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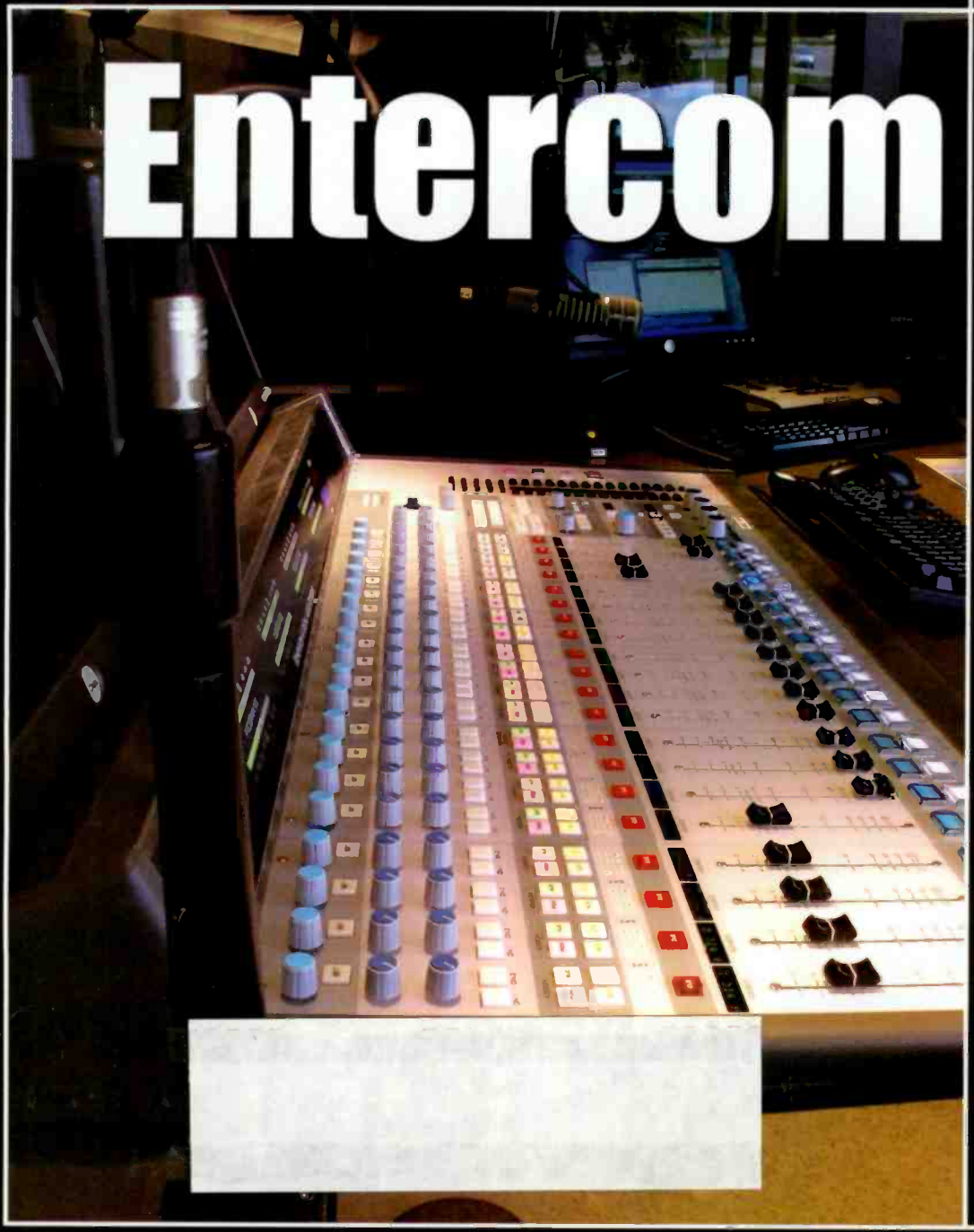

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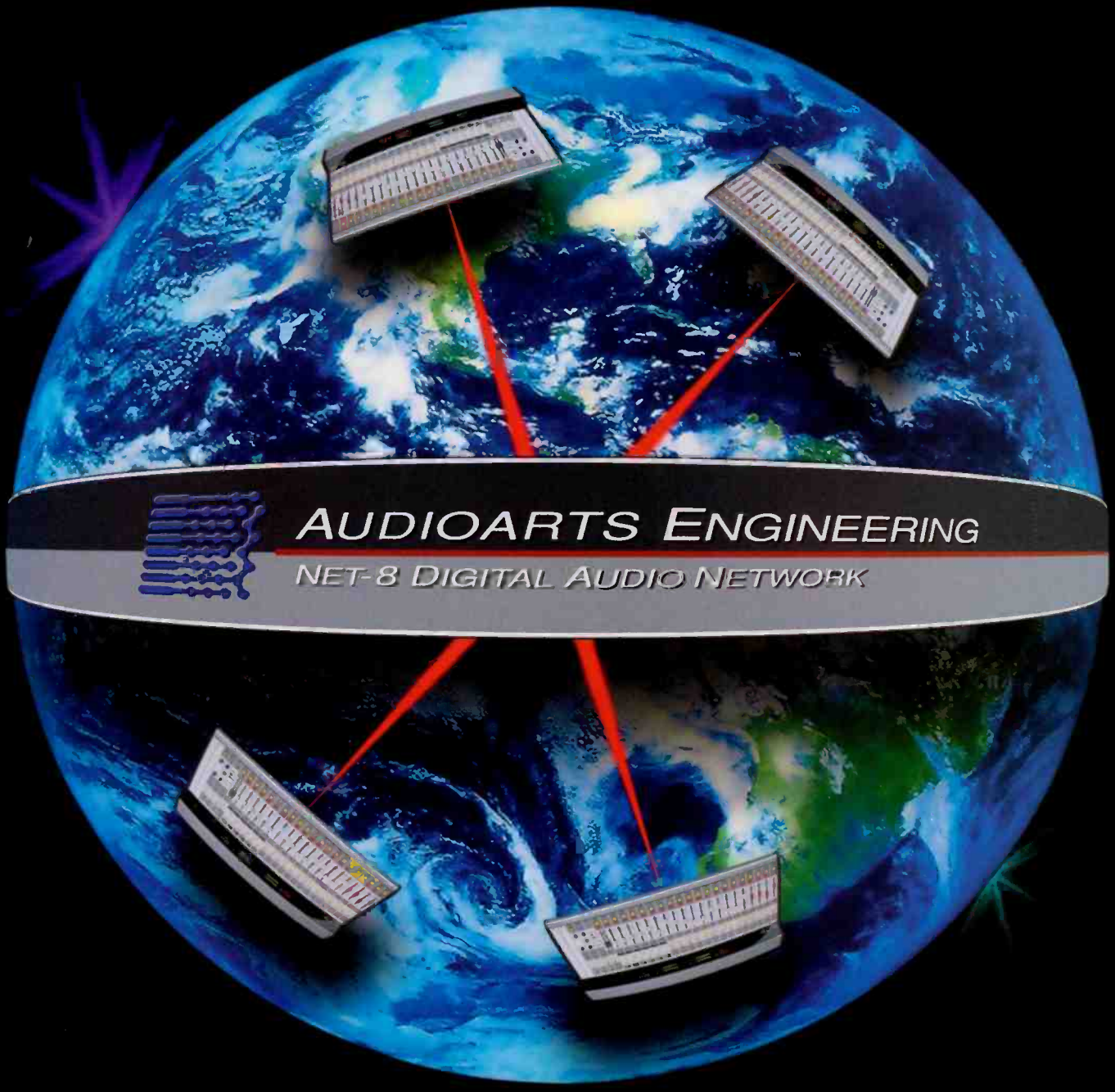

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ON THE COVER

A process not without its interruptions and delays, the Entercom Kansas City rebuild has resulted in a top-notch facility for eight radio stations. Cover design by Michael J. Knust.

Wireless Broadband Internet Remotes

"The first time out with the Tieline was a brilliantly simple experience for everyone involved. For lack of a better phrase, the codec just worked."

- **Christian Vang**
  Chief Engineer
  Clear Channel St. Louis

"The codecs sounded great. My management was very, very impressed with the demos"

- **Grady Jeffreys,**
  Technical Manager,
  Mackay Communications

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

- **Mike Rabey**
  Chief Engineer
  Entercom Indianapolis

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Currents Online

Selected headlines from the past month.

25-Seven Systems Becomes Axia Partner

25-Seven Systems will introduce Livewire compatibility for its Audio Time Manager time compression processor at NAB2007.

Day Sequerra M4.2R

Day Sequerra Sells 1,000th HD Radio Monitor

The unit was sold to Vermont Public Radio (VPR) in Burlington, VT, who ordered the new Model M4.2R.

Will-Burt Acquires AMI

Antenna Mast Incorporated (AMI) specializes in the design and manufacture of portable, multi-use telescoping mast systems. AMI will be integrated into the Mast Division of Will-Burt.

Continental Names Philips as Broadcast Product Line Manager

Norman Philips brings his 35 years of radio experience to Continental. Phillips served as VP and director of engineering for Susquehanna Radio until the company was purchased by Cumulus Media Partners in 2006.

DRE, TCL Ally to Manufacture FM Extra Receivers

Chinese consumer electronic products manufacturer TCL and Digital Radio Express (DRE) have formed a strategic alliance to manufacture products that use DRE's FM Extra technology.

Snover Named VP of Wirecad

Paul Snover has joined Wirecad as vice president of sales and marketing. Snover's experience includes work as a system designer, integrator and entrepreneur.

Axia Updates IP-Audio Driver

New features in Version 2.4.7.3 include an added audio recording path through the Windows Mixer for easier recording of local audio streams and reordered stream identifiers for easier configuration.

Site Features

FASTtrack for PDA

The *Radio* magazine FASTtrack, a categorical listing of the exhibitors at NAB2007, is available for your PDA. Download your copy and carry it with you during the show.

Radio magazine Podcasts

Listen to in-depth analysis of important topics with the *Radio* magazine podcasts. New podcasts are being created weekly, so check it out!

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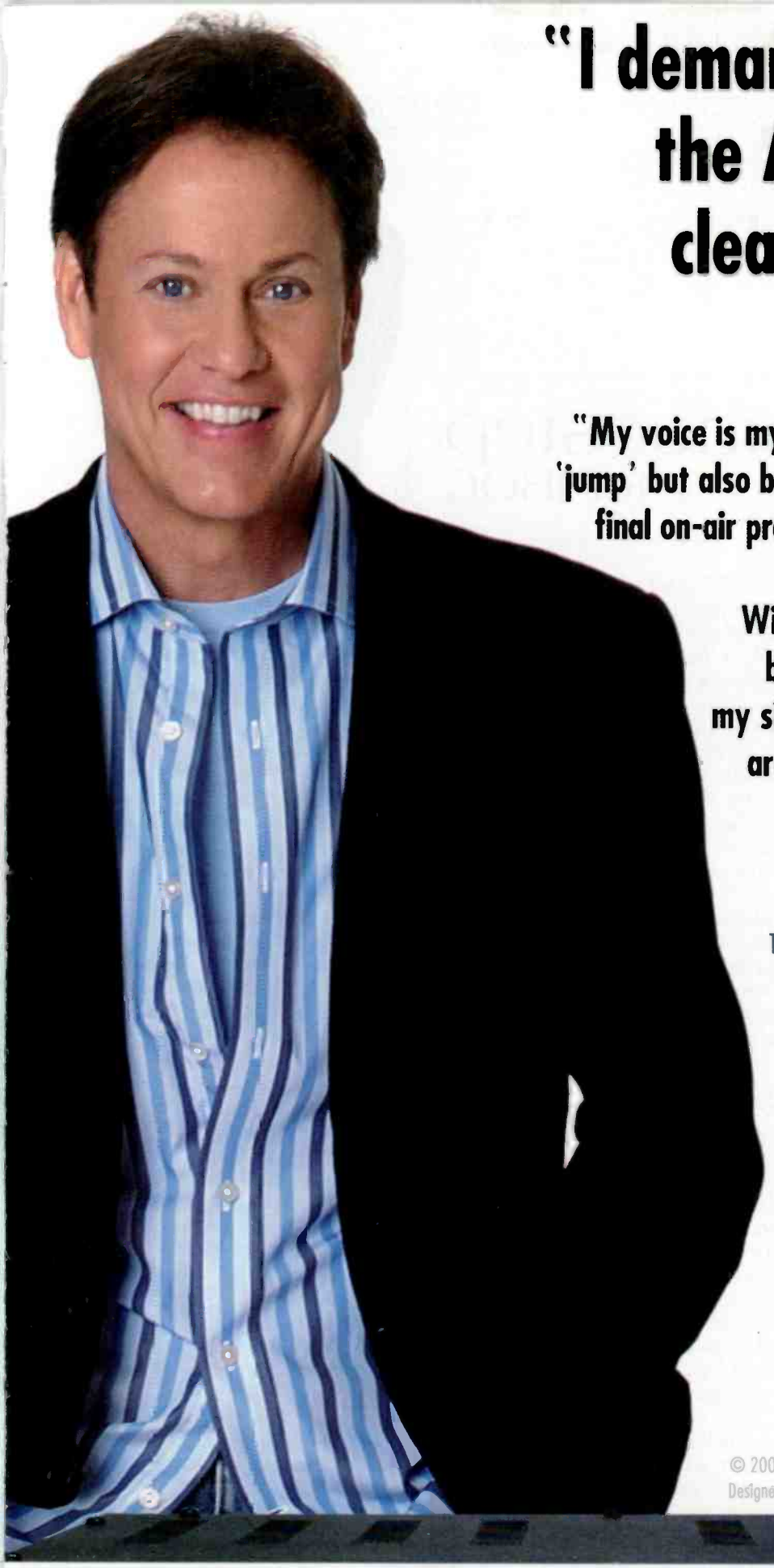
Industry Events

The *Radio* magazine Industry Events section lists upcoming conventions and conferences.



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Another step for IBOC

In an open agenda meeting on March 22, the FCC voted to accept the Second Report and Order, First Order on Reconsideration, and Second Further Notice of Proposed Rulemaking that are all part of the MM Docket No. 99-325, which are included in the Digital Audio Broadcasting Systems and Their Impact on the Terrestrial Radio Broadcast Service proceeding. (That's a mouthful.) This is the latest event in the ongoing proceedings relating to the IBOC digital radio transmission system, better known as HD Radio.

The issue had been delayed for a vote for several months, and opponents and proponents alike were eagerly anticipating the outcome, which can easily be called a victory for the HD Radio proponents. The most significant change is that AM stations are now authorized to transmit HD Radio signals at night. The cheers for and the jeers against this are equally loud.

Allowing digital AM transmissions at night puts the AM roll-out on track with the FM now. While simply allowing nighttime use doesn't correct the known challenges that exist, it will allow an easier means to evaluate the situation and perhaps determine a better solution during the hybrid operating phase.

Other elements of the ruling don't provide such sweeping changes in the system, but rather streamline some processes. For example, FM stations can now multicast without obtaining prior FCC authority, FM stations are permitted to use separate analog and digital antennas without applying for special temporary authority, and FM stations are allowed to operate in the extended hybrid mode. The ruling also allows IBOC transmissions on FM translators, FM boosters and LPFM stations.

Other aspects of the ruling answer some long-standing questions. For instance, multicast streams must observe the same EAS, station ID, sponsor ID and political broadcasting rules as the main channel streams.

There were several points that were not addressed in the ruling, and many of them were the subjects of commissioner's comments during the meeting. With localism, and diversity of voices and public interest being such an omnipresent effort by the commission, many broadcasters anticipated specific rules to mandate stations to provide community-interest programming on the multicast streams.

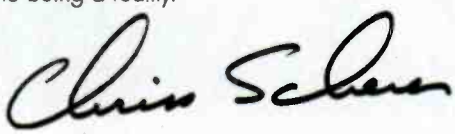
Commissioners Adelstein and Copps referred to this in their dissenting-in-part comments. Commissioner Copps even posed a question in his comments: If a station can multicast, does a licensee really need to own eight stations in a market? Commissioners Taylor-Tate and McDowell and Chairman Martin believe that licensees will do the right thing and use the additional streams to provide public interest programming on their own without being forced to do so.

There is also no mention of digital recording and redistribution of an IBOC stream. While this was mentioned, it was not included in the ruling because this issue is already being heavily debated in other arenas. There is also no specific timeline for stations to commence IBOC transmissions or to cease analog transmissions. This is being left to the market to decide.

The ruling also defers a decision on digital radio standards already approved by the National Radio Systems Committee until a later date.

So what does all this mean? In short, it means that HD Radio has taken another step forward to becoming *the* system for the United States. It's still not the singular standard—and I doubt that the commission will ever take that definitive step unless every station transmits an HD Radio signal—but it is the FCC-preferred system.

The commission stopped short of answering some heavy questions about digital radio service, but the heavy questions don't have easy answers. By deferring these questions for now and further authorizing IBOC, the commission has brought a ubiquitous digital radio standard a little closer to being a reality.



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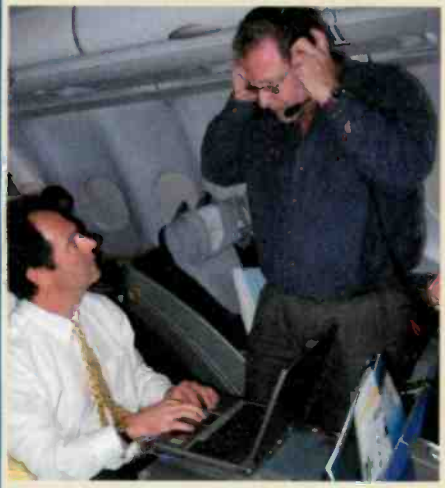

... successfully aired his three hour talk show from a commercial airplane [using ACCESS] at 37,000 feet on a regularly scheduled flight between Frankfurt, Germany and New York, US.

Peter Greenberg---Host of the syndicated radio program Travel Today

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

Radio Free Asia—Live from the Himalayas

"The results [with ACCESS] were especially reliable considering that Dharamsala has one of most "problematic" Internet infrastructures that we have come across."
— David Baden, Chief Technology Officer Radio Free Asia

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Ski Mountain Remote

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

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JAMN 94.5—Walk for Hunger

"ACCESS was used on the air exclusively for JAMN945 at this one. It was all over EVDO with a tremendous amount of active cell phones in the area. The ACCESS was connected to the Verizon wireless Broadband...

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Radio via Wimax

By Kevin McNamara, CNE

Occasionally there is the promise of a new technology that guarantees to change the way we do business or perhaps even change our lives. Consider what we did before the cell phone became popular or, for those in my age bracket, before we had hundreds of TV channels instead of just three. We are getting ready to witness another such event with the introduction of a wireless standard called the Worldwide Interoperability for Microwave Access, also known as Wimax, also known as IEEE 802.16x.

The previous standard, 802.16d-2004, provided Wimax as fixed point-to-point systems. The standard was expanded in 2005, with the current 802.16e-2005, adding operation in non line-of-sight applications, such as mobile applications.

Wimax provides a wide range of wireless connectivity options that might soon replace more well known standards such as Wi-fi, and third generation wireless telephony technologies such as GSM or UMTS. The data throughput of Wimax will vary with the amount of bandwidth available and can operate with delivery systems that work in as little as 1MHz or over 50MHz of bandwidth. However, even systems operating with different delivery platforms will still be compatable, which is perhaps the biggest advantage of Wimax.

It is not unusual for technologies to evolve and improve with the availability of new hardware, but what makes Wimax particularly interesting is that it will become the delivery method of choice for the advanced wireless services (AWS) that are in the beginning stages of deployment in the United States.

How could this affect traditional broadcasting? In the same vein that satellite radio has become an alternative delivery medium for programming, thus creating a new competitor in essence, the AWS could form a nearly perfect delivery platform that can provide a wide range of audio, video, data and telephony services. Investment insiders call this capability the Triple Play or Quadruple Play, which explains the price being paid for the FCC licenses recently auctioned.

Communication advantage

Unlike terrestrial or satellite broadcasting, Wimax provides a true two-way platform that not only has the capability of fixed broadcasting to a particular market, but will also provide fully bi-directional access from subscribers from fixed and mobile locations.

Another reason for the predicted success of the Wimax platform is in a networking protocol called IMS or the IP Multimedia Subsystems. The basic concept of IMS is that an IP-based platform can access a wide range of dissimilar networks such as Wi-fi, DSL, cellular, voice over IP and Internet Protocol TV.

Once the services are deployed subscribers will need the appropriate customer premise equipment (CPE), similar to a cable TV decoder. That interface will likely serve every communication need the average household uses: telephone, Internet access, video and audio services. Sounds pretty good, right? That the same service also can provide the same services in a mobile environment, like a cell phone on steroids. Imagine having all of the services you enjoy at home in the car.

Wimax is not only for the home, it can also provide high-speed data services to businesses. The nature of the technology makes it a perfect solution for the last-mile problem, where traditional wired services can be provided within a short distance of a subscriber, but there are inadequate facilities to deliver directly to a residence or business.

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Wimax vs. Wi-fi

The differences between Wimax and Wi-fi are significant. Data throughput for Wi-fi has improved significantly during the past few years from 2Mb/s to the current 54Mb/s and provides a range of about 300 feet; by contrast, Wimax data throughputs exceed 75Mb/s at a range of about six miles. The range that Wimax can operate is predicated by its frequency of operation, height and antenna configuration; however, in practice, Wimax will be deployed similarly to that of a cellular mobile telephone network, where a number of sites are placed within a metro area to fill the entire market. The sites will also hand off to each other, thus providing a seamless user experience to mobile customers.

Fixed applications

Wimax is also a natural replacement for any service that is currently supplied by a wired medium such as telephone and cable, in effect bypassing the local cable or public switched network. Wimax networks will be designed similar to traditional cellular networks, using several nodes that will cover a desired footprint. Each node is fully meshed with surrounding nodes. This mesh concept provides a higher level of availability or reliability than most current systems. Consider a business that needs to connect two separate buildings with a high-bandwidth connection. If a Wimax network covers these buildings, it would be a simple matter of adding the CPE and creating the appropriate IP port.

Mobile applications

Current mobile telephony technologies provide poor to adequate data services. The third generation technologies, including UMTS, CDMA2000 and EVDO, have greatly improved throughput and reliability, but it is in the fourth generation of mobile technologies where Wimax will be implemented. All of the cellular carriers have entered into agreements with equipment suppliers to provide Wimax equipment, including Wimax-enabled phones, which are currently available in Europe and Asia, and in the United States by the end of the year. Sprint is upgrading its network with Wimax capabilities in a few markets; other carriers will soon follow suit.

Terrestrial and satellite broadcasters will feel the impact of this emerging technology within the next few years. In past articles, I have made a point that terrestrial broadcasters better start looking at their properties as platforms rather than a source of programming. They have a unique advantage of having coverage footprints that provide signals throughout most of the country. While IBOC might provide some audible parity with other digital mediums, broadcast operators need to begin to find ways of leveraging that coverage in ways that will adapt with future technologies.

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

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LPFM and FM translators given new latitude

By Harry Martin

Recently, the FCC has gone well beyond its rules in allowing a pirate FM station to operate an LPFM station legally under a special temporary authorization (STA). It did so by authorizing the assignment of what the rules say is unassignable—namely, an LPFM station—to an entirely new entity. In addition, in apparent anticipation of a rulemaking covering this subject matter, the FCC permitted at least a few AM stations to use FM translators to overcome signal deficiency problems.

Pirate operator legalized. In June 2006 the FCC began proceedings to shut down a pirate FM station in Goldfield, NV. The pirate operator, faced with enforcement action, went off the air. But in December, the pirate filed a request for an STA. The "mission statement" included in the STA request said the station's purpose, if approved, would be to promote the Goldfield area's history, which the applicant said was nationally significant, and to warn the local population of the dangers of fires and floods. The applicant also said it would provide information about road conditions, local law enforcement, school activities and programming geared to the area's elderly.

The STA was granted a month later in spite of an FCC rule (Section 73.854) that denies eligibility for LPFM authorizations to anyone who "has engaged in any manner... in the unlicensed operation of any station" in violation of the Communications Act. Here, the applicant had been engaged, at least until getting caught, in just such an unlicensed operation. What got the STA approved was a supportive letter to the FCC from Senate Majority Leader Harry Reid (D-NV).

This case has caused considerable criticism of the FCC, needless to say. The commission has always been subject to political influence—as an agency created and funded by Congress, this is to be expected—but a blatant rule override to accommodate a politically connected illegal operator is discouraging to the honest broadcasters, particularly those who operate LPFM stations, who take the rules seriously and, in return, expect the FCC to do so as well.

LPFM transfer approved. The FCC has been granting transfer and assignment applications for LPFM stations even though Section 73.865 of the rules prohibits such transactions. Under a waiver policy developed by the Audio Division, transfers or assignments to new owners now may be approved if three conditions are met: (1) there is no profit being realized (2) the buyer is a local entity and (3) the buyer has no other broadcast interests, including no other LPFMs and no FM translators. In a recent decision the FCC extended its waiver policy to allow the assignment of even unbuilt construction permits.

AM stations get FM translators. After intervention by Congressman John Spratt (D-SC), chairman of the House Banking Committee, station WRHI, Rock Hill, SC, was recently granted authority to broadcast its signal on an FM translator. In apparent anticipation of the rulemaking being promoted by the NAB, the FCC has granted at least one other such waiver in recent weeks.

Dateline

Radio stations in Arizona, Idaho, New Mexico, Nevada, Utah and Wyoming must file their biennial ownership reports by June 1.

Also by June 1, radio stations in the following states must place their annual EEO reports in their public files and post them on their websites: Arizona, DC, Idaho, New Mexico, Maryland, Michigan, Nevada, Ohio, Utah, Virginia, West Virginia and Wyoming.

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

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Alternate

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Since radio first started broadcasting, the way we reached our listeners was over the air. We put audio into an RF transmitter and served the audience; it was that simple. Today, however, radio faces challenges from new technologies that are eroding the traditional radio audience. During the past year reports have been released by Arbitron, Edison Media Research and Bridge Ratings that show listenership and TSL

by Jeff Smith CEA, CBNT

channels

ial transmission

among younger radio listeners is sl pping at an alarming rate. One Edison Medi a Research study showed TSL among 18 to 24-year-olds has gone down by 24 percent since 1993. Yet, in the UK some of the latest RAJAR data shows that radio listenership 's on the rise with more than 45 million listeners or 90 percent of the population. What is working for the British broadcasters that we are not doing here?

