield redirects lightning energy to the ground. Lightning during a thunderstorm can cause a breakdown of insulation between the shield and the inner conductor aside from damaging sensitive electronic equipment at the sending end of the coax line. The shield of the coax line should be grounded to the tower at least at the top, middle and bottom parts of the run.

The transmission line should be essentially flat along its length. This flatness refers to the impedance matching along the line that should be consistently 50Ω or 75Ω, depending on the system. This is determined with the use of a time domain reflectometer (TDR) where a pulse is sent through the line and the reflected pulse is monitored on a display. Impedance bumps indicate a mismatch. The location of the mismatch can be computed, and a physical inspection can often locate the problem. When reviewing a TDR read-out, there will be small bumps from flange connections, tuning sections and

Figure 3. A network analyzer is useful to fully evaluate a transmission line's health.

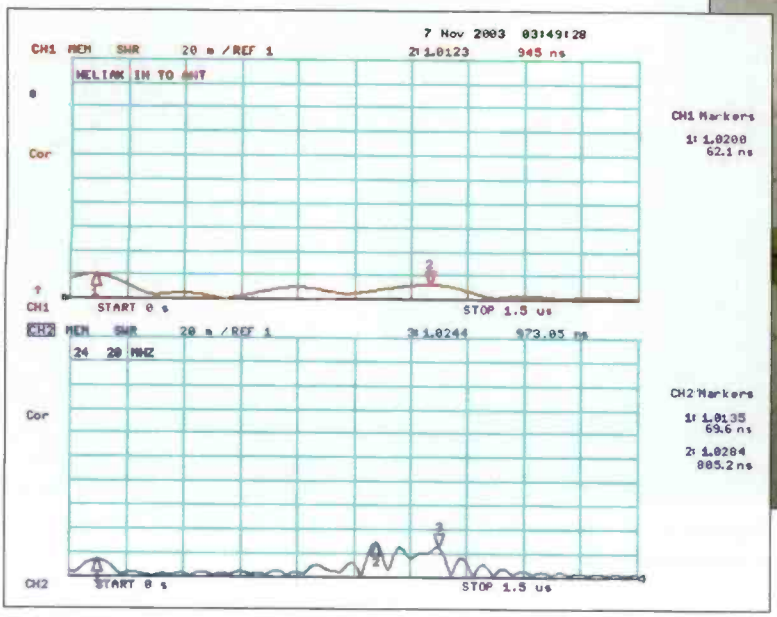


Figure 4. A network analyzer display showing a good VSWR plot.

Figure 5. Opening this elbow revealed an obvious problem.

elbows. A better way to measure the line is with a network analyzer (Figure 3) because we can do other electrical testing and tuning to flatten the line. A plot, as shown in Figure 4, can yield valuable information as to the changes in the impedance along the coax run. VSWR changes at specific points need to be determined annually to identify abnormal deterioration of connections and other components of the transmission from the output of the transmitter's PA, through the filter and patch panel and then to the antenna. Fine matchers after the elbow, as shown in Figure 2, may need to be adjusted to compensate for aging of the system.

Keep coax healthy with this checklist

During a tower inspection or maintenance

1) Check for dents or bending on rigid line sections. Replace deformed sections.
2) Inspect all flange connections for warping and tightness. Tighten bolts and use lock-washers with all nuts. Use high-strength stainless steel bolts and nuts only.
3) Inspect that all line hangers are properly installed and free from corrosion.
4) Check that gas barriers and tuning slugs are not leaky.
5) Inspect that grounding kits are present and properly installed. Replace defective or install additional grounding kits as needed. Improve weatherproofing as applicable.
6) Check for signs of corrosion on all line support hardware. Replace or clean and cold galvanize as needed.

On a regular basis

7) Check that the dehydrator is working properly. Replace desiccant that indicates excessive moisture.
8) Check the air pressure on the coaxial cable. There should be enough air pressure at all times especially during humid weather. Fix leaks for good.

At least once a year

9) Conduct a transmission sweep from the PA output of the transmitter to the antenna. Tune coaxial fine matchers and sections as needed. You may need a tower crew (at least two) to do the hands-on work along the tower.
10) Open sections with excessive impedance bumps for internal physical inspections. Replace bullets and any suspicious inner hardware as needed and clean thoroughly before re-assembly.
11) It is not a bad idea to check the coupling value of the coaxial directional coupler, if the system has one, for accurate RF power measurements for analog transmitters. This ensures that power measurements are calibrated at least once a year. ■

Frequency response sweeps

Test the coaxial line for frequency response sweeps at least once a year. The test needs to include the filter and patch panel, and the signatures should be compared from previous years. This is more important now with digital due to the wider actual bandwidth being used. Compare signature plots to determine problems that are brewing and therefore be able to rectify the situation prior to any signal field tests.

Lintag is an RF engineer for Victory TV Network in Little Rock, AR.

