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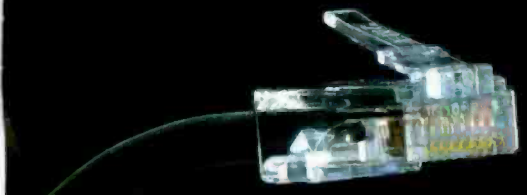

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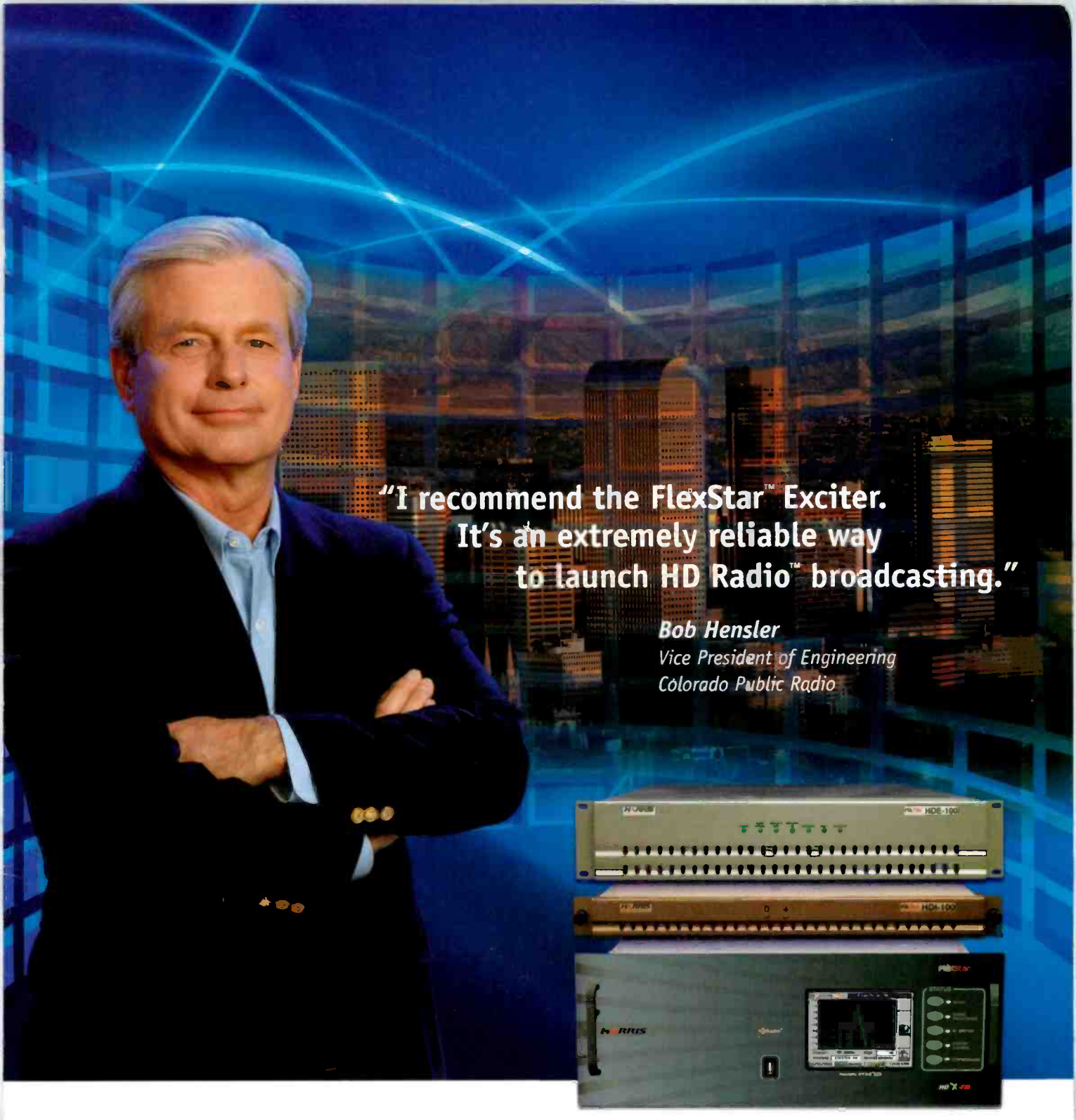

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Contents

Radio
THE RADIO TECHNOLOGY LEADER
Radio Magazine
www.beradio.com
April 2006 • Volume 12, Number 4

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Features

Departments

Columns

ON THE COVER:
Dayton Public Radio's fresh start is an end-to-end overhaul of its facilities. Photo by James DeYoung of James DeYoung Photography, Miamisburg, OH. Cover design by Michael J. Knust.

Remote Broadcasting over the Internet

The remote from Mexico was a spectacular success, in no small part thanks to the flawless sound which the Tieline G3 provided over the public Internet

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Currents Online

Selected headlines from the past month.


Wooten

Clear Channel Recognizes its Station Engineers

The company recognized 10 individuals in various regions, and Charlie Wooten, director of engineering in Panama City, FL, was named 2006 Clear Channel Radio National Engineer of the Year.

FCC Establishes Public Safety and Homeland Security Bureau

The move is designed to "provide a more efficient, effective, and responsive organizational structure to address public safety, homeland security, national security, emergency management and preparedness, disaster management and other related issues." This includes the EAS.

NAB Announces Board Election Results

The two-year terms of the newly elected board members will begin at the June 2006 board meeting.

Axia Audio, Broadcast Electronics Collaborate

The agreement allows BE to add the Axia IP-audio driver to Audiovault and other BE broadcast products. In addition, BE will become an Axia value-added reseller.

Clayborn Appointed Orban/CRL North American Sales Manager

Kevin Clayborn has worked for CRL for 13 years.

Arbitron Begins Roll-out of PPM

The roll-out schedule puts the PPM into the top 10 U.S. radio markets by the fall of 2008, and into all of the top 50 U.S. radio markets two to three years thereafter.

Site Features

Radio Glossary

With new technology comes new terminology. We've started a list of the new language of radio broadcasting and put it online.

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The *Radio* magazine FASTtrack, a categorical listing of the exhibitors at NAB2006, is available for your PDA. Download your copy and carry it with you and you'll always know where you're going.

Today in Radio History

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Multicasting.

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A rosy future

Here we are, days away from the start of the biggest broadcasting event of the year. Like you, when I get to the convention floor, I expect to see continued activity about digital radio. As usual, HD Radio will be the main topic, but there will be touches of DRE and DRM, with maybe a hint of Cam-D in the air. Multicasting, enhanced data capabilities and the latest generation of hardware and software designs will all be in the mix. We're deep into digital terrestrial radio, and as it has been over several years, digital radio will be bigger news than ever.

Talk of IBOC is everywhere. We even see more attention to HD Radio in newspapers and consumer magazines. I have included some aspect of it in this column in all but one issue over the past year. Recently, data released in mid-March offered even more hope to the HD Radio supporters and greater dismay to the opponents.

Bridge Ratings released its updated projections of consumer use of various forms of radio and digital media. The projections run through 2020, and show steady increases in usage for HD Radio, XM, Sirius and mobile phone streaming, and leaps in usage of Internet radio and wireless Internet usage.

Naturally, the HD Radio proponents focused on the projection that HD Radio may have two million listeners in 2008 with a long-term projection of 46 million listeners by 2020. These projections make 2020 the year that HD Radio will equal the usage of Sirius or XM.

The part that seems to have been ignored is that Internet radio and wireless Internet are expected to jump to more than 200 million users by 2020. For Internet radio, this is a tripling in usage from 2006, while for wireless Internet it represents nearly a 12 times increase in usage. The jump for HD Radio from 2006 to 2020 looks impressive at nearly 83 times, but the actual number of projected HD Radio users in 2020 will be just more than half the number of Internet radio users today.

To me, these projections are locked on current technology. It's impossible to project usage for something that is not yet invented, but we have already seen the rapid acceptance of portable media players and devices with consolidated functions including telephone, PDA, media player, GPS and more.

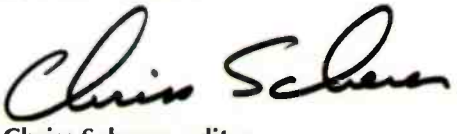
Entire cities are working on wireless Internet coverage plans. Wi-max is getting noticed for what it could offer. Who knows what else may be in place by 2020.

This all means that that HD Radio, DRE and Cam-D may have shorter lives than some think. Radio stations must begin to look beyond the integrated function of creating and delivering programming to the masses. The two functions are separate. Digital radio deals with the final delivery. A radio station is a content provider with one delivery channel tied to it. There are lots of other delivery channels available.

Some radio groups are already considering these alternative delivery options. At the end of 2005, Clear Channel made it known that it was looking at alternate distribution methods for its content, such as Yahoo, Apple and Microsoft. NPR has also looked into alternative channels, including satellite radio and cell phone streaming.

As further evidence that these alternate delivery channels have some promise, several rating services are including streaming and downloaded content in their measurement packages.

There are lots of companies installing HD Radio systems. There are many who are waiting to see what will eventually happen. Both strategies are based on an individual company's goals, plans and vision. For Clear Channel and NPR, it appears to be as simple as identifying another outlet.



Chriss Scherer, editor
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COMREX

Working with wireless carriers

By Kevin McNamara, CNE

If your company owns a tower, it is likely that you are either currently leasing space to a wireless carrier or have been approached to lease space. Station managers and owners are well aware of the potential revenue opportunities that leasing tower space yields, and some have formed separate business units to maximize revenue through leasing their tower assets.

Build it and will they come?

When it comes to the construction of new towers, several broadcast station owners build towers with additional capacity to accommodate potential tenants. In most cases, this is definitely the proper approach, however it will not necessarily mean that wireless carriers will be scrambling for space and, in fact, you may never realize additional revenue. To clarify this statement, I'll take you through the internal process that carriers use to decide where sites need to be built.

If a tower already exists in a suitable spot, wireless carriers are usually eager to lease space.

The search ring

Wireless carriers require sites for a number of purposes such as coverage (providing signal in certain areas), fill (providing signal in gaps between adjacent cell sites), and quality (additional site to offload call traffic from adjacent cell sites).

Because carriers have been building sites for the past 15 years or so, it is fair to assume most of the initial coverage objectives have been met (in the top 100 markets) with the exception of formerly rural areas where there is significant movement of population due to urban sprawl. This leaves the majority of new sites being built for the purpose of fill or quality. Also, consider that the next generation, called 3G (and 4G), of wireless will require significantly more bandwidth (permitting high-speed data and voice services) than currently available, therefore the FCC will grant new spectrum to wireless carriers in the near future to accommodate the emerging technologies. The projected increase in bandwidth will create additional requirements for fill sites.

The decision of where a specific site is needed comes from the network-engineering group of the respective carrier. The need is largely determined by 1) responding to customer complaints of poor signal and dropped calls and 2) the amount of money a site could potentially generate, a function of the total call traffic handled by an individual site, i.e. the ability to handle increased simultaneous callers equals more revenue. Once the need is determined, a search ring is issued to the group (or outside vendor) responsible for finding a viable site; this is typically called the site acquisition phase. The search ring document itself is nothing more than a circle overlayed on a street-level map; the centroid of the ring represents the optimum location for a site based on theoretical limits. A search ring is similar to the Area to Locate study used by broadcasters to identify potential tower locations based on co-channel and adjacent-channel interference limits.

Based on the type (PCS, cellular) of site and its purpose (coverage, fill, quality) the search ring might be as small as a half mile in diameter. A ring this small doesn't provide many options in terms of what might be available. Reality: It is also the reason you may not be receiving inquiries for space on your tower.

Complicating the identification of potential site candidates, wireless sites need to meet four primary criteria. They must be capable of meeting the qualifications in Table 1.

Site types

In the wireless world there are two basic types of sites: rawland or collocation. Rawland sites are those that require a new supporting structure (tower, monopole, flagpole) to mount the antennas. Collocation sites are sites where existing structures are used to mount antennas (rooftops, existing towers, steeples). From a cost perspective, collocated sites are generally cheaper to build, however certain collocation sites can cost significantly more than a rawland, particularly if sites are required to be concealed from view and significant structural modifications are required to replace or reconfigure portions of an existing structure. Reality: Vendors that perform wireless site development for carriers usually prefer to build rawland sites because they get paid a higher rate. The downside is that rawland sites are much harder to zone and could become a costly battle if there is a lot of public opposition.

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Making Digital Radio **Work.**

Site Requirements	Details
Leasable	The potential landlord must be agreeable to most of the carriers business terms. Can proper right-of-ways and easement be obtained?
Zoned	Most jurisdictions only permit telecommunications facilities in certain types of areas (industrial, commercial).
Permitted	Must be able to meet all governing building codes (the need to retrofit an old structure to meet current codes might be cost prohibitive).
Constructed	Can the site be reasonably and safely constructed? Is there proper access for cranes and other construction equipment, can power/telco be brought to the site?

Table 1. Tower site qualification criteria.

Leasing issues

In their ideal world, carriers want the potential landlord to accept the lease that they provide (also termed "using the carriers' paper"). The fact is that landlords will accept a lease on carriers' paper, but with changes, ranging from minor language modifications to complete removal or rewriting of major sections of the lease. The majority of carriers will ultimately agree to a lease providing there are no significant changes to the portions of a lease that deal with term (they generally like to maintain the lease for 20 years,) restrictions placed on their ability to make technical changes/upgrades as necessary (provided those changes don't exceed the original defined leased premise,) and indemnification (don't make them liable for every problem unless it is a direct result of the tenant's installation).

Leasing rates vary depending on the market, the carriers desire/need for the particular site, the ease of zoning, the availability of alternate sites within the ring, the amount of anticipated traffic on the site and if additional amounts need to be paid for a sublease (i.e. different ground owner than the tower owner). Reality: typical wireless lease rates average $2,000/month with 3 percent per year escalation. Most carriers have predetermined maximum lease rates (per market) that are automatically acceptable. If that amount is exceeded, it will need approval from an upper level of management.

Does the zoning work?

Zoning for telecommunications sites is problematic, primarily due to the increased awareness of the impact of wireless sites within a community. "Not in my backyard" is a common theme heard in a zoning hearing for wireless sites; the public comments range from potential radiation issues to visual and environmental impact. As the sites become closer to residential areas, the effects a site will have on home values becomes a problem. In some respects,

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12:00 Lunch- Keynote TBA

2:30 Planning Digital Audio Infrastructure

4:00 Reception

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zoning has become a little easier because most jurisdictions have put a wireless ordinance in place, which provides a clear definition, up front, of where a site can be placed and the appropriate steps required to get approvals.

Unfortunately, the nature of wireless network design doesn't always place a site where it might be zoneable due to use restrictions or perhaps not meeting specified property setbacks, in which case a variance will be requested. However, this can take a long time and drive the cost well beyond budgeted amounts. If you are building a new tower, any zoning approval you are seeking should also state that the use of the tower by subsequent wireless tenants will be permitted by right, thus eliminating the majority of zoning obstacles by potential wireless tenants. Reality: Zoning boards in most jurisdictions may actually help you lease space because they will always try to have a carrier located on an existing tower first, otherwise it is up to the carrier to present solid testimony supporting the need to be somewhere other than your tower. Reality 2: Towns have figured out that they can make money on wireless carriers if they lease space on town-owned property, therefore wireless ordinances may specify that the carrier should identify or rule-out suitable town-owned opportunities before choosing other locations.

Final thoughts

Whether your company owns existing tower assets or you are getting ready to build a new structure, always be aware of where wireless carriers are located nearby (within 1.5 miles), the density of population or the presence of major roads nearby, this will give you a good indication of potential future revenue opportunities that may exist. For example, you may note existing monopolies or rooftops with carriers installed, this might indicate an adequate supply of locations within the area, however it could also mean that the population center is moving in the direction of your tower and a need for additional sites in the future.

Myth: You can solicit carriers for space on your tower. As mentioned, a carrier has a specific objective in mind. While it never hurts to advertise yourself as a wireless-friendly landlord, you are unlikely to drive business to your tower unless it fits with their plan. When the time is right, they will find you.

Consolidation within the industry is reducing the field of potential tenants. Companies that have merged (AT&T/Cingular, Sprint/Nextel) are actively consolidating both carriers within single sites, where possible, thus eliminating the need for hundreds of sites throughout the county. This is a trend expected to continue over several years.

McNamara is president of Applied Wireless, Cape Coral, FL. Contact him at kevin@appliedwirelessinc.com.