Alternate Channels

The simple answer may be that they have adopted a platform-neutral philosophy. They are using nontraditional delivery methods to deliver their product to the listener. Concepts like Internet radio, Wi-fi, podcasting and even cell phone listening are drawing listeners that otherwise would not be there.

Internet

Streaming audio over the Internet has been around for several years but in the past few years it has seen a huge gain in listenership. One of the driving forces behind this surge is the availability of high-speed Internet access. Speeds that enable high quality audio streams are now available with cable modems, DSL and even residential fiber-optic service. These speeds allow Internet streams to deliver quality audio and other features our audience wants. Today radio stations can deliver artist and title information, the ability to purchase the song, unique advertising and graphics via the Internet. The other benefit the Internet affords broadcasters is the ability to add additional channels without the cost associated with HD Radio multicasting. It is easier than ever for broadcasters to add channels that narrowcast, meaning they offer variants of the main program or something totally different.

Internet radios, such as these from Solutions Radio and Soku, are making their way into common use.

Podcasting

The Internet also allows broadcasters to offer something new for radio: podcasts. Podcasts allow broadcasters to deliver a product that a listener can take with them on their portable media player. The technology for this is relatively new but has great potential. A broadcaster can post updates as often as wanted to these digital media files. Then, using a format know as RSS or another know as ATOM, let the world know that the file has been updated. RSS and ATOM are formats known as "feeds" that provide information such as publish date, titles and accompanying text descriptions of the audio. A consumer uses a type of software known as an aggregator to subscribe to and manage their feeds. Aggregator features are even built into websites like Google and Yahoo.

A podcast-specific aggregator is usually always on. It starts when the computer is started and runs in the background. It manages a set of feed Uniform Resource Identifier (URIs) added by the user and downloads each at a specified interval, such as every two hours. If the feed data has substantively changed from when it was previously checked the program determines the location of the most recent item and automatically downloads it to the user's computer. It is estimated that 20 percent of podcasts are actually consumed on portable media players while 80 percent are consumed on the PC onto which they are downloaded, or deleted from the PC without being listened to. Many applications also automatically transfer the newly downloaded episodes available to a user's portable media player. The downloaded files can then be played, replayed or archived as with any other computer file or stored to a portable media player.

Wi-fi

Another exciting alternative for radio, along the lines of high-speed wired Internet access, is Wi-fi (IEEE 802.11x) hot spots. These hot spots, which enable wireless high speed Internet connectivity, are often found at restaurants, train stations, airports, libraries, coffee shops, bookstores, gas stations, department stores, supermarkets and other public places. Many universities and schools also have wireless networks on their campus', not to mention individuals who are using Wi-fi at home. With these hot spots becoming so readily available it is yet another way for broadcasters to deliver compelling programming wirelessly. Wi-fi radios are becoming more readily available today. They are manufactured as tabletop and portable devices that look like traditional radios, but instead of just offering AM and FM they also receive Internet radio. Users can also listen to Internet streams and download podcasts using their Wi-fi-enabled laptops and PDAs.

Mobile phones

Another delivery method for audio that is not traditional but many people believe will outpace any other technology today is streaming audio over 3G-enabled mobile phones. Many companies today, including Orban, are making codecs that allow broadcasters to send a

continued on page 35

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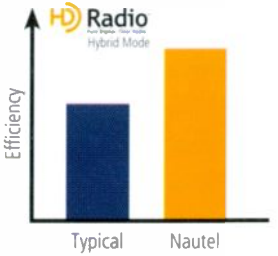

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a practical guide to IP audio networking

the essential introduction to audio over IP brought to you by APT

Introduction & Contents

Over the last number of years, APT have gained extensive experience in the field of audio over IP networking. We have supported many customers through the transition from synchronous to IP and worked hard in standards bodies within the industry to ensure interoperability of audio codecs over IP networks. Now, with the help of this booklet, we would like to share our knowledge and experience with you.

This practical guide provides background information on IP networks, their implications for real-time audio transfer and recommendations for those specifying both networks and equipment for audio over IP broadcasting. We trust you will find the information beneficial and will feel free to get in touch with any further questions you might have.

Table of Contents

From Synchronous to IP

The stalwart of the broadcast industry for many years, synchronous networks have been considered the industry standard for audio transport worldwide. Balanced analog copper circuits, microwave and synchronous based systems such as V.35/X.21 or T1/E1 have been the traditional choice for studio transmitter and inter-studio links in professional audio broadcast networks. Readily available from all major service providers, the popularity of synchronous links has been largely due to the fact that they offer dedicated, reliable, point-to-point and bi-directional communication at guaranteed data rates.

However, the reign of synchronous links as the preferred choice for STLs is currently coming under threat from a new challenger in the form of IP based network technology. While IP technology does have some disadvantages for audio transport, the benefits over existing synchronous networks are increasingly proving too persuasive for broadcasters to ignore:

- **Cost** - IP links are generally much cheaper to install and operate
- **Greater Flexibility** -in contrast to finite bandwidth limits of synchronous networks (i.e. T1 (1.5Mbits) or E1 (2Mbits)
- **Greater scalability** - the incremental cost of adding bandwidth is much lower with IP networks
- **Widespread availability** - IP networks are generally available from all Service Providers
- **Network Efficiency** - IP networks can offer flexible multipoint configurations
- **Resource Efficiency** - Use of IP for audio enables consolidation of Engineering and IT skills

It is clear to see that the use of IP networks for audio delivery enables broadcasters both to leverage their existing infrastructure and achieve greater flexibility in terms of content sharing and network configuration. It also provides them with a scalable platform for future development in areas such as HD-Radio, data services etc..

However, despite the scalability cost-efficiency and flexibility of IP networks, packetized audio transport is not a perfect solution and broadcasters must take care that the quality of their audio and reliability of their audio delivery is not sacrificed in the interest of cost savings.

This booklet provides an overview of the most important issues that broadcasters need to consider before embarking upon IP migration. The issues are certainly not insurmountable and, if correctly and intelligently implemented, IP audio networking can have a significantly positive impact on a radio station's efficiency and output.

IP Network Considerations

IP networks were designed to transport non-time sensitive data from point A to point B within an acceptable timeframe. Should data get lost or delayed, files can be re-sent and webpages refreshed. However, this is not possible in a broadcast environment where reliable, real-time audio transport is an imperative. Therefore, the inherent characteristics of packetized networks must be identified and managed in order to deliver successful audio broadcasts over IP.

Network Selection

The main prerequisite for any network is that it should be of sufficient quality to support the uninterrupted flow of packets from the sender to the receiver. This implies a certain level of service with regards to maximum number of packets lost, maximum latency etc... and means that audio over IP for broadcast quality applications cannot be achieved on unmanaged networks such as the Open Internet, contentious ADSL links or contentious WANs or LANs. Without QoS (Quality of Service) or other traffic priority mechanisms, a broadcaster will have no control over IP network conditions and therefore no control over the quality of the audio emanating from that network.

However, dedicated links, links that provide a guaranteed Quality of Service or links which provide a low contention ratio (10:1 or less) are much better suited to professional audio broadcasting and will yield much better results - these tend to be based on SDSL connections rather than ADSL.

Transmission Protocol Selection

It is important to understand how the audio data is actually carried within an IP infrastructure. The digitized audio stream is assembled into packets of audio information for transmission over a network. This is achieved using Real-time Transport Protocol (RTP) which attaches a timestamp and sequence number to each audio packet. The receiving end will then use this information to re-assemble the packets in order and play them out it the original sequence. It will also alert the destination to missing or out of sequence packets.

TCP or UDP?

The RTP packet is further enclosed inside a Transmission Control Protocol (TCP) or User Datagram Protocol (UDP) packet. There is a common mistaken assumption when broadcasters first broach the subject of audio over IP that TCP will be the most appropriate protocol. However, as a connection-oriented protocol, TCP dictates that the receiving end must acknowledge receipt of every packet sent. Should a packet be dropped, this protocol will cause the sender to repeatedly and fruitlessly request an acknowledgment from the receiver producing unwanted data peaks on the link. These peaks will deplete available bandwidth, cause audio glitches and create unacceptable delays.

As a connectionless protocol, UDP employs a "send and forget" strategy with no acknowledgement required making it much more suited to real time audio applications. As the protocol is fairly lightweight, it also creates less overhead and processing delay on the link. Although offering little in the way of payload protection or guaranteed delivery, UDP is generally reliable in practice. Ethernet itself has some built-in error recovery (CRC) and it is unusual, though not unheard of, for an Ethernet datagram to be lost or corrupted. UDP is thus the preferred transport protocol for audio over IP but care should be taken to ensure that quality of service on the link is maintained at a high level.

SIP

Typically IP codecs are connected together over a private LAN or dedicated WAN. When this is not possible (e.g. when negotiating firewalls), then a signalling protocol must be employed to make the connection. While several protocols are available, the most useful and widely used is SIP.

SIP is a signaling protocol for creating, modifying, and terminating sessions with one or more participants. A lightweight protocol with only six messages, SIP minimizes complexity and is also transport-independent so it can be used with both UDP and TCP.

As SIP is a peer-to-peer protocol it is possible for clients to connect directly with each other using the concept of client (audio codec) and server (computer system used to route SIP calls). Larger systems will require the use of proxy servers to forward SIP calls towards the intended destination (see diagram below) and registrar servers which are essentially databases of SIP clients.

SIP acts as a carrier for the Session Description Protocol (SDP), which describes the media content of the session, e.g. what IP ports to use, the algorithm being used etc. Once the connections have been made, SIP endpoints simply exchange media streams - typically using RTP over UDP .

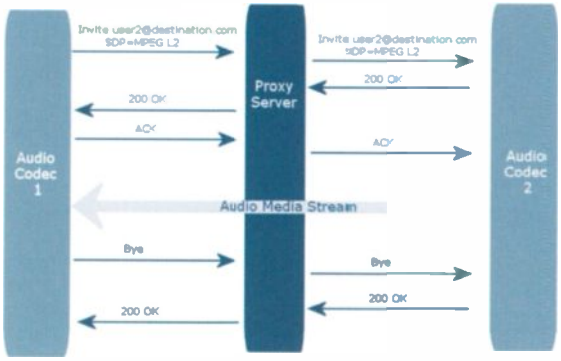


Figure 1: A Typical SIP Session for Audio Transfer

Specifying Network Bandwidth and Packet Size

The choices made with regard to audio settings (e.g. algorithm, mode, sample rate etc.) will define the data bandwidth required to transport encoded audio over the IP network. For synchronous connections this actually equates to the bandwidth required to transport the compressed audio but in IP we must add an overhead that is required to packetize the audio data.

Encapsulation into an IP packet adds Ethernet header bytes containing information related to the routing of the packet along the IP Network, as well as header bytes for UDP and RTP. The packet information is examined by the routers and switches which constitute the routing intelligence on the network and take decisions as to how, when and where to route each packet.

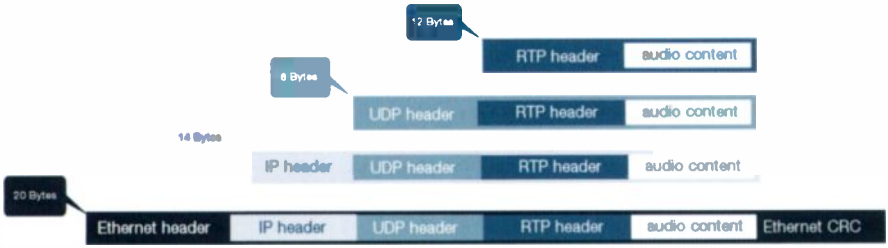


Figure 2: How an IP packet is constructed

The packet headers containing this data must be included in every packet that originates from an IP device on an IP network. Hence, there is a correlation between packet size and bandwidth requirement. The table below details the IP data rate for audio transportation against corresponding synchronous data rate.

Audio Data Rate	Audio Packet Size (bytes)	IP Packet Size (bytes)	IP Packets/ sec	Packetization Delay (ms)	IP Data Rate
64 kbps	128	194	62.5	16	97 kbps
64 kbps	256	322	31.25	32	80.5 kbps
64 kbps	512	578	15.625	64	72.3 kbps
64 kbps	1280	1346	6.25	160	67.3 kbps
128 kbps	128	194	125	8	194 kbps
128 kbps	256	322	62.5	16	161 kbps
128 kbps	512	578	31.25	32	144.5 kbps
128 kbps	1280	1346	12.5	80	134.6 kbps
256 kbps	128	194	250	4	388 kbps
256 kbps	256	322	125	8	322 kbps
256 kbps	512	578	62.5	16	289 kbps
256 kbps	1280	1346	25	40	269.2 kbps
384 kbps	128	194	375	2.7	582 kbps
384 kbps	256	322	187.5	5.3	483 kbps
384 kbps	512	578	93.75	10.7	433.5 kbps
384 kbps	1280	1346	37.5	26.7	403.8 kbps
576 kbps	128	194	562.5	1.8	873 kbps
576 kbps	256	322	281.25	3.6	724.5 kbps
576 kbps	512	578	140.625	7.1	650.3 kbps
576 kbps	1280	1346	56.25	17.8	605.7 kbps

Figure 3: Table Showing relationship between IP Bandwidth Requirements, Packetization Delay and data rates

While choosing a larger packet size will reduce the overall bandwidth requirements and network latency, it also means that if a packet is dropped, a correspondingly larger amount of payload i.e. audio is dropped. In addition, some networks are configured to work only with IP packets below a certain size - the Maximum Transmission Unit (MTU) - and will fragment larger packets using a process that works poorly with RTP.

Finding the optimum packet size will always be a balance between bandwidth efficiency, network latency and audio quality.

Dealing with Packet Loss

All packet-based systems are susceptible to dropped packets, resulting in dropped audio. As discussed, we can negate the problem by choosing smaller packet sizes but in so doing we incur greater packetization overhead and bandwidth requirements

Theoretically, if a packet is lost, the receiving codec could request that the sending codec retransmit the packet in question but this is usually impractical as the delay involved in generally unacceptable. The other options for dealing with packet loss are concealment, correction or temporarily abandoning the packetized network in favor of an automated backup to a synchronous network.

Concealment

Various methods can be used to conceal errors in the final reproduction of the audio due to packet loss. They range from simple repetition of the last good packet received, to silence/noise injection or interpolation and retransmission. All have an impact on the reproduced audio.

In listening tests the injection of silence produced unacceptable breaks in the audio that led to a level of incoherence. The use of white noise improved the intelligibility of the reproduced audio but was again noticeable. The use of repetition of the last known good frame produced favorable results. The use of interpolation/pattern matching/waveform substitution to conceal the loss of packets is possible but the benefits versus complexity are governed by a law of diminishing returns. The results of these techniques are all governed by subjective improvements in audio quality and are also subject to the amount of audio lost that is being concealed or repaired.

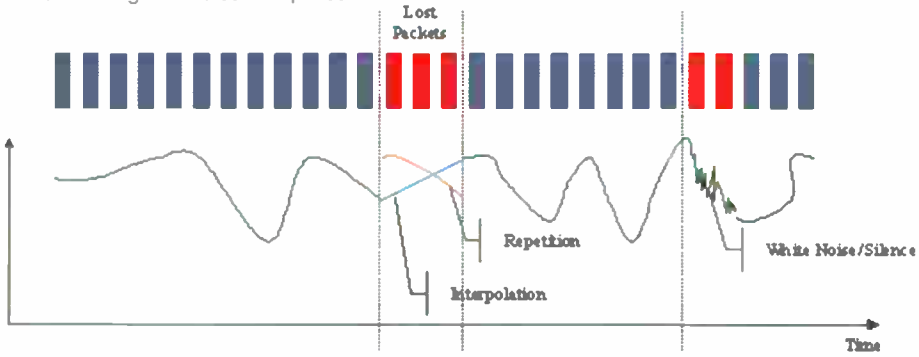


Figure 4: Packet Loss Concealment

Correction

The use of Forward Error Correction to ensure packet recovery can be effective in audio streaming applications but it has implications for real time applications due to the processing and data overheads associated with FEC algorithms. FEC rearranges the transmitted bits and adds redundant data so that a missing packet can be reconstructed based on nearby packets.

The determination of how much FEC to use should be related to the losses experienced with the medium being used as adding more overhead to a heavily congested medium may only make the situation worse. Also, the scheme used must be tailored to the type of loss being experienced. (see table overleaf)

Technique	Overhead	Complexity	Scope
FEC per n-1 packets	low	low	Uniform Loss No Burst Recovery
FEC packet per packet	low	high	Full Recovery possible
FEC packet per n packets	med	high	Burst loss recovery possible depending on scheme Increased delay

Figure 5: FEC Techniques Comparison

To maintain compatibility and interoperability between codecs the FEC information should be sent via a separate port so that the audio codec does not become confused if it cannot handle the FEC scheme.

Link Quality

There are two main methods for the improvement of link quality: RSVP and DiffServ. RSVP (Resource reSerVation Protocol) is more complex and involves the reservation and relinquishing of required resources throughout the network. DiffServ (Differentiated Services) on the other hand offers a traffic classification framework that evaluates the priority of network traffic on a "per hop" basis. Each packet is classified and awarded a DSCP (Diff Serv Code Point) value which is evaluated by the network and prioritized accordingly. Critical traffic will then be provided with more predictable (lower latency) paths through the network.

Although not a short term fix to packet loss, the use of SLAs (Service Level Agreements) can provide long term stability on an IP Broadcast link in guarding against packet loss. Any Telco or provider will issue a SLA against an IP link typically guaranteeing uptime in percentage terms. This percentage can be reconciled to criteria such as lost packets and actual down time on the link.

Synchronous Backup

Even with all necessary due diligence applied in the selection of the IP Network and Service Provider, there is still the possibility of a major outage on the network. This can equate to consecutive dropped packets over a sustained period of time but is more likely to be large consecutive bursts of dropped packets. In the event of such a failure, the broadcaster will be off-air unless they have a backup. A primary IP link can be backed up either by a secondary IP link supplied by a different service provider or a point-to-point synchronous link. A many to one backup is also possible but will only be effective if the Primary IP links are diversely routed.

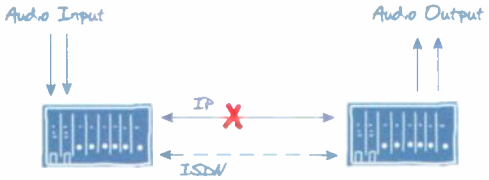


Figure 6: Automatic Back-up on APT's WorldNet Oslo

Professional audio codecs will provide the ability to trigger the backup from the primary IP link to the secondary synchronous link using a number of different criteria such as silence on the audio output of a specific audio module or a defined threshold in the Performance Monitoring log. Similarly, the automated restore back to the primary IP link could be defined in the Performance Monitoring log i.e. number of consecutive packets received without a single drop would equate to a restoration of the primary link.

Jitter

It is a feature of packet switched networks that any packet can take any route from source to destination and Jitter is the inevitable side-effect of this feature. Jitter occurs when packets arrive either side of their predicted arrival time and the receiving codec is unable to achieve real-time playout. The effects of jitter can be overcome by the use of a jitter buffer which stores enough packets to compensate for the effects of out-of-sequence packets.

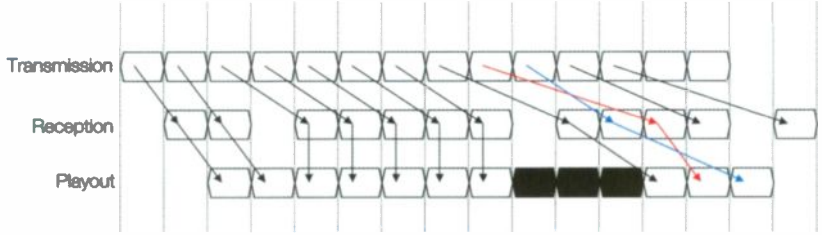


Figure 7: Network Jitter Effects

The above diagram shows the effect of network jitter on the reception of audio and its subsequent playout through an audio system. The buffer depth will usually be set in milliseconds but for the purposes of this example it is set to a two packet buffer. Provided the network jitter is low, the system is unaffected and plays out the packets received in sequence. However, should jitter increase beyond the pre-determined buffer, packets which arrive after the determined playout time will be dropped, resulting in corrupted audio.

Latency

All networks have transport latency due to the natural laws of physics. Transporting an electronic signal through any medium will take a finite amount of time that cannot be removed.

In an IP network where there is both the standard transmission delay and also the packetizing delay to contend with, this latency will typically equate to approximately 10-30 ms. As noted previously in this booklet, packet size and jitter buffering will also have an effect on the delay experienced.

The latency figure quoted above represents the inherent latency throughout the network as the data passes through switches, routers etc and does not include audio compression delay nor sample frequency effects. Any coding delay resulting from the use of compression will add directly to the existing latency of the system. The choice of audio compression algorithm is therefore critical in determining the end-to-end latency of the system and low delay coding techniques must be selected for for real-time audio over IP applications.

Equipment Considerations

A typical IP network is made up of much more than just links for audio transfer. A professional approach to audio transport over IP requires mastery of not just the network but also the suite of hardware and software tools which allow control, supervision and operation of packetized audio delivery.

These tools enable not only network and equipment monitoring but the implementation of remedial action, hardware redundancy and error alleviation. Where possible, the broadcaster should seek to source an integrated solution which delivers all these services in a single product, specifically the audio codec. This integrated solution allows the administrator to manage both audio AND data services from a central location either by a unified control software or on a higher level by SNMP.

Design Philosophy

The design philosophy behind products is a key factor to consider when purchasing equipment for use in a professional broadcast environment. There are two key approaches: DSP-based or PC-based product development.

PC architecture uses off-the-shelf motherboards which are generic, low cost platforms not designed for use with audio or 24/7 operation. Instability and memory leaks within the operating core can often lead the system to "hang" as a PC is prone to do.

DSP-based systems on the other hand are designed from the outset for high quality audio delivery and signal integrity. They typically offer faster boot-up operation, much greater stability and a significantly greater operating bit depth (resolution).

While it may be acceptable for a home user to reset their PC, it is definitely not acceptable for professional broadcast applications and PC-based architecture should be avoided for "always on" applications.

Hardware Redundancy

For mission-critical STL applications, hardware redundancy is vital to ensure back-up in the case of network or equipment failure. A broadcaster must consider the importance of each link and source equipment which provides the necessary fail-safe options. Hot-swappable audio modules, redundant power supplies and automatic back-up functionality are just some of the options that should be considered.

Configurability & Quality of Service

As noted in the previous section, there are many variables in the world of IP networking. It is therefore vital that the audio codec selected provides the broadcaster with the flexibility and control to manage anomalies on their IP network and get the best quality audio performance from the bandwidth available. This will typically include audio setting

configuration, control of packet size, ability to buffer audio to compensate for jitter, forward error correction to disguise packet loss and the ability to set Quality of Service at the transmission point.

The codec should also provide maximum flexibility with regards to network configuration, allowing the broadcaster to implement unicast, multiple unicast and multicast applications.

Audio Algorithms

Having prepared your IP network for audio transport, the next step is to choose the best method of sending audio down the link. Restrictions in available bandwidth will often rule out linear or PCM audio and some form of compression is usually required. There are two main types of compression techniques: ADPCM and Perceptual algorithms.

Perceptual based algorithms (such as MPEG L2, MPEG L3 (MP3), AAC and their many derivatives) use psycho-acoustic based principles which analyze audio content and determine what is audible to the human ear. The algorithm will remove all inaudible content and is therefore, by definition, "lossy". Using multiple passes of a perceptual codec (for example, consider the broadcast chain for HD Radio or DAB) will result in content heavy with artifacts. Ultimately this will cause "listener fatigue." swiftly followed by tune-out to a station offering higher audio quality.

Additionally, perceptual coding will introduce a delay to the audio delivery which is generally unacceptable for real-time audio applications. Working on the assumption that the IP transport stream will naturally introduce a minimum delay of 20 milliseconds, it is imperative to minimize the latency of the compression algorithm employed. In essence, using a perceptual coder, even a low delay variant, will render the solution unusable for any level of real-time broadcast such as talkback applications and off-air monitoring.

ADPCM algorithms offer a more attractive alternative given their gentler, non-destructive approach to coding. ADPCM-based, Enhanced apt-X® technology delivers both exceptional acoustics and ultra low delay, making it particularly suited for audio over IP applications. Enhanced apt-X overcomes the problems associated with multiple psycho-acoustic passes of audio in the broadcast chain as it is extremely resilient to tandem coding, retaining acoustic integrity up to and beyond 10 encode-decode cycles.

Along with the well-documented features of low latency and audio performance, Enhanced apt-X also features AutoSync™, an embedded word pattern which aids connection and synchronization and complements the packetizing nature of UDP/IP. As a non-frame based algorithm, Enhanced apt-X allows for smaller packets (as small as 64 bytes) contributing less delay and enabling quicker synchronization. The ability to start synchronisation on receipt of the next valid sample and to achieve full synchronisation within 3ms @ Fs=48kHz ensures faster recovery from packet loss.

Management and Monitoring

With a wide number of variables and constantly changing network conditions within the field of IP audio networking, it is vital that broadcasters have access to extensive control and monitoring capabilities. This can be achieved either by front panel control, SNMP or a dedicated Management System software package.