Barix Technology
Instreamer, Exstreamer

By Chris Wygal

Audio engineering inherently begs two simple, yet necessary questions: How do we get audio from here to there? And will it sound good? Telephone hybrids, POTS codecs, RPU transmitters and ISDN have been staple routes for getting audio in and out of the studio. Some studios even have the luxury of having hard copper lines installed. With the right amount of impedance matching and luck, a clean audio feed is attainable. But when the copper gets old and the signal becomes marginal, it's time to look elsewhere for cost-effective remote audio retrieval.

Such is the case at Victory 88.3 FM, the 50kW flagship station of the Flames Sports Network, which broadcasts Liberty University football and men's basketball games. Both athletic arenas are built on the same campus as the station, and engineers in the mid-1980s made game time audio available using copper telephone lines that were already in place. By cross-connecting around the campus Lucent switch, one-mile balanced audio feeds were established.

Performance at a glance

Controlled via Web browser or IR remote control

Encodes and decodes MP3

IP or RS-232 control

Connects via any IP link

Unbalanced RCA and S/PDIF I/O

This worked well until 2005, when the aging lines became too noisy to satisfy a critical listening ear. No amount of impedance matching seemed to work. The copper was simply too old (and wet). When the university IT technicians told me that our IP network was reliable for audio transfer, the audio over IP idea began to stir in my head.

Inside the box

Barix manufactures TCP/IP-based network amplified audio products that can be used within local area networks and over the Internet. I chose the Barix Instreamer and Exstreamer Gold to connect the Victory FM studios to the broadcast booth at Williams Stadium for football broadcasts. The Instreamer can be thought of as the transmitter and the Extreamer a receiver. Put simply, when connected to a network (standard RJ-45 network connection) the local network dynamic-host-configuration-protocol (DHCP) server allocates an IP address to each unit. When a DHCP server is not available, Barix uses the IPzator function to search the network for an available IP address. A supplied ear bud allows the user to listen for a friendly voice to recite the address on power-up. This feature is known as Sonic IP, and it helps to have pen and paper in hand to write down the announced address.

Once the IP addresses are established, while within the same network, type the address in a browser (for example, http://10.40.51.32). A comprehensive online interface allows for control of each unit. The only physical control on the Instreamer and Exstreamer is a reset button. Otherwise, you have full real-time control via the LAN.

The audio inputs and outputs connect via stereo RCA or coaxial S/PDIF, which qualifies the Instreamer and Exstreamer as a prosumer solution to IP-based audio transfer. However, general managers and engineers agree that clean, affordable audio transfer is a must for radio as well. The audio stream is MPEG Layer III, and the sample rate and compression is configurable. The bandwidth requirements, depending on the configuration and selected audio quality, are between about 40kb/s and 107kb/s. When the Instreamer and Exstreamer connect to each other, there is noticeable (but normally negligible) delay depending on buffer settings. Of course, traffic and stability can affect the performance of any device connected to a network.

The Instreamer comes with a stereo ear bud, which allows for monitoring the input level of the audio and announced IP address. The Exstreamer also has an ear bud that plugs into the analog RCA output for hearing the announced IP address. When the Exstreamer is permanently installed, an infrared remote control allows for easy volume and playlist adjustments (the Exstreamer can also interface with a PC or audio server to

2006 PICK HIT Radio

stream playlists). Changes to network settings, audio and streaming adjustments on both units are made through the online interface.

I have not experimented thus far with inter-network connections, but the university IT people tell me that through cooperation with other IT networks, firewall and IP address assignments it can be set up to allow for long distance remotes. In our case, when the Liberty University football team is on the road, we can take the Instreamer to other campuses.

Setup options

The Exstreamer offers flexible options that allow for setups based on personal preference or network configuration. Using the Zserver feature, the Exstreamer will play music from playlists on any PC on the network or a Web server. The unit can be set up as a stream "puller" or stream "receiver." Also, in situations where a network connection is not available for configuring the unit, a supplied serial cable allows for RS-232 connection through a PC port.

The Instreamer shares its configuration flexibilities with the Exstreamer. The Instreamer can serve as a shoutcast/icecast source. Also, audio players such as Winamp or Windows Media Player will play audio originating from the Instreamer. This is a great technique for monitoring the unit, or for listening to remote playlists.

While the Barix design concept accommodates consumer-based installations, the Instreamer and Exstreamer are well suited for radio stations that need to move audio in real-time. If the program material can withstand data compression, the MP3 stream provided by Barix is more than sufficient. Using a critical ear, I have not heard digital artifacts or jitter that degrades program material.

Barix Technology

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E-MAIL info@barix.com

Wygal is the programmer, engineer and Web designer for WRVL in Lynchburg, VA.

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.

These reports are performed by the industry, for the industry. Manufacturer support is limited to providing loan equipment and to aiding the author if requested.

It is the responsibility of *Radio* magazine to publish the results of any device tested, positive or negative. No report should be considered an endorsement or disapproval by *Radio* magazine.

Audio Design Associates HD-Pro

by Don Danko
CBRE CBNT

Radio stations finally have an HD Radio monitor that can be mounted in a rack to interface with the professional equipment within a radio station. The HD-Pro tuner was my introduction to Audio Design Associates, and I am impressed with how the unit is designed and built. This receiver is loaded with options that make it helpful in the complete implementation and integration of HD Radio broadcasting at any station.