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Streaming copyright royalties audited

By Harry Martin

Soundexchange has begun an enforcement program to ensure that webcasters are accurately paying royalties owed to the record companies and recording artists represented by Soundexchange. Soundexchange collects copyright royalty fees paid by broadcasters who stream their signals on the Internet, as well as those paid by other webcasters.

Starting in February 2006, Soundexchange began auditing 11 of the most popular Internet radio websites. The audits, which are permitted by U.S. Copyright Office regulations, will cover the years 2002, 2003 and 2004. Four broadcast group owners will be among the first to be audited: Bonneville, Clear Channel, Cox and Susquehanna. The remaining websites to be audited are America Online, Beethoven.com, Live365, Microsoft, MTV Networks, Real Networks and Yahoo. Soundexchange has announced that this is just the beginning of its enforcement program and it intends to perform regular audits of webcasters, both large and small.

U.S. Copyright Office regulations permit Soundexchange to audit webcasters once during each calendar year. The audit may cover any or all of the prior three calendar years. No calendar year may be subject to audit more than once. Audits of the webcasters' records must be conducted by an independent and qualified auditor and must take place during reasonable business hours using generally accepted auditing standards. For their part, webcasters must use commercially reasonable efforts to obtain or to provide access to any relevant books and records maintained by third parties for the purpose of the audit and retain such records for at least three years.

Before finalizing its written report, the auditor must review its tentative findings with the webcaster to remedy any factual errors and clarify any issues relating to the audit, but only if the webcaster cooperates with the auditor to remedy promptly any factual errors or clarify any issues raised. The auditor need not review its tentative findings with the webcaster if the auditor suspects fraud.

Finding results

Once the auditor issues its final written report, Soundexchange and the webcaster are required to accept the findings in the report as determinative on copyright royalties owed in the audited years. Soundexchange is required to pay the cost of the audit, unless it is determined that the webcaster underpaid its royalties owed by 10 percent or more, in which case the webcaster must, in addition to paying the amount of any underpayment, pay the costs of the audit.

Broadcasters currently simulcasting their on-air broadcasts on the Internet, or contemplating doing so, should be sure to inform themselves about the record-keeping obligations, reporting requirements and, most importantly, royalty fees to which Internet streamers and webcasters are subject. In view of Soundexchange's dominant role in this area, it would be prudent for a webcaster to obtain a Soundexchange Internet webcasting license, if it does not already have one.

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

Dateline:

Radio stations in Michigan and Ohio must file biennial ownership reports on or before June 1, 2006.

June 1 also is the deadline for radio stations in Arizona, DC, Idaho, Maryland, Michigan, New Mexico, Nevada, Ohio, Utah, Virginia, West Virginia and Wyoming to place their annual EEO reports in their public files and post them on their websites.

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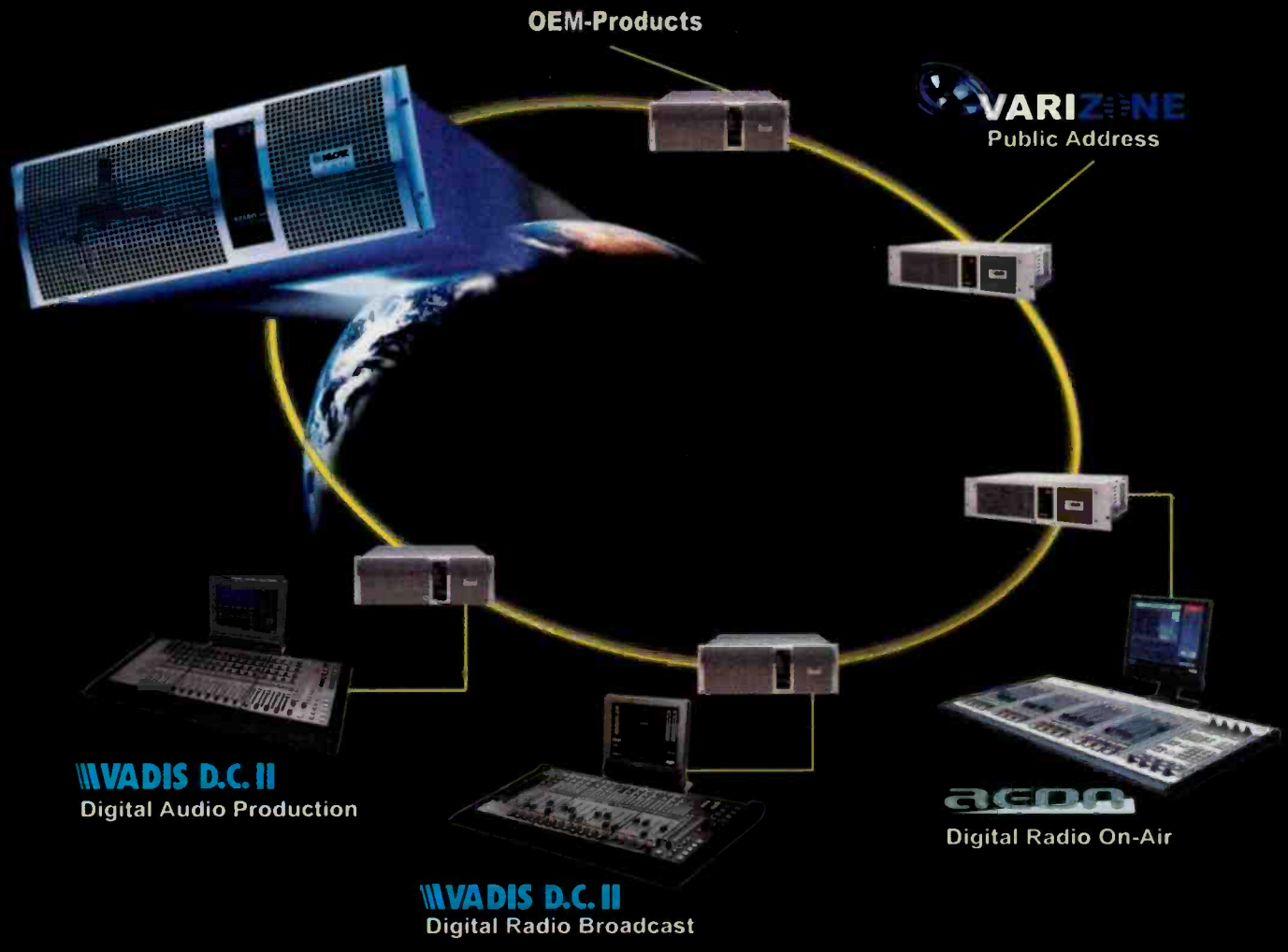

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TRENDS IN TECHNOLOGY

Sound

advice

By Doug Irwin

processing can create a signature sound, but don't overlook the practical aspects.

More and more stations are getting program content to listeners via data-reduced means, such as netcasting and HD Radio. Fortunately, more audio processors are being built with feature sets meant to accommodate this trend.

Is there really any need to process audio for these two applications? Of course there is. Let's take a look at the similarities and differences between HD Radio, netcasting, and analog AM/FM radio.

For HD Radio (specifically the HD1 signal, or the digital version of the analog transmission) there is no technical reason for processing beyond keeping the program audio encoded in the AES data stream from hitting 0dBFS. However, in practice, as the HD Radio receiver fades audio from the analog version to the digital, and vice-versa, it is pleasing to the ear if the two audio paths sound the same. This requires some amount of processing for the audio encoded into the AES data stream for HD1.

Sound advice

Like its HD1 brother, HD2 doesn't technically need any audio processing either; however, many of the practical reasons for audio processing that are relevant to AM and FM are also of importance to HD2 and streaming audio (netcasting) as well.

One of the most important reasons for audio processing is simply to combat ambient noise levels in a typical listening environment. For in-car listening, we have to combat the effects of wind and road noise. No driver wants to have to continually move his volume control up and down on a source-by-source basis as he goes down the road. In a home listening environment (the kitchen, for example) we have to contend with multiple sources of background noise. In an office environment there are many sources of noise, and because the space is generally shared you have to consider your office mates as well. No one wants to hear the neighbor's radio blaring.

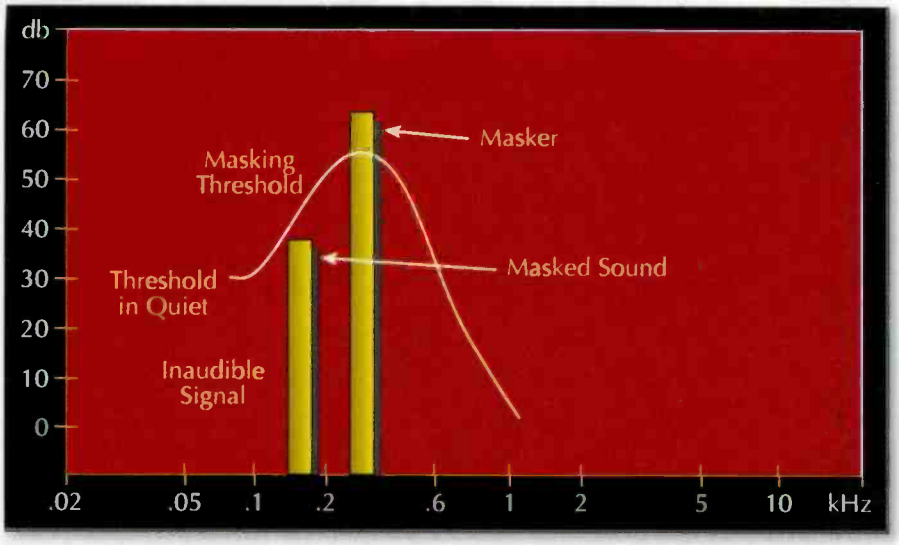

Figure 1. The masking effects in the frequency domain: A masker inhibits perception of co-existing signals below the masking threshold.

Another important reason for audio processing is to add that sonic signature that so many programmers (rightly) insist that a radio station have This can also be done for netcasting. Programmers and engineers alike are going to seek a signature sound for their HD2 stations as well.

So, many of the basic reasons for audio processing are as important in the streaming audio application, and in the HD Radio application, as they are in the more familiar AM and FM media. Yet there are major differences in the way processing is accomplished between the related media.

Don't cut the losses

With respect to netcasting and HD Radio, the lossy codecs that are used in the build-

ing of the data stream that we eventually hear coming out of speakers on the other end all work within a few basic precepts. First, in their emulation of the way human hearing actually works, the audio spectrum is broken into discrete critical bands, each having a differing bandwidth. At 100Hz, for example, the bandwidth is about 160Hz. At the 10kHz center frequency, the bandwidth is about 2.5kHz. Based on the level of the strongest signal in a particular band, and the center frequency of the particular band, the codec calculates the masking threshold, which is the level below which the human ear, while encountering the loudest signal in the particular band, will not be able to hear.

The codec then throws out signals below the masking threshold, and sets the number of bits used to encode the loudest signal in that particular band. The number of bits is reduced to the point that quantization noise in that particular band will not be perceptible to the human ear listening to the audio coming out of the decoder.

There is masking not only in the frequency domain (as described above) but in the time domain as well. A loud sound can mask quieter sounds for up to 200ms after it; this is called backward masking. A loud sound can also mask sounds that come before it—up to about 15ms. This is called forward masking. Sounds that would be masked in this way are effectively thrown out by the codec.

Lossy codecs take advantage of the way human hearing works, in the time and frequency domain,

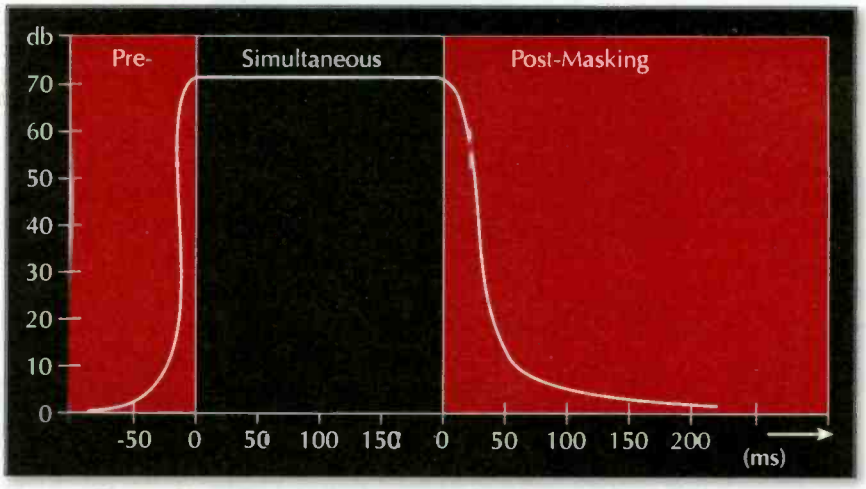

Figure 1. The masking effects in the frequency domain. A masker inhibits perception of co-existing signals below the masking threshold.

FM audio processors on a budget

The price of DSP-based audio processing has come down with more competition and maturing of the technology. There are several manufacturers building less expensive versions of their flagship models.

Omnia has the Omnia 3 Turbo, a DSP-based audio processor that included a three-band AGC and a multiband limiter. A digital stereo generator comes standard. This unit succeeds the Omnia 3.

Orban makes the 2300, a digital audio processor with a two-band architecture and a built-in stereo generator. AES I/O are included, along with remote control via GPI, RS-232 or Ethernet. This unit is the successor to the Orban 2200.

Broadcast Warehouse makes the DSPX-mini, a 1RU simplified version of the DSPX. This unit includes AES I/O, four-band architecture, a DSP-based stereo generator with clipping, and RS-232 or Ethernet control.

The BW DSPX Mini

You aren't limited to DSP architecture if you happen to be looking for new audio processing.

Inovonics produces the David-III, a multi-band audio processor with a digital-synthesis stereo generator. Also included are limiting and composite clipping.

CRL manufactures the Amigo, a FM processing system with dual-band AGC, stereo enhancement, a multi-band limiter and digitally synthesized stereo generator. ■

Sound advice

by not encoding sounds that are ultimately imperceptible, and by efficiently using the minimum number of bits to encode the sounds that are perceptible. The ultimate goal is to fit as many useful bits as possible through what is typically a data-bandwidth limited path between the program source and the far end—our listeners. In the case of HD Radio, the amount of payload data is limited (now) to 96kb/s. In the case of netcasting, the cost of providing the service is usually proportional to the data rate of the stream times the number of listeners. We all want to provide the highest data rate to

The Wheatstone Vorsis is designed for production or on-air use.

an unlimited number of listeners, but in practice we can't afford to do that. The compromise is to limit the data rate of the stream. The effectiveness of the current generation of lossy codecs makes the listening experience acceptable (if not downright enjoyable) to the majority of users.

One of the most effective tools for audio processing in the analog domain is old-fashioned clipping. The amount of clipping used in the analog media of AM or FM is, of course, subjective and usually dependent on an agreement between programming and engineering. However, clipping is not effective when it comes to processing audio that will go through a lossy codec system. The reason behind this is quite simple. If you were to clip a pure sine-wave, what you would have on the output side of the clipper would be the fundamental signal (the sine wave you put in) plus harmonics that each have a level and time relationship to the fundamental. If you now pass that clipped sine wave through a transmission system that does not have the adequate frequency and phase response so that the harmonics arrive on the other end in the same level and

The Omnia 6EX is the premium version of the company's series of DSP-based processors.

time relationship, you will find that you no longer have a clipped sine wave; what was a nice flat-top at first is now slanted to one side. The clipping is negated. This is what would happen in the lossy codec. The lossy codec could simply not encode the harmonics at all, or, it might waste bits by encoding the distortion products (i.e. the harmonics) at a low bit rate, which could be noted on the far end by quantization noise in the critical bands that contain the harmonics. Not good.

Because 75µs emphasis is used in the transmission of analog FM, analog FM audio processors include a high-frequency limiter working along that emphasis curve. A typical trick to build loudness on analog FM is to "get in" to the HF limiter more. HD Radio and streaming audio applications are "flat" though, and therefore there is no reason for HF limiters in those applications.

HD RADIO?

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Moseley

Dave Chancey 805 968 9621
Bill Gould 978 373 6303
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Sound advice

There is still a need to provide absolute peak protection in a digital system, though, you will not like the sound of your audio encoded in to an AES data stream as it hits 0dBFS.