Whichever option is selected, the user should ensure that it provides them with the following capabilities:

- At-a-glance status of all codecs throughout network
- Flexible configuration of audio settings: algorithm, sample rate, data rate, mode etc...
- Ability to define audio profiles for quick and simple configuration
- Flexible configuration of transport link. For IP, this will involve setting up packet size, jitter buffers and IP unicast and multicast routes. It also encompasses the configuration of automatic back-up to either a secondary IP port or synchronous links. For synchronous back-up, transport configuration will also require extensive functionality in the form of timeslot allocation, drop and insert configuration, speed-dial set-up etc.
- Performance Monitoring providing statistics on packets transmitted and received, error counts, sequence errors etc..
- Ability to set critical, major and minor alarm conditions relating to silence detection, loss of connection, loss of sync, exceeding jitter buffers etc...
- Ability to set conditions which are triggered on alarms i.e. switch to automatic backup and revert after *n*secs of stable audio stream.
- Alarm and Event Logs to enable analysis of recurring errors and conduct accurate network diagnostics.
- Remote Software Update Control

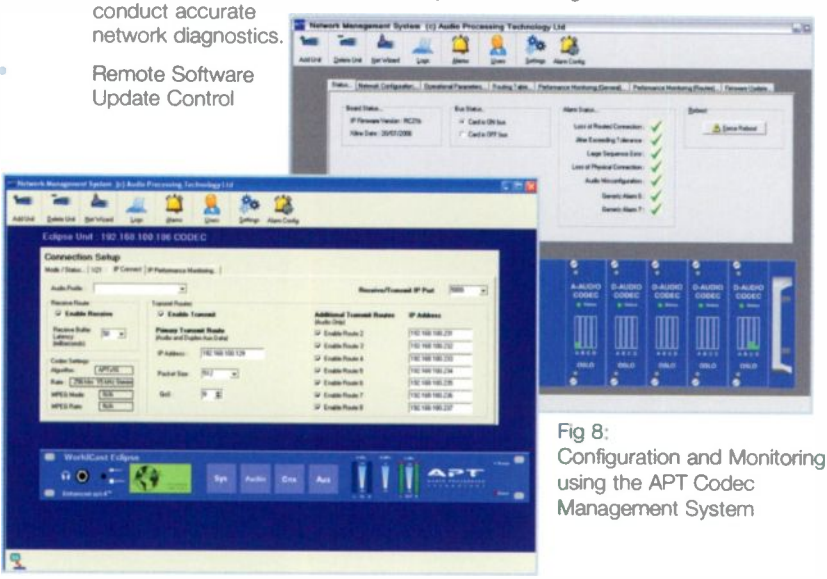


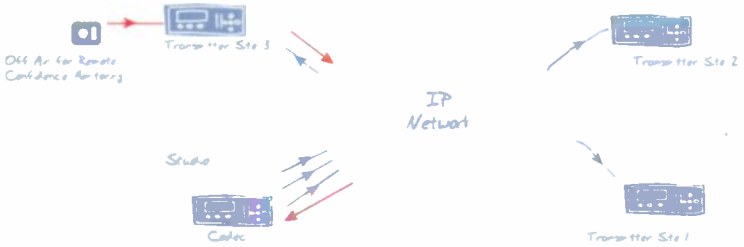
Fig 8:
Configuration and Monitoring using the APT Codec Management System

Unicast and Multicast

Unicast Applications

Unicast links offer simplex, point-to-point connections. Despite their simplicity, they still play an important role in the construction of professional audio networks.

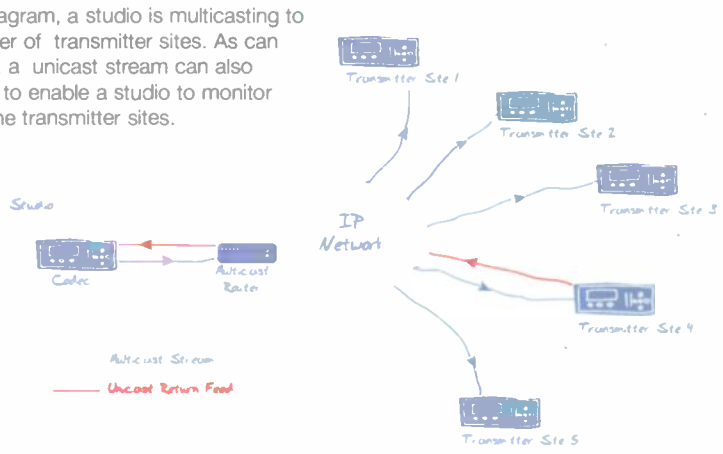
In the example below, a stereo codec at the studio site has established a multiple unicast to a number of transmitter sites. The studio is able to monitor the off-air content by means of a return feed from Transmitter Site 3.



Multicast Applications

Multicasting is a highly efficient technique used to transmit from a single audio source to many destinations using the IP infrastructure. The source sends the IP stream to a multicast router using a Multicast Group address as its IP destination address. Receivers use the same address to inform the network that they are interested in receiving packets sent to that group. This is carried out using Internet Group Management Protocol (IGMP). The nodes in the network take care of copying the IP packets and routing them to all subscribed destinations.

In the diagram, a studio is multicasting to a number of transmitter sites. As can be seen, a unicast stream can also be used to enable a studio to monitor one of the transmitter sites.



Summary and Checklist

As we mentioned at the beginning of this guide, the potential benefits of switching from Synchronous to IP audio networks can be substantial. It is possible to achieve greater network efficiency and considerable cost-savings while still maintaining the quality and reliability required for professional audio broadcasting. In order to achieve this, the following criteria must be assured:

Network Checklist

- Fully uncontended symmetrical line for duplex connections (1:1 contention) ☑
- Bandwidth must be equal or higher than audio bit rate plus overhead (see table P4) ☑
- Guaranteed Quality of Service through the use of SLAs (Service Level Agreements) ☑

Equipment Checklist

- Robust, DSP-based Hardware Codec with high level of redundancy ☑
- Configurable Parameters to adjust for network conditions ☑
- Powerful Performance Monitoring to help enforce SLAs ☑
- Low Delay algorithm such as Enhanced apt-X to counter inherent delay associated with IP ☑

APT's IP Codec Solutions

WorldNet Oslo

The jewel in the crown of APT's broadcast audio codecs, the WorldNet Oslo offers broadcasters and service providers a flexible, highly reliable and multi-featured audio multiplexing solution for Studio Transmitter Links and Inter-studio networking.

- Modular, Multiple Channel Audio Multiplexer
- Audio over T1, E1 or IP
- Redundant Power Supplies
- All cards hot-swappable
- Powerful Codec Management System
- Enhanced apt-X, J.57 or Linear audio
- Up to 4 audio channels per card, Up to 7 audio cards
- Analog and AES/EBU audio interfaces
- 5.1 Phase-Locking for seamless surround sound
- In-band Management over E1/T1 link

Designed to transport both compressed and uncompressed audio and data over various digital networks, the WorldNet Oslo is based around a 19 inch, 3U high standard rackmount chassis which is card-based expandable. Redundant power supplies, "hot-swappable" cards and automatic back-up functionality ensure 24/7/365 reliability for mission-critical applications.

Various network interface modules eliminate the need for external multiplexers or media converters. Audio can be transported via synchronous or packet-switched networks with support for T1 (1.5Mbit/s), E1 (2Mbit/s) and Ethernet (IP) interfaces. An ISDN option will be added in 2007.

A maximum of 28 audio channels in simplex mode and 14 audio channels in duplex mode are possible in each frame. Plug-in audio modules in over 12 different configurations offer analog, AES/EBU, simplex, duplex and 5.1 phase-locked options. As well as uncompressed linear audio, J.57, J.41 and MPEG L2, the WorldNet Oslo also supports 16 or 24-bit Enhanced apt-X offering cascade-resilient, near-lossless audio quality with under 2ms delay.

WorldCast Codecs

Designed specifically to deliver optimum audio performance and reliability over IP networks, WorldCast IP Audio Codecs are the choice of professional broadcasters worldwide and many hundreds of WorldCast units have already been deployed in STLs and studio-studio links throughout the globe. The core features of all products in the range include:

- **Outstanding Audio Quality** - All WorldCast codecs offer Enhanced 16 & 24-bit apt-X as standard.
- **High Compatibility** - All WorldCast codecs support SIP and SDP protocols enabling quick and easy connection to all compliant IP codecs.
- **Consistent Reliability** - All WorldCast codecs are designed around a DSP-based architecture to ensure 24/7 reliability.

WorldCast Eclipse

A multi-interface, multi-algorithm codec for a new age of broadcasting, the WorldCast Eclipse delivers bidirectional stereo audio over multiple networks:

- IP (allowing connection to other codecs linked to Wide Area and Local Area Networks);
- X.21 (allowing connection to high speed fixed synchronous networks);
- ISDN (allowing connection to other codecs over dial up digital ISDN links)

Standard 16-bit apt-X, Enhanced 16 & 24-bit apt-X are supplied as standard and an optional multi-algorithm suite incorporating MPEG 1/2 Layer II/III, MPEG 4 AAC, G.711 and G.722 is also available. A rich array of features are provided on the WorldCast Eclipse including Automatic Back-up, Silence Detect, Contact Closures and Alarm Ports.

WorldCast Meridian

WorldCast Meridian is a multi-algorithm, fully duplex, stereo audio codec offering both IP and Leased Line connectivity. It provides a reliable and proven platform for studio to transmitter links and inter-studio networking applications.

Standard 16-bit apt-X, Enhanced 16 & 24-bit apt-X are supplied as standard and an optional multi-algorithm suite incorporating MPEG 1/2 Layer II/III, MPEG 4 AAC, G.711 and G.722 is also available. The system also offers an array of features including Automatic Back-up, Silence Detect, Contact Closures, and Alarm Ports.

WorldCast Horizon

The WorldCast Horizon is a fully duplex, two channel stereo codec designed to enable real-time transport of broadcast quality audio over IP networks. Both analog and digital (AES/EBU with external reference) units are available.

The WorldCast Horizon incorporates Enhanced apt-X coding technology which, thanks to its low delay and exceptional acoustic properties, is particularly suited to the transport of audio over packet-switched networks. Contact closures and opto-couples for remote status alarms are also provided.

Codec and Network Management Systems

Supplied as standard with the WorldNet Oslo and all WorldCast IP audio codecs, APT's Codec Management System (CMS) Software provides control of up to 6 units on a network. The exceptionally intuitive user interface offers at-a-glance status and alarm monitoring as well as extensive configuration capabilities for both audio and transport settings. A demo version can be downloaded from www.aptx.com

For large-scale broadcast networks, APT's Network Management System offers control of unlimited codecs, hierarchical views, event logging, extensive alarm configuration and much more...

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Florida Office:	772 340 0850

continued from page 18

high quality audio stream to devices like cell phones. National providers such as Sprint Nextel, Verizon and AT&T are selling devices that allow customers to listen to audio streams on their phones. This is a great opportunity for broadcasters to deliver programming in yet another place. Subscribers to a station's mobile content will be able to interact directly from their phones to listen to streamed and on-demand content including podcasts of news, weather, traffic, celebrity interviews and popular show segments. They can also find the title and artist of songs played on-air, make a song request directly to the station and receive a text message before the song is played, get free station wallpapers for their phone, and even submit content like pictures and audio to the station.

HD Radio data channels

One other alternate channel for traditional radio is the data portion of HD Radio. This is different than the current HD-2 and HD-3 additional channels. Using the data streams available to HD Radio may allow broadcasters to deliver things like conditional access products. This would work similar to pay-per-view on TV. Listeners could choose to subscribe to services offered by radio on the data channels. These could include news, addition programming or anything else imaginable. Conditional access technologies will be making an appearance at NAB2007.

The marriage of personal electronics continues as cell phones, such as the Motorola E398, add media player functions.

The possibilities are endless for broadcasters who have the vision to use some or all of the additional channels becoming available today. With the worlds of radio and Internet becoming more blurred it is almost an inevitability that broadcasters will need to adopt some of these new technologies or get left behind. A platform-neutral type of attitude may serve broadcasters better in the long run.

As radio continues to faces challenges from other entertainment sources it must adapt. People today like to listen to their Ipods, carry their cell phones and spend a lot of the day on a computer with high speed Internet access. If radio can deliver its product to more than just the traditional radio receiver it will serve the public and advertisers better than ever; if not the future may not be so bright. As broadcasters in other parts of the world have proven, listeners are out there and have a desire for quality programming, we just need to put our product where the listener is.

Smith is president, JRS Broadcast Engineering, Monroe Township, NJ.

RSS is a convenient way to publicize podcasts for distribution.

More effective podcasting

by Brad Erpelding,
Online audience development manager

Podcasts are easy to create, especially for radio stations. They provide an additional means to offer something unique to your listeners. Because they are so easy to create, many listeners may create their own podcasts. Don't let the opportunity slip by. Find a topic and have your air staff get busy.

There are many online tutorials on how to create and submit a podcast, but there are a few key points that will help promote and distribute your podcast. The best part is that there is no charge to submit the feed to any of the podcast directories.

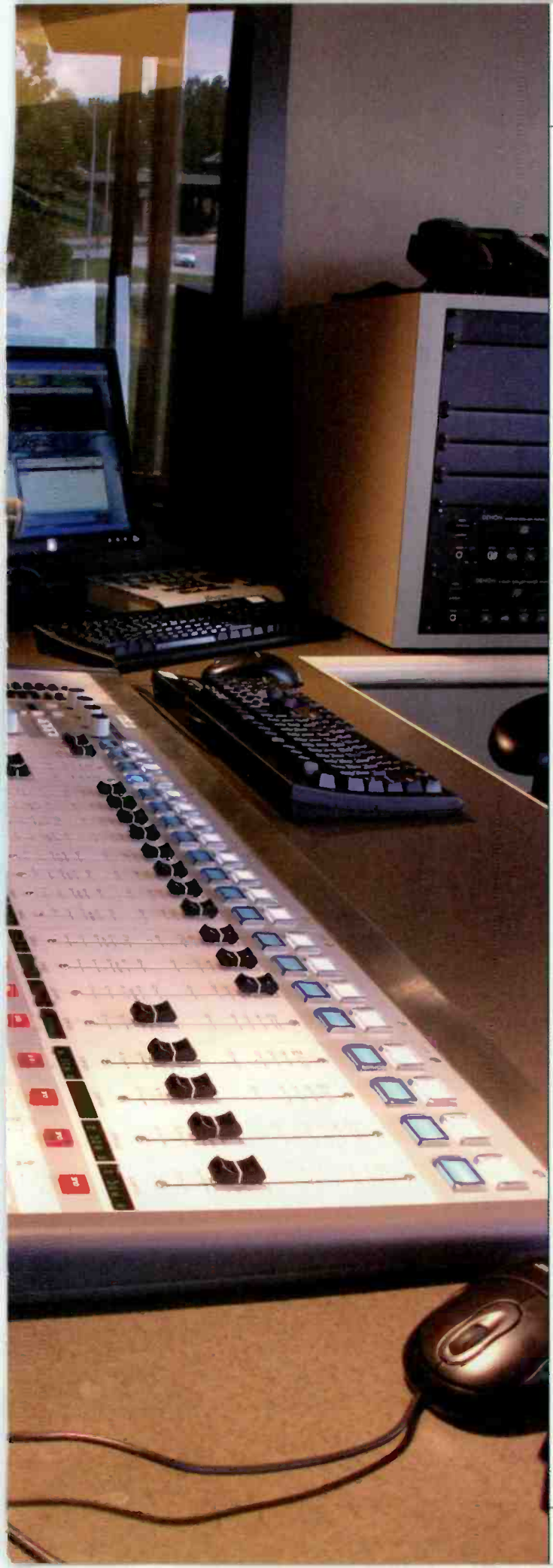
Station podcasts will naturally be posted to the station's website. Unfortunately, that's where many stations stop. Practically speaking, station listeners may not be the same as podcast listeners, so don't limit the distribution tools to just one place.

Making a podcast available through an aggregator will not only help listeners find your podcast, but will also make it easier for them to download it. First, create an XML document for the feed aggregator to use to determine the title, artist, and many other variables for the audio files. This XML file should be stored in the same directory as the audio files on the server.

Then promote the feed using an aggregator, such as Feedburner or Feedzilla. Enter the URL of the XML file as requested by the aggregator. The URL should look something like http://beradio.com/podcast/feeds/podcast.xml. There are usually several options within the aggregation site, such as e-mailing the podcast to someone else and promoting the feed.

Now that the podcast has been produced, it can be submitted to Itunes and other podcast directories. Don't forget to add a link on the station website to the feeds on the aggregator and on the podcast directory.

These simple steps will help listeners—existing and new—find your podcasts and easily access them. ■



When it's time to move

by Chriss Scherer, editor

Building a new facility to house multiple stations seems to be a normal part of radio operations today. Several years after the consolidation frenzy, many stations believe that the industry has settled, and they are now turning their attention to maximizing their own facilities. The Entercom cluster in Kansas City began making plans to do this several years ago, and the results of those efforts are finally seeing fruition.

Before moving into their new location, the eight stations owned by Entercom occupied a building full of history in Westwood, KS, a suburb of Kansas City. The building, originally built in the 1920s as the transmitter site for what is now KMBZ-AM, grew with the trends of radio broadcast ownership. In 1968 the building was expanded to house the studios of KMBZ-AM and KMBR-FM (now KYYS). It was added to again in 1995 when Entercom began operating nine stations from it.

When it's time to move

The building was at its limits, and the parking lot had been extended as much as it could. There still wasn't enough room. Furthermore, the studio facility was in the center of a residential neighborhood, and the constant needs of a business were straining the relationship between Entercom and the community around the facility.

In 1999, Entercom purchased the Sinclair stations, and the research began to build yet another addition. That never materialized because of the projected cost, and instead, attention turned to acquiring a new building. Several years later in 2004, and after four or five possible new sites were considered, a purchase agreement was signed to buy the building that houses the stations now. In 2005, the

Nate Johnson of Lightner Electronics makes some final checks in Edit 1, one of the production studios.

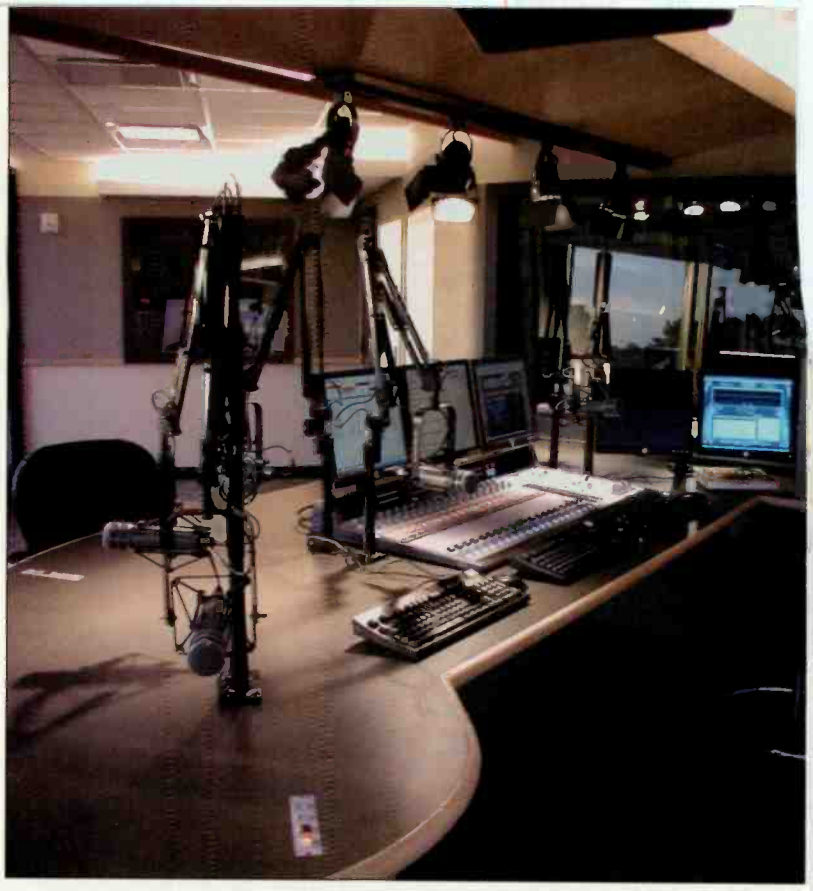
When it's time to move

work began to strip the interior and commence construction on the building on Squibb Road.

The Squibb Rd. building at one time housed the headquarters of the now-defunct Vanguard Airlines. The three-story building is significantly larger than the previous facility, and Entercom only occupies two of the three floors. Entercom is currently seeking a tenant for the first floor. Located at one of the major crossroads in Johnson County, the new location provides the station with an easy-to-find and accessible address.

The work begins

One added benefit to the selected building is that a monopole tower was already in place on the site. This meant that permits for a tower for the station's own use would be simplified, and the



The studios for KQRC-FM (The Rock) were the first to be completed. This is also the largest FM air studio.

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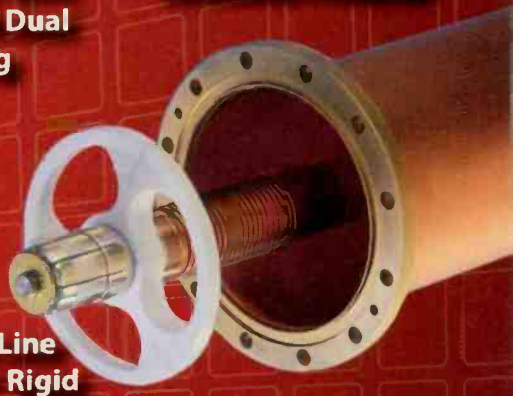

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When it's time to move

existing monopole user leases land on the property (the tower is owned by its tenants), which would provide instant revenue.

The internal building construction and renovation had some difficulties from the start, which delayed the project. A major delay was related to structural improvements to the building to support the roof-mounted air handlers. Once the unforeseen structural problems were resolved, the construction work began.

The renovation of the exterior was completed in February 2005, and the interior construction began shortly thereafter. Once the walls were in place, the studio work began. The sales staff moved in on Feb. 25, 2006, while traffic, accounting and management moved in on March 10, 2006. The first station on the air from the new facility was KQRC on July 16, 2006. The other FMs were added about one every four weeks after that. KMBZ-AM and KCSP-AM, with their news, talk and sports focus, took a little longer.

Design philosophy

The on-air operations occupy the third floor, and the business operations occupy the second floor. The three main production studios are on the second floor and are adjacent to the main lobby. The lobby area is open to the third floor, and visitors can look up to see the on-air studio for WDAF.

The KMBZ talk studio (left) is a large room that can accomodate at least eight people.

KMBZ control (below) is also a spacious room. The studios for KCSP are a mirror image.

Meet the stations

There are five FMs and three AMs in the group

KQRC-FM – The Rock
Kansas City's Rock Station

KRBZ-FM – The Buzz
Alternative

KUDL-FM
Adult Contempory/Soft Rock

KYYS-FM – 99-7 KY
Classic Rock

WDAF-FM – The Wolf
Country

KCSP-AM – 61 Sports
Sports Talk

KMBZ-AM – News Radio 980
News, Talk and Sports

KXTR-AM
Classical

All the FMs transmit HD Radio signals and carry HD-2 Streams

KQRC-HD2 – Live Rock
KRBZ-HD2 – Comedy
KUDL-HD2 – Classical
KYYS-HD2 – Subterranean – Deep Tracks
WDAF-HD2 – Smooth Jazz

The air studios are along the south wall of the building except for the air studio for KXTR, which is on the north side. Each FM has an air studio and a production studio that, for the most part, face each other. KQRC also has a producer/screener studio, and KUDL also has a news booth.

The studios for KCSP and KMBZ are almost mirrors of each other. Both have a large control room, a talk studio that can easily house six or more guests and a small production studio. The newsroom is next to the AM

studios and sits in the inner core of the building.

Offices for each station's programming staff are housed near their corresponding studios. There are also offices for morning shows and jock prep areas.

Master Control is located around the studios and houses two rows for everything except the RF systems. A separate houses four racks for the RF equipment. This room is adjacent to the tower to reduce the RF cable needs. The room location was also chosen for RF because it's easier to route audio and data wire than coaxial cable.

Entercom has an engineering staff of five people. Mike Cooney is the director of engineering/IT and oversees

Equipment List

360 Systems Instant Replay
APC monitor/keyboard drawers
APC racks
Audemat-Aztec Goldeneagle HD FM
Audio Labs Voxpro
Audioarts 8400
BE Audiovault, News Boss
Belden 9116
Broadcast Tools Silence Monitor III
CBT Systems Classic on-air lights
Denon TU-1500RD
Digigram BOB-8
Dixon NM-250 MKII
E-V FE-20
Eventide BD500
Furman Plug Blocks
Gefen KVM stuff
Gepco DS601, DS624, DS608, DS401, MP1022
Harris World Feed panels, Intraplex STL Plus
Hall PR-30
Henry Engineering Matchbox HD, Twinmatch HD
Imediatouch medialogger
JK Audio Auto Hybrid
KRK V8 Series II, V6 Series II
Krone punch blocks
Liberty Furniture
Lightner Electronics Integration services
LPB Silent Mic Booms
Lucid Genx 6-96
Mackie HR-H24
Marantz PMD 325 (CD)
Middle Atlantic PD-1415C-NS power strips
Motu 24I/O
Neutrik NP3C, NC-3MX, NC-3FX
O.C. White mic booms and risers
Orban Audicy
Primex Wireless clocks
Rane HC-6
Raritan KVM
RDL TX-LM2, STD-10K, ST-SH2, DRA-35T
Sony MDS-E11, MDS-E12
Superior Essex 52-241 CAT-5e cable
Symetrix 528E
Tascam 112 MKII, CDRW-2000
Telos 2x12, One, Zephyr Xstream
Tieline Commander G3
Wheatstone 1202A, Gen 3, Gen 5, Gen 6, Gen 8, Wheatnet 4864, Bridge router

Above: Each station's production studio is centered around a small console. This is the production studio for KMBZ.

Left: The exterior of the facility. All but one of the air studios are situated along the top floor windows.

When it's time to move

the staff. Ken Wolf is the chief engineer, Kirk Chestnut and John Morris are staff engineers, and Fred Suhr is the IT manager. With the complexities of running stations that have active programming formats, the task of maintaining the existing facilities while simultaneously building new ones was overwhelming. To get the process started, Cooney hired some outside help.

Allegiant Technologies ran all the wiring. Once the backbone was in place, interconnections and studio assembly began.

For the next step, Lightner Electronics was contracted to handle the integration. With a crew led by Steve Koehle, the equipment was installed and programmed, and the physical assembly of the studios began.