Cosmetically, the unit features a black, brushed aluminum look and enough LEDs to impress anyone. Realistically, the LEDs provide the status of the unit and the signal at a glance instead of paging through a menu structure. The front of the unit is well labeled. Another immediately noticeable feature is that the unit has dual HD Radio tuners built in. These tuners can also receive RBDS text along with AM and FM hybrid digital/analog signals, digital-only signals, analog-only signals and, as an added bonus, analog weather band broadcasts.

The headphone output can be switched between the two tuners with a push of a button, and the headphone amplifier has enough volume to overpower room noise or any other outside noise to allow for more controlled monitoring. The RF meters have one LED to indicate that an HD Radio signal is available, another to indicate that an analog pilot is present and a 10-segment RF level meter. The RF level is also available as a number from one to 10 on the display with a few keystrokes. I tested the receiver with an external antenna as well as a paper clip antenna to help determine the limits of the tuner. The non-technical paper clip antenna proved that the sensitivity of the tuner was sufficient to pull in weaker signals with full quieting.

Performance at a glance

- Receives AM, FM and weather bands
- Provides split mode, alarm contacts, dual tuners, LED indicators
- Dual receiver design with dual audio outputs
- Balanced and unbalanced analog outputs
- AES3 and optical digital outputs
- Front-panel headphone output
- RBDS and HD Radio PAD readout

Full metering

Audio meters for the left and right channels of both tuners sit between the two-tuner RF meters. They are easy to read, fast-acting 20-segment LED meters and are labeled from -40dB to +3dB. Having them side-by-side allows you to compare two stations' audio levels. Although they are relative and do not provide a percent of modulation, they provide helpful information.

To the left of the unit is the main interface, which allows the user to change channels, read a station's RBDS text or HD Radio PAD and the station's frequency and call letters. In addition to tuning one channel at a time or using the seek function to scan for broadcasts, the user interface also provides an easy way to directly tune a frequency. It was necessary to add a switch to allow for the display/control to be used for both tuners. The two buttons are clearly labeled which, along with an indicator LED for each, eliminate any confusion as to which tuner the display/controls actively affect.

Anyone who has set up HD Radio processing will tell you that syncing the analog audio and digital audio is a necessity. Complicating this matter is that broadcasters have few options to listen to the analog signal and the digital signal simultaneously. One of the most useful features of this unit is the split-mode feature. In this mode, the audio output provides the analog signal in the right channel and the digital in the left channel. This feature, along with an oscilloscope, will provide an easy method of fine tuning the delay.

Another useful feature is a toggle mode button to force the receiver to digital, analog and analog mono modes. The manual points out that the analog mono mode is useful for weak signals that float in and out of stereo mode. The unit also features a switchable high-frequency roll-off filter for AM and FM and a voice band-pass filter for the weather band.

The back panel

The real estate on the rear panel of the receiver is used for interfacing options. The tuner outputs include AES/EBU balanced digital and TOS-Link optical digital outputs. In addition, there are balanced XLR and unbalanced RCA outputs. Both tuners feature F-connectors that can be

helpful if the two stations being monitored are in different directions.

Another bonus feature is the alarm capabilities built into the unit. Each tuner has an alarm relay that can be set to trip for low RF level, low left or right audio level or loss of the HD Radio signal. A set of DIP switches customize which one, two or three of the above conditions will trigger the alarm relay. The unit also provides an alarm adjustment to set the time interval between zero and 30 seconds and has a power up timer to deactivate alarms for a programmable time period. Both help eliminate false triggering. The RF level trip set (low level threshold) is set using an adjustment pot for each tuner and the corresponding LED. The user has a choice of a normally open or normally closed contact to signal external indicators or remote control equipment. Computer integration and control is also included via an RS-232 or Ethernet port.

The HD-Pro tuner can be configured and operated with a crossover cable and a PC. Changing channels, broadcasting band, audio modes, engaging the filter and reading the RBDS is accomplished using the included software. The manual discusses the uses, features and set-up of the equipment but doesn't delve into operational issues, which would be useful.

Overall, I found the HD-Pro tuner to be intuitive, and well designed and built.

Danko is VP of engineering and operations, Cincinnati Public Radio.

The rear panel of the HD-Pro

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by Kari Taylor, senior associate editor

Tower duplicator

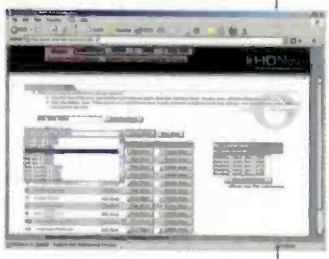
Microboards Technology

Blu-Ray Tower: The tower is available with five or 10 recorders. Its onboard high-capacity hard drive supports image storage, and the system will duplicate Blu-Ray discs and DVD-recordable discs. Systems come with a one-year warranty and unlimited phone support.

612-470-1848
www.microboards.com; sales@microboards.com

Programming for HD Radio multicasts

OMT Technologies



HD Now: This service provides HD Radio multicast broadcasters with a way to control programming and content. With one workstation, stations can create multicast programs by accessing a music library with more than 150,000 music titles or 100 programmed channels in various music formats. Multiple HD Radio channels can be managed remotely from a central location to include customizable music, liner and commercial content that is relevant to each market.