This can be accomplished by the use of a look-ahead limiter. The HD Radio or netcast audio processor includes a delay line in the audio path and uses that delay to determine where in the time domain it needs to limit a peak, and then does so at the appropriate time.

So, you can see that some processing functions commonly used in analog processing, like clipping and pre-emphasis limiting, are of no use for HD Radio or netcast processing. On the other hand wide-band automatic gain control (for level consistency, source to source), and multi-band gain control (for greater intelligibility, along with assertion of a sound signature)

Resource Guide

Manufacturers of audio processors and processing accessories

AEV SRL
+39 051 950 350
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Aphex Systems
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IDT Impact Development
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Inovonics
800-733-0552
www.inovon.com

Linear Acoustic
888-292-3117
www.linearacoustic.com

Microcon Systems
440-546-0967
www.soundgreat.com

Neural Audio
425-814-3200
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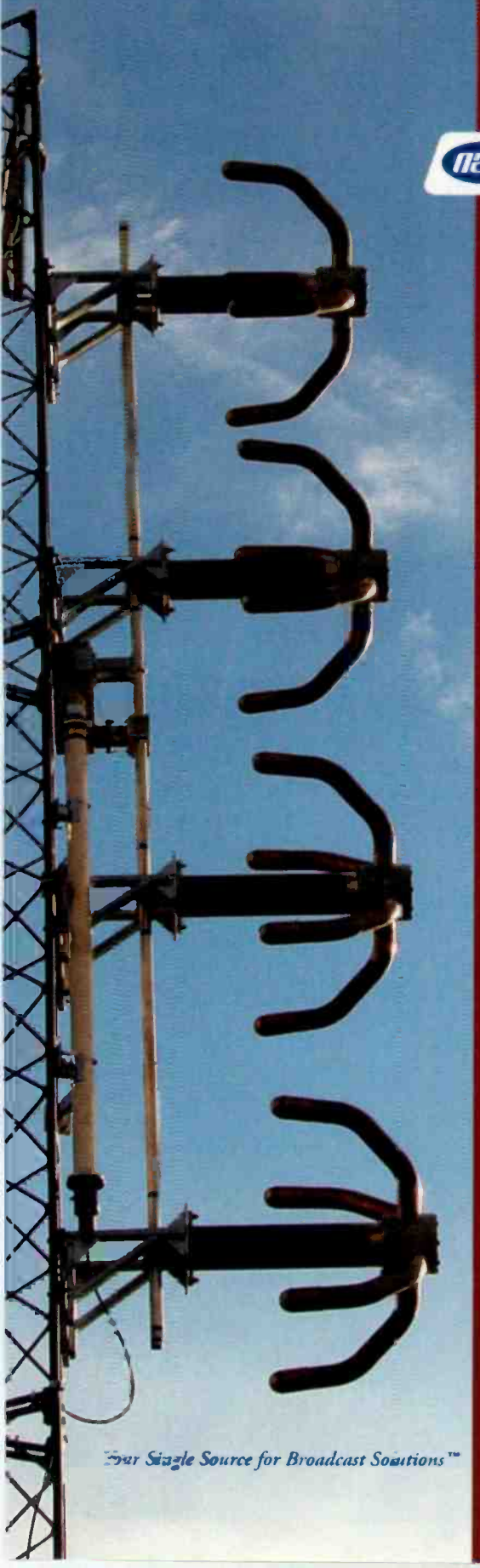

NEW LYNX™ Dual Input Side Mount FM Antenna for IBOC Operations

The Electronics Research LYNX™ Dual Input Side Mount FM Antenna is designed specifically for FM IBOC applications. This new antenna is capable of transmitting both the analog and digital FM signals without requiring a high loss hybrid combiner and maintains high isolation between the digital and analog transmitters. The design meets the current Federal Communications Commission requirement for informal notification of IBOC implementation.

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Sound advice

and absolute peak control are useful for HD Radio and netcast processing, as they are in analog processing.

The current crop

Wheatstone has introduced the Vorsis AP-3, a 1RU unit audio processor with built-in three-band AGC, parametric EQ, de-esser, downward expander and peak limiter. Control can be achieved via the front panel, via local computer control or via Ethernet.

Broadcast Warehouse offers its DSPX, a 1RU audio processor featuring the typical elements of a broadcast audio processor: wideband AGC, multi-band AGC and limiting, HF limiting and a stereo generator for FM applications; plus a separate output that makes use of look-ahead limiting (as opposed to HF limiting) for streaming audio applications. Control is accomplished via the front panel, RS-232 or Ethernet.

Remote control of processors through RS-232 or other means has become common. The Broadcast Warehouse DSPX is one such unit.

Broadcast Warehouse has also recently introduced the DSPXtra, which features the *Ariane* (by Translantech Audio) RMS leveler as its front end.

Omnia offers a DSP-based FM audio processor known as the Omnia-3; the Omnia-3net unit is specifically built for streaming audio applications. If you are about to delve into streaming audio, you may want to consider the Omnia A/X, a software-based processor that runs on a computer and

Resource Guide

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Sound advice

works in conjunction with Windows Media, Real and MP3 streaming encoders.

Omnia's flagship processor is the 6EX (or 6EXI) and it retains the modern features that you would expect. Its processing engine is totally DSP based. Some of the most basic features are a six-band limiter with adjustable cross-over points; a built-in (DSP-based) stereo generator with a composite clipper; and the now-ubiquitous Ethernet connectivity. The 6EX features a simultaneous processing path for HD Radio; and the 6EXI option includes a diversity delay that allows the user to avoid the delay line built-in to HD Radio exciters, thus completely isolating the analog transmission from the HD Radio equipment.

The Orban Optimod-FM 8500 is the latest in a long line of the company's on-air audio processors.

Omnia offers AM processors as well; the 5EX and the 5EX+HD. These share many of the same features with the FM brothers—AES inputs and outputs, DSP-based processing and Ethernet connectivity.

Orban's flagship product is the 8500. Its processing functions are completed by DSP; AGC, multi-band, stereo encoding and composite clipping included. It also features a parallel processing path for digital radio included as standard, along with a built-in diversity delay. Communications with the 8500 is accomplished with something as simple as contact closures from your remote control, or via RS-232 (like an old-fashioned dial-up modem) or via its TCP/IP interface, which comes standard.

Orban also offers the Optimod 1100PC, which is a professional sound card designed specifically for streaming media applications. On-board DSP performs the typical audio processor functionality—AGC, multi-band, EQ and look-ahead limiting. It also can function as a mixer because it has one stereo analog input, two AES or S/PDIF inputs with sample rate converters, and one WAV input.

Orban offers Opticodec-PC, which is encoding software that makes use of MPEG-4 AAC/aacPlus encoding technologies. It's available in multiple versions, and able to run on all the standard platforms.

Orban has a new product to be introduced this spring: the 9400. This processor has two parallel processing chains (the wide-band AGC and stereo enhancer are all that are in common) allowing it to serve as an on-air processor and HD Radio (or streaming audio) processor simultaneously. Unlike its brother, the 9200, this unit serves as a stereo audio processor in both domains allowing the user to process for C-QUAM should they need to do so.

How important will audio processing be for the future of radio? The universe of choices that a tech-savvy listener now has is practically mind-numbing: aside from HD Radio, and the recently introduced HD2 channels and accompanying streams, there are countless other streams available from around the world. Wi-fi radios will soon be here en masse. No longer will you be competing against your buddy across town, or even a half dozen stations. The radio listener will no longer be limited to the carriers in town. With that in mind, the features of streaming audio, processing amongst them, will become more important than ever.

Irwin is director of engineering at Clear Channel, Seattle.

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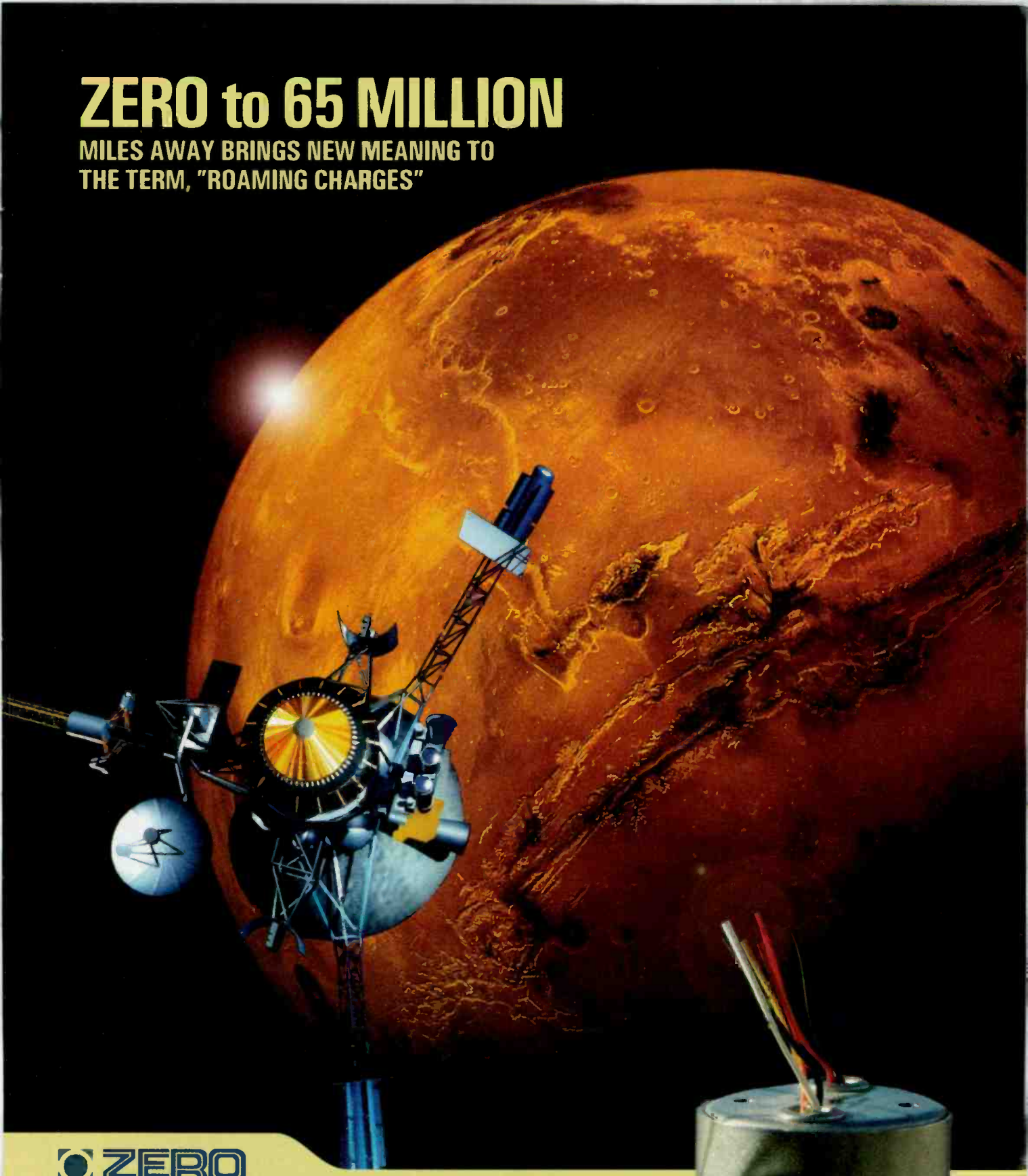

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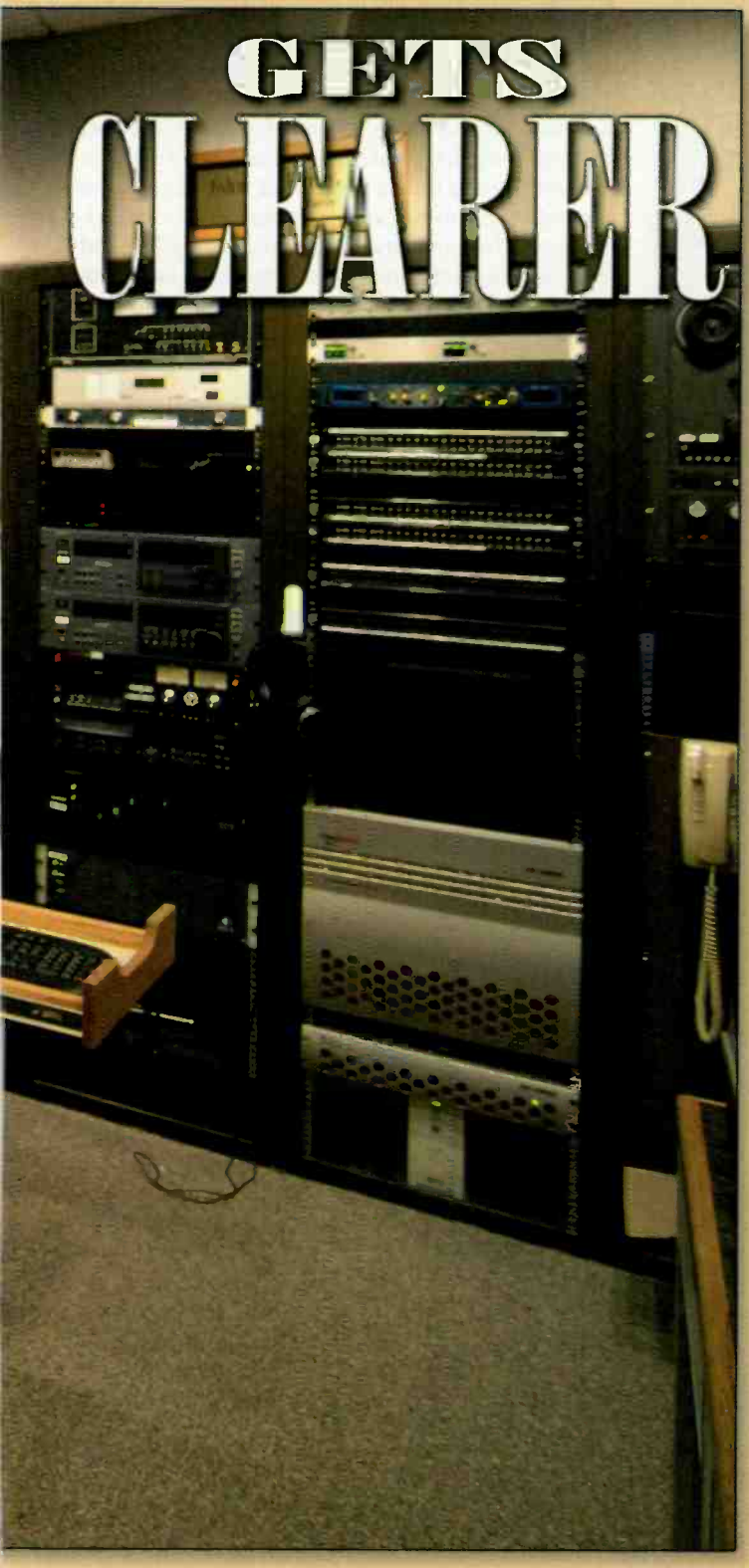

From its rather humble origins in 1985, which included sharing a frequency with the Dayton Public Schools station and using a 200W transmitter and a rooftop antenna, Dayton Public Radio (DPR) has become the pre-eminent source for classical music and fine arts programming in Dayton, OH, and west central Ohio. The 1994 addition of 50kW WDPG in Greenville, OH, to reach the northern areas, and the purchase of FM 88.1 in 1998 for WDPR in Dayton to allow 24-hour operation, gave DPR the capability to reach more than 1.1 million people. By 2004, Dayton Public Radio was poised for its next evolutionary growth step.

The genesis of this project was an opportunity to relocate and upgrade WDPR's transmitter site from a deteriorating leased tower that was only 200-feet tall, to the local PBS affiliate's 1,500-foot tower. The site relocation was also to include replacing the 30-year-old transmitter that had become increasingly unreliable. Because of the extent of this upgrade, and with the prospect of IBOC on the horizon, former Board Chairman Dr. Michael Jaffe and General Manager Georgie Woessner decided to incorporate a complete facility upgrade to digital at the same time.

The first phase involved the transmitter site relocation to WPTD's 1,500-foot tower with a seven-foot face width. Such a large tower would cause pattern distortion without some form of optimization. Therefore, a single-layer ERI panel antenna was selected to obtain the optimum pattern, fewest nulls and wide bandwidth. The required transmitter power output at the increased antenna height was only 2kW, so low level combining of the analog and IBOC digital signals through a linear solid-state transmitter was the obvious choice.