All the FM air studios have similar layouts. This is the KUDL air studio.

Digital by design

Where possible, the facility is digital. The main signal routing is handled by the Wheatstone Wheatnet router, and the BE Audiovault handles the bulk of the audio playback. This centralized approach greatly simplified the overall signal flow for all the stations. Every source is available at every destination (where it's allowed). Of course, with the convenience comes the need to be more attentive in the setup. IP addresses, source naming and cable identification are extremely important.

The digital path is also maintained to the transmitter sites when possible. The FM stations primarily use two shared transmitter sites, and a third site serves as a single-use backup for any of the stations. The BE Big Pipe is configured to provide a ring between the studios and two main transmitter sites to provide added redundancy in case of a failure of one of the paths. The previously owned STL equipment is also in place for backup.

Like any good facility design, there's lots of backup. The Wheatstone router is configured to distribute station sources between multiple frames so that if there is a failure in one frame, the station still has audio. The router itself also has a backup controller. The Audiovault servers are also configured in a main and backup server configuration, and the RAID array is dispersed over several systems.

The little touches

Every facility has its own unique nuances that make it special. The emergency audio path with the Whirlwind mixers is one example. These small touches are incorporated to accomplish a specific purpose, and they often go unnoticed. Here are some that stand out.

Table-top speaker mounts

The KRK speakers are mounted on risers to place them in the sweet spot. The risers are actually left over PVC pipe that was spray painted black. All thread runs through the countertop into the speaker.

Wire labels

Self-laminating label sheets were printed in an inkjet printer and applied to the cables. These do not require a heat shrink cover, so labels can be easily updated if changes are made.

Label strips

Front-panel adjustments on the distribution amps have no provision for labels. Instead of writing on the equipment, which looks tacky, a self-adhesive plastic labeling strip with an inserted paper legend is used. The strips are available from Uline, Slip Strip or Holdex. ■

Edit 2 is another smaller production studio located on the second floor.

As a last-step studio failure backup, each station has a direct-wired feed of each studio console, its automation system output and any other needed audio feeds into a Whirlwind mixer. This mix is fed to a jack panel in the RF room so that it can be patched directly into an STL if needed.

It's unlikely that any studio construction project is completed without a hitch, and the Entercom Kansas City project fits easily into this generalization. The construction project is in its final stages and the last station, KXTR, is due to move in during the spring. Then the attention will turn to clearing out the old studio building for a new tenant. The history of the former studio location is not completely lost. The transmitter for KMBZ is still located there.

Online Extra

More photos and a floorplan of the facility are posted with this article online at *beradio.com*.

FACILITY FOCUS

The technology behind Entercom KC

Symetrix Voice Processors

From the first broadcast telephone Interfaces to the birth of the voice processor, Symetrix maintained a perfect balance of performance, value and reliability. The classic

analog Symetrix 528E and the dual-channel, fully digital, AirTools 6200 package every processes necessary to help you sound great. Microphone preamplification, de-essing, compression/limiting/AGC, downward expansion, parametric EQ, filters, and voice symmetry alignment may be used simultaneously. Processes may be reordered via patch points on the rear of the 528E or by software drag and drop on the 6200. The 6200 offers remote software control and set up via Ethernet, USB, or RS-232 as well as 256 programs—a unique program for every voice talent.

www.symetrixaudio.com
425-778-7728

Electro-Voice RE-20

The broadcast ndustry-standard microphone, the dynamic, cardiold RE-20 features the Electro-Voice Variable-D design to reduce the boominess that can result from proximity effect. A favorite among broadcasters and sound engineers worldwide, the heavy-duty, internal p-pop filter reduces unwanted pops, while the internal element shock-mount reduces vibration-induced noise. The large diaphragm provides flat frequency response and handles high SPL levels with ease. The pickup uses a humbucking coil. The RE-20 also includes a bass roll-off switch. An optional suspension shock mount is available.

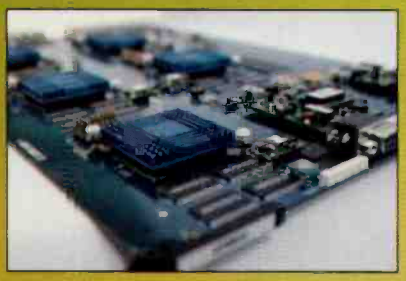
www.electrovoice.com
800-392-3497

NAB 2007 NEW PRODUCTS

Automation software
Prophet Systems Innovations
Booth N6511

Nexgen Digital 2007: The software offers less network traffic and a revamped logs screen. The DRR module has been revised to make its logs work more like station logs, allowing staff to transition between tasks faster. An on-air image is now protected with a pooled hot-spare sytem that allows any machine to take over in the event of a failure. It also includes redundant WAN-casting. Production tasks go faster with a new mass changer and filters that let the user browse just the content he wants to view.

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



Digital console
Calrec Audio
Booth N8529

Omega: The Omega uses Bluefin high-density signal processing technology, features 160 channel-processing paths packaged as 48 stereo plus 64 mono channels, and allows as many as 24 5.1 surround channels. This console is smaller than the company's Sigma but with the same bus structure and delay facilities. The console is equipped with 160 mono DSP paths and is managed on one DSP card. Available in three frame sizes, 24, 32 and 48 faders, the console offers eight 5.1 surround, stereo, or mono audio groups, 20 auxiliary outputs (20 mono or 10 stereo), and 48 outputs for multitrack or general-purpose feeds.

+44 1422 842 159; www.calrec.com; claireh@calrec.com

Digital audio editing
Sony Media Software
Booth SL2823

Sound Forge 9: An upgrade to their professional digital audio editing application, the latest version includes new features such as multichannel file recording, editing and processing, phase scope metering and Dolby Digital AC-3 export. Also, the software and CD Architect 5 software are now compatible with the new Microsoft Windows Vista operating system.

800-577-6642; www.sonymediasoftware.com

Microphones
AKG
Booth N7715

C5, D5: The C5 condenser vocal microphone and D5 dynamic vocal microphone feature a dent-resistant spring steel wire mesh grille cap for maximum protection of the capsule and a zinc alloy die-cast housing. An integrated shock absorber system minimizes handling noise. The C5 features a 24-carat gold sputtered housing that protects the condenser capsule against moisture and humidity plus a removable Presence Boost adapter for increased intelligibility. The D5 dynamic includes the new Laminate Varimotion diaphragm technology. The D5 is also available in a switched model, the D5 S, which features an on/off switch on the body.

818-920-3212
www.akgusa.com; akgusa@harman.com

Booth numbers are current as of March 26

Mobile recorder
Korg
Booth SL13014

MR-1, MR-1000: These mobile recorders provide source recording, podcasting, broadcast journalism including ENG/EFP, as well as archiving final mixes and master recordings. The hand-held MR-1 (shown) is capable of one-bit/2.8MHz recording and playback, while the tabletop MR-1000 delivers one-bit 5.6MHz. Both recorders support multiple recording formats including DSDIFF, DSF and WSD one-bit formats, as well as multi-bit PCM format with resolutions up to 24-bit/192kHz. The included software can remove dc offset, gain control and fade in/out. Users can transfer data from the internal hard drive to a computer via high-speed USB 2.0 connection. The MR-1000 features studio quality, ultra low-impedance mic preamps with balanced XLR/1/4" inputs with phantom power and built-in limiting, plus XLR and RCA outputs.

631-390-6500; www.korg.com

Reference monitor
Klein + Hummel
Booth N7117

M52: The monitor can be powered by a 12V to 20V battery. The enclosure is constructed entirely of aluminum. The floating transformer-balanced input (+6dBu) offers a common mode rejection ratio of more than 50dB. The speaker is fitted with an XLR input jack for secure, professional connections. The power switch, switching (85V to 230V) mains connector, fuse holder and a four-pin terminal for battery operation are all located on the rear panel.

+49 711 45 89 30; www.klein-hummel.de
sales@klein-hummel.de

Emergency warning receiver
Global Security Systems
Booth N6734

First Alert: A wireless, battery-driven receiver, it is designed for mass distribution of alerting messages to the public. The equipment uses existing FM subcarriers to deliver data to the receiver.

228-255-7220; www.gssnet.us; info@gssnet.us

RDS encoders
Broadcast Warehouse
Booth N7328

RDS1, RDS2, RDS3: The RDS1 encoder is a rack-mount unit with a simplified set-up through the user interface, which allows all the basic RDS parameters to be controlled with four buttons. All options and settings are controlled from the front panel LCD display. The RDS2 encoder supports scrolling text and timed text lists. Users can program as many as 8,000 characters of information into the encoder. The RDS encoder provides a full loop-through interface for connection to the existing broadcast chain. The RDS3 provides TCP/IP connectivity. It creates an RDS subcarrier and permits the insertion of static RDS parameters. The RDS3 may be controlled through its 10BaseT Ethernet port and has an embedded Web server.

888-866-1671; www.broadcastwarehouse.com
info@broadcastwarehouse.com

Multi-stream networked audio processor
Omnia Audio
Booth N7726

Omnia.8X: With algorithms modeled after the Omnia.3net, this processor provides eight discrete three-band stereo audio processors in a single, networked unit. Its architecture works ahead of any bit-reduced audio coder to reduce artifacts and improve the audio destined for HD Radio, Internet and satellite broadcasting. Use it to process headphone feeds where off-air monitoring is not possible; as multi-band level control for remote codecs or on-air telephone systems; to process and send multiple audio streams from a single studio complex to multiple transmitter sites; or on-demand for in-studio musical performances or commercial production applications. The processor uses the Livewire protocol over Ethernet.

216-241-3343; www.omniaaudio.com
info@omniaaudio.com

RF amplifier
Eddystone Broadcast
Booth N5128

PA500: The PA500 is a 500W FM power amplifier based on the PA 1000 range. This amplifier incorporates a "fresh air tunnel" concept that reduces maintenance and increases reliability. The unit features comprehensive monitoring and fits in 3RU.

+44 1789 768870; www.eddystone-broadcast.com
info@sbsfm.com

Power amplifier
Kramer Electronics
Booth SL6105A

Model 904: The amplifier outputs 75W RMS per channel and it incorporates an output level knob with a multi-color LED output level indicator. The 904 also has a headphone output and a mute button. The amplifier is housed in a 1RU chassis. The inputs and outputs are on five-pin detachable terminal blocks. The unit incorporates short circuit and overload protection circuitry, and touts a THD+N specification of 0.06 percent for the speaker outputs.

888-275-6311
www.kramerelectronics.com
info@kramerelectronics.com

Messagecasting feature
Broadcast Electronics
Booth N7106

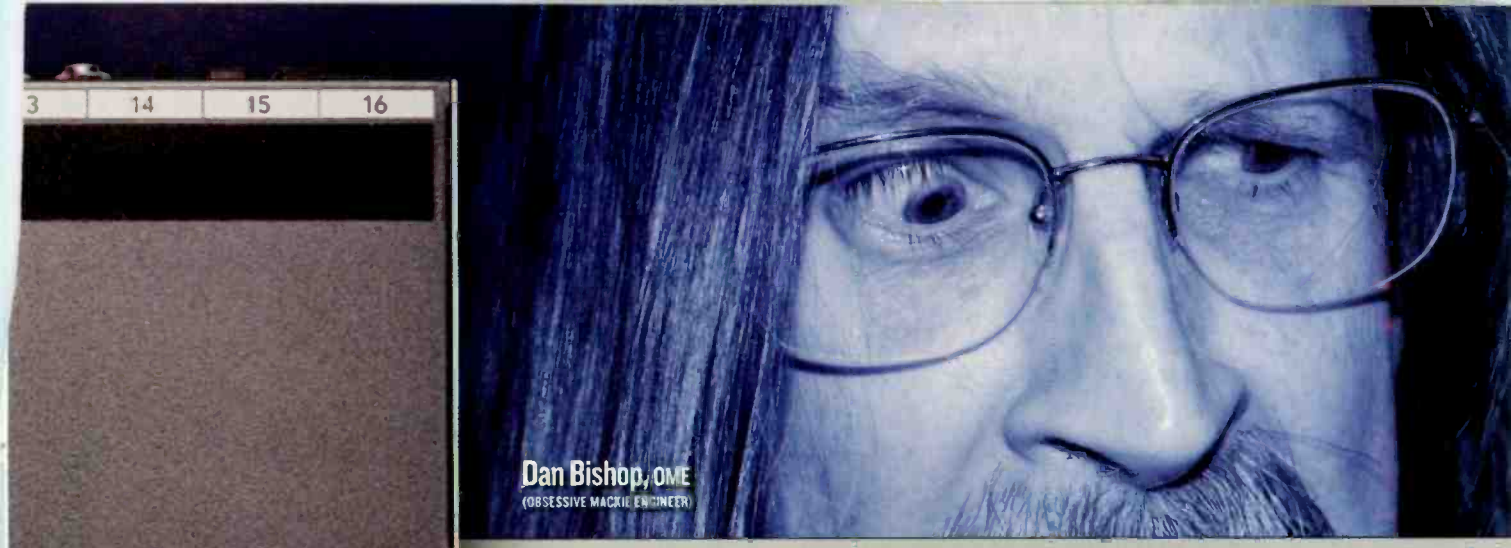
Revenue Center: Revenue Center includes all the management tools necessary for selling a flight of message impressions not associated with audio content over the air, or for selling on-air support text such as advertiser phone number, coupon code or website address. The new feature is the latest option available for The Radio Experience, BE's Messagecasting platform for generating and scheduling HD Radio and RDS messages. Message impressions can be scheduled to interleave with "now playing" song information, or as standalone messages through The Radio Experience.

217-224-9600; www.bdcast.com
bdcast@bdcast.com

Wireless audio interface
JK Audio
Booth N9426

Daptor Three: Using Bluetooth wireless technology, this interface connects to the user's cell phone like any other Bluetooth-enabled headset. The interface allows balanced and unbalanced connections to a cell phone. It will also connect to other products, such as a laptop, that allow a similar headset connection. Features of the unit include XLR balanced line input and output and 9Vdc battery operation.

800-552-8346; www.jkaudio.com
info@jkaudio.com



This man could use a vacation.

Take advantage of his obsession with the New VLZ3s.

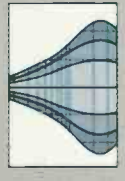
We didn't think we could improve on the original VLZ mixers... at first. Then an over-achieving engineer decided to try it. First he made a more musical 3-band EQ. Then he came up with the new XDR2 mic preamp, one with more consistent frequency response across the entire gain range. We figured that was it. Didn't hear from him for awhile. Then he burst in showing how his new summing bus lets you add more signals together without running into clipping. OK, OK we thought. Give it a rest! But he couldn't be stopped. He started doing things like rounding off corners, building a clever handle right into the mixer...he even made the silkscreening on it EASIER TO READ. It got so out-of-hand, our HR department advised us to make him take some time off. So we did. But not before we put all of his improvements into the new VLZ3 mixers.

Learn more about this OCD-driven triumph at: **www.mackie.com/vlz3**

NEW XDR2 MIC PREAMPS
Our new mic pres are quieter than ever, and with even higher headroom. Oh, and there's a good 60dB of gain range, too.

FULL BANDWIDTH
Across the entire frequency range of a VLZ3 you'll experience an amazingly low noise floor, even at excessively high output levels.

MORE CHANNELS BEFORE CLIPPING
Taking advantage of "negative gain summing," our new summing bus lets you mix more signals together while maintaining optimum audio.



MORE MUSICAL EQ
Musical EQ isn't new to Mackie, but with our new EQ the three bands work better independently of each other, giving you more overall control.

VLZ3

MACKIE.

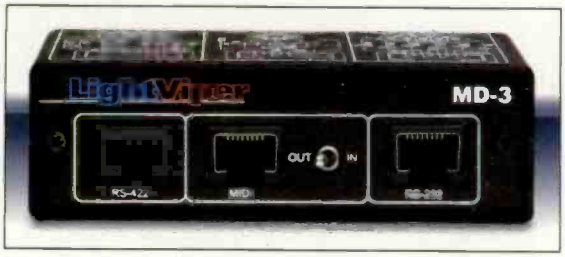
www.mackie.com/vlz3

Multi-control interface translator

Fiberplex

Booth N6534

Lightviper MD-3: This multi-control translator for Lightviper translates RS-422, RS-232 and MIDI control signals through fiber optic transport systems. The rear panel contains three RJ-45 connectors and a single switch. The switch is used to determine whether MIDI is sending or receiving on each device. The translator derives power from the Lightviper system via the connection between the RJ-45 control connector on the Lightviper unit and the RJ-45 connector on the MD-3. The MD-3 is used in pairs; one MD-3 is required at each end of the system. An MD-3 pair is capable of sending a specific type of control signal (e.g. RS-422) through a Lightviper system and outputting that same control signal on the opposite end.



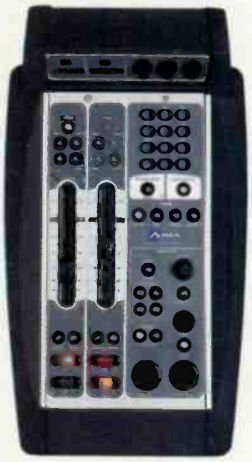
301-604-0100
www.fiberplex.com

Compact control surface

Axia Audio

Booth N7726

Element 2-Fader+Monitor: Suitable for use in news booths, dubbing stations and as workstation mixers, the module allows Axia clients to order Element consoles in compact sizes of two to 10 faders. The equipment combines two fader strips with overbridge alphanumeric displays and status symbols with a two-space monitor/options section, all of which fit into a four-position module. Features include four program buses, four aux send buses, two aux returns, automatic mix-minus and dedicated talkback functions on every fader. A one-touch record mode provides off-air recording and recall of talent preferences. It also features three-band digital parametric EQ.



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

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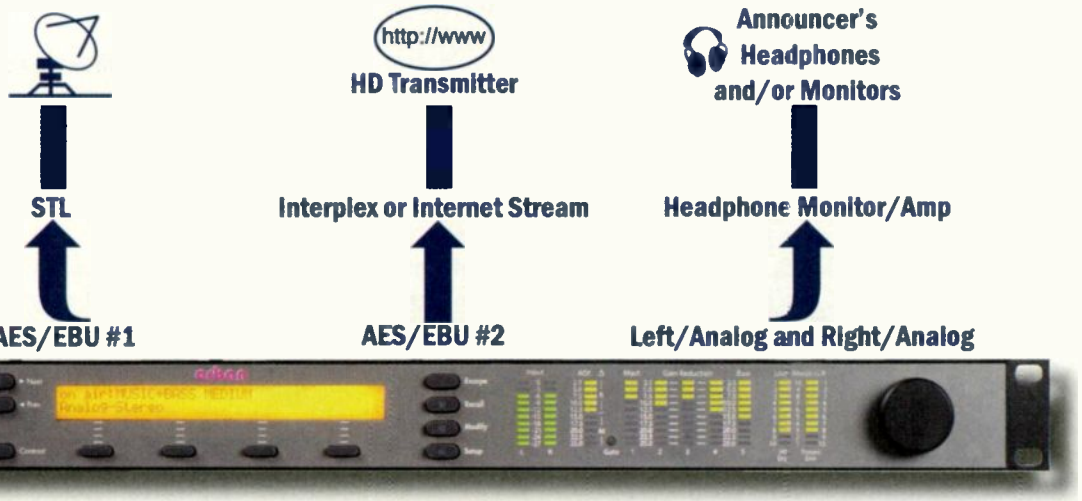

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Custom panels
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Booth C7617

Luma Vue: These panels can be rear illuminated for instant identification. The panels and plates can be used for connection panels, switch panels and diagrams of any kind. The panels are available in a variety of sizes or shapes, including standard gang plates, wall plates and rack panels. They are available in 1/8" or 1/4" thicknesses to fit individual requirements. UV stabilized for outdoor use, the panels feature non-metallic cell cast acrylic. The panels will not rust or tarnish and are offered in 10 colors to match or contrast the venue's decor. Colors include red, burgundy, blue, navy, almond, white, grey, black, gold and silver. Panels are also available in gloss or matte with a no-glare finish.

800-642-9473; www.wireworks.com
info@wireworks.com

Cue-triggering software
Merging Technologies
Booth SL4014

Ovation: An add-on software option for any Pyramix system from a native system upward, Ovation consists of several software modules, including Cue Editors, Cue Sequencers and Cue Players, that can be used to supply performance cues and automation data for anything from a single-auditorium theater to an entire venue or suite of broadcast studios where live recordings are created. The software is compatible with the MIDI Show Control protocol, allowing integration with existing venue or studio control technology. Audio is output on any of 128 channels, which can be routed via a software matrix to the system's outputs. Output options include ADAT, AES-EBU and MADI, and there will also be various MIDI and general-purpose output options.

207-773 2424; www.merging.com; kbarnsley@merging.com

Multimedia engine
Fairlight AU
Booth SL4010

Dream II Satellite-AV: This Crystal Core multimedia engine delivers 230 channels each with eight bands of EQ, three stage dynamics, 192 track recording and editing in a complete multi-format mixing system. The entry-level DAW offers a 96 channel CC-1 engine with an SX-20 unit (sync I/O plus 12 analog outputs, two line level inputs, two mic/instrument Inputs, four S/PDIF inputs and eight S/PDIF outputs) plus the Satellite-AV controller. This provides 64 concurrent recording tracks, with 96 tracks available for editing and playback.

631-265-4499; www.fairlightau.com; sales@medaigear.us
info@fairlightau.com

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info@efronstudios.com
www.efronstudios.com

Digital hybrid
JK Audio
Booth N9426

Inkeeper 1x, Innkeeper 1rx: The Innkeeper 1x feeds audio in and out of telephone lines. The digital hybrid connects audio signals to a standard analog telephone line without variations. The unit features a 16-bit DSP to monitor the phone line and audio signals continuously. Its dual-convergence algorithm achieves trans-hybrid loss typically exceeding 50dB, without any setup. Users can monitor the send signal, the caller's voice or a mix of the two. The audio connections include mic/line switchable XLR input, XLR caller output and an additional, user-defined XLR output. The Innkeeper 1x can be remote controlled by the optional Guest Module 1, RIU-IP remote interface or the included RS-232 cable. The Innkeeper 1rx is the 1RU version.

800-552-8346; www.jkaudio.com
info@jkaudio.com

Transient voltage surge suppressor
Henry Engineering
Booth N7432

Powerclamp series 4: These surge suppressor units are rated for 60,000A of surge attenuation. The units will virtually eliminate spikes and surges on ac power lines, attenuating them to within a few volts of the normal ac voltage. They reduce the chance of serious equipment damage or malfunction caused by ac power disturbances. The devices also remove noise and harmonics from the ac power line.

626-355-3656; www.henryeng.com
info@henryeng.com

Enclosure
APW Mayville
Booth SU7220

Stantron E-Rack: The modular approach of the Stantron E-Rack allows users to configure their own rack systems. Removable, quick-release side panels and cable-chase panels provide access for cable management. The straight cable runs in the E-Rack's open frame design eliminate kinks, bends and protrusions. Multiple lacing points located every 6" along the rack support heavy bundles.

800-558-7297; www.stantronracks.com

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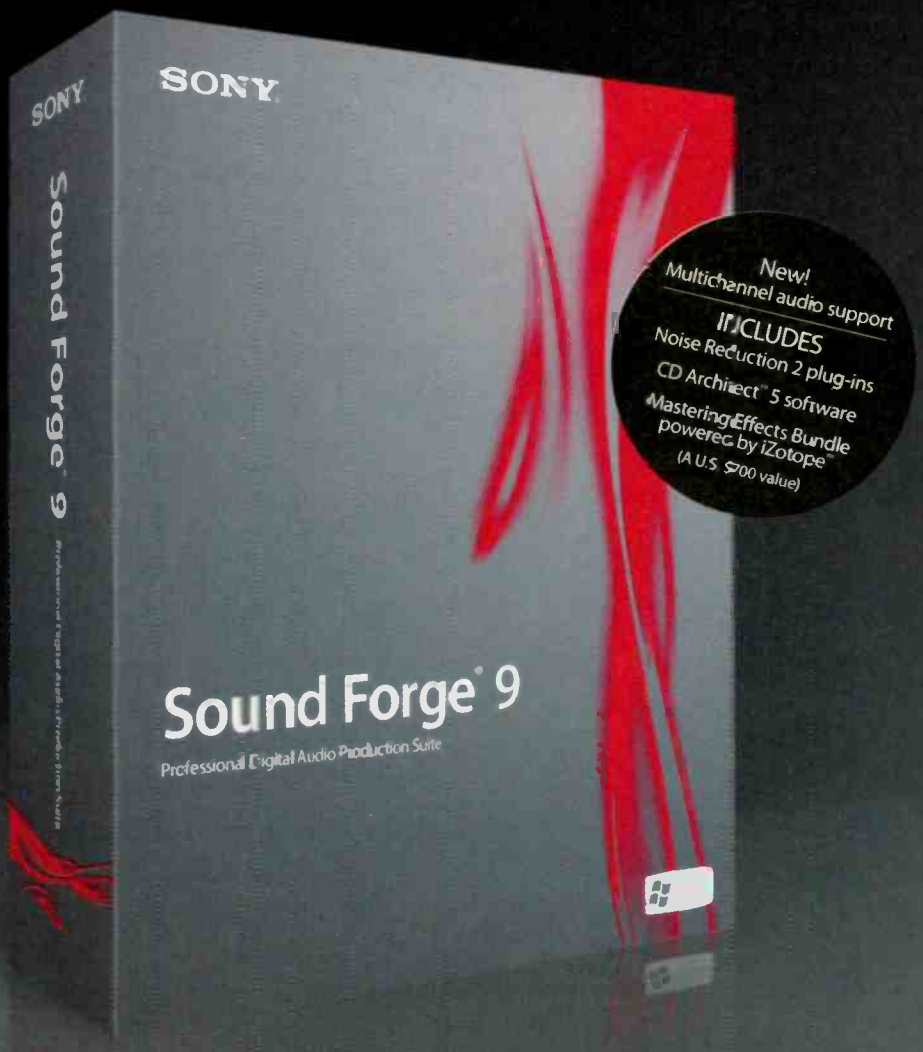
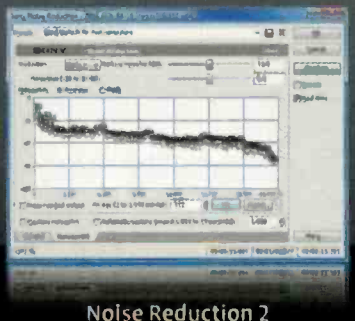



Sound Forge® 9


CD Architect™ 5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Sound Forge software is the go-to tool for audio production professionals, and has been since the dawn of digital audio editing. Why? Because it's fast, it's precise, and it's rock-solid dependable. New version 9 is now a full-on audio production suite with included software for CD design, effects processing, and mastering. The Sound Forge 9 suite also has a long list of new features including multichannel audio recording and editing, and Dolby Digital AC-3 encoding. Put it to work in your studio and see why after more than a decade, Sound Forge is still the most comprehensive and efficient audio editing platform you can buy.

sony.com/soundforge9

Works with Windows Vista™

Portable digital recorder
Marantz
Booth N1831

CDR310: This unit records in uncompressed and MP3 formats. Other features include built-in microphone preamps with XLR connectors and 48V phantom power for use with external condenser microphones, a built-in microphone and built-in CD-R/CD-RW burner, all within one lightweight, compact unit. The burner can create audio discs, for instant playback on any CD player, or data discs for transfer to a computer or for archiving purposes. Battery power capability—using the optional RB1651 battery—allows four hours of remote operation without an external power supply. Analog line-level and S/PDIF digital I/O allow connection to a wide range of audio equipment.