888-665-0501; www.omt.net; omt@omt.net

Drop-in modules, studio accessory panels

Axia Audio

Accessories for Element: New accessories for the Element console include interface modules for Telos broadcast telephone systems, a Production Module and Motor-Fader modules that work with the Element's Show Profiles feature to recall preset audio levels. Six Studio Control panels interface with the Element to provide on-air hosts, guests and producers remote control of headphone selection and mic channels. Six accessory panels for the Element are available: the Mic Control/Headphone Selector Panel is equipped with an LED alphanumeric readout; the four-button programmable Smart Switch and five-button Film Cap accessory panels provide access to customized software functions; and the Producer's Mic Control Panel is for use at a dedicated producer's position.

216-241-7225; www.axiaaudio.com
inquiry@axiaaudio.com

EAS, wire service capture

Wireready

Alert Ready: This electronic newsroom, EAS alert and wire service capture software allows the user to capture all these events in a personal e-mail account. It stores the needed documentation if the EAS printer fails, and it can also be used to save paper and archive EAS messages. The system runs in the background of any Windows 2000/XP computer. The software generates a warning if planned tests do not occur. One computer can be used to capture and e-mail messages from multiple receivers. Users can automatically publish EAS messages to a website with the Web Ready add-on.

800-833-4459; www.wireready.com
sales@wireready.com

Dual-capsule mic

Marshall Electronics

MXL V67I: Incorporating dual 1" gold sputtered capsules, a red LED on both sides of the mic indicates which side is currently active. The solid-state electronics can operate on phantom power. On the instrument's back is a 6dB attenuation switch that enables the microphone to better handle high sound pressure levels, along with a low frequency roll-off switch to compensate for proximity effect or to eliminate wind noise during outdoor recording.

800-800-6608
www.mxlmics.com
sales@mxlmics.com

Automation software

Prophet Systems Innovations

Nexgen 2006: One enhancement to this software is that it offers an easier way to produce podcasting content. Users can burn podcasts straight to an audio or data CD using the Podcast Wizard and Podcast XLR8R. Users can also preschedule podcasts to be automatically created and transmitted. Automatically back up station content as well as restore Voice Tracs and logs. Titles now include station, date, hour and position within the hour. If stations have to do re-takes on Voice Tracs, the software lets users undo and redo them, making it easier to create multiple takes.

877-774-1010; www.prophetsys.com; sales@prophetsys.com

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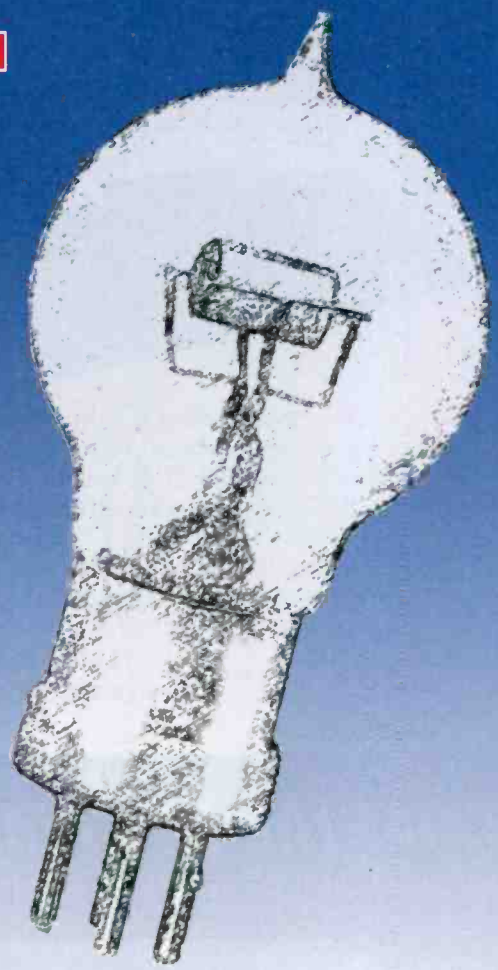

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www.ZonumIndustries.com

Se habla Espanol

Mixing console
Yamaha

M7CL: Available in 32- or 48-channel formats, the console features a small footprint and a lightweight self-contained design useful for fixed and mobile applications. The Centrologic interface combines a touch-panel control surface with Yamaha's Selected Channel structure that guides the user through a logical navigation system.

The console features four stereo inputs and three mini-YGDAI expansion card slots, 16 mix buses, eight matrix buses, an L-C-R bus, eight DCAs and 16 omni outputs. The built-in power supply is backed by optional single or double failsafe external PW800W PSUs. Full-length 100mm motor faders are provided for all input channels. As many as eight signal processors can be used simultaneously, and all of these onboard modules are capable of operation as graphic EQs.

714-522-9000
www.yamaha.com/proaudio

Buy-it-now service
Pop 2 Life

P1 SMS: Using short message service (SMS) codes, a station listener can obtain song and artist information. The service tracks the music being played on a station and then sends a reply to the user. The message reply provides listeners with a way to buy a ring tone and receive artist alerts. A station can access a Web interface to customize SMS codes for additional events, such as contests and polls. The interface also features several reporting sections that can be used for research, revenue tracking and DJ interaction.