Processing, on the other hand, is subjective and never involves obvious choices. After polling other classical music stations and conducting listening tests, I chose the Optimod 8400 (being replaced soon with an 8500). A Neustar codec conditioner is also used on the main HD Radio chain and the secondary audio channel (SAC). This configuration has passed muster with the station's golden ears and our critical listening audience.

Vocal review

One of the challenges in adding HD Radio and still preserving the highest quality analog signal involved the STL system. I wanted a system that would deliver uncompressed linear 20kHz stereo audio in AES/EBU, 7.5kHz mono audio for the SCA with radio reading services, a LAN data package with at least 300kHz capacity for the HD Radio stream, data for RBDS and bi-directional data for the remote control. The studios are located downtown, so a line-of-sight microwave path was marginal and vulnerable to new building construction. I investigated the possible installation of fiber to facilitate the bandwidth of an E1 circuit, but the cost was prohibitive. The station was already using Intraplex STLs on T1 cir-

Dayton Public Radio

cuits,so I next investigated upgrading them. The solution came in the form of a new Intraplex Apt-x card that allowed us to fit everything onto a T1. To avoid problems with the IBOC signal by layering multiple compression algorithms,I did not want to use any digital compression on the main audio channels. However, the Apt-x has proven to be audibly transparent.

The HVAC system is a closed loop with positive pressure in the room to provide the best environment. The transmitter exhaust is vented into the room where two redundant HVAC units control the temperature and the humidity. If both HVAC units should fail,there are high-efficiency pleated intake air filters and a backup exhaust fan. The old transmitter has been installed as a backup analog transmitter with automatic changeover capabilities. The installation also includes a new Burk remote control system with automatic monitoring and logging and an Audemat-Aztec RBDS encoder. Following installation of the antenna,the fine matcher was adjusted to obtain a VSWR of 1.03:1 across the channel. There were some challenges when conducting a proof of performance, as the existing TFT and Belar modulation monitors did not have sufficient selectivity to reject the digital sidebands,so additional external filtering was required. The addition of an HD Radio modulation monitor greatly simplified the process. An Agilent spectrum analyzer verified compliance with the FCC mask.

This is the production studio with a PR&E console, Enco DAW and Vistamax routing switcher. Only a portion of the extensive CD library is visible.

Inside voice

The next phase involved the conversion of the studios to digital,with the challenge of remaining on the air during the process. I decided to upgrade the

Sometimes, getting out the ladder is just too much work.

WFCJ's John Graham does a little studio maintenance.

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Dayton Public Radio

production studio first, and then move the on-air operation into production while the air studio was upgraded. A small, temporary editing room was wired to ease the production burden during this transition. The studio walls, soundproofing, HVAC and acoustical treatments did not require any modifications. However, to alleviate existing static problems I did replace the carpet with computer room carbon-backed carpet installed over grounded copper straps using conductive adhesive.

Two PR&E Airwave Digital consoles had previously been purchased to replace the consoles damaged by a water leak, so each studio

WDPR Transmitter

Andrew HJ7-50A Heliax
Audemat-Aztec FMB80 RDS
Bird BPM power meter
Burk ARC-16
Dielectric RF switch
ERI 1083-1CP panel antenna
Harris Z6HDc transmitter
Harris Dexstar Exciter/Exporter
Harris Flexstar HDX-FM
(replacing the Digit exciter)
Intraplex HD STL
Mod Sciences Sidekick SCA
Myat feed line components
Neustar Codec Conditioner
Optimod 8400 (8500)

The WDPR transmitter (original pre-Flexstar configuration).

Centralization of Media General streamlines, minimizes costs

Integrated systems from Florical, Scientific-Atlanta, Grass Valley, Leitch and others create environment based on central control

A functional solution to a key issue facing most TV operations: how does a TV operation minimize capital investment costs and reduce overall operational expenses? **Media General Broadcast Group** addressed that issue when they centralized operations of 10 CBS stations and 1 UPN station from a common hub in Spartanburg, SC.

The Team

Media General's technical team selected **Florical Systems** to provide the hardware, software and guidance to achieve these goals. The design team from Media General Broadcast Group included **Ardell Hill**, Sr. VP of Broadcast Ops, **Mark Turner**, IT Director and **Matt Heffernan**, GM/Central Broadcast Ops.

The Plan

Their simple strategy was based around these overall goals: A central control solution to standardize and centralize traffic and master control duties while distributing workload among stations. Although centralcasting was considered, the team chose a central control model based on market size of the spoke sites and to limit the cost of network connectivity present in centralcasting models.

The Rollout

Here's how their plan was executed successfully and quickly:

1. **Centralizing traffic ops** improved efficiencies. This includes standardized reporting, quicker access to avails info for sales, and faster customer service.

2. **Centralizing master control** of 10 stations from a single hub and WAN based in Spartanburg, SC. The automation systems at the stations are monitored and controlled by the hub over a partial T1 network. The hub can modify any channel's schedule right until the next event to air, and controls each local station's automation system, video servers, switchers and logo inserters. The WAN handles typical system functions and the network features three separate backup circuits. If an unlikely WAN failure occurs, each local station can quickly switch to local mode and maintain automated operations until the WAN is restored.

Master control hub at Media General

3. **Program acquisition** is controlled at the hub by Florical's **Multi-Site ShowTimer** system which prepares the master and each station's daily recording schedule. It sends commands over the WAN to control each station's device servers which control local equipment to position dishes, tune receivers and record satellite feeds used by the stations across multiple time zones. Each spoke station retains a copy of the daily recording schedule for use by a local backup controller in the event of loss of hub connectivity. The local controller also allows the remote station to add recordings to the master record schedule.

4. **Program timing can be handled by one person** who then updates all sites with synchronized start times for all program recordings using Florical's **MediaTimer**. Even though each station may be assigned programs to segment and time, all timing data is stored in a central media database available to all stations. Because all program recordings start at the same universal time, there is no need for any start time reconciliation adjustments. Human effort to time the program segments is significantly reduced and the resulting timings are distributed across all stations.

The results: substantial improvements in operational efficiency with no loss in reliability, low interconnection costs and minimal capital outlay. This ambitious plan was completed in early 2005.

Equipment List

Automation: Florical's AirBoss and AirBoss Editor
Asset Ingest and timing: Florical's MediaFiler and MediaTimer
Satellite receivers: Agile-Omni's 830 and 930, Tandberg's Altela, Scientific-Atlanta's DSR 4810
Satellite record scheduler: Florical's ShowTimer
Dish & receiver control: SatelLink
Video Servers: Thomson Grass Valley's iDVR, SeaChange MediaClusters
Switchers: Saturn MC, GVG 2100 MC and Utah's MC-500 MC
Logo inserters: Leitch's Logomotion I and II
Routers: Panacea and Quintech RF
Microcontroller: Microfirst's 1610

What IS centralization?

Centralized television operations designed by Florical uniquely combines the customer's business model with its technical capabilities. This creates a customized, central infrastructure based on the geography and market sizes of the stations in the group. Centralization can be configured as either a centralcasting or central control model.

Control can be centralized at the hub, local at the regional station or shared. Storage can be at the hub, the regional station or at both sites.

Centralization consists of four elements:

1. **Interconnection between the hub and each spoke station** must be established with the necessary broadband connection ranging from a partial T1 to an OC3, with sufficient bandwidth to support all control and monitoring requirements.

2. **Automation system capabilities must be sophisticated** enough to handle centralization functions and up to 20 regional stations per control room across multiple time zones. Flexibility should allow adaptation to multiple operational models to offer significant growth advantages.

3. **Asset and archive management** insures that scheduled materials will be available for air when needed, reducing or eliminating routine tasks. This improves system efficiency and eliminates costly human errors while lowering operating expenses. *The more an asset management system can do unattended, the greater the savings in operational costs.*

Workflow process updating allows people in traffic, programming and sales to overcome the resistance to change in status quo at the hub and spoke stations. This is achieved by changing human focus from "execution" of the program stream to "preparation" of the material to be aired. All Florical systems are designed with this process in mind, focusing attention on accuracy in preparation which creates maximum efficiency in automated on-air playback. Today's environment requires a change from a technical solution in a traditional broadcast environment to an IT-based infrastructure.

Keep options open. Some broadcast groups may consider a central control model to reduce expenses, but may later wish to repurpose existing automation to the centralcasting model if network costs drop.

Florical clients include **Groupe TVA** in Canada, **Emmis Group**, and all of the O&O stations of the **NBC Television Network**.

Discuss your options for centralization with minimal capital outlay and maximum business process efficiency. Contact Florical Systems, the experts in centralization, quietly creating custom solutions for group owners since 1995.

Dayton Public Radio

was designed around them. By using the same model console in both studios, the staff has had fewer problems acclimating. The consoles are reconfigured with appropriate digital and analog cards as required. The consoles output sample rate is fixed at 48kHz, so that is the house standard. The rate conversion to 44.1kHz for the IBOC HD Radio encoder takes place at the transmitter.

Arrakis designed customized studio furniture for the studios to accommodate the non-parallel walls. The audio equipment in each studio includes a complement of Tascam CD players, Sony CDR recorders, Sony mini-disc machines, Panasonic DAT machines, 360 System Digicarts and Alesis Masterlinks. The majority of the classical music library is contained on more than 6,800 CDs, but there are still some rare selections only available on vinyl records. Consequently, a turntable is maintained in

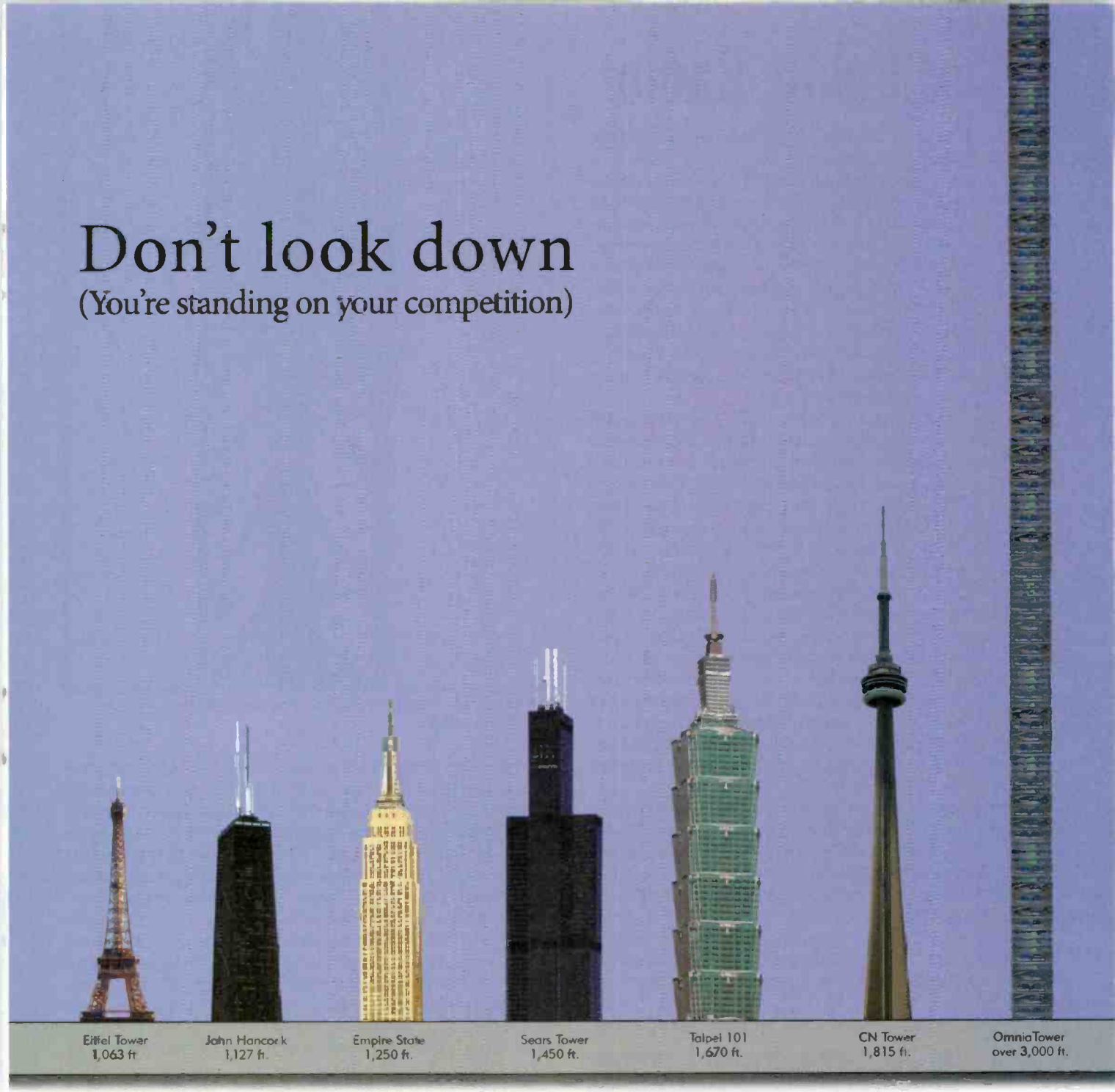
WDPG Transmitter

Andrew HJ8-50 Heliax
Bird BPM power meter
Burk ARC-16
Dielectric antenna
Dielectric IBOC 4.77 combiner
Dielectric RF switch
Harris HT-20 transmitter
Harris Z12HDs transmitter
Harris Flexstar HDX-FM exciter
Intraplex HD STL
Modulation Sciences Sidekick SCA

The Enco DAD automation system, satellite downlink receivers and webcasting.

Don't look down

(You're standing on your competition)



The Empire State building is pretty tall. Taipei 101? CN Tower? Even taller. But Omnia dwarfs them all. In fact, if you stacked up all the Omnia audio processors in use around the world, you'd have a tower well over 3,000 feet high.

In just a few short years, Omnia has emerged as the best-selling audio processor in the world. More importantly, it's the most successful stations in top markets like New York, London, Paris, Rome, Beijing, Tokyo, Amsterdam and Berlin, that have put Omnia on top. And more broadcasters are upgrading every day, using Omnia as their secret weapon to stay miles above the competition.

Speaking of heights, did you know that Omnia processing now powers stations broadcasting from every one of the famous structures pictured above?

Big or small, isn't it high time you upgraded to Omnia?

Ready to Multicast?

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

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Dayton Public Radio

each studio. Cassette and reel tape machines are also available for format dubbing when necessary.

My associate, Russ Hines, was primarily responsible for revamping the inter-studio wiring using Gepco and Belden multi-pair analog cables, multi-pair AES/EBU digital cables, multi-conductor control cables and CAT-5 cables. All wiring is color-coded depending on signal type and function, and each wire is labeled at both ends with its number, source, destination and function. A Vistamax 64x64 routing switcher capable of sample rate conversions plus D/A-A/D conversions takes care of signal and control routing for all sources outside each studio as well as multicasting feeds. Any input source, whether digital or analog, is available as a digital and analog output.