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

Portable line array sound system
Anchor Audio Communications/Portaco
Booth N6313

Beacon: The Beacon combines the sound coverage of a line array system with an enclosure that eliminates the need for a speaker stand. The enclosure includes three 8" woofers and an array of eight 4.5" mid-range speakers that deploys to a height of 6'. The unit provides a 120° pattern for a distance of 500'. Features include two universal mic input jacks, built-in UHF receiver with 16 user-selectable channels, 110/220 power supply, max SPL at rated power 110dB and frequency response of 60Hz to 15kHz ±3dB.

800-262-4671; www.anchoraudio.com

Power amplifiers
Crown Audio
Booth N7715

XTI series, XLS series: The line consists of four models ranging in power from 300W per channel to 800W per channel. The bridge/mono switch allows users to quickly and easily set the amplifier for bridge mono mode. Also, the signal indicators greatly increase monitoring capabilities for the user.

574-294-8000; www.crownaudio.com
audioinfo@crownintl.com

Portable PA
Avlex
Booth N4631

Mipro MA-808: Featuring a rugged, high-impact enclosure with retractable handles and integrated wheels for easy transport, this biamplified system features a 50W Class AB amplifier for the high frequency driver and a 120W Class D amplifier for the 10" woofer. The unit includes an MP3 recorder/player module, support for two wireless receiver modules, and storage provisions for the wireless mic transmitters. The MP3 recorder/player module supports CD, MP3 and SD cards. The Flash card reader/writer supports MP3, WAV, and WMV formats and features 128MB of memory, with a recording capability up to 8.4 hours. Audio can be loaded into the system via the USB connector. The system operates on ac or battery power.

877-447-9216; www.avlex.com; sales@avlex.com

Software automation
D.A.V.I.D.
Booth N5431

Media Mover: Automated conversion to Web-ready formats, transfer and display on Web pages, multiple parallel play-outs and website scheduling are features of this system. The metadata provided with an entry can be used to create the file name and a subdirectory structure where files will be stored. Media Mover supports transfer via FTP and file copy. Secure transfer is possible using SFTP, SSH and SSL FTP. Back-ups of files are stored on a local server. Media Mover also features metadata transformation and conversion. It has built-in interfaces to external content management systems such as SQL. It also supports export of the data via XML and HTML. Media Mover can also create the MP3 audio, ID3 tags and RSS feed files required for podcasting.

888-374-3040; www.davidsystems.us; info@davidsystems.us

UPS
Staco Energy Products
Booth N3813

Trestar P: This parallelable UPS is available in 125kVA to 150kVA and 180kVA to 225kVA sizes. It provides top and bottom cable entry, matching batteries and internal disconnect, and a front control panel with a LCD panel. The system provides 93 percent efficiency and less than three percent total harmonic distortion with a seven percent harmonic filter. The filter comes standard on the 180kVA to 225kVA size, and is optional on the 125kVA to 150kVA units. All units can accept a voltage input range of +15 percent to -20 percent as normal, while continuously regulating the output to within one percent for a balanced load and three percent for a 100 percent unbalanced load. Both models offer optional 208Vac input and output, external maintenance bypass and extended battery run times.

937-253-1191; www.stacoenergy.com; sales@stacoenergy.com

UPS
MGE UPS Systems
Booth C6822

Pulsar MX 5000 RT: This UPS is scaleable from 5kVA to 20kVA. The system delivers 4,500W of power, built-in redundancy capabilities, hot swappable batteries and power modules, and integrated output receptacles for plug-and-play functionality. Designed to deliver protection for 20 to 110 servers, the online double-conversion UPS uses modular redundant architecture that can scale power and runtime as demand increases or when users require higher levels of availability. Using 3RU for the combination of power and battery submodules, users can configure the new units as freestanding tower or rack-mounted systems. The 5kVA unit features a front access hot-swappable battery and power sub-modules, auto battery-test, multilingual LCD display and power management software. For extended backup time, users can add external battery modules to achieve up to two hours of runtime.

800-523-0142; www.mgeups.com; info@mgeups.com

Vocal mic
Heil Sound
Booth N9420

Pink Pearl: The Pink Pearl PR20 large diaphragm vocal microphone is the first model introduction in the new Spotlight Series. With the pink ribbon on a pink pearlescent finish, the mic represents completely new dynamic microphone technology and is designed for a wide range of professional applications.

618-257-3000; www.heilsound.com; info@heilsound.com

Broadcasting headset
Production Intercom
Booth N2235

DMH 948 ACS: The mic boom is a flexible gooseneck that is adjustable over a range of positions and is damped to reduce noise. The mic is mounted on the end of the boom using elastic suspension. The interchangeable mic capsules are electrically connected via a threaded fitting. Four condenser mic capsules are available: omni-directions, cardioid, cardioid with low frequency roll-off and hyper-cardioid.

800-562-5872; www.beltpack.com; info@beltpack.com

Broadcast recorder
Zaxcom
Booth N9017

ZFR100: Recording as many as 12 hours of audio directly to a 2GB Flash memory card, the recorder includes a full-featured time code reader/generator that stamps the time code onto broadcast WAV or MP3 files. The miniature recorder weighs about 4 oz. and can be powered for up to 24 hours with two AA batteries. The unit can be worn on the body as a back-up to wireless microphones when wireless operation is not possible or reliable. An optional 8Vdc to 16Vdc power input is also available. The unit can record in a continuous 12-hour loop or in traditional record/stop operation.

973-835-5000; www.zaxcom.com; info@zaxcom.com

Patch panel
Jampro Antennas
Booth C2515

RCPU: The RCPU is a quick release patch panel with a low insertion loss. A positive lock mechanism ensures quick re-direction of RF signal paths. The equipment is useful for patching RF feeds to an emergency antenna, alternate main/auxiliary transmitters, filter by-pass, master station combiner re-routes and test point insertions. No tools are required to make patches. The unit comes in several sizes with an optional signal-flow indicator panel, dual-line power splitter or power measuring VSWR.

916-383-1177; www.jampro.com; jampro@jampro.com

Modulation analyzer
Audemat-Aztec
Booth N8614

Navigator: The unit can be used on site to validate a transmitter's performance, tweak its operating parameters or to monitor the tranmitter's operation. There are three types of inputs on the unit: RF, multiplex/composite and audio. The analyzer can measure all audio signals, with or without de-emphasis, and the modulation power. The device also includes a digital spectrum analyzer and it decodes all RDS groups from PS to PI.

305-249-3110; www.audemat-aztec.com; contact@audemat-aztec.com

Software for Exstreamer/Instreamer
Barix Technology
Booth N8034

Low-latency software: The new software application for low-latency streaming in its Instreamer and Exstreamer IP audio encoding and decoding devices is based on the Barix Real-Time Protocol (BRTP). BRTP is specifically designed for radio stations and broadcast groups that wish to deliver a live signal from one studio to multiple Internet radio outlets without the delays associated with audio streaming. The application can be used over a standard broadband infrastructure and public Internet connection.

866-815-0866; www.barix.com; info@barix.com

NAB2007 NEW PRODUCTS

Upgraded remote control system

Davicom

Booth N5413

Next Generation Mini-Mac: The newest unit shares many features with its big brother, the Mac, but has a limited number of inputs/outputs (eight metering inputs, 16 status inputs, two audio inputs, eight physical relays and one reach-through serial port), and cannot be expanded. Version 5 of the firmware is daylight saving time ready for North America, offers bilingual voice and screen capability (supporting Unicode character sets), multiple alarm-call lists (for day/night work shifts, weekends or specific events) and a user-defined log. Configuration and control of Mini-Mac and Mac units is ensured by the included Mac Comm software version 5, which allows customized screens for each user and site.

418-682-3380; www.davicom.com; info@davicom.com

Testing device

Whirlwind

Booth C8128

AES Qbox: By substituting a Qbox at a problem point in a system, the user can verify signal presence or generate a signal to determine if the problem lies farther down the line. Three operating modes are selectable: in/out normal mode, pass through and cable test. The unit recognizes digital sample rates from 32kHz to 192kHz. A set of input sample rate indicators shows the following sample frequencies (in kHz): 32, 44.1, 48, 88.2, 96, 176.4 and 192. The digital audio is converted to analog and may be monitored via an unbalanced, 1/8" TRS stereo line/headphone output or with the built-in speaker. The built-in tone generator provides 440Hz for the left channel and 880Hz for the right.

800-733-9473; www.whirlwindusa.com; sales@whirlwindusa.com

Mic station

Beyerdynamic

Booth N9014

Revoluto: Manufactured for use with the MCS-D 200 conferencing system, this mic station provides sound reproduction without the use of a gooseneck microphone. Using line array technology, the microphone capsules create an omnidirectional pattern allowing the speaker to move around without affecting the volume or sound quality. With its multi-capsule design, the unit provides additional redundancy with no loss of pick-up. The Revoluto station is available in three versions: basis, standard and graphic.

800-293-4463; www.beyerdynamic-usa.com
info@beyerdynamic-usa.com

Low-power transmitter
Harris
Booth N2502

ZX3500: A 3.5kW model from its expanding range of ZX low-power transmitters, this unit will switch between digital, analog and hybrid modes on the fly, and can be delivered with one of three Harris exciters: the Flexstar HDX-FM, the Micro Max analog exciter and the Digit CD exciter. For multicasting, it can be used with Ibiquity's Generation 3 exgine architecture, which brings the HDI-100 importer and HDE-100 exporter back to the studio and reverts the HDX exciter to a more user-friendly and reliable DSP-based operation.

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

XLR chassis connector
Neutrik
Booth N8526

DLX series: This connector series features a compact, all-metal housing and offers RF protection and electromagnetic shielding. Its duplex ground contact provides contact between the chassis and cable connector, as well as the option to solder chassis ground to pin one. The series also offers a male connector designed with a metal retention bar for improved pull-out force. The series is available in three- to seven-pole configurations with gold- or silver-plated solder contacts and nickel or black metal housing.

732-901-9488; www.neutrik.com; info@neutrikusa.com

Subwoofer
JBL Professional
Booth N7715

LSR 4312SP: The subwoofer is based on a 12" low-frequency transducer with a neodymium motor structure and powered by a 450W amplifier. The subwoofer features a dedicated low frequency effects input and five balanced XLR bass management inputs with selectable crossover for 5.1 surround sound production. Two-channel 24-bit/96kHz digital S/PDIF and AES/EBU inputs can be assigned as LFE or stereo bass management inputs.

800-852-5776; www.jblpro.com; info@jblpro.com

Multi-user headphone distribution
Henry Engineering
Booth N7432

Multiphones II: For use with the Multiphones multi-user headphone distribution system, the new unit supports 12 guest pod headphone listening stations and now includes zoned talkback. This feature allows the user to divide the listening stations into three zones, so that a guest pod or group of guest pods can be addressed via the built-in talkback feature. The system provides headphone listening facilities to multiple users, with each user having a headphone jack, amplifier and volume control. The system is interconnected with CAT-5 cabling.

626-355-3656; www.henryeng.com; info@henryeng.com

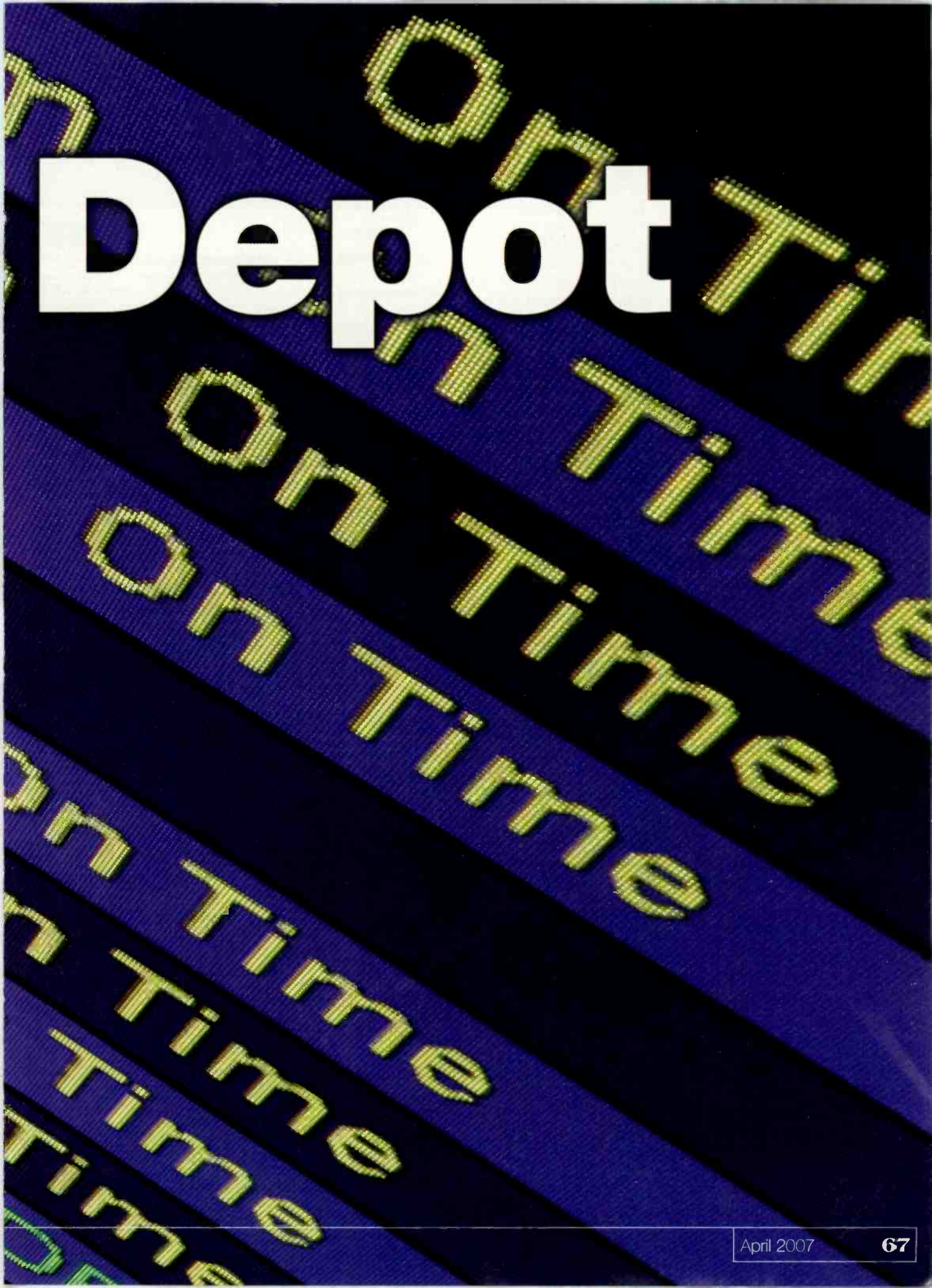
Now Arriving at the Content

by Scott Socum

Public radio broadcasters have been anxiously staring down the tracks, waiting for the new technology to pull into the Content Depot. After some delays, they're finally celebrating the onset of this next generation of program delivery.

It has been a prolonged transcontinental haul for the Public Radio Satellite System (PRSS), the distribution network that handles thousands of hours of programming each year for more than 400 public broadcasters. Each of the participating members owns a piece of the collective assets of PRSS, plus their own uplink and downlink equipment. PRSS passes the programming through the facilities of NPR Distribution's uplink at the Network Operations Center (NOC) in Washington, DC.

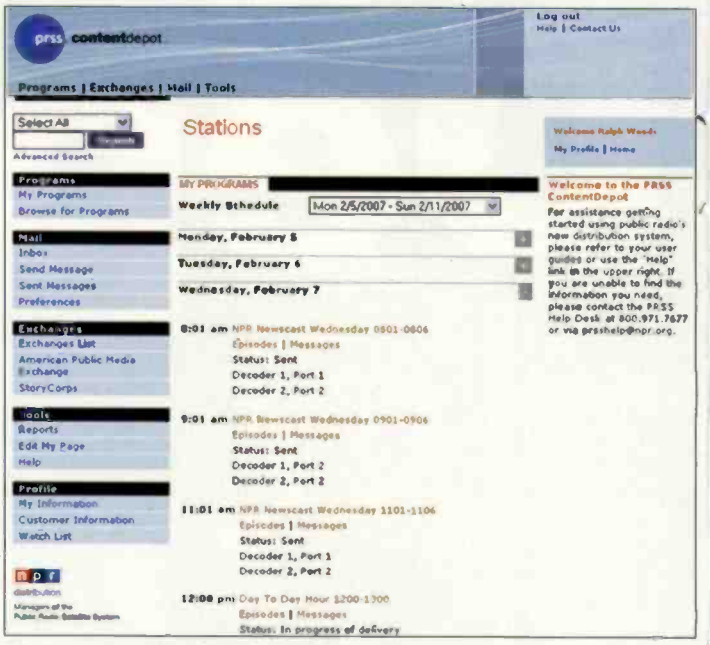
Depot



Now Arriving at the
Content Depot

In 1998, a design advisory group was formed to examine and enact the best options to replace the once-cutting-edge Satellite Operating Support System (SOSS), which used satellite channels for real-time transmission of live and pre-produced programming. After assessing an assortment of options, the group chose to continue with satellite distribution (IP-enhanced) because it was the most cost-effective and reliable means to reach its national consortium of stations, bypassing the network congestion and bandwidth requirements of the Web.

Content Depot's design initiative: Program producers would be able to quickly upload new content nationwide, and to keep track of exactly who was running precisely which programs—essential to improving service, as well as the accuracy of the billing information. Communications between more than 100 producers and their client stations would be enhanced. Program originators could also upload associated graphics, text, rights information and more to the online PRSS Content Depot portal using a Web interface. The design parameters for



The station's online interface to access program material.

the new system included the capability of passing along program closures, and the program associated data for HD Radio program transmissions.

The store-forward capabilities of the new system would simplify the stations' processes for capturing and airing pre-recorded shows. Another element, which became known as PRSS Content Exchange, would be provided for communities that wished to exchange programs for certain regions or specialized topics, delivering files on demand.

The system has been implemented in phases, at the network level and by the stations scattered across the continent. In 2001, PRSS participants began accessing the program catalog using Web browsers. In the fall of 2002, NPR Distribution brought BBC Technology aboard to assist in testing file transfer and associated metadata with standard file formats, using the satellite transponders for the channels and IP packets as the carrier.

By 2003, PRSS had chosen International Datacasting Corporation as the vendor for the two satellite receivers to be installed at each PRSS Content Depot downlink site. In that same year, the Public Radio Exchange, or PRX, partnered with PRSS to provide PRX contributors and users with the option of Web or satellite delivery. The train was picking up speed, but not ready to take on passengers at the Content Depot.

Three C-band channels for the PRSS streams were opened on the newly launched Galaxy 16 satellite when it became available in June 2006. New receivers and instructions were shipped to public stations, and finally, Content Depot went online on Nov. 1, 2006.

From point A to point B

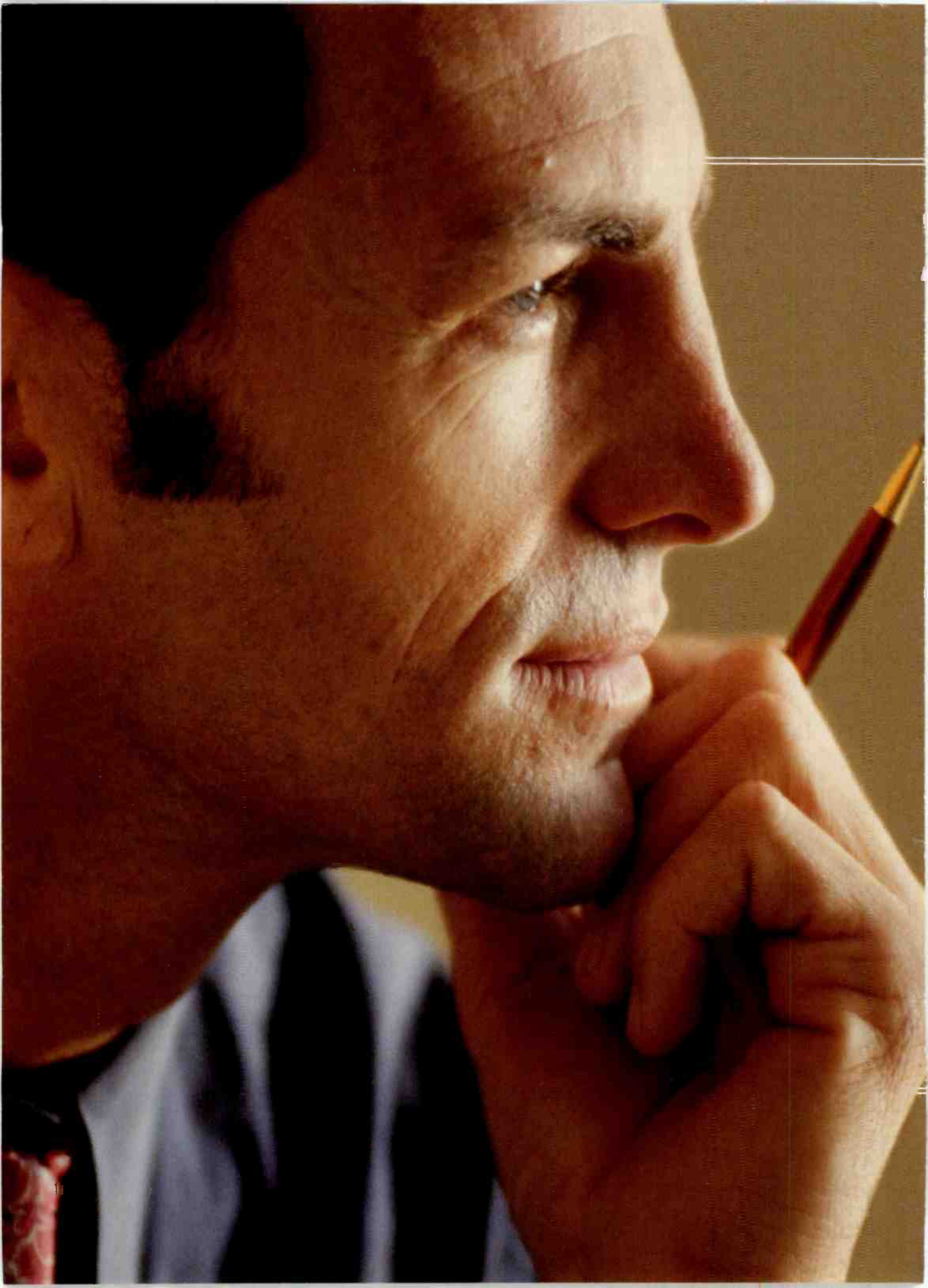
Until Content Depot was launched, programs from producers around the world would arrive at NPR Distribution in a variety of formats and media. Now, it is simplified and standardized.

"All of the pre-recorded content from the 100+ producers who use PRSS is uploaded via the Web, " said Martin Bloss, director of Technology for NPR. "Only in the rare case of an emergency is any other submission method used."

Producers log into the Content Depot portal on the Web and upload their shows in convenient program segments, along with associated graphics and data. Content Depot's headend asset management system scans the uploads for viruses, then makes the materials available through the satellite distribution system for live broadcasts, or for automatic storage at the station sites. Producers use the same Web interface to track which stations are downloading their features, and to exchange messages with subscribing stations for feedback on programming and promotional needs.

Participating stations also have log-ins with the Content Depot portal at NPR's NOC in Washington. When they view the home page, their screens display which programs are slotted for their sites, and the status of downloads and live features. Users can browse through all the PRSS offerings, audition those items of interest and subscribe to the features that they will download by satellite for their facilities. A small percentage of Content Depot users without satellite reception capabilities gain access through alternative channels, including the Internet.

Stations have two types of receivers at their end, each with unique IP port addresses. The first is the IDC SFX2100 storage appliance, a receiver that includes a 120GB hard drive for capturing 900 hours of pre-recorded programming. Public radio station racks are also sporting the IDC satellite



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Now Arriving at the Content Depot

stream decoder (SR2000pro), equipped with a pair of stereo audio outputs for the live program feeds.

"All programs delivered by Content Depot are [IP] addressed," Bloss said. "The multicasting addressing scheme allows for one, many or all stations to receive a particular program based on the producer's permissions and station subscriptions."

Stations generally have redundant pairs of the streaming decoders and the file receivers, primarily for backup. That configuration varies at some sites, such at KUOW in Seattle, which uses five streaming decoders and two of the storage appliances. KUOW also oversees separate public radio programming for a sister station, KXOT in Tacoma, WA. Each FM has a primary and backup streaming device, plus another port is dedicated to breaking news and the NPR hourly news feeds. Yet another brings in BBC programming, which airs around the clock on KUOW-HD3. The file-receiver units capture programs for both stations' playback at a later time.