866-767-2533; www.p1sms.com
littmedia@pop2life.com

Amplifier, exciter
Energy-Onix

SST-1000C: This system includes SST-30FS, a 30W exciter, a broadband SSA-1000C, a 1kW amplifier, an ac line surge protector and a polyphasor lightning protector. The SST-30FS includes a built-in stereo generator. All chassis are 19" rackmountable and occupy 19 1/4" of rack space. The ac line surge protector features additional ac outlets that can provide line surge protection for processor and STL receiver.

888-324-6649; www.energy-onix.com
energy-onix@energy-onix.com

-- UPGRADES and UPDATES --

Millcreek Broadcasting needed to develop a new antenna site in Utah's Bountiful State Park, so the broadcaster called **Jampro Antenna/RF Systems** to design a low-profile tower that could deliver eight strong FM frequencies and allow for future expansion. (www.jampro.com) ... **Backbone Networks** has released version 4.1 of Backbone Radio Pro, its turnkey Internet radio station software suite. (www.backbone.com) ... **Broadcast Electronics** reports that orders for its Messagecasting products from The Radio Experience have tripled in the first six months of 2006 compared to the same time period in 2005. (www.bdcast.com) ... **Audio-Technica** has released the next generation of its Artist Series microphones, which includes hand-held and instrument mics in a variety of polar patterns. (www.audio-technica.com) ... Las Vegas Pro Audio is now shipping the portable **Soundfield** ST350 microphone system. The ST350 is comprised of a lightweight multi-capsule microphone and compact mic-pre/control unit that generates surround and stereo simultaneously at balanced line levels. (www.soundfield.com) ■

NEW PRODUCTS

USB audio interface
Digigram

UAX220-Mic: This equipment provides professional mic preamps, 2/2 balanced analog I/Os, no driver to install, no external power supply required and direct control of all settings on the box. Key features include a dedicated headphone output stage with independent level control, Neutrik XLR connectors and headphone jack, and zero-latency direct monitoring.

703-875-9100; www.digigram.com; input@digigram.com

Silence sensor
Digital Juke Box

Silent Treatment: This silence sensor software program runs on any PC to monitor an audio channel from a radio station or Internet stream. The end user can set the listening device, threshold, delay before notification, e-mail addresses to alert, send text messages to several cell phones and even trigger a program to run.

740-282-SOFT; www.digitaljukebox.com; sales@digitaljukebox.com

GALLERY

Independent Talkback

A Headphone System with Selectable Talkback for Each User

FlexPhones Master

The FlexPhones Master is a professional Broadcast/Studio six channel distributed headphone system with independent talkback capabilities. Each of the six channels provides stereo program monitoring and selective talkback with interconnection via CAT5 cable to multiple Active Headphone Remotes (AHR-1) and/or Monitor Selector Interface (MSI). Multiple masters may be cascaded to form larger systems.

The FlexPhones Master is equipped with inputs for stereo program and talkback audio. Rear panel program and talkback trimmers are provided to pre-set maximum input levels. The microphone/line level talkback input is available via a rear panel plug-in euroblock connector, while the front panel XLR connector facilitates the use of a user-provided gooseneck microphone or headset. The front panel is equipped with a level control for local headphones with both 1/4" and 1/8" stereo headphone jacks. The six front panel talkback switches allow the user to independently communicate with each AHR-1 listener and can be configured to insert talkback audio into only the left or both ears and dim either or both program channels. Any combination of switches may be pressed, while the "All-Call" interrupts all listeners. The Talkback function can be remotely controlled. Six RJ45 jacks are provided to distribute audio and power via CAT5 cable to the AHR-1's, which conform to the Studio Hub format. Low-Z balanced audio distribution is used to preclude audio degradation with long cable runs.

AHR-1 Active Headphone Remote

The Active Headphone Remote (AHR-1) contains a stereo amplifier designed to work with any combination of high-efficiency headphones with impedances between 24 and 600 ohms. The AHR-1 is equipped with 1/8" and 1/4" headphone jacks, level control, user-configured utility momentary pushbutton and LED indicator. Two rear panel RJ45 jacks are provided for connection via CAT5 cable to the FlexPhones Master. The AHR-1 may be desktop mounted, under counter or with the optional HR-1/MP or HR-1/MP-XLR mounting plates, which may be turret or counter-top mounted.

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www.broadcasttools.com

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CHAPTER

CAREER

TURN BACK THE CLOCK TO FIVE MINUTES BEFORE CONSOLIDATION

It's hard to believe, but there IS a place that still believes in local radio which serves the needs of Main Street instead of Wall Street. It's a place where radio can still be done in a non-corporate, creative environment. It's a place where the owner does not believe in the three "U B's" (Unrealistic Budgets, Uninspiring Bosses and Unbelievable Beatdowns). It's a place where the owner still believes that magic, passion and possibilities are the cornerstone of the Radio business today, AND tomorrow. It's in Chicago, at Newsweb Radio Company.