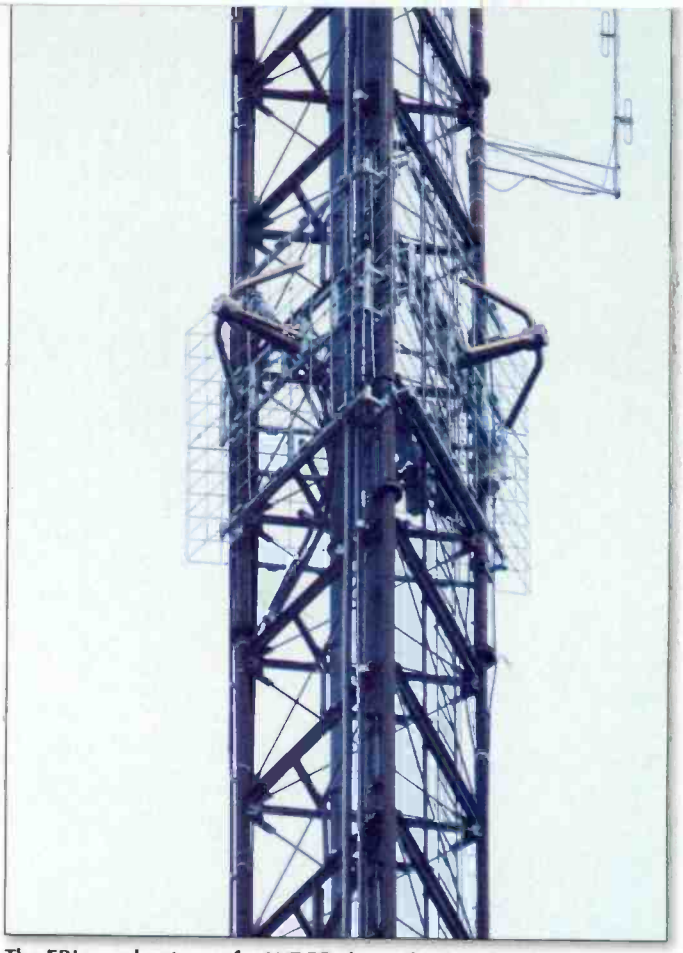
A new Enco digital audio workstation (DAW) has been added primarily as a result of the PRSS upcoming Content Depot satellite delivery system. The pier-to-pier network connects the workstations in the air studio, production studio and operation manager's office. All files are backed up on the SATA mirrored hard drives in the air and production workstations. The music is still played live from CDs during the majority of the broadcast day, with the DAW used mainly for satellite assist during overnights as well as pre-recorded programs for holidays. The production DAW uses Cool Edit and is augmented by a 360 Short Cut editor. The Audio Science audio cards provide analog and AES/EBU digital inputs and outputs, and are capable of multiple sample rates, linear uncompressed audio or MP2 and MP3. All sources are converted to uncompressed linear WAV files for the best quality and to avoid artifacts from multiple compression algorithms. Each card offers four outputs, two are sent to the console for that studio, and two are sent directly to the routing switcher for multicast feeds that don't need to go through the studio.

The DPR studios are located in the heart of Dayton's theatre district, so a fiber link was installed between the Schuster Center, Victoria Theatre and the DPR studios to enable live broadcasts of performing arts events. The Multidyne 2200 system is capable of bi-directional video for monitoring the stages, as well as six channels of analog audio and six channels of AES/EBU audio. There is also a statewide T1 system maintained by Etech Ohio (formerly Ohio Educational Broadcasting) linking all public broadcasters in Ohio with bi-directional broadcast quality stereo audio as well as ISDN.

The terminal room contains the satellite downlink and recording equipment for the PRSS system as well as the noisy computer workstations for the Etech Ohio system, the Enco system, the webcast streaming audio and the computers in each studio used to access the www.dpr.org website for updating the current playlist. All workstations use KVM extenders via CAT-5 cable and a master terminal that can access any workstation is available in the terminal room.

The third and final phase, currently underway, is the digital conversion of the WDPG Greenville transmitter site that simulcasts with WDPR. The WDPG transmitter runs a TPO of 12kW, is less than 10 years old and is performing flawlessly. Therefore, I chose a mid-level combining scheme with a solid-state HD Radio transmitter for maximum efficiency and some level of redundancy. An Intraplex T1 STL configuration similar to WDPR's feeds the site. In the final configuration, the HD Radio and all multicasting and data signals are fed into a Harris Importer/Exporter computer. All signal processing is co-located at the studio. The signals are then distributed to each Intraplex STL system, one for WDPR and one for WDPG. The Flexstar exciters at each transmitter generate the analog and digital signals. The digital signal is currently monitored off air with a Kenwood receiver car stereo until the permanent monitors are delivered.

The results of this project have been most gratifying. The signal coverage is at its maximum potential. A-B listening tests with original source material have resulted in unanimous opinions that any differences are indiscernible. Dayton Public Radio's new facility provides the quality, capacity and flexibility to explore and utilize all the potential that HD Radio and Tomorrow Radio multicasting have to offer. Dayton's Voice of The Arts now has the strongest, clearest and most versatile voice in its history.



The ERI panel antenna for WDPR sits at the 880' level on WPTD's tower.

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Stitt is president of JMS and Associates, Cincinnati, OH.

Photos by James H. DeYoung.

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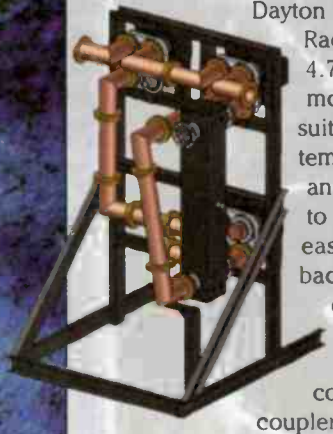

Dayton Public Radio implemented its HD Radio broadcast utilizing a Dielectric 4.77dB IBOC coupler/injector and motorized coaxial switches. Ideally suited for a split-level combining system, the coupler allows the analog-only and hybrid analog-digital transmitter to feed the antenna, while providing easy switching between main and backup operation with four switchable operation modes. In the case where either transmitter is tasked to operate independently, the motorized coaxial switches bypass the 4.77dB coupler and send the signals directly to the antenna and test load. When mated with a matched load, the 4.77dB couplers combine the two signals while providing approximately 40dB of isolation between the two transmitters. This image shows a typical sub-system with a 4.77dB coupler and three motorized switches.

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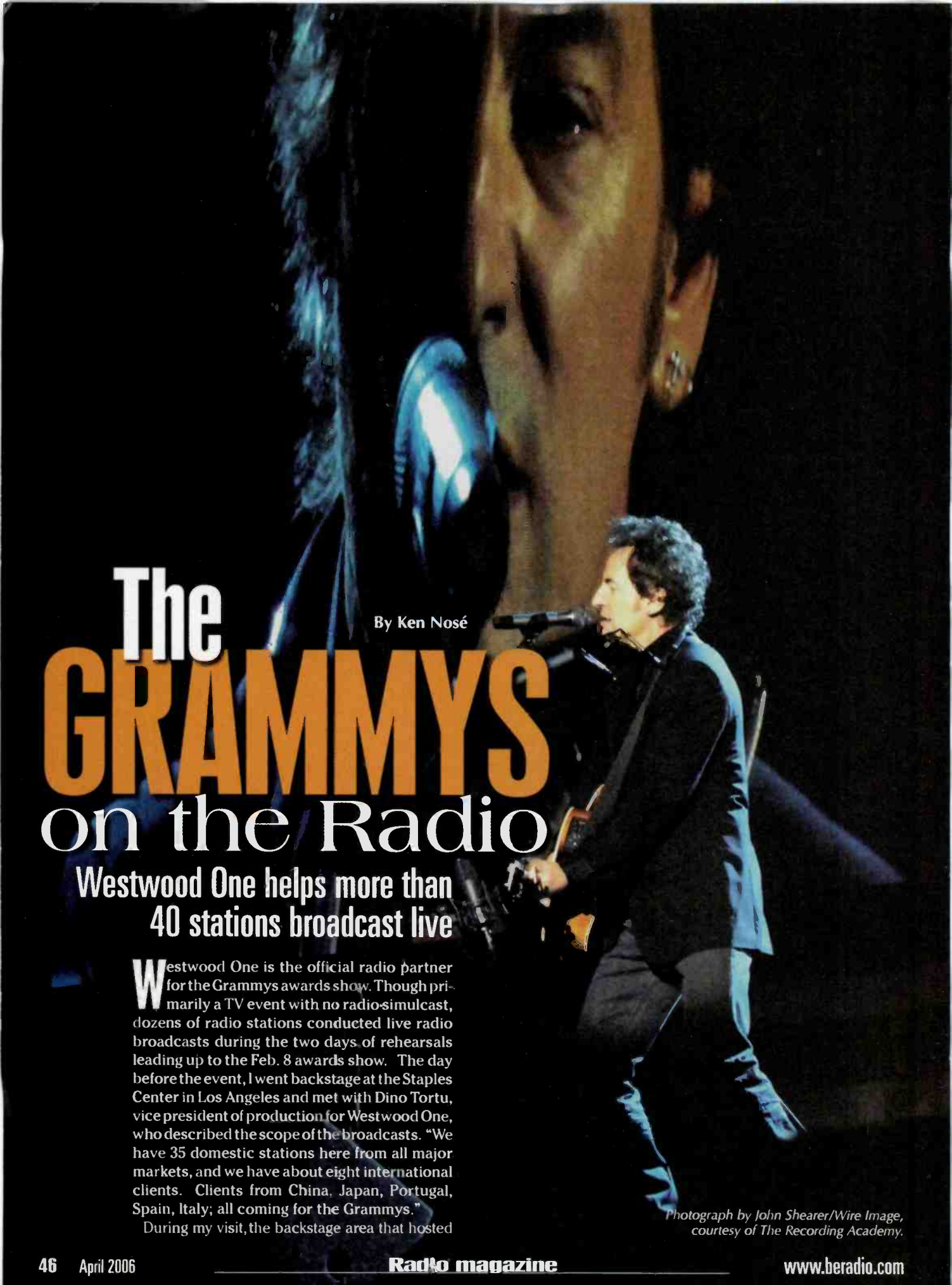

The GRAMMYS on the Radio

By Ken Nosé

Westwood One helps more than 40 stations broadcast live

Westwood One is the official radio partner for the Grammys awards show. Though primarily a TV event with no radio simulcast, dozens of radio stations conducted live radio broadcasts during the two days of rehearsals leading up to the Feb. 8 awards show. The day before the event, I went backstage at the Staples Center in Los Angeles and met with Dino Tortu, vice president of production for Westwood One, who described the scope of the broadcasts. "We have 35 domestic stations here from all major markets, and we have about eight international clients. Clients from China, Japan, Portugal, Spain, Italy; all coming for the Grammys."

During my visit, the backstage area that hosted

Photograph by John Shearer/Wire Image, courtesy of The Recording Academy.

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the radio remotes was a sea of people and activity. All of the stations creating remote broadcasts were set up in a long row with tables on either side, close enough to the stage that the sound of the Grammy rehearsals cut through the din of people who were filtering through for interviews or performing the broadcasts. The placement was ideal for a live event broadcast, as Tortu describes.

"The stations love it because they're getting here, [and] they get to actually hear the ambient rehearsal going on. It's very exciting."

Having all of the stations set up in the same area had other benefits as well.

"We're here for two days of rehearsals, we bring artists in for interviews, and they stop by and talk to stations of different markets. So for artists it is great because they get to talk to 35 markets in an afternoon," said Tortu.

The typical station setup. This is WPLJ, New York.

From a technical perspective, the challenge that Westwood One faced was how to provide for the different needs of each station, while making it work for the widely varying formats, local time zones and on-site technical ability that each station might have.

How does it be everything to everyone? The solution was to keep it flexible, open, and above all, simple. Tortu described the setup provided by Westwood One as being straightforward. "We typically have a very simple set up for each station; it's just a simple Shure M367 mixer with four SM-58 microphones, four Koss UR-15C headphones fed from a Symetrix 304 headphone amplifier and one side of a Telos Zephyr Xstream. They transmit via ISDN back to their stations. They can hear their return feeds and they can broadcast live."

Additional inputs were provided on the mixer also, allowing stations to bring their own equipment for source material.

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The ISDN codecs are placed between the stations using them.

Multiple tasks

The Zephyrs were set up so that two stations could share one ISDN line to transmit separate broadcasts, using Layer 3 mono transmit, G.722 return at 64kb/s and 48kHz sampling rate. A total of 25 ISDN lines were used, which thanks to this approach, supported more than 40 stations. Most of the stations were paired to share a single Zephyr, but there are exceptions. "One or two will have an oddball algorithm that doesn't match anyone else's so those stations get their own Zephyr," said Tortu.

Following the simpler-is-better approach, the setup was designed to make troubleshooting easier as well. Instead of having a large farm of ISDN codecs in one location, each station is provided with a small rack with the codec right next to its mixer setup. Tortu described the benefits. "If the Zephyr farm is here, and the guy across the room has a problem, you're here working on it, he doesn't know that. If you're standing next to him saying 'let me help you out,' it makes him a little more sure."

Each station's audio setup is basic and easy to understand.

In addition to ISDN, Westwood One provided wireless Internet connectivity because each year more and more stations bring editing programs on their laptops. Using the remote broadcast setup provided, they have the option of taking the mixer output directly into their laptops instead of using the ISDN codec. This allows stations to record to their laptops, convert the audio to MP3, upload the file to an FTP site at the station and pre-feed all of the radio bits. With this setup, some stations don't use the ISDN at all.

Ken Nosé is a software engineer and audio engineer in Los Angeles.

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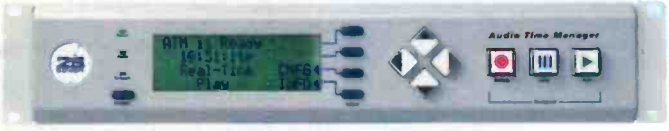

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Air Tools 6200

by Tim Wright, CPBE

One of the advantages of working in a major market is that equipment manufacturers come to you to show off the latest products. Recently, the team from Symetrix/Air Tools visited Chicago to demonstrate the latest offerings in IP-controlled products. One particular item that caught the eye of the Clear Channel engineering department was the Air Tools 6200 dual voice processor. We were already familiar with the venerable 528E microphone processor—we have several of them in each of the 28 studios at our facility—so we were acquainted with the favorable performance-to-cost ratio of the Air Tools products.

Performance at a glance

Occupies 1RU
Software-based system
Dual-channel, single-band AGC processing
Real-time configuration via multiple means
Analog and AES-3 I/O

A unique application

At the time of the demonstration, Clear Channel Chicago was heavily involved in launching HD Radio on each of our seven stations. We were looking for products to process an audio side-chain so that the jocks could hear a pre-delay simulation of what was going to air. The general consensus among the engineers in attendance was that the 6200 product was worth a try. Though it is specifically designed with microphone processing in mind, there was no reason it could not work as a stereo program processor. We liked the fact that it could be configured over the LAN using the provided software. We also liked the idea that the front panel controls, and there are not many, could be locked so that little fingers could not play.

A 6200 arrived just in time for the launch of one of the HD Radio stations, so I set it up and was able to quickly configure an IP address using the software supplied, a laptop PC and a USB cable to the front-panel USB port. General setup is possible using the front panel, but the USB was quicker. Once the IP address was set to an existing subnet on our LAN, I used the LAN to connect. John Boehm, Clear Channel Chicago's transmitter supervisor, assisted with the processing, and was quickly able to make the 6200 sound close to the PD's settings on the main processing. We did notice a bit of inconsistency from song to song, but that was to be expected when comparing a single band processor with a multi-band processor. The DJs, however, never noticed when we switched the 6200 online to their monitors. The product was a hit, so we ordered several more for the other stations. I will admit that we are not using the 6200 on all the stations, because aggressive main processing on two of them was hard to match using the single band AGC of the 6200. In those instances, we were forced to opt for a more expensive multi-band solution from another manufacturer.

Back to its roots

Recently, a staff addition to one of the stations necessitated the ability to day-part program the microphone processing in the studio. Everyone has his own idea of how he wants his voice to sound, and every voice is different and needs to be processed differently, especially when those involved have differing levels of mic technique. As I mentioned, we are using 528Es in the air studios, and they serve us well, but they are not programmable to change parameters on the fly. They also require security covers to keep the jocks from playing with the knobs. Enter the 6200. Because we were already familiar with the product, a quick order was placed for two units to handle the four microphones in the studio. Once again, Boehm was called on to do the setup. He was able to do a quick off-site configuration, once I placed the two units on the LAN, and the next day we installed them in the studio. While jacked into the 6200 USB port, with headphones on and sitting in the studio, it was a simple walk-through process to make a change. Before long, the smiles on the DJs faces told us that the settings were right. This procedure was followed for the

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balance of the day, and the following day we fine tuned it while Boehm was at one of the transmitter sites and on the phone with the studio. The front panel controls were then locked out, and the settings archived to a PC for later reference.

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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.*

Software and connections

The 6200 truly is a software-defined product. The designer software comes on a CD and is also available at the Air Tools website. Configuration is accomplished by using a graphical interface. Configurable parameters include preamp gain, phantom power, output levels and a series of DSP modules. These modules may be rearranged by dragging and dropping the graphical block diagram in the desired order. Typical DSP modules include symmetry, high- and low-pass filtering, a shelving filter, a four-band parametric EQ, expander, compressor and AGC. Once a configuration is defined, it can be saved and loaded into a daypart scheduler to change to a different processing preset at a fixed time of day. The clock in the 6200 can be set manually or via a time server on the network.