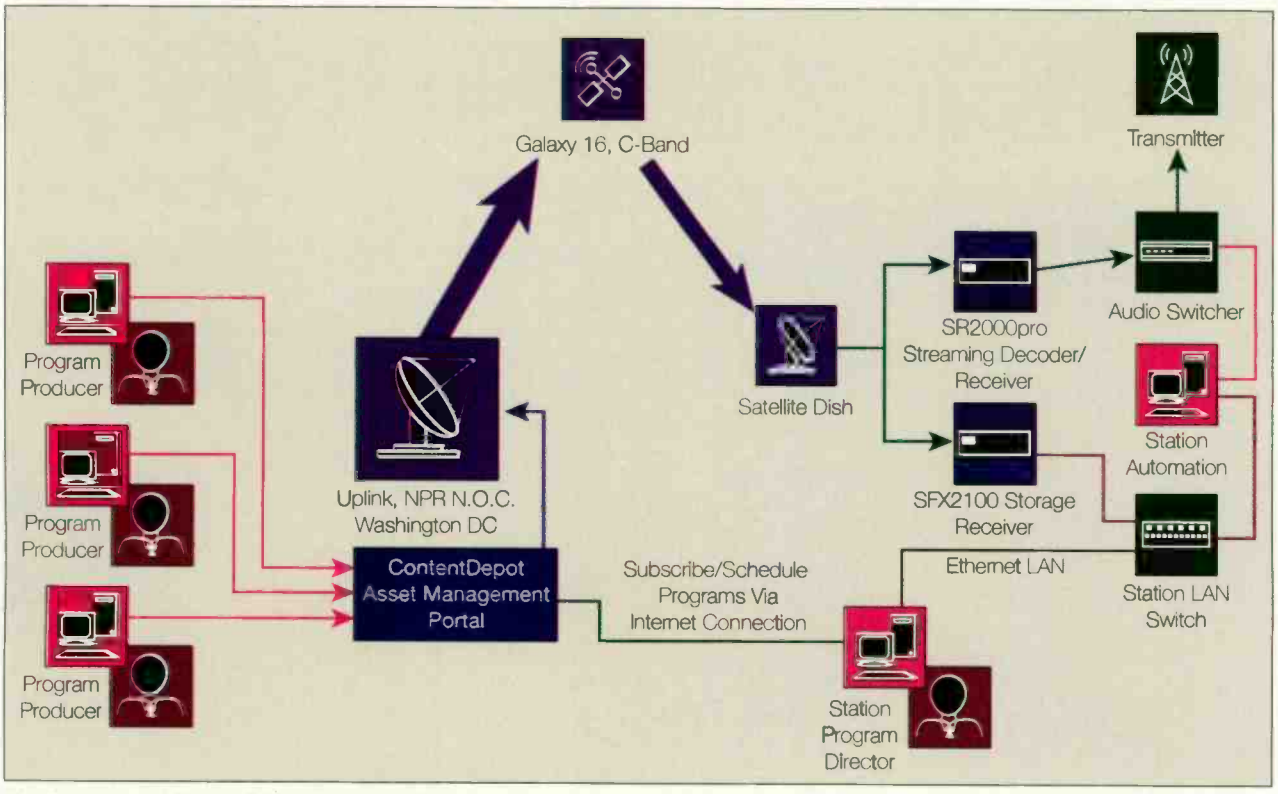
At Seattle's KUOW-FM, Doug Paterson, producer for content from outside sources, notes that he implemented Content Depot in phases, beginning first with the pre-recorded feeds when the system came online in early November 2006. Subsequently, he added the live network programming, and as of Feb. 10 began picking up the live decoder feeds that KUOW prefers to time-shift.

The file-based programs are delivered by Content Depot as MPEG-1, Layer II, 44.1kHz sampling, in a broadcast WAV (BWF) format. The associated metadata is bundled with the audio in Cart Chunk or the AES-46 standard. Files for programs can be sent in faster-than-real-time; an hour-long show may take much less than 60 minutes to download, depending on traffic.

Through their local LANs, station automation systems and their administrators can see the files that have been pushed into their storage receivers by PRSS, and those program elements can be downloaded automatically into the station's play-out drives.

Most automation systems have developed an interface to the Content Depot SRX2100s, although there have been a few glitches along the way as the new operation was brought online. KUOW/KXOT uses the Broadcast Electronics Audiovault automation system. Paterson said that BE's CDI interface has undergone a few modifications as users discovered some shortcomings.

Stations that didn't own an automation system that interfaced with Content Depot were sometimes provided with a utilitarian 1RU Enco box, and given the option to add some Enco features and functions at reduced prices for PRSS members. Like BE, Enco has overcome some early issues with the implementation of Content Depot, including audio up-cuts of programming.



System overview of the Content Depot system.

All aboard?

The original optimistic prediction of a system roll-out by 2004 underwent several revisions, now to an expected completion at the end of April of this year. PRSS has provided some leeway to stations that are upgrading from the old SOSS configuration.

The two types of receivers used with Content Depot are manufactured by International Datacasting.

"At the completion of the transition, the entire 428-station PRSS network will be utilizing the Content Depot and the old satellite system de-commissioned," said Bloss. "At this point in the transition, [February] about two-thirds of the stations have their equipment racked and installed, and we believe a little over half of the network is using some of the Content Depot programming. We have heard from several stations that are completely converted. By operating the old system in parallel with Content Depot, stations can make the conversion when it is most convenient for them."

What's next for Content Depot development? "Like any major undertaking, the first round of improvements is around areas where the system doesn't yet meet all the desires of the users," said Bloss. "That is where work is focused currently. Throughout the transition we are collecting ideas for improvements and enhancements to be added in over time."

The Content Depot initiative and its IP-over-satellite implementation has placed PRSS in the pioneer's spotlight, for which Bloss offers this low-key acknowledgement: "There has been general interest in the U.S. and international broadcast community in the techniques we employ."

And with that, NPR's director of technology pulls at the bill of his conductor's cap, and makes ready for the next innovations coming down the track.

Slocum is a freelance writer based in Kansas City.

Creative REMODELING

With some creative thinking and purchasing, WSTB was able to update its facility without breaking the bank.

By Ron Bartlebaugh

Creative studio remodeling became the mandate at community/high school radio station WSTB-FM in Streetsboro, OH (near Akron). The station operates on a minimal budget with almost all of its income generated by its annual on-air fund drive. The old 10' by 14' on-air studio had become outdated physically and technically. Required improvements included not only broadcast-related equipment, but also lighting, furniture and seating, floor, wall and ceiling materials and electrical power distribution and protection. With an initial budget of $5,000, WSTB's part-time IT Director Dan Kuznicki and Contract Engineer Bill Weisinger, along with volunteers and student assistants, created a remodeling project that focused on form, functionality and cost effectiveness and yet yielded a futuristic high-tech appearance.

To continuously serve its 30,000 weekly cume audience, the station's modern rock/Sunday Oldies program origination was switched to one of the station's two production studios during spring break. The existing on-air studio, in excess of 10 years old, was gutted in one day—including the old patch bays and wiring as well as the removal of the old kitchen cabinets being used for studio equipment support furniture. The existing double-layered drywall with internal insulation was determined to be adequate and therefore left in place. As part of the remodeling project, the walls were covered with a heavy grade commercial carpet purchased at a close-out price of $0.44 per square foot from a local building materials retail chain store. Rather than gluing the carpet to the wall, the WSTB remodeling team elected to use roofing felt nails along the top and bottom of the walls to keep the carpet in place. This method of installation allows the carpet to breathe and flex, which greatly improves its low frequency acoustical absorption abilities. In addition, the nails are easily removable when the carpet needs to be replaced. The old 2' by 4' suspended ceiling tile was removed and replaced with a new 2' by 2' suspended ceiling tile with a nice reveal edge costing $1.77 each. The new ceiling with its tile reveal edge and the loose mount wall carpet mutually contribute to an acoustically good sounding room.


CABLE TV
ROOF WINDOW

Creative REMODELING

The original studio entry door, a modified good quality, residential exterior door with a large window, was left in place. Its modifications include a tight weather strip seal at the top and sides of the door and a weather threshold at the base of the door. Those seals serve as sound isolation barriers in the already relatively quiet WSTB studio/office complex.

The studio window that provides the WSTB announcer with a view of the two production studios was also deemed adequate and left in place. The old studio design positioned the announcer's back to the window and to the door; however, the new design places the window at 90° to the announcer and places the announcer facing the door. The new orientation creates a take-charge sense of ownership of the room for the announcer, which was one of the many project goals.

The concrete floor received a new coat of paint. An inexpensive carpet remnant was then placed over the floor and is held in place with an appropriate tape for easy removal and replacement when required. The HVAC system was deemed adequate and therefore was not updated.

What you see

A new lighting system design was an important goal of the project. A combination of track and recessed ceiling fixture lighting using low voltage halogen floodlight lamps make up the majority of the room's lighting design. Four colors of rope lighting are encased in a newly constructed wood frame soffit around the perimeter of the room at the top of the 12' high walls. The open side of the encasement is covered with a translucent cloth that provides ventilation and light diffusion. Each announcer has his choice of the colored perimeter lighting scheme and overall room brightness using inexpensive lighting control products that are readily available from Internet vendors. Because WSTB operates on a minimal annual budget, like so many community/high school radio stations, the cost of replacing expensive light bulbs is minimized by taking advantage of the voltage limiting and soft ramp

The door (just visible on the left) and window are now visible to the operator.

Area	Cost
Video wall, wiring, display and distribution	$1,120
Total cost for new "island" countertops and support structure	$940
Electrical components, wiring, power filtering and protection	$735
Primary lighting fixtures and control devices	$675
Equipment upgrades, cd player, mic boom, misc	$550
Color changing decorative "mood" lighting	$375
Outside consulting and assistance	$360
Computer equipment, webcam and related hardware	$330
Automation system hardware upgrade	$325
Wall coverings, carpet and mounting hardware	$325
19" widescreen automation monitor upgrade	$220
On-air lights, bulbs, telephone flashers and alert strobes	$196
Additional studio digital telephone	$175
Ceiling tiles, ceiling supports and frame upgrade	$165
Misc hardware store pieces and parts	$155
Weather satellite video extension	$145
Misc expenses	$145
Misc. mounting hardware, monitor arm and LCD mounts	$135
Floor paint and carpet remnants	$125
Food for volunteers	$92
New keyboards, mice and related peripherals	$65
TOTAL	$7,353

Table 1. The cost breakdown of various items for the remodeling project.

The existing door was re-used. A vanity light was adapted to serve as an on-air light.

A production studio temporarily served as the air studio during the remodeling.

up features of the lighting controls.

An inexpensive on-air light was created from a three-bulb bathroom vanity light fixture that was found on close-out for $1.00. Repainting it red and installing three clear red bulbs for $2.40 each yielded an aesthetically pleasing light. An identical fixture using inexpensive adjustable speed DJ strobe bulbs with colored gels provides a three-lamp wall mounted annunciator panel for EAS, telephone and doorbell indications.

Two gooseneck style desk lamps occupy part of the furniture countertop. One light is always on and aimed at a large wall-mounted write board located just slightly to the right of the announcer. The other light is located just to the left of the announcer. That light, controlled by the on-air light circuit, comes on with the microphone to illuminate the copy board in the event the announcer does not otherwise have sufficient light to read the copy.

The main support

The focal point of the studio is the newly constructed U-shaped studio furniture that supports much of the broadcast equipment and provides two guest positions in addition to the announcer position. Using inexpensive design software, the 40" high stand-up operation furniture was designed for proper operating ergonomics. The heart of its construction is a 2" by

4" stud frame covered with plywood and carpet. The countertop, made of durable plywood, is painted a futuristic silver-gray color and covered with 30 coats of polyurethane varnish for durability. A similarly painted 4" diameter PVC drain pipe routes vertically from the left rear corner of the furniture to above the ceiling for the cable paths. The furniture unit features open door access at both ends of the U for storing equipment and other operating essentials.

Following the same color scheme is a large custom-made cabinet mounted high on the wall in front of the announce position where it can easily be seen. This unit, with its angled front, provides a surface mount area for five LCD video monitors that cost $140 each. The monitors are used to display security, weather and other pertinent information. Each monitor is driven by a video game jockey unit costing $30.00 each and mounted using inexpensive LCD monitor mounts purchased on the Internet for $6.99 each.

A newly acquired 19" widescreen LCD monitor, used for program automation, sits on a newly purchased highly stable three gooseneck LCD mount located to the right of the Dynamax audio console that was brought in from the former studio. To the left of the announce position and adjacent to one of the two guest positions sits a 14" LCD monitor that is used for Internet access and station database acquisition. All computers and other noise generating devices are located outside of the studio but sufficiently close by so

The custom generator panel provides flexible control of ac power.

Painted silver, PVC pipe was used to route cable from the ceiling to the furniture.

The new operator's position after the remodeling.

that expensive extender devices are not required.

Readily available power conditioning and monitoring equipment is used in the studio along with UPS units to ensure proper power filtering and distribution. During the remodeling, we paid close attention to the power distribution scheme to ensure that all electrical receptacles in the studio were connected to the same phase and were properly filtered. Power demands on the pre-existing standby power generator had to be carefully calculated as well. The on-air studio termination to the WSTB facility-wide star ground system was also upgraded as part of the overall project.

The entire project was completed over a three-week period for a total cost of $7,353 using all volunteer labor. The breakdown of the expenses is shown in Table 1. All locally purchased off-the-shelf items were on clearance and received an additional 10 to 15 percent favorable discount from the retailer. Creative shopping over the Internet also yielded many good deals. In addition, a locally based microphone manufacturer generously donated three new studio grade microphones. Other items purchased for the project included two used RPU radios from Ebay, two custom control/interface boxes from name brand manufacturers, a multi-output headphone amplifier, a combo CD/MP3 player and logging software.

The combination of careful planning and design, creative shopping and the use of skilled volunteer laborers familiar with local building codes has yielded a studio facility that includes many features typically found only in more expensive facilities.

Bartlebaugh is director of engineering for the WKSU stations, Kent, OH, and president of Audio and Broadcast Specialists, Akron, OH.


WLW Mode

The colossus of Radio

by Michael A. Banks

Crosley Radio's 1936 WLW Model Super-Power Radio Receiver

In 1935, Zenith Radio produced a radio receiver called the Stratosphere model 1000Z. The set used 25 tubes and three loudspeakers, more than any other radio to date. A then-amazing 50W drove its three speakers—one 6" dynamic high-frequency and two 12" dynamic low-frequency speakers.

Standing 50 1/2" tall, the Stratosphere sold for $750—more than many automobiles. (In comparison, a new Ford cost $652.) At that price it's no wonder that only about 350 sets were produced during the four years the Stratosphere was offered.

This achievement impressed Powel Crosley Jr., the president of the Crosley Radio, who praised it as a fine example of quality in radio construction. But, it used only 25 tubes and three speakers. Crosley, who also owned the 500kW powerhouse WLW, was inspired to surpass Zenith by bringing the world the largest and most powerful radio receiver yet known.

A close friend of Commander Eugene MacDonald, president of Zenith, Crosley may have taken the Stratosphere as a light-hearted challenge. That aside, as Crosley said later, "It is fitting that the owner of the world's most powerful radio station make the world's greatest radio receiver."

The Colossus of Radio

Crosley's engineering and marketing staffs urged him to forget the idea. They felt it was an impractical exercise from an engineering standpoint, and that the market for such a radio—if one existed—would be miniscule. But Crosley was not easily discouraged, and, as one employee put it at the time, "It is characteristic of Mr. Crosley that he is a good salesman, enough so to win his point in an amiable manner." Of course, the fact that Crosley owned the company had some bearing on the matter.

A major undertaking

Surpassing the Zenith Stratosphere turned into a bigger project than anyone had expected. Many engineering conferences were held throughout the winter months, some of which included the Crosley advertising, sales, cost and purchasing departments. To aid with speaker selection and the acoustics involved in cabinet design, the chief engineer of the Jensen Radio Manufacturing Company (the same company that today manufactures speakers) was retained as a consultant.

Out of the numerous meetings and Crosley's imagination came the basic specifications: the radio would be a superhetrodyne receiver with no fewer than 30 tubes, six loudspeakers, four chassis and be housed in a suitable cabinet. More intricate than any set ever built, it would naturally have the highest possible quality and richness of tone.

The set would be called the WLW Model Super-Power Radio Receiver. This name was chosen by Powel Crosley Jr., a spokesman said, as "symbolical of the great 500,000W broadcasting station, the most powerful in the world." (Crosley never missed an opportunity to use one product to promote another.)

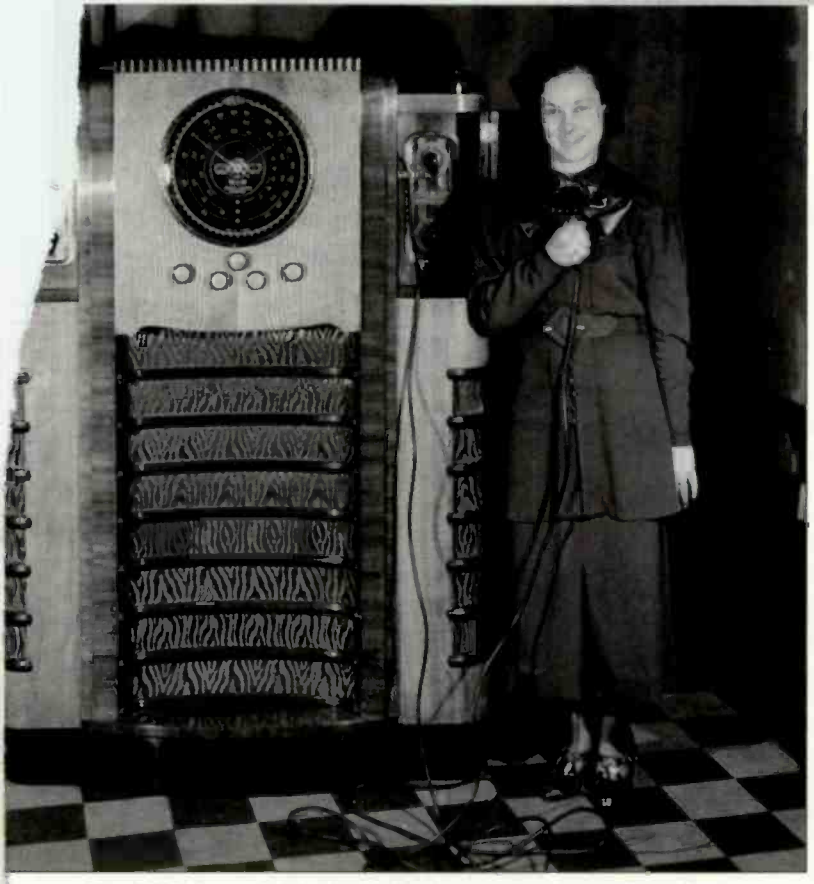
Early in the spring of 1936 Crosley assigned one of his engineers, Amyle P. Richards, the task of designing the radio. The 31-year-old Richards had his doubts about the project at first. "The logic of the situation was not at once apparent when Mr. Crosley gave the orders for construction," he was quoted as saying. "From the cost angle—engineers cannot ignore costs—it was perhaps the best plan, but from the angle of sheer engineering skill, it was not a desirable plan. But it also must be understood that the plan here adopted was necessarily in accordance with the wishes of Mr. Crosley."

Although his engineer's mind questioned the project, Richards enjoyed the challenges the project presented. In fact, he later wrote that he "enjoyed every minute spent on the creation of this receiver and welcomed the responsibility of making it a commercial possibility."

The project involved four basic segments: a variable radio frequency or pre-selecting amplifier, an intermediate frequency amplifier, a pre-audio amplifier and the power supply. Richards designed a separate chassis for each segment. Three audio channels handled low, medium and high frequency ranges, and a triple-tuned transformer.

Every feature that could be built into a radio was included. Automatic volume control (actually gain control, then a relatively new idea) minimized undesired volume increases when a station's signal power suddenly increased, or a listener tuned from a distant station to a more powerful local station. Automatic frequency control prevented drifts from the tuned frequency. By increasing or decreasing volume to match variations in signal modulation strength, an automatic volume expansion feature compensated for the natural or intentional variations in the volume of the music or other program being broadcast.

In its completed form, the WLW Model Super-Power Radio Receiver indeed surpassed the Zenith Stratosphere model. It had 37 tubes, six speakers and 75W of power. The cabinet stood 58" tall, 42" wide and 22" deep. Everything inside the cabinet that could be was chromium-plated. The transformer coils, tubes and speaker frames were finished in black, and each chassis had its own serial-number plate.



The WLW model included a crystal mic so that the receiver could be used as a public address system.

The inner workings

The speaker bank consisted of three high-range tweeters and two 12" mezzo or mid-range speakers, plus an 18" auditorium speaker for the low range, with the voice coil circuits phased for maximum quality sound reproduction. The speakers were focused in three directions, and the low-range speaker sat in a special cushioned mounting to prevent cabinet resonance. Because of weight considerations, the WLW model was shipped with the speakers uninstalled. (The 18" speaker alone weighed 85 pounds.) With the speakers installed, the WLW Model Super-Power Receiver tipped the scales at 475 pounds.

In keeping with the Crosley tradition of adding something extra to everything the company built, the radio receiver featured a public address system and microphone. The microphone was a 4" crystal type, attached to the set by a 25' cord. The microphone's input could be switched to any or all of the set's three audio channels. A two-way switch cut out the radio entirely, or allowed the microphone's input to be blended with a radio program. This was probably the first instance of a radio

The Colossus of Radio

equipped with a PA system. The designer rated it as having enough volume to address a crowd of 10,000.

The receiver could reproduce the entire range of audible sound, from 20 to 20,000 cycles per second. Its tuner brought in every frequency from 540 to 18,300 kilocycles, which at the time encompassed the commercial broadcast, police, amateur, and ship bands as well as foreign stations.

Such an impressive radio demanded a impressive cabinet. A modernistic style was chosen, and seven types of wood went into the cabinet's construction. A grille cloth designed especially for the Crosley WLW model completed the exterior. The fabric's design was a classic flame motif, popular in tapestry and furniture upholstery, as well.

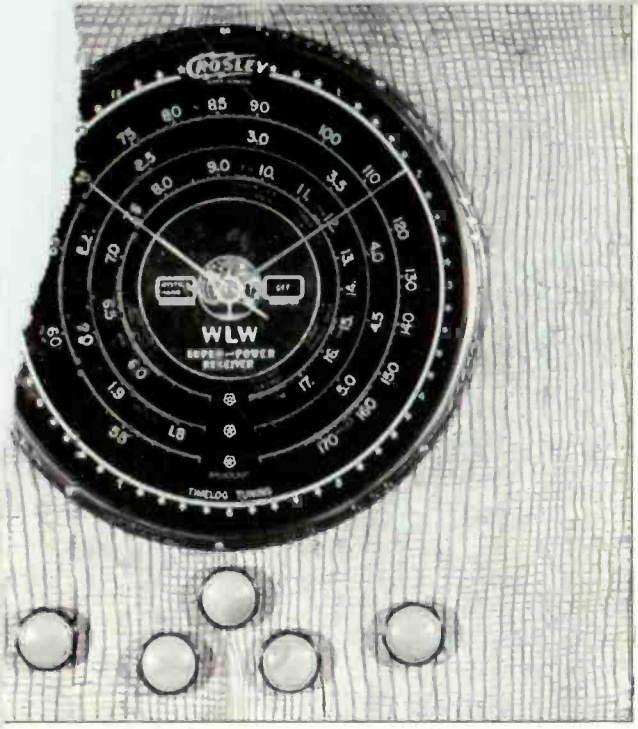
Every imaginable user control was included. An eye-catching 12" airplane-style tuning dial was mounted at chest-level, and beneath it were two volume controls (one for low and middle frequencies and the other for high frequencies), two tuning knobs, and a special fidelity control that incorporated the on/off switch.

The fidelity control allowed the user to select from five preset frequency ranges. The normal selection passed only the middle range of audio frequencies. A high fidelity selection, intended for listening to music, increased the response for 40- and 4,000-cycle frequencies by several decibels. A mellow tone setting made whatever radio program was on sound as though it were issuing from the inside of a large barrel. This was accomplished by suppressing high-frequency response. A bass selection accentuated bass response and cut off high frequencies. The final setting offered by the fidelity control, noise reducing, emphasized the high- and low-frequency response. A mechanical display to the right of the tuning dial's center indicated which fidelity setting was in use (including off).

The fidelity control feature was apparently popular for only a few years in the mid-1930s. It probably added too much to a radio receiver's cost to appear on any but the high-end models. Also, many radio owners may have found it too complicated to use.

Tuning was accomplished with two knobs, one for fine and one for broad adjustments. The knobs turned two clock-like sweep hands (one short, one long) on the dial's face. Appropriately, the outer rim of the dial was marked

A look inside the rear cabinet of the WLW model showing the multiple assemblies.



Detail of the tuning dial with its various unique displays.

with the numbers one through 12, just like a clock face. The clock numbers and sweep hands composed a mnemonic device for remembering station settings. A station tuned in with the short hand pointing at 10 and the long hand pointing at three on the dial might thus be remembered as 10:15. The feature was called Timelog Tuning.

A mechanical display to the left of the dial's center displayed the name of the band tuned in.

Three tone controls were set in their own panel on the left side of the cabinet—one for bass, mezzo and treble control. On the right side of the cabinet were the microphone input and controls. Hinged, curving wood panels covered both sets of controls.

An external feature of special interest was a visual tuning indicator, which was Crosley's answer to RCA's Magic Eye indicator. This was incorporated into the Crosley trademark at the top of the tuning dial.

The trademark consisted of the name Crosley with a bolt of lightning passing through it. The lightning part of the logo was cut out and a neon tube was installed behind it. The intensity of this tube's glow increased or decreased as the voltage in a dc amplifier varied. The net effect was to light an orange-red flash of lightning through the Crosley trademark when a station was tuned in. The stronger the station, the brighter the flash. So, tuning into WLW would make the most of this feature.