My name is Mike McCarthy, and I manage the engineering at these 9 stations in the Chicago area. Somehow, I know there is an engineer somewhere who still feels the same way that I do. I am looking for that person to join me. If you live and breathe engineering, love to get your hands dirty as much as you hate to do paperwork, still believe that engineering is in the field as opposed to behind a desk and you want to do it in a non-corporate environment, we should talk. I don't care about your current market size, shape or where you are at now. I do care that you are an experienced in AM/FM RF as well as having experience with computer networking and automation systems. I don't care about your experience ... I care about your expertise. If these things are important to you, email your resume and salary history to me at **mmccarthy@9chicago.com**. We are an equal opportunity employer.

CHIEF ENGINEER

Utah Public Radio in Logan has an immediate opening for a Chief Engineer. Will be responsible for technical operation of two FM stations and 27 translators. Applicants should apply at jobs.usu.edu.

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Contributor Profile

Meet the professionals who write for *Radio* magazine.
This month:
Facility Showcase, page 32

Gary Blau
Director of Engineering
Lincoln Financial Group - Miami

For the past seven years Blau has been director of engineering for Lincoln Financial Media's Miami radio division. Starting in college radio at WUVT Virginia Tech, for more than 30 years he's worked as a CE, market DOE and VP engineering in markets including Phoenix, Washington, New York and Los Angeles for broadcasters including Jefferson-Pilot, AMFM, Chancellor Media, Colfax Communications, Compass Media, Walt Disney, US Radio, NBC and RKO. He's also active in new media, and is co-founder and CTO of webcaster BoomerRadio.com. As W3AM he also loves big-iron ham radio.

Radio
THE RADIO TECHNOLOGY LEADER

Written by radio professionals
Written for radio professionals

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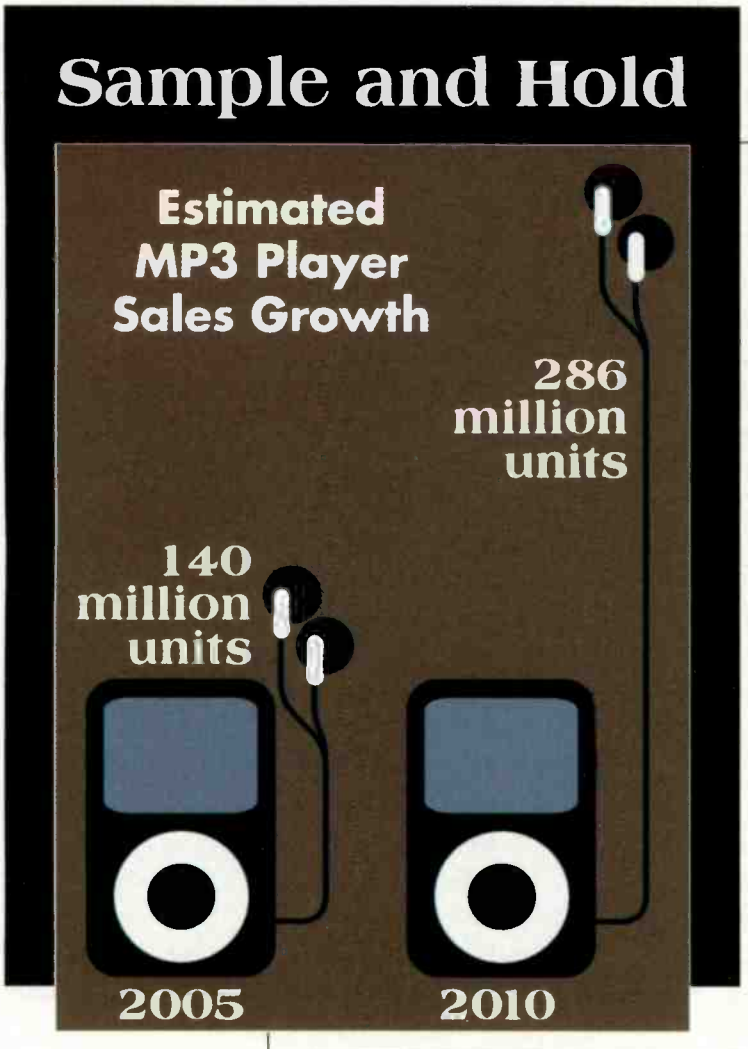
by Kari Taylor, senior associate editor

Do you remember?

While radio undergoes its current transition to digital, there have been other transitions that were implemented to improve AM performance. During the late-1980s, the NRSC created a transmission standard that allowed AM receiver manufacturers to increase and flatten their frequency response without the risk of increased interference. To do this, broadcasters had to implement a modified 75µs pre-emphasis specification, which is defined as NRSC-1.