Audio connections on the back panel include stereo (or dual mono) analog in and out, AES out 1 and AES out 2. Because the primary function of the 6200 is microphone processing, AES inputs are not provided on XLR connectors, but they can be accessed on a special RJ-45 jack called the Homerlink. This link can transmit four AES-3 mono channels and receive two AES-3 mono channels over a CAT-5 link. Specific applications are for integration with the Air Tools Studio Matrix system for crosspoint routing. Also on the back are RS-232 and Ethernet (10 BaseT) ports for programming. A midi port is available for use with the optional Air Tools RC-1 controller, and a TC89/TC90 port for time code input. A Euroblock connector allows for RS-485 control using third-party products, hardware contact closure for remote bypass and two software-definable analog ports for connecting external 10kΩ pots for physical control of DSP functions. Finally, there is a standard IEC three-prong jack for power input (110Vac to 240Vac, 50Hz to 60Hz).

What can be improved

In configuring the units for microphone processing, we discovered that even though the front panel is software locked, the right combination of actions can unlock the panel. This is not documented, and I will not do so here because I don't want the jocks finding the secret. Although I understand the reason for this backdoor, I would like to see it a bit less easy to open. Also, I would like to see a software capability to disable the front panel USB port. I do not discount certain jocks from trying to crack the system by plugging their laptop into the port. Password enabling the software interface would provide the same level of security.

Overall, we are impressed. The unit sounds good as a voice processor, is configurable and provides enough presets to easily day part our processing. In addition, its versatility allowed us to use it in an unconventional application for pre-HD Radio delay processing for fake air fold back.

Wright is senior studio engineer at the Clear Channel stations in Chicago.

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DBX 286A

By Chris Wygal

Aggressive consistency and clarity is a high priority for today's on-air and production talent. In a day when radio is competing for listenership, the guy chatting away on the air is expected to gain the listener's attention. However, effectively processing the human voice is tough and expensive. While a microphone may sweeten a seasoned announcer's voice, or compensate for a less-than-perfect one, an unprocessed mic is, for the most part, unacceptable when a station wishes to stay dynamically competitive. Fortunately, maintaining vocal punch and clarity is easy with the DBX 286A, which packs a huge dynamic bang for a not-so-huge dynamic buck.

Performance at a glance

80Hz highpass filter
48V phantom power
Simple adjustment controls
External insert for adding other processors
Accepts mic and line level inputs
Reduces noise

In the on-air and production studio, just about anyone can get behind the mic. This is especially true in a station where in-studio interviews are frequently created. In these situations, voice processing must accommodate people who know nothing about projection and mic placement. Even with top quality studio mics in ideal acoustic environments, voice fluctuations and off-mic instances still occur. With that in mind, I've used the system for nearly seven years in two separate radio facilities and have heard solid processing on every voice that wanders into the studio.

Processing power

The 286A is a user-friendly processor. Each stage of processing is divided and labeled accordingly and flows left to right: mic preamp, compressor, de-esser, enhancer, expander/gate and output. In the mic preamp section, gain control is available and can boost input as much as 60dB. A four-LED meter indicates the input level and clipping. The unit provides 48V phantom power and an 80Hz highpass filter to cancel rumble. The process bypass completely bypasses the entire unit, making it transparent in the signal flow.

A real highlight on the 286A is the absence of ratio, hard/soft knee, threshold and hold/release adjustments in the compressor section. But isn't this supposed to be a vocal processor? It is, but DBX takes a different approach by simply offering drive and density adjustments. These parameters basically decide "how hard and how much." The drive adjusts how aggressively the processor levels and compresses the signal, and the density adjusts how deep the compression goes and for how long. For example, if you really want to squash the material, turn up the drive considerably. The adjustments are scaled one through 10, which is easy for newbies to the world of audio processing to use. The processing is metered on an eight-LED meter in this section. Setting drive and density at about six to seven is a good conservative start, but as with any processor, experimenting is important.

The next section is the de-esser. This pinpoints unwanted high frequencies, and sets the threshold where the frequencies will be compressed. If the voice talent is considerably "ess-y," for example, or if the microphone favors high frequency response, 8kHz to 10kHz can be compressed, or quieted. The de-esser however must be used with great care, as I've found that incorrectly de-essing can give the voice talent an unwanted lisp.

Next in the processing chain is the enhancer. These adjustments are again scaled one to 10 and offer low frequency (LF) and high frequency (HF) detail. This is essentially an equalizing section. As with the rest of the 286A, simplicity is paramount, and the LF and HF adjustments are more than adequate. The LF and HF attributes intelligently equalize vocal material. Low frequencies are accented without creating a muddy sound, while high frequencies are accented without creating shrill sibilance.

The expander/gate section of the 286A reduces noise when program material is silent. Buzzing, hissing or general unwanted noise can be attenuated, or gated, using the expander/gate. This is a more traditional section of the 286A, as the threshold and ratio are measured in decibels

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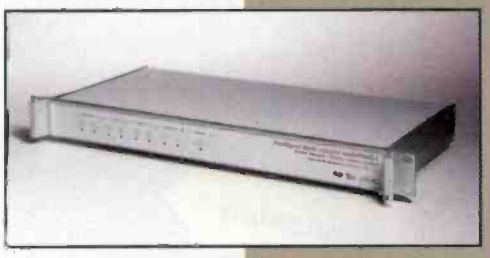

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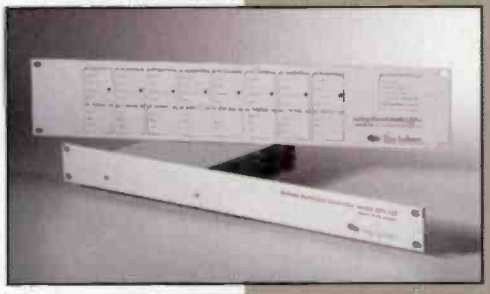
- printer port
- battery backup



Model RFC-1/B
Remote Facilities Controller

- dial-up remote control
- transmitter monitoring
- automated control

Sine Systems, inc

nashville, tennessee · 615-228-3500 · www.sinesystems.com

The rear panel of the 286A.

and ratios respectively. The user can also create a tight and punchy sound on a kick drum for example, or cancel noise that is picked up by other open mics on the stage or in the studio.

The final stage is the output. Any compressing or gating can result in level changes, so increasing or decreasing the output level at this stage is needed to set a nominal line level output. A single LED indicates clipping.

Taking a look at the back of the 286A, the line-level output is a ¼" jack, and the unit accepts mic and line level inputs, and an external processing insert for adding other processors into the processing chain. This provides several options in integrating the 286A. For in-studio setups, I use the unit as a dedicated in-line mic preamp and processor. However, for field applications, I insert it into the console using a Y-cable. The back panel displays a wiring diagram to help.

Of the many mic preamps and processors available to sound engineers, the DBX 286A stands out as a simple, conservatively priced audio processor. I've used the processor to level and compress singers, guitars, radio voice work, and I've even used it in mastering radio spots and music selections. It's great in the studio and in live applications as well. The novice finds it easy to operate, and the experienced sound designer enjoys its transparent effectiveness.

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

DBX

P	801-568-7660
F	801-568-7662
W	customer@dbxpro.com
E	www.dbxpro.com

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

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.*

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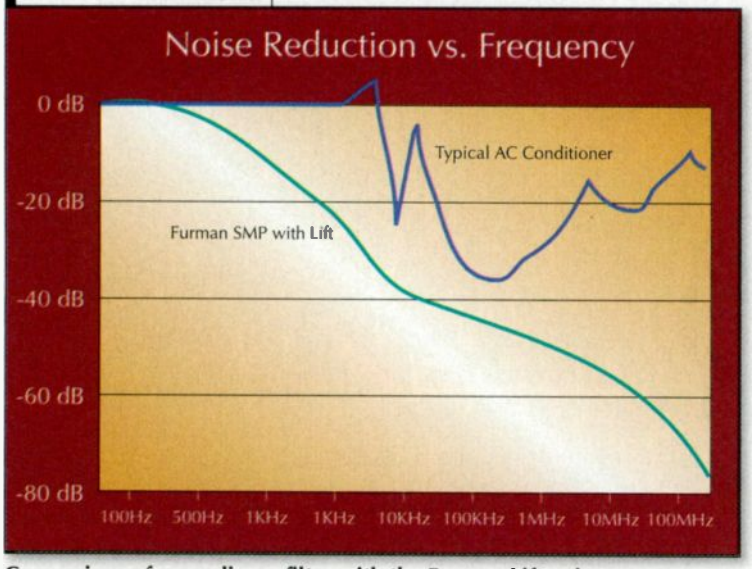
Furman Lift

by Garth Powell

As the capabilities of electronic equipment continue to increase, the quality of the electricity that powers them is following an opposite path. The two even work together to force power quality into a downward spiral—as more and more PCs are plugged in across the country, their switching power supplies add noise to the electrical grid, distorting low-level information and corrupting digital data. Many people know that a lightning strike can cause a devastating power surge, but few realize that hundreds of surges pass through ac lines every day, caused by power utilities as they switch from one transformer to another throughout the day to adjust for peak demands. While noise and small surges don't carry the dramatic finality of a major surge, they do have a destructive cumulative effect that shortens the life of components and impairs their performance.



Comparison of a non-linear filter with the Furman Lift noise reduction system.

As the quality of ac power continues to worsen, the only solution is to condition power before it reaches sensitive electronics—something that many people never take into consideration. Most people are familiar with the plastic $10 or $20 power strip surge protectors available at just about any department store. While they are effective at adding outlets, they provide little protection from surges and zero filtration of noise.

A better way

A better solution is a power conditioner that holistically improves the quality of the power running from the wall into expensive electronic equipment. Furman Sound is a manufacturer of power conditioners and related products. Some of the applications for its range of conditioners are sound reinforcement, audio and video recording, broadcasting, data processing, telecom and home theater. The power conditioning needs of many facilities are met with the PL-8 II, a base model that provides nine protected outlets for a rack full of equipment. The Power Factor Pro (floor/stage) and Power Factor Pro R (rack-mount) power conditioners are capable of lowering the ac line impedance supplied by wall outlets while reserving a current surplus for peak demands. The company's AR-15 and AR-20 are voltage regulators that not only control the level of incoming voltage, but also provide the protection and filtration of a power conditioner. A common factor between these devices that sets them apart from common surge protectors and even other power conditioners is Furman's proprietary Series Multi-Stage Protection Plus (SMP+) technology, which incorporates non-sacrificial surge suppression with an advanced filtration system and automatic shutdown capabilities.

Extreme Voltage Shutdown (EVS) is an SMP+ technology that protects equipment against sustained overvoltage situations such as accidental connections of 120V equipment to a higher-voltage outlet (usually 220V). These accidents are most likely to occur when setting up equipment in unfamiliar outside venues, or in new builds or during renovations where new power drops get mislabeled, or even go unlabeled. While surges are transitory, extreme voltage situations last as long as the equipment remains plugged in—or until an EVS-equipped power conditioner blocks the power supply to all connected components and critical circuits, which it does if the voltage rises to 15 percent above nominal or higher.

The surge of power

Surges are a different matter, both in their cause—a variety of events not directly related to human error—and in their transitory nature. Powerful surges can be as suddenly destructive as extreme voltage situations, and their dangers are well known, even if people inaccurately believe that lightning is their sole source. However, also dangerous are the small surges that occur dozens to hundreds of times daily, causing accumulative damage to sensitive circuitry. Look for a power conditioner that can protect equipment

from surges of any size or frequency without sustaining any damage, and therefore don't require maintenance. Power conditioners equipped with Furman's Series Multi-Stage Protection (SMP) circuit can handle multiple 6,000V and 3,000A pulses without sustaining any damage.

Another important criterion for determining a surge suppressor's effectiveness is its clamping voltage—the specification that indicates how much voltage will pass through the device into the electronics it protects. Furman's SMP circuit clamps surges at 188V peak. Other conditioners on the market that claim to be non-sacrificial employ circuits with extremely high clamping voltages. Though this may save the power conditioner from sacrificing itself, it thwarts the unit's main purpose of preventing high voltages from passing through to connected equipment.

The third feature of SMP+ is Linear Filtering Technology (Lift), which is designed to counter electrical noise. Particularly through the 1980's, ac contamination has steadily grown worse; a trend that closely correlates with the proliferation of the personal computer and its accompanying switching power supplies. Noise distorts low-frequency information, which defines the harmonics, instrument timber, spatial cues and other signals that provide resolution and depth to high-end audio. Linear filtration significantly lowers the noise floor, thereby uncovering this important low-level information.

Traditional non-linear filters can lower noise in some octaves but not others, which results in resonant peaking that can actually add more than 10dB of noise to the incoming ac line. The error they make is in assuming that real-world electrical impedances are constant, such as the type manufacturers produce in the lab environment. The effect of non-linear filtration is perhaps most noticeable by discriminating technicians who have complained—rightly so—that many power conditioners re-equalized their carefully calibrated systems. In the strictest sense, a 400Hz tone at 90dB will be rendered unchanged regardless of ac noise or the filtering system that's used.

However, a 10kHz signal that is occurring simultaneously at 60dB below the fundamental 400Hz tone will be affected by ac noise that is induced 50dB below the 400Hz tone. Simply put, the ac noise that is coupled into electronics may be higher in level than much of the low-level signal it is attempting to record or reproduce, resulting in a masking effect. Furman's Lift ensures noise reduction along a smooth, linear curve with no resonant peaking to preserve low-level signals.

Producing audio is more than knowing how to play an instrument or handle a workstation mixer. Because electricity is a key component of producing sound, manage the power that is fed into sensitive electronic equipment carefully.

Powell is senior product designer at Furman Sound, Petaluma, CA.

Intraplex Netxpress

By Steve Edie

Decisions for acquiring technologies should weigh heavily on obtaining integrated solutions that provide the least complexity in the all-too-complex radio environment. The tools should fit with the existing infrastructure and provide flexibility to expand into new methods of content sharing and distribution. Bandwidth limitations are a typical roadblock and are nothing new to anyone who has transported critical audio. In the past, the solution has been expensive—bandwidth is available in linear increments (T1, ISDN)—with each additional link increasing costs linearly. What is needed is a cost-effective way to increase bandwidth and capabilities within and between facilities across the country and around the world: equipment that can serve as the facility's STL or studio-to-studio link, and when needed, expand to provide bi-directional communications (audio, data voice) within a group of affiliated stations/studios and transmitters.

T1 vs. IP-based Ethernet

As reported in the online publication *Heavy Reading*, "Ethernet is a widely used, simple, cost-effective, granular and scaleable technology that can enable service providers to roll out and quickly provision a range of tailored services at competitive prices—leveraging a lower cost base than that associated with traditional transport and switching technologies....Legacy services offer no compelling value."

T1 dedicated circuits have long been the long-distance wireline technology of choice. They offer dedicated, point-to-point, bidirectional communication at guaranteed data rates. They are also expensive. A recent review of FCC tariffs in the Midwestern United States shows that a T1 line typically costs $400 to $450 plus mileage costs of around $100 to $300 per month. A typical cost of $600 to $700, or $420 per Mb/s of data per month, is required and will serve only the basic needs for one broadcast channel.

The Internet has changed many things, including the cost and concept of bandwidth. Ethernet wide area network (WAN) connections are becoming ubiquitous throughout the world. Ethernet services account for nearly 66 percent of all new data services installed during the last two years in the United States. For a similar price as a T1 line, customers can get a 10Mb/s Ethernet Private Line (EPL) with six times the bandwidth. This additional bandwidth can support multiple audio channels over an STL and studio-to-studio sharing of audio and data from anywhere in the world. Other applications might include transmitter telemetry and remote control, surveillance and confidence monitoring. Whether you're looking for cost savings or increased bandwidth, moving from dedicated T1 services to IP-based services over Ethernet is worth considering.

The cost of additional TDM/T1 circuits increases linearly. The scaleable nature of Ethernet changes this dynamic. In 2005, the typical cost increase from a service provider to go from a 10Mb/s link to 100Mb/s is two times. This is a substantial difference from the expected 10-time increase. For about the cost of two T1 lines (3Mb/s), a user can have 100Mb/s of Ethernet connectivity to manage and expand their offerings.

When considering the use of an EPL/WAN link, it's important to consider other services and applications that the provider has available. For instance, the additional cost of the 100Mb/s connection may allow voice over IP (VoIP) service to lower phone costs, off-site data storage for mission critical information and other applications to reduce the overall cost of operations. There are currently more than 120 service providers offering Ethernet services in the United States for enterprise customers.