The WLW Model Super-Power Radio Receiver was announced on Nov. 25, 1936. The press release for the set was headlined "Here is the Colossus of Radio," and offered a breathless listing of the components and capabilities of this new wonder of the radio world. The receiver was presented as powerful and practical. "In spite of the fact that it has tremendous volume range with a maximum output of 75W," the release explained, "this gigantic receiver can be toned down to arm-chair or living-room levels and still retain all the original expression of the music as rendered in the studios."

The set made for excellent PR, and Powel Crosley Jr. surely had a laugh over it with his friend Eugene MacDonald at Zenith.

The set was priced at $1,500. There is no record of how many of the WLW Model Super-Power Radio Receivers were built, but the first sale was made to Wheless Gambill, a Crosley distributor in Nashville, TN. Powel Crosley Jr. certainly put one in his home, and probably sent one to Eugene MacDonald at Zenith.

Designer Amyle Richards received a bonus of sorts for his work. He had earned a Bachelor of Science degree in Electrical Engineering from the Oklahoma Agricultural and Mechanical College in 1927. In 1939 he submitted a thesis to the college's engineering department based on the WLW receiver, and on the basis of the project was granted a professional degree in electrical engineering.

Banks is the author of more than 40 books, the most recent of which is Crosley: Two Brothers and a Business Empire *that Transformed the Nation (Clerisy Press, 2006).*

Samson Technologies Zoom H4

By Barry Thomas, CPBE CBNT

The Samson Zoom H4 portable recorder looks like something out of *Men In Black* but it's an exceptionally versatile portable recording device. During the process of reviewing this device I even encouraged a friend to purchase one for her music radio show.

Radio industry producers have long been looking for a replacement for the flawed yet ubiquitous hand-held minidisk recorder. The H4 is like many portable recording products with its hand-held size, but it is unique in how it serves the needs of several segments of portable recorder users. The recorder is obviously designed for prosumer/home recording but it has features that make it an exceptional all-around tool for radio recordings. It also is ideally suited for news conference and field interview situations.

The unit includes two built-in electret condenser microphones in an X/Y pattern for surprisingly good stereo recording. This makes it useful for crowded interview conditions where you need to reach through a crowd to hear the official making a statement. No worries about a cable to get tangled. It's incredibly easy to start a recording, as well. Essentially, press the big record button twice and you're rolling.

Performance at a glance

- Small size
- Up to 24-bit/96kHz linear and 320kb/s MP3 formats
- Built-in X/Y condenser mics
- Combo XLR/1/4" input jacks with phantom power
- Onboard studio effects
- SD card memory
- Four-track recording

Extra features

There are two features that make this device a cut beyond a shirt-pocket recorder. For one thing, Neutrik XLR/TRS combination jacks for the external inputs make the recorder useful for news conferences and provide the ability to tie into line or mic level pool outputs. The second features is its surprisingly good battery life using two AAs. It also comes with a dc wall wart.

The unit can create recordings in several formats up to 24-bit/96 kHz WAV but also 320kb/s MP3 onto removable SD memory chips. A 2GB chip provides 380 minutes of recording. A 128MB SD chip is included.

The recorder is also designed to serve as a computer audio interface. The USB interface allows the mic or line interfaces to be used as a high-quality input to a computer for direct recording.

The recorder is specifically designed for the home recording environment. It's through this application that most of the advanced features can be found. For music recording, it can also be used as a four-track audio recorder. This mode supports stereo (tracks 1/2 or 3/4) or mono recording. This mode allows simultaneous recording on two tracks and listening on four tracks using the on-board 3.5mm headphone jack. The recording format in this mode is 44.1/16-bit WAV. The four-track controls allow level and pan adjustment of all tracks and mixdown of tracks to a stereo or mono file without manipulation with a computer, although that's certainly easy to do, as well.

In the four-track mode there are a few other features I thought were useful in music applications. The internal metronome makes it simpler to lay down tracks consistently, but I particularly liked the on-board chromatic tuner. It's obviously intended as a means to tune guitar strings but it displays good readings for brass instruments and keyboard audio as well. I checked the tuning with a tuning fork. Dead on.

Interviews and more

I ran the H4 through a number of recording tests in interview, music and conference room settings. Although the microphones are electret condensers, it's not particularly good for conference settings where the subjects sit around a table. It's better suited to being pointed at the subject at reasonably close range. The on-board processing does a decent job for a news interview, but for music applications, audio editing plug-ins or external equipment would do a better job.

For radio applications, I would expect the recorder to live in a briefcase and be pulled out quickly and put to use. It comes with a drawstring bag to serve as a case but the bag isn't large enough to hold the H4 and the Patch-Adams-Nose foam windscreen. The bag is also a little flimsy. I'd like to see a zipper-style case with pockets for SD cards and other items. A digital camera case

The LCD display is easy to read and shows the current settings and level meters.

could do the job nicely, though. The unit's plastic housing is better than many portable recorders but it seems a little easy to scratch. I'd like to see an Ipod-style wrap-around case that would allow access to the inputs and controls while protecting the unit from scratches and minor bangs.

There has been a recent software revision that fixed a problem that could cause excessive modulation noise when recording MP3s using 256kb/s or VBR. It also added a function for selecting the type of host computer when using the H4 as an audio interface. This selection helps prevent waveform distortion when a sound source with little harmonic content, such as a sine wave signal, is input.

Overall the Zoom H4 is an excellent recorder for radio in that it is a good all-around radio recording device. It has excellent features for interview and news applications but is also well suited for radio station producers that work on the road or from

Samson Technologies

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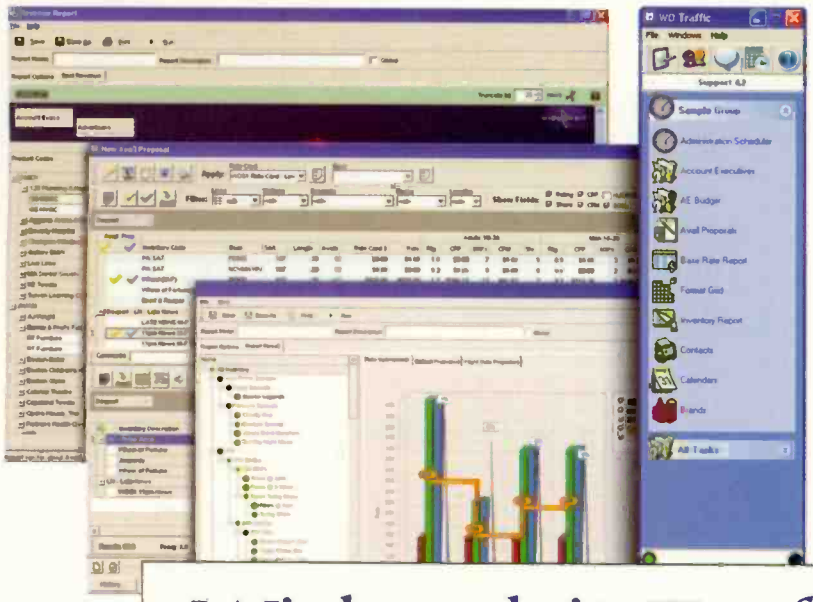
home. This unit is becoming a great addition to my bag of recording tricks.

Thomas is vice president of engineering for Lincoln Financial Media, Atlanta.

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.



Wideorbit Traffic

by Sid Schweiger

During 2006, the New England cluster of Entercom Communications was evaluating traffic software when we learned about Wideorbit for Radio. At the time, Wideorbit's traffic software was a relative newcomer to radio, although it had been used by TV stations for quite a while. Entercom's Sacramento cluster had successfully implemented Wideorbit (WO) the previous December and was pleased with the results. Because this gave us a model to follow, we decided to make the change as well. Our WO system went live on Aug. 1, 2006, and we have not regretted making the move.

Unlike many traffic software packages, this one is written from the ground up for Microsoft Windows, and takes advantage of all that Windows is capable of, particularly multitasking. Our previous traffic software was limited to one function at a time—a limitation that hurt productivity. With WO there's no need to close windows and open others to check something in another area of the software. Minimize the current window, return to the WO menu window and open another window.

Dual monitors on the traffic workstations makes this even easier; just drag open windows to another part of the desktop. Because account executives can enter sales orders themselves, the traffic staff can now devote more time to assembling the best possible log for each broadcast day, which helps increase station revenue.

Performance at a glance

Real-time scheduling and processing of orders

Supports single, multistation and multistation/multichannel environments

Multiple levels of access and security

Interfaces with on-air automation systems

Remote Internet access to all system functions

Automated notifications of potential problems

Electronic order entry and invoicing

Reports

Revenue reporting is a significant feature of any traffic software package, and here again Wideorbit shines. The financial reporting is outstanding, and with ever increasing regulatory oversight (particularly the provisions of the Sarbanes-Oxley Act), this is an important consideration. Any report is available instantly.

As an IT manager, there are several aspects I find to be a vast improvement compared to systems I've used in the past. Wideorbit features multiple levels of security, which enable the system administrator to grant access to several station employees without worrying that orders, logs or financial data will be compromised.

There are two big advantages of this software. One is having remote access to WO through our firewall without any access restrictions. The other is that account executives can enter their own sales orders. Sales orders progress through every necessary step from the AE through to the log without using a single sheet of paper. At each step of the way, WO sends an e-mail back to the AE to track the progress of the order. If an order is not approved or is bumped from a log for any reason, the system will generate an e-mail to the AE explaining why.

Yet another use of the software's e-mail functionality is for self-diagnosis, system status reporting and crash analysis. Its support staff receives these e-mails directly from our servers, and can then take any necessary remedial actions.

As with any traffic system transition, start planning as early as possible. The software's operational backbones are Microsoft Windows Server 2003 R2, Microsoft SQL Server 2005 and some robust hardware. The WO staff assisted us in mating their systems with our requirements. The Entercom New

England cluster comprises eight radio stations and originates the play-by-play broadcasts for Boston Red Sox Baseball, Boston Celtics Basketball and the Boston College Eagles. All programming elements are stored on and assembled by the Broadcast Electronics Audiovault automation system. So, plenty of interaction is necessary to make it all work as a unit.

Because ours was one of WO's early roll-outs in radio, the implementation specialists needed some help integrating the log formats with Audiovault, but this problem was resolved by having WO and BE collaborate before the software went live.

Hardware needs

The server-side hardware needs to be robust. Be sure that when lots of people are logged in the software will not bog down because of deficient hardware. We ordered our servers and licenses directly from Wideorbit, but that's not mandatory. The company provides thorough documentation detailing the needed hardware so a user can buy his own servers.

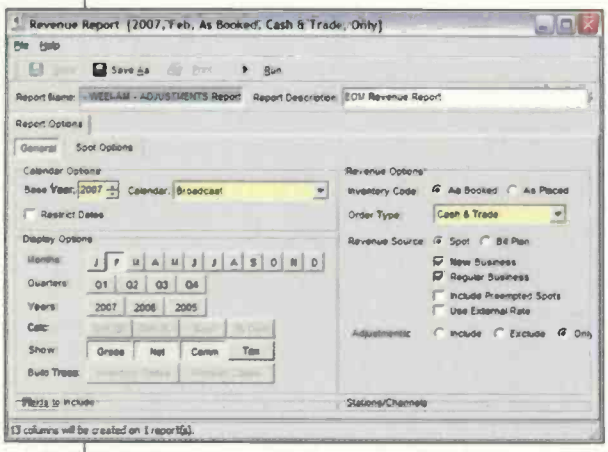
For our operation we ordered two application servers and one database server. The application servers, which each user logs into using a client provided by WO, feature two Intel Xeon Dual Core CPUs with 2GB of RAM. The database server offers four Intel Xeon CPUs and 16GB of RAM. We also ordered an external drive array for database storage, which houses 14 36GB SCSI drives. All hard drives are configured as RAID-1, and each server features dual gigabit-Ethernet NICs.

WO obtains servers from Dell with Silver support: three years of 24/7 on-site support with four-hour response. We had to use that support almost immediately because we ran into a RAM problem with one of the application servers. However, Dell support responded as promised, and the problem was solved well before we put the server online.

We purchased 100 run-time licenses for SQL Server, which has proven to be more than enough for our needs. If the hardware is ordered from

WO, the company will set everything up at its offices before shipping the servers to the user.

While implementing our traffic system I compiled this list of tips to keep things running smoothly.



Revenue reporting is a significant feature of any traffic software package.

- WO recommends excluding the entire data folder from real-time antivirus monitoring, because that would slow system response. To protect those files, we run a weekly scan during off-hours (Sunday evening).

- WO recommends disabling the combined download and installation of automatic updates. We experienced a slow-down in server response when updates requiring a reboot were downloaded and installed, so we set automatic updates to download the patches but not install them. Installation should be done during off-hours.
- The people who use the system a lot (the traffic and business departments) should have PCs with dual monitors and at least 1GB of system RAM so they can handle multiple windows.
- Spelling counts. We had an early snag with e-mails being sent out of WO not being delivered. It turned out that some of the addresses entered in the system were misspelled.
- Have a plan for backups. This is, after all, the system that creates revenue and financial reports for the station.

Schweiger is IT manager of Entercom New England, Boston.

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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GLOBAL SECURITY SYSTEMS

www.gssnet.us or 601.709.4240

Soundtech Lightsnake

By Ben Weiss, CPBE

The PC is a natural part of everything we do in radio today. There is little separation between audio, RF and IT anymore. Because of this, it's easy to find lots of audio-to-PC interfaces to make a laptop or a desktop machine a complete production facility. The units that I have seen usually provide several inputs and outputs, and offer an easy and quality alternative to a custom sound card. These are handy and have their purpose, but what if you only need to provide a single mic input?

There are mics that are built with a USB connector instead of an XLR, and they seem to work well, but many only work as a USB device. I have several dynamic mics that I like to use, and the ability to use my usual set of mics is an option that I would like to keep. To help me with this, I found an interface cable that provides what I needed: the Soundtech Lightsnake. The Lightsnake series is instrument output (guitar, bass) or mic output to USB in interface cables. The cable gets its name from the LEDs in each end of the cable.

Performance at a glance

16-bit 48kHz or 44.1kHz output

76.1dB THD + N

83.1dB SNR

81.6dB dynamic range

1MΩ input impedance

Frequency response @ 48kHz sampling 20Hz to 19.2kHz

Works with Win 98 or later and Mac OS 9.0.4 or higher

The first challenge was opening the package. The cable is packaged for retail sale in a plastic clamshell case that is impossible to open without completely destroying it. Once opened I found the cable, a mini CD with the USB drivers and a 30-day demo DVD with Sony Acid, Sound Forge, Vegas and other audio software programs. I passed on the demo software and went straight for the cable. I didn't read the manual because printed documentation is nonexistant, which concerned me at first.

Plugging in

I tested the cable on a PC running Windows XP Pro. I plugged the cable in and Windows immediately recognized it as a USB audio device. Once the PC recognized the cable, both ends of the cable lit. It looked like everything was ready to roll. I plugged in a hand-held mic, opened an audio editor, created a new file, clicked record and saw audio on the meters. So far so good.

I opened the audio control window to check everything, and I saw that the Soundblaster card was installed, and now an additional audio device called USB Audio Device was available.

I went back to the editor and clicked play. As was to be expected, audio played back. While this isn't surprising, I was pleased that I was able to use the cable without any real installation. The cable is touted as plug and play, and it actually is.

I repeated the installation test on another PC running Windows XP with a Lynx soundcard, and the process was the same. Plug and play all the way.

The cable LEDs have a function beyond the simple light show. When the cable is ready to go, the lights are on steady. When the audio recorder is put into record, the LEDs flash. This is to show that the cable is active and functioning.

The cable itself is rather robust and measures $^5/_8$" in diameter and is 10' long. This is much longer than is necessary for recording a voice track while sitting at the PC, but having the extra cable length may be convenient for some uses. The connectors on each end are securely attached. The XLR connector housing is a little larger than a standard XLR. The USB connector is rather beefy,

but the A/D converter electronics are encased within it. The larger connector and thicker cable could present some stress to the PC's USB connector if the user is not careful. Both connectors are sealed, so there's nothing to repair if something breaks, although the XLR end could probably be replaced if needed.

Soundtech

P 847-949-0444

W www.soundtech.com

E info@usmusiccorp.com

The real test of the cable is in how it sounds. On the first installation, I played the audio back through a small set of powered Yamaha speakers. The audio sounded good. I could see a little dc offset on the audio editor waveform. When I listened to the audio on the second installation, which was routed through a console and over a pair of JBL speakers, I could clearly hear some underlying hiss that followed the record level setting. The noise was low, but it was noticeably higher than the mic chain feeding the console and audio editor.

With a multimeter, I noticed that pins one and three of the XLR connector are tied together, which means the audio path to the USB connector is unbalanced. This could be one source of some of the noise, although it's more likely just the audio amplifier or A/D electronics.

Look what I found

After recording several audio tracks, I decided to look at the contents of the driver CD and found that it includes a user manual. The manual is basic and contains little technical information, but there isn't too much to using the cable in the first place.

The cables are available through several online music retailers, and the instrument version is available at Target, so it's obvious that this product is geared toward the consumer market. Regardless, the cable provides an easy way to interface a mic to a PC without requiring a separate sound card. The quality is not as high as a dedicated sound card or professional mic processor chain, but the cost of this cable is also significantly less. The cable could find a suitable use for creating podcasts or capturing interviews on the go.

Weiss is director of engineering for the four Wilks radio stations in Kansas City.

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by Kari Taylor, senior associate editor

Firewire audio interface
Focusrite Audio Engineering

Saffire Pro 10 I/O: This unit features the monitoring control software Saffire Control Pro, and offers the option to aggregate multiple units, all controlled via the same control platform. The 1RU interface combines eight channels of pre-amplification with eight balanced line outputs and stereo S/PDIF I/O. The unit can be bus-powered or powered via an external PSU.

516-249-1399; www.focusrite.com

Recording mic
AKG

C414 LTD: The 1", large-diaphragm pressure gradient microphone features five switchable polar patterns for placement and application flexibility, three bass roll-off filters, three pre-attenuation settings as well as dual-color LEDs that provide quick visual reference of selected polar pattern and output. The C 414 LTD also includes a transformerless output stage for distortion-free low frequency reproduction and wide dynamic range.

818-920-3212; www.akgusa.com
akgusa@harman.com

Tower light
Dialight

LED medium-intensity red-white beacon: This light is designed to overcome vibration and extreme weather conditions. It is a 20,000 candela flashing white light combined with a 2,000 candela steady or flashing red LED obstruction light. Operating temperatures range from -55° to +55° C and it can withstand conditions including direct sunlight, wind blown rain, wind speeds of 200kph, high humidity and salt fog. The LED dual beacon also offers reduced light pollution with an optical design that focuses the light selectively and avoids spilling excess light toward the ground.

800-835-2870; www.dialight.com; info@dialight.com

Audio processor
Broadcast Warehouse

DSP Xtreme: The larger version of the DSP X and DSP Xtra audio processors, this device has a 2RU form factor and the front panel contains two LCD color screens, one of which is touch sensitive. In addition to the hardwired traditional LAN and serial (RS-232) interfaces, this processor supports Wi-fi connections. A remote trigger port allows preset selection through contact closures. Six bands of audio limiting, distortion controlled clipping and look-ahead limiting are features of this processor. Real time clock scheduling (day-parting), user and factory presets, a/b auditioning, sample rate converted digital I/O with sync input, 24-bit 128x oversampled A/D and D/A converters and 28-bit DSP processing are all features.

888-866-1671
www.broadcastwarehouse.com
info@broadcastwarehouse.com

Infrared link
Amplivox Sound Systems

Sir Buddy: This system works via line of sight infrared technology. The signal will not go through walls or interfere with another broadcast frequency. Only the microphone will be picked up by the receiver. The 50W audio system includes projector and laptop interface cables to provide a companion audio booster for a laptop and a video projector. The system allows the presenter to amplify 2W to 3W computer or LCD projector with clear sound. The solid-state stereo amplifier has a built-in receiver allowing the presenter to be hands-free with wireless freedom to roam within 150'.

800-267-5486; www.ampli.com

Audio-optimized PCs
Spectral Computers

7000 Series, RM-5100, CB-1100: There are eight new additions to the line of high-powered Windows-based computer systems, including new AMD processor availability and a compact cube case design option. Each workstation delivers 64-bit performance (when Windows XP Professional X64 is loaded). All 7000 and 5000 Series computers feature a 3RU case with a low-noise automatic temperature control system and a 400W power supply (except the RM-5100, which features a 300W power supply). The chassis provides multiple Firewire and USB 2.0 ports, a DVD-R/W 16x dual layer drive, LAN ports, 7-in-1 card memory card reader, keyboard and optical mouse. The RM-5100 uses Windows XP Home, while all 7000 Series models use the Windows XP Professional operating system.

818-981-3101; www.spectralcomputers.com

Active ribbon monitors
Samson Technologies

Rubicon 5a and 6a: These monitors feature 2" velocity ribbon high frequency transducers that complement a two-way active system. Both speakers feature: two-way active ribbon studio reference monitor; four-position high frequency level control; and tuned shelf-ported painted wood enclosure. The 5a offers 5" low-frequency driver with butyl surround, a bi-amp design and 50W low frequency/25W high frequency. The 6a offers 6.5" low frequency driver with butyl surround, a bi-amp design and 75W low frequency/25W high frequency.

631-784-2200; www.samsontech.com
info@samsontech.com

Podcasting
Digital Juke Box

Quick Podcast: Manage and publish multiple podcasts by uploading your audio and video files. Generate and publish podcast RSS feeds for Itunes and other directories. Automatically notify podcast directories, including Itunes and Yahoo, when new podcasts are available. The interface makes it simple to upload and manage MP3 and MP4 audio/video files. Find subscriber numbers, average bandwidth, disk space use and more. Generate and publish RSS feeds in minutes.

888-ONAIR-99; www.digitaljukebox.com; sales@digitaljukebox.com

Rackmount splitter
Radial Engineering

Radial 8ox: An eight channel rack-mount splitter, this unit features eight mic inputs, eight main outputs for the live mixing console, a transformer isolated output for recording and a third auxiliary output that is equipped with ground lifts for monitor or broadcast feed. Input and output connections are on the rear panel using Phoenix screw terminals or 25-pin D-Sub. Each channel is equipped with a 30dB input pad to allow high output line level devices to be connected and then sent to various mic level inputs, such as those found on mic preamps and mixers.

604-942-1001; www.radialeng.com

Pro Tools utility
Maggott Software

Sibliminator: This utility harnesses the field recorder features in Pro Tools to give users the same editing tools. The system can manipulate a group of broadcast WAV files so that Pro Tools sees them as alternate channels of each other. This gives the user the ability to select any piece of audio and instantly swap it with the corresponding audio from another channel or take, greatly speeding up the process of editing from multiple takes.

www.maggot.co.nz
support@maggot.co.nz

Music library
Mediatone Music

Studio Cutz: In addition to auditioning and downloading individual songs, stock music users can now license and download entire CDs within moments of their purchase. Or if they prefer, users can choose to download the CD now and still have a physical CD shipped to them.

866-252-7788; www.mediatonemusic.com; info@studiocutz.com

Portable mixer
AETA Audio Systems

Mixy: The analog interfaces located on the front panel of this mixer can be activated by potentiometers or via the menu, while digital interfaces are exclusively activated via menus. With an internal Ni-MH battery the mixer provides more than 10 hours of use. Connect an additional external battery, from 8V to more than 28V, with automatic and silent switching between sources. The mixer features three mic/line on XLR3 and two line inputs on XLR5, a S/PDIF input, AES/SPDIF outputs and optical output, as well as a stereo input/output over USB. The input sensitivity gain can be adjusted by the menu by 10dB steps from zero to 50dB. The maximum level, without activating the additional -20dB pad, is +19dBu.

+33 1 41 36 12 00; www.aeta-audio.com

BNC connectors
Canare

BCP-PC Series: The 75Ω connectors offer a longer body and a three-piece crimp design. The outer contact and the pin are gold-plated. Models are available for several cables, boasting 26dB or less return loss at 1.0GHz and 20dB or less at 1.5GHz.

818-365-2446; www.canare.com; info@canare.com

Sound control
Auralex Acoustics

Sonosuede Pro: Consisting of four 16" x 48" x 2" thick back-beveled panels predominantly used for corner trapping, and eight 16" x 48" x 1" rectangular-shaped back-bevelled panels for a total of 64 square feet, the system's design offers several decorative options. The system's mounting blocks provide acoustic and aesthetic benefits.

317-842-2600
www.auralex.com
auralexinfo@auralex.com

Slope-front rack
Lowell Manufacturing Company

L45-21: This rack features side handles, casters, a stow-away door and two cut-outs for external mounting of accessory switches or controls. A roll-out turret is 26.875"H to fit under standard height desk surfaces and counters. The rack also features 12RU of mounting space on a 15° slope for viewing of equipment while seated. The locking front door is hinged at the bottom and slides into the base for out-of-sight storage. The locking rear door has a 2"H opening for wire access. A turret also features two decora-style cut-outs with cover plates above the locking front door for optional mounting of low voltage accessory switches or controls.

636-257-3400; www.lowellmfg.com
info@lowellmfg.com

Mixer
Allen & Heath

XONE:S2: A 19" rack-mounted 4U mixer, this product is available with linear or rotary VCA channel faders, and features four stereo dual-input channels, two mono mic/stereo line channels and a USB audio interface. An output limiter system enables the user to preset the maximum output level of the mixer, irrespective of input level. The main mix outputs are on balanced XLR, and an additional mono output, also on XLR, can be used as a zone feed or can be used to feed a sub-bass stack. Two mono/mic or stereo channels are included.

800-431-2609; www.allen-heath.com/US

Exciter
RVR

TEX-1000LCD/S: This exciter's digital user interface diagnoses and controls all the parameters displayed (frequency, output power, measurement). Adjustable power output from zero to 1,000W on-air under any VSWR conditions is available via fold back control. The exciter is available with two SCA/RDS input connectors. It also features a built-in stereo coder. Fully integrated telemetry and SMS alarms with built-in GSM modem and a battery for the battery charger are optional.