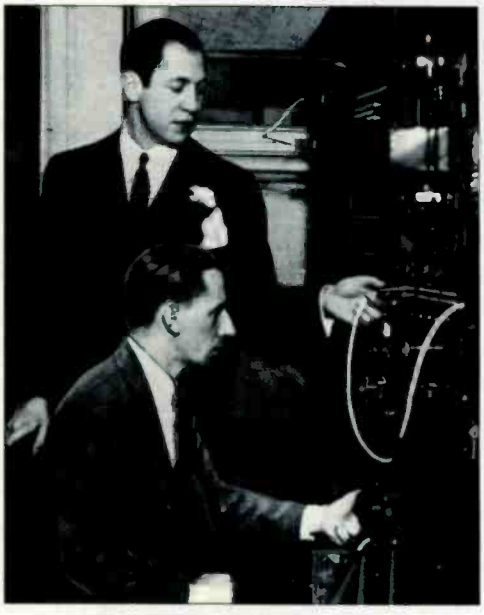
Shortly thereafter Orban introduced the Optimod-AM 9100B audio processor, which expanded on the company's success with multiband FM processing. The literature on the 9100B touted the unit's ability to "increase coverage and improve source-to-source consistency." The processor could be configured to operate in mono, C-Quam stereo or Kahn stereo. Mono units were field-upgraded to stereo by plugging in additional cards.

Sample and Hold



Source: In-Stat "Portable Digital Audio Players: Market Growth Exceeds Expectations," 2006.

That was then



This picture ran in the September 1969 issue of *Broadcast Engineering*. William S. Paley, president of the Columbia Broadcast System, is making contact for the first time on the control board that connected a regular network of 43 stations. W. T. Abbott, chief engineer of WABC, is at the controls.

The equipment was large and heavy, and it used storage batteries to heat the filaments of the amplifier tubes, and Edison cells created the 250V needed for plate voltage. The batteries had to charge every night.

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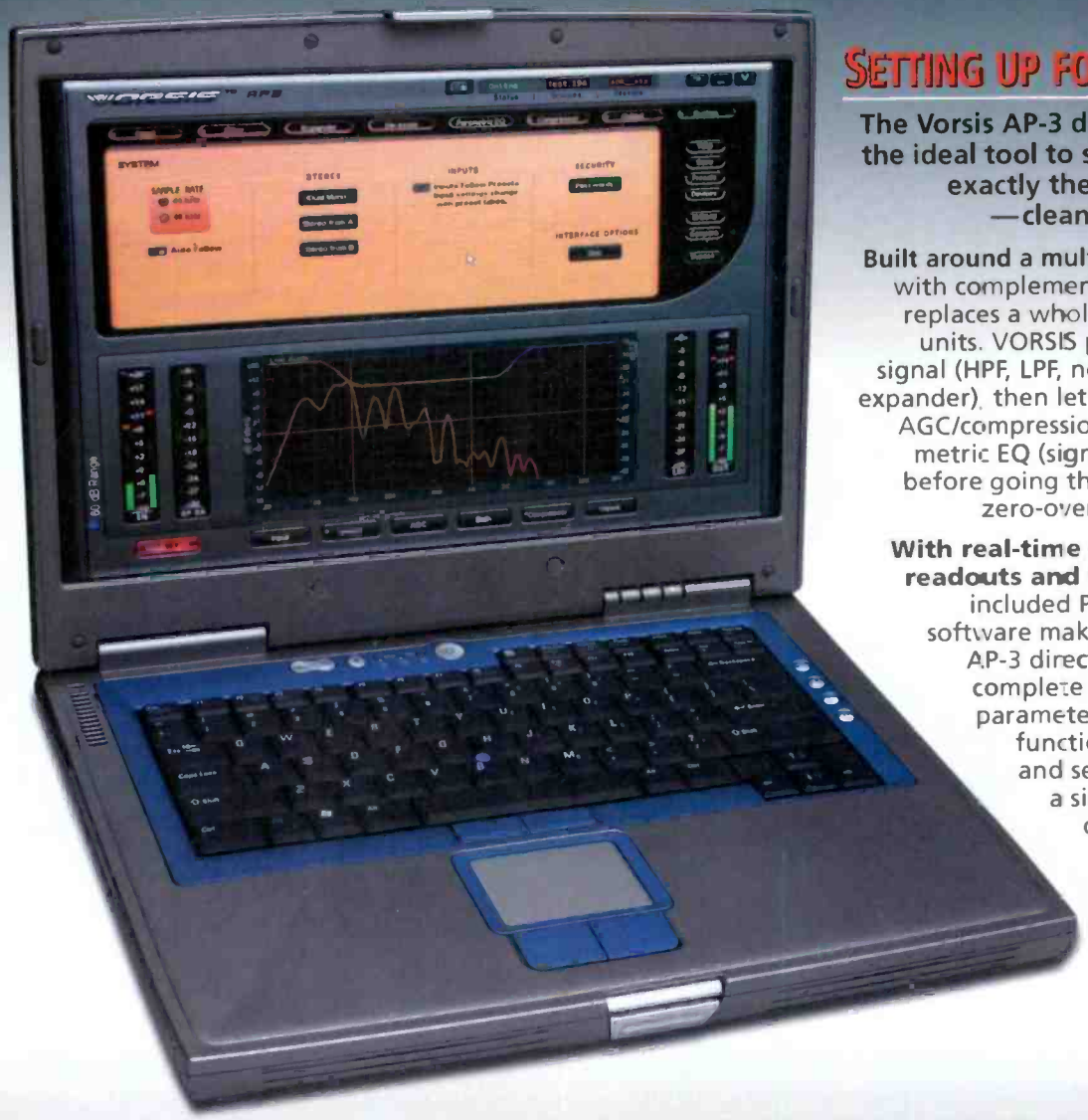
Can Do BIG Things!