Partners in migration

Migrating from T1 circuits to an IP-based system is an adventure that, until recently, was not for the faint-hearted. Moving to IP-based systems required numerous devices from various manufacturers as well as an IT expert capable of integrating and troubleshooting. At best, this was an expensive venture—typically only attempted by well-funded organizations. At worst, attempts at this type of migration produced only large expenses with no working solution. Down the road, support could easily have become an issue because of the various manufacturers involved.

IP-based systems present numerous challenges to systems that operate in real time. Program audio, streaming

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So if you *are* looking to touch your listeners, you should be looking at the Aphex Model 230.

www.aphex.com

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Illustration by Jesse Caesar. Aural Exciter, Big Bottom, Easyrider, RPA, and Logic Assisted Gate are trademarks of Aphex Systems.

media and other high priority data need to arrive at their destination reliably, with minimum delay and in a manner that appears seamless. IP-based systems were not designed for that. Instead they were designed to get data from point A to point B in a reasonable time (typically measured in tens of milliseconds to seconds, depending on network traffic), and if something got lost along the way, it was resent whenever possible. Although that type of network may work fine for getting a file to the printer or browsing a static Web page, it is not acceptable within a broadcast setting.

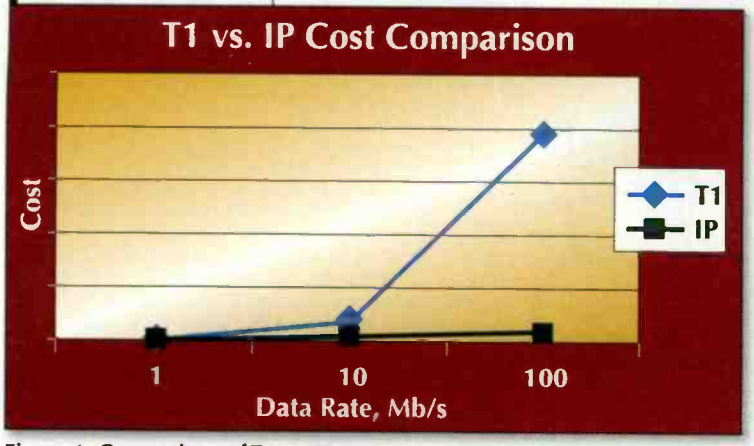


Figure 1. Comparison of T1 vs. IP costs.

A managed platform approach to professional audio transport over IP, Intraplex Netxpress offers not only audio transport but also a suite of hardware and software tools to manage and implement a variety of digital services over packet-switched networks. Hardware redundancy, network monitoring and error mitigation as well as input policing, allow broadcasters to migrate services off of dedicated lines and onto readily available and lower cost IP networks. Additionally, Intraplex Netxpress is designed to use existing Intraplex modules.

Netxpress provides a bridge between a station's current infrastructure and the networked systems needed for upcoming product offerings including HD Radio, data services and audio streaming applications over the Internet. You can begin with just two Netxpress frames, one at the studio and the second at the transmitter. Add a third at a sister station across town and both studios can share content. Either studio can feed the transmitter. A fourth unit at a second transmitter means you have real backup capabilities in the event of a disaster. Either studio can feed either transmitter, or both. All that is needed are a few simple configuration changes. A fifth unit located halfway across the country at the group's corporate base could easily share and provide content to any of the other four.

Netxpress offers new possibilities for content sharing,

collaboration and system-level redundancies. Radio groups can consolidate studios and share content among multiple locations, while national broadcasters can more easily feed multiple transmitters from a few primary studios. Having the audio as a series of digital packets also makes it easy to use standard server technology for store-and-forward as well as streaming applications.

Service	Data Rate (Mb/s)	Cost ($/month)	Bandwidth Cost ($/Mb/s)
T1	1.544	$600-700	$420
Ethernet Private Line	10	$600-1,000	$80
Ethernet Private Line	100	$1,500-2,000	$18

Table 1. Cost comparison of various types of connectivity.

Inherent value

IT personnel will tell you that much of their cost reduction is done through centralized management and deployment of software and services. Intraplex Netxpress provides the capabilities and monitoring tools needed to support centralized management of IT and audio services. This is done through SNMP, Web browsers, software downloads that allow immediate return to a previous version and access to network statistics. With this Netxpress can be used in varied applications including point-to-point and point-to-multi-point audio transfer; multiple audio programs using multiple compression algorithms (or no compression); support for existing PBX/PABX telephone systems; and a variety of data circuits, even those not inherently designed for IP transport.

As various services are centralized and moved from T1 TDM circuits, engineering resources can be redeployed into other areas, such as moving ancillary services off of dedicated systems and onto Netxpress, simplifying the system and increasing resource and bandwidth utilization. Monitoring tools show problems and areas that can be better utilized. Hardware redundancy keeps minor problems from affecting services. With broadcast services and IT functions built on the same platform, the need for spares is reduced.

Edie is the Intraplex product manager at Harris, Cincinnati.

Reference: Heavy Reading, Stan Hubbard, "Ethernet Services Carrier Scorecard: North America", Vol. 3, No. 7, April 2005

100 years of innovation

The Radio Technology Leader recognizes the radio technology leaders and innovators

While history recognizes Guglielmo Marconi as the father of wireless communication, it was Canadian Reginald Aubrey Fessenden who showed the world that it was possible to send the human voice via wireless. On Dec. 24, 1906, he transmitted the first audio signals. He played an Ediphone recording of Handel's Largo, played *Oh Holy Night* on the violin and read from the Bible. This event proved that wireless communication could be used for more than simple Morse code.

History has recorded many pioneering advances in technology, and a great number of them have molded radio broadcasting into the technology that it is today and is becoming tomorrow.

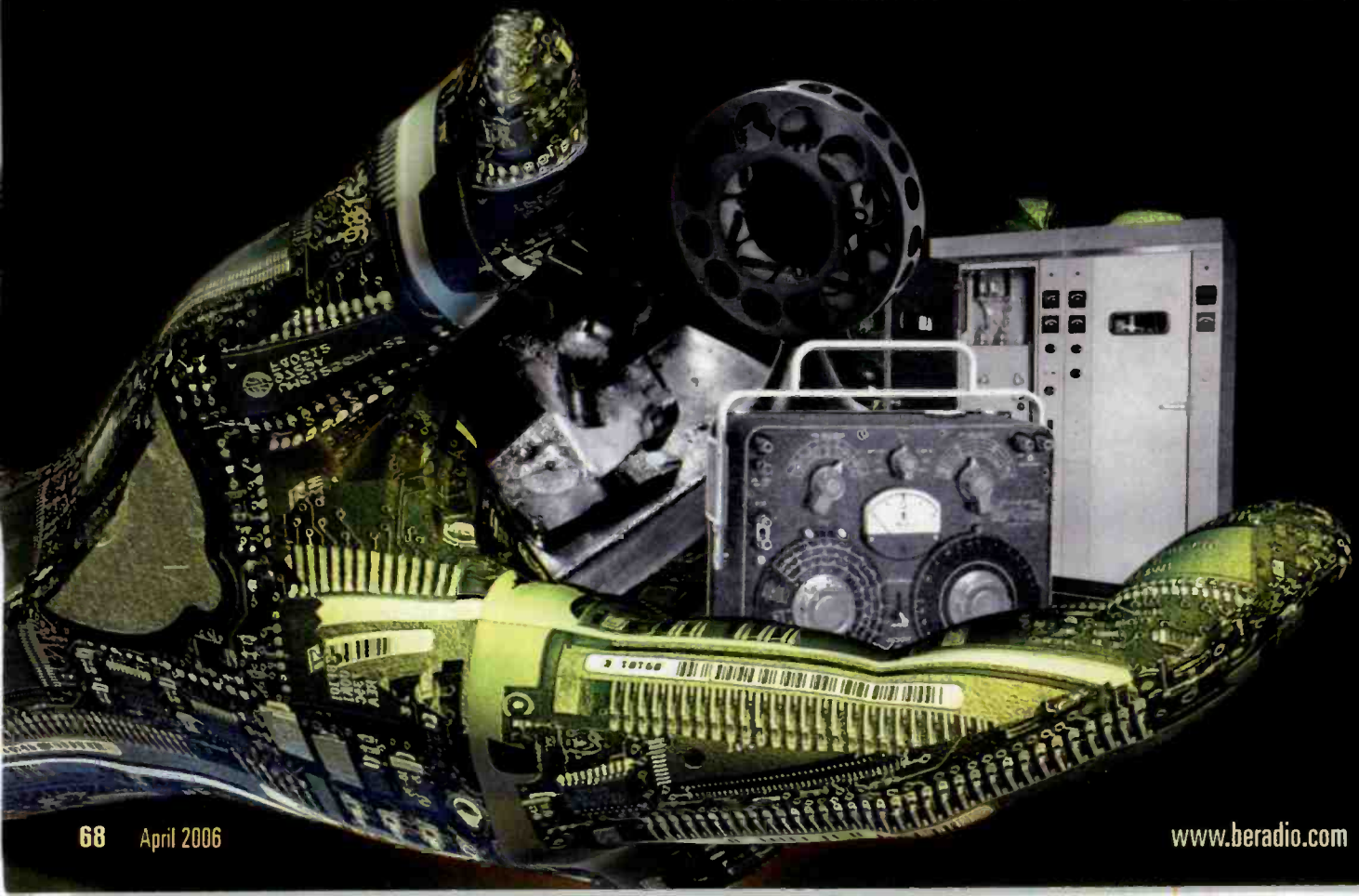
To celebrate radio's 100 years of audio transmission, *Radio* magazine is preparing a special tribute to the technology of radio broadcasting, and we want your help.

We will recognize the top 100 technology innovations that have influenced radio's evolution or are used in radio today. You can help us identify this technology.

Send your ideas to radio@prismb2b.com. While the name of the product or technology is the basic information, include as much information about your submission as you can. Submit complete products or general technologies. We'll create a list of all the ideas and have a panel of *Radio* magazine readers and contributors determine the final list.

We'll announce the results in the December issue—just in time to celebrate the 100th anniversary of Fessenden's accomplishment.

E-mail your ideas to radio@prismb2b.com by Aug. 1, 2006. Everyone who submits an idea will be entered into a drawing to win a *Radio* magazine t-shirt. Submit as many ideas as you like. It will also help us if you tell us why you think your idea should be recognized.



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New Products NAB2006

By Kari Taylor, senior associate editor

Antenna
Dielectric
NAB booth C2020

FMVee: The FMVee antenna offers useful characteristics for FM stations desiring the advantages of top mounting and combined-station operation. This antenna is designed for digital, analog or both types of service. With a full 20MHz bandwidth and power ratings for up to 10 Class C stations, this system is useful for multistation operation. For analog and digital services, this antenna provides a means of combining the signals at the antenna element level, eliminating the need for inefficient signal injecting or mid-level combining.

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www.dielectric.com; dcsales@dielectric.com

Speaker cable
Belden
NAB booth C1655

Brilliance Low Cap: The cable's performance gains are achieved through the use of high-conductivity, oxygen-free copper conductors that are void of impurities. The speaker cables are available with 10, 12, 14 or 16 AWG bare copper conductors and feature round, brightly colored and satin-finished PVC jackets. Distinctively colored jackets provide ascending/descending sequential markings at 2' intervals and print legends that incorporate location information and also facilitate accurate, streamlined installation.

800-BELDEN1; fax 765-983-5294
www.belden.com; info@belden.com

Exstreamer Gold
Barix Technology
NAB booth N1531

IP audio distribution: The Exstreamer Gold is an MP3 player that can pull digital audio from the network while converting it into music or voice. This device features a built-in amplifier and speaker output. The system communicates over a standard network connection with PCs, digital audio servers, Internet radio stations and analog audio sources using the Instreamer audio encoder. The unit offers audio synchronization technology built in to allow more than one unit to be installed. It is controlled using a standard Web browser or IR remote control (Barix accessory).

+41 43 43322 11; fax +41 44 2742849
www.barix.com; info@barix.com

Audio networking system
Harris
NAB booth C807

PR&E Vistamax Envoy: This system provides a way to achieve simple audio networking. It can be rack-mounted anywhere network inputs and outputs are required, including talk, on-air, production or news studio. Vistamax Envoy also is a way to expand inputs and outputs on an existing Vistamax system.

800-622-0022; fax 513-459-3890
www.broadcast.harris.com; broadcast@harris.com

Audio networking system
Audioarts Engineering
NAB booth N1815

AE-Net 8: Designed for small- to mid-market stations, the system connects as many as eight studios and operates autonomously with no external PC required other than for initial set-up and source naming. Once configured, the PC can be disconnected and the system will run stand-alone. Installation requires eight CAT-5 cables that interconnect eight studios. The router is capable of 44.1kHz, 48kHz or external sync operation.

252-638-7000; fax 252-635-48547
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Solid-state transmitter
Crown Broadcast
NAB booth N3912

FM10K: The Crown FM10K is a 10kW solid-state transmitter with features such as a wideband frequency range, a small footprint and a three-year warranty.

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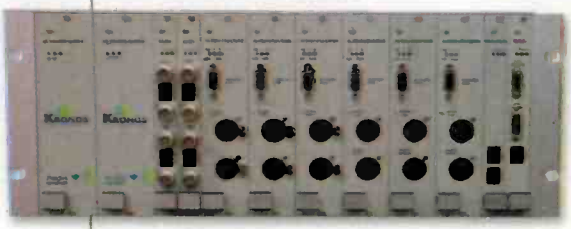
T1/E1 multiplexer
Kronos
NAB booth N4519



E1/T1 Multiplexer: This system transports voice channels, audio and data across 2.048Mb/s or 1.544Mb/s structured links, using time-division multiplexing (TDM). The multiplexer supports four E1 or T1 links. It is possible to drop and insert time slots across any of the connected T1 circuits. Audio coding options are J41, J42, J57, ISO MPEG Layer II, ISO MPEG 1/2 Layer III, G711 and G722.

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www.ataaudio.com; sales@ataaudio.com

Upgrades and Updates

Broadcast Electronics has added expanded functions to The Radio Experience with new studio applications for text generation and management as well as an RBDS generator and RBDS data receiver. (www.bdcast.com) ... **Firstcom Music** has released its 15 libraries in the Broadcast Wave file (BWF) format. More than 2,000 CDs containing about 40,000 compositions are included in this update. (www.firstcom.com) ... **Gepco** is now shipping its X-Band microphone cable. The flexible, high-bandwidth cable series has been designed for use in critical recording studio facilities or live sound venues. (www.gepco.com) ... **Audemat-Aztec** has received Ibiquity Digital certification on the Goldeneagle HD AM monitoring unit with a spectrum analyzer option. Audemat-Aztec received certification of its Goldeneagle HD FM in October 2005. (www.audemat-aztec.com) ... **Audio Design Associates** (ADA) has begun shipping several models of tuners with HD Radio reception capability, including multicast decoding. (www.ada-usa.com) ... **Vorsis** has added software enhancements to its GUI of the AP3. Users of the remote monitoring software now have the choice between two processing modes: production and air chain. (www.vorsis.com) ■

Portable CD recorder
Marantz
NAB booth N600

CDR632: This CD recording technology hosts sync (level-dependent) recording, and programmable auto fade-in and auto fade-out recording. Any CD-R recordable or CD-RW re-recordable disc media may be used for recording, and the system can playback unfinalized CD-R and CD-RW discs. Data and digital audio disc formats are supported for CD-R and CD-RW. MP3 playback is available from CDs, allowing for long playback times. There is a MP3 directory feature for easy navigation to the exact file the user wants to play. CD text display is supported, and CD text may be entered from the front panel. Features such as power-on play allow audio to begin playing back as soon as the unit is powered up. It offers four playback modes: continuous, shuffle, programmable and single-play. Stereo analog I/Os are provided, as are RCA and TOSlink digital I/O in S/PDIF format.

630-741-0330; fax 630-741-0652
www.d-mpro.com; info@d-mpro.com

Energy-Onix
Studio-to-transmitter link
NAB booth N3335

Telelink II: This link offers Linux-based hardware and software that permits broadcast quality STL over a reliable Internet or LAN connection. Service can be provided anywhere network access is available.

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Sonifex
A/D-D/A converter
NAB booth N4507

RB-ADDA2: A new version of the combined stereo RB-ADDA A/D-D/A converter, this system is 192kHz, 24-bit compatible. Features of this converter include an optical input and output, front-panel push-button controls and separate AES/EBU and word-clock synchronizing inputs so that the A/D and D/A sections can be used independently.

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Enco
Content adaptive processing
NAB booth N617, C2507F

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Middle Atlantic Products
NAB booth SL1181

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Analog, digital translator
Armstrong Transmitter
NAB booth N611

TRX-HD series: Designed to transition a translator station from analog-only broadcasting to digital, the TRX-HD receives an FM station's entire signal payload over the air, including its HD Radio digital component. The signal content is transferred to the TRX-HD transmit side for retransmission on the translator frequency. The TRX-HD10 provides 10W in the hybrid digital mode, the TRX-HD50 provides 50W hybrid digital, and the TRX-HD100 is a 100W hybrid digital translator. Higher hybrid power levels are achieved by adding an Armstrong solid-state amplifier.

315-673-1269; fax 315-673-9972
www.armstrongtx.com; sales@armstrongtx.com

Remote monitoring
Wit
NAB booth N3039

Easi-8: By connecting this Ethernet-based remote monitoring and control system to a LAN hub, concentrator or Ethernet switch, the system can be accessed from almost anywhere in the world. A unit will monitor eight inputs and each input can be individually set as metering (voltage monitoring) or status (binary). Multiple units can be tied together via the software control panel to monitor more than eight sources. Voltages from zero to 160V ac or dc can be measured and set to auto-ranging or user-defined at one, four, 16, 64 or 256V full scale. The ac frequency tolerance ranges from 20Hz to 400Hz.

801-326-1300; fax 801-553-9433
www.witinc.net; info@witinc.net

Router and console control surface
Sierra Automated Systems
NAB booth N907

Riolink-Rubicon: Riolink now operates stand-alone as a 32x32 router and mixer in conjunction with a Rubicon, Rubicon-SL or Rubi-T console control surface. Add a second Riolink for 32x32 audio I/O, analog and digital.

818-840-6749; fax 818-840-6751
www.sasaudio.com; sales@sasaudio.com

T1 and IP codec
Audio Processing Technology
NAB booth N1217

Worldnet Oslo Updates: New options for the Worldnet Oslo have been added for increased flexibility. An IP transport is now available in addition to the existing E1/T1 connection options. The Ethernet interface can also be used for WAN/LAN data transfer. A Quad Encoder and Decoder module that offers four simplex channels per card has been added. Using a Quad Simplex Card along with a duplex stereo card will provide a 5.1 transport method.

323-463-2963; fax 323-463-8878
www.aptx.com; aptmarketing@aptx.com

Signal processor
Vorsis
NAB booth N1815

HD P-3: This HD Radio multi-band processor features an interactive user interface that provides remote monitoring and control.

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

Dielectric Communications
Switchless combiner
NAB booth C2020

Opto-SXFM: Dielectric's Opto-SXFM combines the outputs of two transmitters operating at power levels up to 35kW, allowing for a total combined power level of 70kW. The Opto-SXFM allows switching between transmitters under power, eliminating the need for powering down to complete the switching process. The system uses a patented non-contacting coaxial phase-shifter design, providing a phase shift of at least 180° at three distinct shift positions.

207-655-4555; Fax 207-655-7120
www.dielectric.com; dcsales@dielectric.com

Audioarts Engineering IOC-16
Input/output center
NAB booth N1815

IOC-16: This audio routing and switching system switches 16x16 stereo signals per switcher. Inputs and outputs can be a combination of analog or digital signals, and it combines 24 logic ports with multiple I/O centers, which may be linked together though AE Net to build a 256x256 mixed signal matrix. The Audioarts I/O Center works with AE Net and Net 75 Panels.

252-638-7000; fax 252-635-48547
www.wheatstone.com; sales@wheatstone.com

Time reference for digital sync
Symetrix
NAB booth N2414

Lucid Genx192: Designed to fit in a variety of digital audio situations, this system provides a low jitter master clock reference in a variety of digital audio formats. It is capable of handling sampling frequencies up to 192kHz, and it features two operating modes that are accessed through the front-panel interface. A Sync Source knob allows

the operator to choose internal reference and distribution functions. In distribution mode, an external AES or word clock sync source fed into the device appears at each of the Genx192's 14 sync outputs. The unit also includes circuitry that examines the word clock connections and indicates, via a rear-panel LED, whether that particular connection is properly terminated.

425-787-3222; fax 425-787-3211
www.symetrixaudio.com; symetrix@symetrixaudio.com

Interface for IDI 20 importer

Broadcast Electronics

NAB booth N1808

Dashboard: A new Dashboard interface helps the company's IDI 20 data importer in encoding the HD Radio bitstream for HD2 multicasting. This importer includes a click-and-go startup feature that can be remotely accessed through a network or Internet connection. A default TCP/IP communication link between the IDI 20 and FSI 10 HD Radio signal generator is also part of the upgrade to improve system robustness and reduce network packet losses typical of earlier UDP communications.

217-224-9600; fax 217-224-9607

www.bdcast.com; bdcast@bdcast.com

Rugged optical connectors

Neutrik

NAB booth N3518

Opticalcon: The new system is based on a standard optical LC-Duplex connection, however, these connectors ensure a safe and rugged connection. It enables four copper wires to run power or data signals. A special SMPTE-version 1 has been optimized for broadcast applications, which provides an additional ground-shell contact. To create a simplified installation, the user can connect a conventional LC-Duplex connector on the rear, which causes the chassis connector to act as a feed-through. The cable connector comes pre-assembled with a choice of three mobile field cables, which can be ordered at almost any length.

732-901-9488; fax 732-901-9608

www.neutrik.com; info@neutrikusa.com

Breakout boxes

Digigram

NAB booth N1222

Bob8, Bob12: The Bob8 features four analog and digital stereo input connectors plus four analog and digital stereo output connectors. It works well with the PCX882HR, PCX881HR, VX882HR, VX881HR sound cards. The Bob12 features connectors for one analog and digital stereo input as well as six analog digital stereo outputs and is designed specifically to work with the PCX1222HR and PCX1221HR sound cards. Like Bob8, Bob12 offers four mounting configurations.

703-875-9100; fax 703-875-9161; www.digigram.com; input@digigram.com

Digital mic processor

Vorsis

NAB booth N1815

M-1: Part of the growing Vorsis family, this is a low-cost, digital mic processor that features an interactive user interface that provides remote monitoring and control.

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

Distribution amp

AEQ

NAB booth C6033

DA-26: This analog audio distribution amplifier feeds one input to 12 outputs or two inputs to six outputs in 1RU. Each output features its own level control and galvanic isolation in all inputs and outputs through audio transformers.

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

Control Freaks

SRC-8 III

The SRC-8 III is a computer interface to the real world. Connectio through an RS-232 or RS-422 serial port the SRC-8 III can notify your PC software program that any of 8 opto-isolated inputs have been opened or closed and allows your software to control eight SPDT, 1-amp relays. Communication with the SRC-8 III can be accomplished via short "burst" type ASCII or binary commands from your PC (computer mode). Also, two units can be operated in a standalone mode (master/slave mode) to form a "Relay extension cord," with 8-channels of control in each direction. The unit can communicate at data rates up to 38400. The SRC-8 III may be expanded to 32 inputs x 32 outputs.

SRC-32

The SRC-32 is a computer interface to the real world. Connection through an RS-232 or RS-422 serial port, the SRC-32 can notify your PC software program that any of 32-optically isolated inputs have been opened or closed and allows your software to control sixteen SPDT, 1-amp relays and an additional 16 open collector outputs. Communication with the SRC-32 can be accomplished via short burst type ASCII or binary commands from your PC (computer mode). Also, two units can be operated in a standalone mode (master/slave mode) to form a "Relay extension cord," with 32-channels of control in each direction. The unit can communicate at data rates up to 38400. The SRC-32 may be expanded to 128 inputs x 128 outputs.

ESS-1

The ESS-1 provides a cost-effective, small profile solution for standard serial-to-Ethernet connectivity. Designed with the broadcaster in mind, the ESS-1 is equipped with extensive RFI protection. It is ideal for applications requiring data support for both RS- 232 and RS-422 communications. The ESS-1 allows any device with a serial port, Ethernet connectivity and is ideal as a serial bridge/tunneling or applications where a COM port, TCP Socket, UDP Socket, or UDP Multicast functionality is needed. The small profile of the ESS-1 makes installation hassle-free.

AVR-8

The AVR-8 is a voice remote control system that automatically reports changes detected on any of its eight status inputs to a remote telephone and/or pager. After speaking a greeting message that may identify the source of the call, the AVR-8 then speaks a unique message for each status input. The user may customize each factory-recorded message. After reporting, the AVR-8 is ready to receive commands through your telephone keypad. Functions include telling the AVR-8 to report on the input state of any of the eight status inputs, commanding the AVR-8 to pulse any one of its four SPDT relays for 750 ms and/or turning any one of the relays on or off. When a relay command is given, the AVR-8 speaks the relay 'name' followed by the 'on' or 'off' message.

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SRC-2/SRC-2x

The tiny TOOLS SRC-2 interfaces two optically isolated inputs and two SPST relays to a RS-232 or USB port, while the SRC-2x does this via a 10/100baseT Ethernet port. Both the SRC-2 and SRC-2x can notify a user's PC software program that any of two optically isolated inputs have been opened or closed and allows your software to control two SPST, 1-amp relays. The SRC-2x is also able to send an email when either of the two inputs change state. The user may also add up to 48 ASCII strings per input and 16 user defined strings per relay. Communication with the SRC-2(x) is accomplished via short "burst" type ASCII commands from the user's PC. Also, two units may be operated in a standalone mode (master/slave mode) to form a "Relay extension cord," with two channels of control in each direction. The SRC-2 communicates using RS-232 at baud rates up to 9600 and the SRC-2x via 10/100baseT Ethernet. The SRC-2(x) is powered by a surge protected internal power supply. Either unit may be rack mounted on the optional RA-1 mounting shelf.

VAD-2

The tiny TOOLS VAD-2 is a user programmable two-input multi-number voice/pager auto dialer with integrated stereo silence sensor, designed for dial out paging and/or voice message notification. The VAD-2 is equipped with two dry contact inputs and stereo silence sensor, which when tripped, will sequentially dial a pager and/or up to four different phone numbers and play back a user recorded message corresponding to the tripped input. The VAD-2 also provides two SPST one amp relays for the control of external equipment.

Time Sync Plus

The tiny TOOLS Time Sync Plus provides four separate GPS time referenced outputs. The first is a SPST relay, which pulses at 12:00, 22:00, 42:00, 54:30 each hour and is user programmable in each of four locations for any minute and second each hour. The second output is an active high driver with a 100 ms pulse each second, while the third output is a 4800-baud, RS-232 serial port providing a time zone adjustable hours, minute and seconds time code. The forth output provides an active high driver in the ESE TC-90 serial time code format. Indicator LED's are provided to display power/valid GPS data, programming mode and time sync relay operation. A Garmin 12 Channel GPS receiver with embedded antenna is supplied.

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Armstrong Transmitters	72	315-673-1269	www.armstrongtx.com
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Audemat-Aztec	26, 43	305-249-3110	www.audemat-aztec.com
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Contributor Pro-file

Meet the professionals who write for Radio magazine.
This month: On Location, page 46.

Ken Nosé
Software Engineer
Audio Engineer
Los Angeles

Nosé's most recent work experience has been as a software development manager for a medical software company that specializes in applications for handheld computers. He has applied this skill as the developer of the *Radio* magazine FASTtrack for the PDA for the past four years.

He has also worked as a software engineer for audio manufacturers including Telos Systems and ADC Telecommunications. His broadcast work includes more than 10 years of working on the live music show Live From Cleveland, OH, on WRUW-FM.

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Written by radio professionals
Written for radio professionals

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Sign Off

By Kari Taylor, senior associate editor

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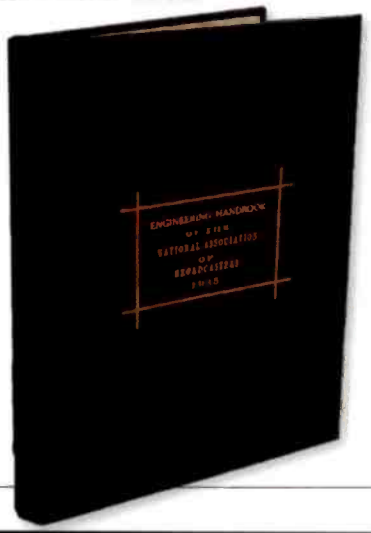
That was then



The first edition of the *NAB Broadcast Engineering Handbook* was printed in 1935 and included nine sections covering topics such as Rolph's Graphs for ground wave propagation, transmission lines and the FCC Empirical Standards and Rules and Regulations. The tenth edition of the handbook, being published this year, discusses more than 80 topics from safety, to towers, to standards and practices. Other obvious recent differences are the inclusion of TV, and more recently, Internet/streaming technologies.

The original handbook was prepared by one person, James C. McNary. Today, the handbook requires a team of three section editors, one editor-in-chief and contributions from more than 60 industry experts.

Sample and Hold

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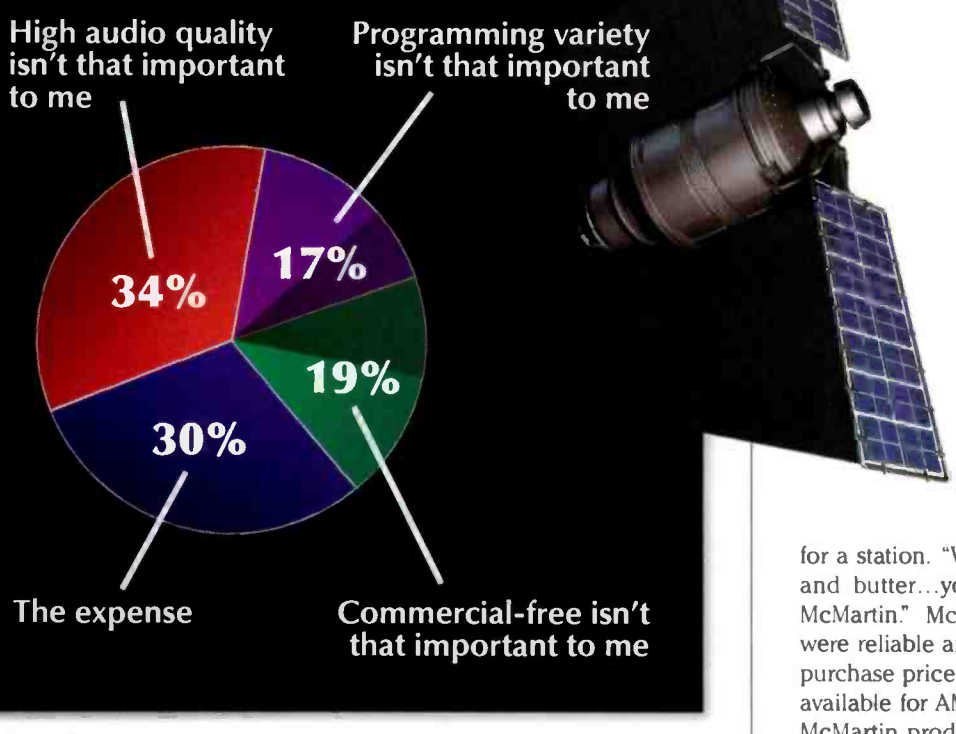
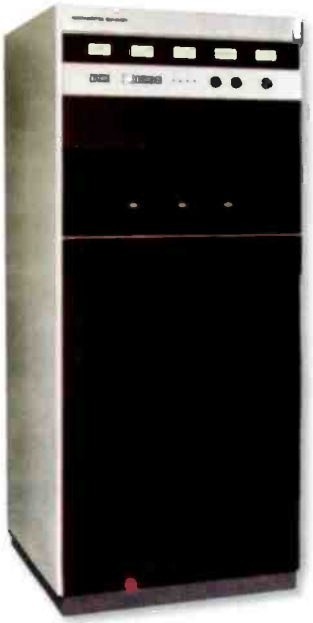


Source: Bridge Ratings Industry Study: Satellite Radio Appeal, March 2006.

Do you remember?



In a 1976 ad for its BA-2.5K transmitter, McMartin Industries touted it as nourishment for a station. "When your signal is your bread and butter...your transmitter had better be McMartin." McMartin claimed its transmitters were reliable and easy to maintain with a low purchase price. A wide range of models were available for AM and FM power levels. All the McMartin products were easily recognized by the omnipresent woodgrain panel.

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