Our new AP-3 is the perfect HD Processor.



SETTING UP FOR HD RADIO?

The Vorsis AP-3 digital processor is the ideal tool to shape your sound exactly the way you want it —cleanly and efficiently.

Built around a multi-band compressor with complementary AGC, the AP-3 replaces a whole *rack* of dedicated units. VORSIS pre-conditions your signal (HPF, LPF, notch filter, de-esser, expander), then let's you apply 3-band AGC/compression *and* 4-band parametric EQ (signal chain reversible) before going through a final stage zero-overshoot peak limiter.

With real-time spectrum density readouts and full metering, our included PC graphic interface software makes operation of the AP-3 direct and easy, offering complete control of all audio parameters, presets, monitor functions, system settings and security—all through a single RJ-45 ethernet connection that lets you control one or many AP-3 units.

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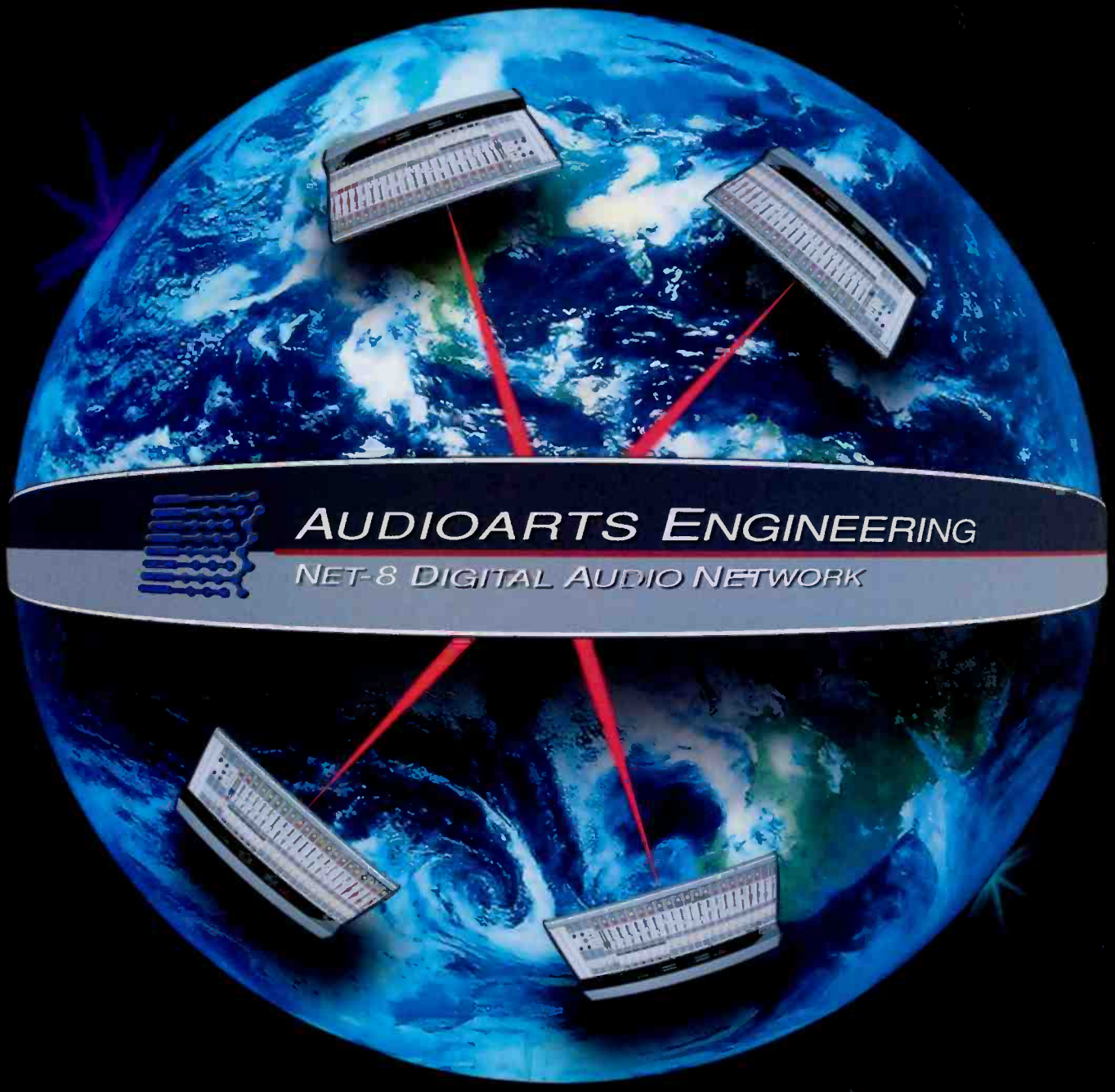

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