305-471-9091
www.rvrusa.com; sales@rvrusa.com

Firewire audio interface
Edirol

FA-66: The interface supports WDM/ASIO2.0 drivers for Windows XP. The FA-66 allows simultaneous recording of six channels of audio at 24-bit/96kHz, or four channels of audio at 24-bit/192kHz. Record two microphones directly into the unit via the included phantom power mic preamps. Record any line-level device through stereo RCA inputs including signals from CD.

360-594-4273; www.edirol.com; sales@edirol.com

CD/MP3 player
Denon Electronics

DN-D4500: The rack-mountable DN-D4500 supports CD and MP3 features, such as key adjust, auto BPM counter and cue stutter. The player features wider pitch control for audio CDs ±24 percent, ±50 percent and ±100 percent supplement the standard range of ±4 percent, zero and ±16 percent. MP3 pitch control is now offered in the range of ±4 percent, ±10 percent and ±16 percent. Shockproof memory is provided for CD (20 seconds) and MP3 (100 seconds). Other features include 0.02-second instant start ability, CD-R/CD-RW disc compatibility, fader start control terminal and coaxial S/PDIF digital output. The unit's operating software can accommodate upgrades via CD-ROM.

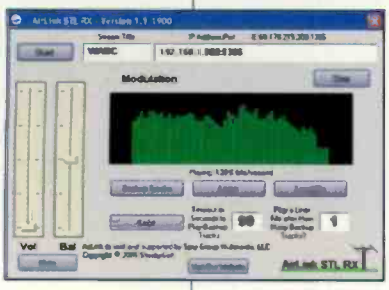
630-741-0330
www.d-mpro.com; info@d-mpro.com

Audio safety messages, alerts
Towerswitch

Talking Alert: This system reduces accidents in the workplace via automatically triggered loud, audio safety messages and emergency alerts. Packaged in a customized, compact (8"H x 6"W x 3"D) self-contained weatherproof housing, the solar-powered system delivers 10 minutes of customized audio messages in any language by simply pressing the information button. The emergency button immediately notifies staff and security. Using a built-in microphone jack, messages can be recorded, erased and re-recorded. Audio playback is initiated by pressing one of the front panel buttons, or by triggering an external input, such as an optional motion detector or magnetic contact on the door leading out to the antenna rooftop. A special magnetic contact is available for tower elevator applications. An on-board relay can also be set to notify security or initiate alarms. The solar power feature has battery backup for redundancy, or it can be powered by ac electricity.

561-482-7334
www.towerswitch.com; info@towerswitch.com

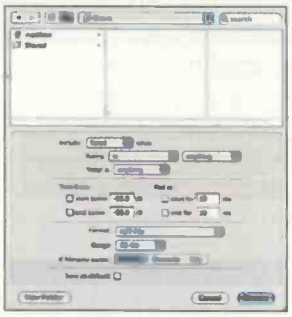
STL
Airlink Communications



Airlink STL RX, TX v1.1.1900: Transmit studio audio to the transmitter tower site without wireless STL transmitters to purchase, frequencies to coordinate, licenses to apply for, or antennas to install or position. This STL consists of a software audio transmitter and receiver. The transmitter is installed at the studio and the receiver installed at the remote transmitter site. Then use a PC at each end and a high-speed Internet or ISDN connection. The system uses the TCP/IP protocol to transmit the audio. The system monitors for connection loss and waits for your stream to reconnect. While the connection is lost, the Airlink STL receiver will begin playing local audio files that have been pre-loaded injecting a liner or sweep after a preset number of songs. The unit plays the station's hourly legal IDs as required by the FCC. The system can feed multiple stations with one transmitter and multiple receivers.

510-781-9700; www.airlink.com; sales@airlink.com

Voice-over automation software
Audiofile Engineering



Voxover: A voice-over automation tool and batch recorder for Mac OS X, this software is useful for projects that require large numbers of individual audio files to be recorded and a typical multi-track recorder is not feasible. The system allows the user to write or import a written script and rapidly automate the recording of that script. The script can be displayed on the system's teleprompter to the voice talent via a wired or wireless network. Sessions can range from completely automated to completely free-form.

www.audiofile-engineering.com

UPGRADES and UPDATES

Radiosophy is now shipping the long-awaited Multistream HD receiver. The radio retails for $269 and includes multicast reception. (www.radiosophy.com)...**Dice Electronics** has released the HD Dice for selected Toyota, Lexus, Scion, BMW, Mini Cooper, Buick, Cadillac, Chevrolet, GMC, Hummer, Oldsmobile, Pontiac, Honda and Acura models. (www.diceelectronics.com)...**DK-Technologies** has added new features to the MSD 600M series audio meter: LEQ Loudness measurement protocol, upgraded Jellyfish surround display, improvements in session logging and more. (www.dk-technologies.com)...**Audemat-Aztec** has released software version 1.4 for its Goldeneagle HD monitor. Contact Audemat-Aztec to obtain the software update. (www.audemat-aztec.com) ■

Monitor and control system
Dielectric

Symphony: This system monitors forward and reflected power, line pressurization, room temperature and switch positions. With these inputs, the system calculates VSWR and can reduce or shut down transmitter power if necessary. It can move switches to change the mode of system operation, restore transmitter operation and communicate the status via the Internet. This information is presented on a touch screen control panel that can be replicated on a remote PC via the Web with no custom software. Also, alarms and event notification are local and remote via phone or Ethernet.

800-341-9678; www.dielectric.com
dcsales@dielectric.com

Test signal source
AES Nashville

AES Audio Test CD: This audio CD was compiled by the Nasville AES chapter and contains more then 75 common audio and software tests. All proceeds to go the Nashville AES chapter. This disc contains audio files and HTML pages. The Tools page includes bonus documents, PDFs, Excel calculators and links provided by various engineers and producers in the Nashville area. The audio portion of this disc contains absolute reference levels for calibrating audio equipment. To play these tracks on the computer, users will need to use a CD player application, such as Windows Media Player or Itunes, or import the files into a digital audio workstation. The 71 audio tracks include level settings, stereo phase checks, tone sweeps, pink noise, pulse signals, 440Hz A reference, and sample audio tracks of voice, drums, guitar and piano.

www.aesnashville.org; studentCDsales@aesnashville.org

Digital media workstation
Rain Recording

Event: Record, playback, edit, burn and transport seamlessly with this interface. Add a USB or Firewire sound card and the workstation can produce professional-quality audio projects. The system also features a host of connection options including DVI, composite, line in/out, mic in, USB, Firewire, S/PDIF stereo out and Ethernet. The workstation uses a 65W power supply. Its dimensions are 6.49"W x 1.96"H x 6.49"D, weight: 3 lbs.

877-MIX-RAIN; www.rainrecording.com

Subwoofers
NHTPro

S80-XD, S-20: The S-80 Xd subwoofer features a peak acoustic output of 117dB SPL at 40Hz, and overall frequency response of 22Hz to 80Hz ±2dB with a -6dB LF cutoff of 17Hz. The unit measures 25.8" x 12.6" x 15.35", and weighs 76 lbs. The S-20 is the replacement for the S-00 and B-20 subwoofers. With an all new aluminum cone 10" woofer and 200W Class D amplifier, the bass reflex design provides tight realistic bass response. This subwoofer offers peak acoustic output of 109dB SPL at 35Hz and an overall frequency response of 33Hz to 110Hz ±2dB, with a -6dB LF cutoff at 29Hz. The unit measures 17.5" x 12.2" x 15", and weighs 35 lbs.

800-648-9993; www.nhthifi.com

Auxiliary relay pack
DM Engineering

Studio Slave: The Studio Slave auxiliary relay pack is a microprocessor-based switching and utility control interface for broadcast studios and control rooms where multiple and various isolated outputs are required to operate from one or more control inputs. Input and output connectors are Eurostyle pluggable types. Relay outputs: eight form C (SPDT) bifurcated gold clad silver contacts for switching functions ranging from low level audio to 2A, ac or dc. Circuits one through four follow input commands while the release time of circuits five through eight may be delayed as much as one second if desired. All output circuits are isolated. Removal of the contact closure or the voltage will deactivate the unit.

805-987-7881; www.dmengineering.com
info@dmengineering.com

Cable
Rapcohorizon

Dominator: Offering four individual types of wire, this cable can include additional components inside each of the connectors that will actually tune the output of the guitar to the input of an amplifier or effects pedal. The microphone cables use black Neutrik connectors with gold contacts or standard Nickel connectors and contacts. Features include several types of heavy gauge wire, including 14, 12 and 10 gauge configurations, with round commercial jackets and pure copper conductors.

573-651-6500; www.rapcohorizon.com
info@rapcohorizon.com

Voltage regulator
Furman Sound

AR-20 II: This 20A regulator delivers 120V of ac power to protect equipment from problems caused by ac line voltage irregularities. The equipment filters and purifies ac power. The regulator accepts any input voltage from 97V to 141V and transforms it to a constant 120V. Its Series Multi-Stage Protection Plus technology combines three filtering and protection circuits. Linear Filtering Technology suppresses noise. Extreme Voltage Shutdown circuitry protects against prolonged over-voltages, such as those caused by accidental connections to 208 or 240Vac, by shutting off the incoming power until the over-voltage is corrected. The system is housed in a dual-space, rack-mount chassis with 12 outlets on the rear panel and two convenience outlets on the front panel. An LED that indicates the output voltage is within regulation.

707-763-1010; www.furmansound.com
info@furmansound.com

Feature packed.

(Kind of like our ads.)

Go (con)figure • The folks at MPR say they really love being able to configure and administer an entire building full of consoles and routing equipment from the comfort of their own offices. Put an Internet gateway in your Axia network and you can even log into Element (or any other part of an Axia system) remotely from home, where there's plenty of Cheetos and Pepsi. Great for handling those 6 P.M. Sunday "help me!" phone calls from the new weekend jock.

Who are these guys? • Why buy a console from Axia? Element was designed by Mike Dosch and his team of ex-PR&E renegades (who know a bit about consoles). And Axia is a division of Telos, the DSP experts.

Perfect timing • You can't have too much time. That's why Element's control display contains **four different chronometers**: a digital time-of-day readout that you can slave to an NTP (Network Time Protocol) server, an elapsed-time event timer, an adjustable count-down timer... and there's also that big, honkin' analog clock in the center of the screen (Big Ben chimes not included).

Screen play • Use any display screen you choose, to suit your space and décor. Get a space-saving 12" LCD, or go for a big 21" monster. (This is Dave Ramsey's favorite Element feature, by the way. Anyone want to bet he bought his monitors on sale?)

Lovely Rita • LED program meters? How 1990's. SVGA display has lots of room for timers, meters, annunciators and more — enough to show meters for all four main buses at once. Reboot to 5.1 surround mode and the light show is even cooler, with surround audio and associated stereo mixes all going at once.

Memory enhancer • We know how forgetful jocks can be. That's why Element remembers their favorite settings for them. Element's Show Profiles are like a "snapshot" that saves sources, voice processing settings, monitor assignments and more for **instant recall**. Profiles are easy to make, too: just have talent set up the board the way they like it, then capture their preferences with a single click for later use. (Hey, make *them* do some work for a change.)

Black velvet • Some things just **feel right**. Like our premium, silky-smooth conductive plastic faders and aircraft quality switches. We build Element consoles with the most durable, reliable components in the industry — then we add special touches, like custom-molded plastic bezels that protect on/off switches from accidental activation and impact. Because we know how rough jocks can be on equipment. And nothing's more embarrassing than a sudden case of *broadcastus interruptus*.

Split decision • No, you're not seeing double. Element gives you the choice of single-frame or split-frame configurations of **up to 40 faders**. Perfect for complicated talk or morning shows where the producer wants his own mini-mixer, or to give talent space for copy, newspapers and such. Solomon would be proud.

Swap meet • Element modules hot-swap easily. In fact, the **entire console** hot-swaps — unplug it and audio keeps going; an external Studio Engine does all the mixing.

Stage hook • This button activates the emergency ejector seat. OK, not really. It's the Record Mode key; when you press it, Element is instantly ready to record off-air phone bits, interviews with guest callers, or remote talent drop-ins. One button press starts your record device, configures an off-air mix-minus and sends a split feed (host on one side, guest on the other) to the record bus. Like nearly everything about Element, Record Mode is **completely configurable** — its behavior can even be customized for individual jocks. Sweeeet.

How many? • How many engineers does it take to change these light bulbs? None... they're LEDs.

Talk to me • Need some one-on-one time with your talent? Talk to studio guests, remote talent, phone callers — **talk back to anyone** just by pushing a button.

The Busy Box for jocks • Element comes standard with a lot of cool production-room goodies you'd pay extra for with other consoles, like per-fader EQ, aux sends and returns and custom voice processing by Omnia™, enabling you to quickly build and capture compression, noise gating and de-essing combinations for **each** and **every jock** that load automatically when they recall their personal Show Profiles. Context-sensitive SoftKnobs let production gurus easily tweak these settings, while simultaneously satisfying their tactile fixations. (Don't worry: for on-air use, you can turn off access to all that EQ stuff.)

Missing features • Did we forget something? Program these **custom button panels** with any macro you want, from recorder start/stop to one-touch activation of complex routing and scene changes using PathfinderPC™ software. You could probably even program one to start the coffee machine (black, no sugar, thanks).

Mix-plus • If constructing a complicated mix-minus on-the-fly brings a big grin to your face, you're excused. But if you're like us, you'll love the fact that Element does mix-minus **automagically**. Forget using all your buses for a four-person call-in, or scrambling to set up last-minute interviews. When you put remote codecs or phone calls on-air, Element figures out who should hear what and gives it to 'em — as many custom mix-minuses as you have faders.

Great Phones • With Element, jocks never have to take their eyes or hands off the board to use the phones. Element works with any phone system, but really clicks with the Telos Series 2101, TWOx12, and new NX-12 that connects four hybrids plus control with a **single Ethernet cable**. Status Symbols™ (cool little information icons) tell talent at a glance whether a line is in use, busy, pre-screened, locked on-air, etc. Even dial out with the built-in keypad.

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AxiaAudio.com

Shown, 16-position split-frame Element, nicely equipped: $12,558.00 US MSRP. Not shown but available: 4-, 8-, 12-, 16-, 24- and 28-position Element. Dual exhaust and whitewalls optional at extra cost.

Element

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E47C: This mic provides 12dB of boost at 100Hz when used at a 1" working distance. The mic features a NOS Telefunken Large Plate EF814k tube for delivering vintage amplification and dynamics response, a N470 power supply, custom 20' Soundelux cable between the power supply and mic, 47 suspension clamp-type shockmount with wood box.

323-603-3228
www.transaudiogroup.com/soundelux.shtml
sales@transaudiogroup.com

Break-out panels
Ram Broadcast Systems

BP1X24RJ45, BP2X24RJ45: Features of the BP1X24RJ45 include: 1RU, 24 bulkhead feed through CAT-5 RJ-45 modules, one large designation strip and front and rear tie bars. Features of the BP2X24RJ45 are as follows: 2RU, two rows of 24 bulkhead feed through CAT-5 RJ-45 modules, two large designation strips and front and rear tie bars.

800-779-7575; www.ramsyscom.com; sales@ramsyscom.com

Microphone
Holophone

H2 Pro: Capable of recording 7.1 channels of discrete surround sound, this mic is now offered with enhanced low frequency effects to permit a higher output level of deep bass. The enhanced mic features eight XLR microphone connectors that are compatible with all multichannel I/O devices. It is also compatible with all surround-sound encoding/playback formats. An upgrade program is available for current H2-Pro owners.

416-362-7790; www.holophone.com
info@holophone.com

Multipurpose mixer
Soundcraft USA

MPM: This mixer is available in two frame sizes offering 12 (MPM12/2) or 20 (MPM20/2) mono inputs, with each model featuring two additional stereo input strips. This mixer provides +22dB headroom through the console. True professional 48V phantom power accommodates condenser microphones of all types. The MPM12/2 and MPM20/2 are equipped with three auxiliary buses, configurable for use as effects or monitor sends, and all main connectors are XLR-type and 1/4" metal jack sockets. RCA phono connectors are additionally provided for disc and stereo playback inputs and record outputs.

818-920-3212
www.soundcraft.com; soundcraft-usa@harman.com

Mastering limiter
McDSP

ML4000: A high-resolution limiter, this device is designed for music, mastering, post and live sound. The ML1 single-band configuration is a mastering limiter with a brick wall design, coupled with multiple stages of limiting for peak detection. A continuous knee control allows the limiter to operate transparently or aggressively. The ML4 multi-band configuration is a four-band gate, expander (upward or downward) and compressor fed into the same limiter algorithm found in the ML1. Each band's gate, expander and compressor can be configured separately or linked together. Steep 24dB/octave crossover filters minimize signal leakage into adjacent bands.

650-318-0005; www.mcdsp.com

Power distribution unit
Pulizzi Engineering

T982F3: This new series is configured for 208V 30A power input. When operating equipment at 208V vs. 120V, it decreases current draw by 50 percent, allowing for greater equipment density. The PDU can power 12 devices with power output delivered via industry standard IEC 60320 type C13 receptacles. The front panel features a two-digit current meter display that can be read from 20' away. The current meter continuously measures the total current draw of all connected devices. This prevents system overload problems and makes load monitoring easy. Configurable options include power cable length, power filtering and current metering. Power filtering protects sensitive electronics from damage caused by electrical noise. The PDU occupies 1RU and is 7" deep.

800-870-2248; www.pulizzi.com; sales@pulizzi.com

Speakers
SAC Pro Audio

Pump series: The Pump series offers a choice of a 6" or 8" mineral-filled polypropylene cone. Two signal-to-noise ratio amplifiers with a fourth order electronic crossover circuit provides a smooth frequency response and SPLs up to 91dB. The Pump 6a features 120W of total power and a frequency response of 45Hz to 20kHz and the Pump 8a features 150W of power and extends the low frequency down to 40Hz. The speakers are magnetically shielded, include front volume control, and rear XLR balanced and 1/4" unbalanced inputs. Also included is a delay protection circuit to avoid pops and noise during power-up, making them the useful for the computer-based digital recording studio.

www.sac-pro.com

Multi-media cable
North American Cable Equipment

CT-SW-450: This cable is made up of two quad shield RG-6 coaxial cables and two CAT-5e cables bundled under one overall PVC jacket. Product specifications include two RG-6 quad shield coaxial cables and two CAT-5e UTP cables. Coaxial cables are swept to 2.25GHz for satellite. All four cables are contained in an overall PVC jacket to save time and labor when pulling lines.

800-688-9282; www.northamericancable.com info@northamericancable.com

RBDS decoder
Viaradio

A20: This IP controlled FM RDS/RBDS market monitor allows a user to measure, monitor and listen to an entire market remotely. An external I/O connector allows the user to also use the A20 as an IP remote control with e-mail notification of your external alarm inputs and eight relay outputs. Stream received audio back to you on-demand for skimming, processing adjustments or just to listen to the market using an ordinary media player. Record the streamed audio into MP2 files for each station for later analysis of advertiser activity, promotions and playlists. Features include signal input impedance >10kΩ, Connectors: BNC unbalanced, 4× rear, 1× front, power consumptions 20VA, and power supply: internal 115V, 60Hz or 230V, 50Hz.

321-242-0001; www.viaradio.com

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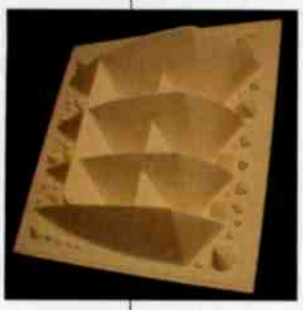
Acoustic panel
Golden Acoustics



Sonic Equalizer Panel: The panel designs are based on a fractal pattern with a Fibonacci sequence. A stretch fabric cover can be installed over the diffusor to blend it into a room. A relatively thin wall creates a concave surface on the backsides of the panels allowing the panels to be backfilled with sound absorption material; acting similar to a bass trap. Proper mass for reflecting sound or sonic energy is a minimum of 4lbs per square foot. Tests show it is 97 percent reflective. Hanging hardware comes with the panels.

248-548-8840; www.goldenacoustics.com

Podcasting
Podomatic

Broadcast to Podcast Services: Radio can offer programming via podcasting with this service. Stations can make all or any part of their content available to their audience at any hour of the day, delivered directly to their PC, Ipod, MP3 player or other portable media device. Stations upload an MP3 file through the company's online wizard and Podomatic ensures the podcast is encoded properly and correctly syndicated to all podcast directories. Stations can then access detailed listener statistics and use a set of online promotional and marketing tools to grow their audience.

www.podomatic.com

Pro Tools LE system
Digidesign

Mbox 2 Pro: This portable audio/MIDI production system provides high-speed Firewire-powered connectivity, 24-bit/96kHz audio resolution and a wide range of analog and digital I/O. It also offers MIDI time stamping support, word clock I/O and dedicated studio monitor outputs. It supports six simultaneous inputs and eight outputs. It includes Pro Tools LE software and more than 50 effects and instrument plug-ins.

800-333-2137
www.digidesign.com
prodinfo@digidesign.com

Remote site manager
Omnitronix

SL-61: The SNMP-Link provides in-band and out-of-band remote access to other devices located at your remote site. The system features a modem or Ethernet interface, four serial ports, 16 on-board I/O channels, four external event sensors and an on-board temperature sensor. It also features a Web browser interface, free alarm software and a rack mount option.

206-624-4985
www.omnitronix.com
sales@omnitronix.com

Containers
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Storm Case IM3075: With multiple layers of cubed foam, these containers protect sensitive equipment during transportation. Available padded dividers provide flexible cavities to hold equipment securely in place while custom-cut foam can be designed for complex equipment configurations. In-line wheels and a telescoping handle make transport easier. Press and pull latches stay closed even if the case is dropped. Unbreakable molded-in hasps for external locks provide a level of security.

800-542-7344; www.hardigg.com

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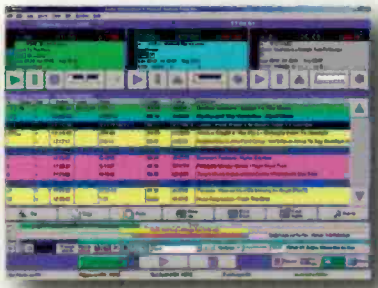
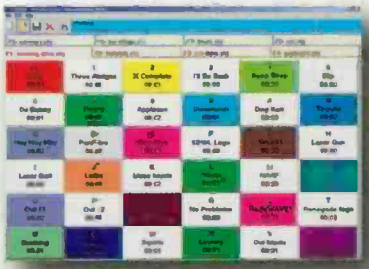
www.bsiusa.com

Radio Automation



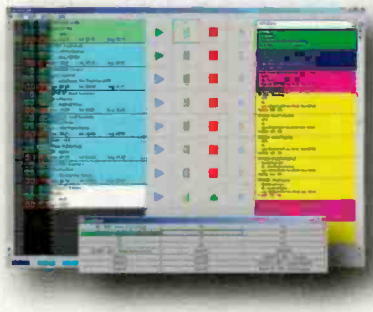
Simian - radio automation and digital play out system

Instant Audio



Stinger- instant acess to 288 'rapid fire' audio files

Digital Cart Player



WaveCart - the original on-screen cart machine

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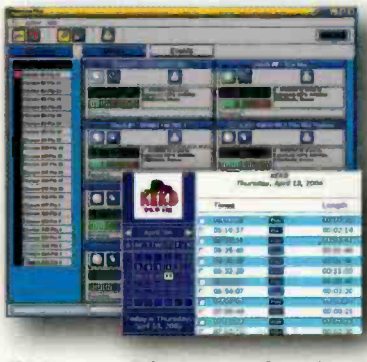

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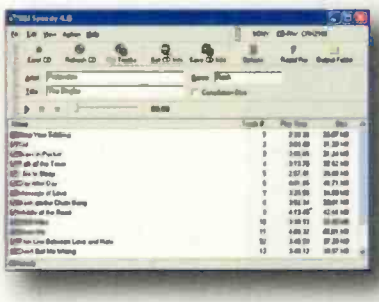

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BSI

Filing comments on IBOC

I have been reading through the comments on the FCC's pending IBOC rulemaking MM99-325, and I am stunned by some of the comments I see. For the most part, the arguments are strongly for or strongly against.

What kills me is all the small market broadcasters that are fighting this will be the ones who scream the loudest when their industry is rendered irrelevant by all the other sexy new technologies for delivering content. Ibiquity is no more a perfect solution than the FM stereo system was, but the industry has been working on some sort of digital transition for well over a decade. There have been opportunities to assist with alternate plans, but many stations would rather stick their heads in the sand and just hope that nothing changes. I don't hear "Is IBOC going to make it?" from the large markets. I only hear that question from small markets and small owners. I know it sucks but there has been plenty of warning.

I recently attended an SBE meeting where the presenter—who works for a company that can financially benefit from the successful adoption of HD Radio—spent the better part of his program completely dismissing and discrediting every slide in the IBOC integration Power Point he was showing. The most positive point the presenter made was to say that when IBOC fails at least you have a new transmitter that will transmit analog.

Everybody forgets that the original concept that the NAB supported was direct DAB over L Band like it is in Europe. Radio stations soundly rejected a new band of channels with preference to an IBOC solution. Well now we've got it—with all its faults—now make it work.

I like Digital Radio Express but I roll my eyes when someone makes the comment to strike a deal with an FM operator to put the AM program on a digital subcarrier. Europe has essentially abandoned medium-wave AM broadcasting. As an industry we decided we don't want to abandon AM, but this concept advocates that idea. Then there's the latest windmill for Leonard Kahn. Cam-D doesn't make existing radios obsolete, just limited. Of course we'd like to actually know what Cam-D does but...

I'm conflicted about an FCC IBOC ruling. There's a possibility that one day the commission will require some sort of community programming on multicast channels. My radio purist side likes that idea, but my business side is concerned about it.

name withheld by request

Love the podcast

I've been a regular reader for a long while, but only recently discovered your podcasts. The weekly Radio Currents podcast is conveniently brief and has alerted me to stories and subjects for follow up when I finish my commute. I also enjoy your longer-form Open Mic Podcast. It's a great addition to be able to hear the actual audio of the interviews from the magazine and website. While nothing will replace the print or online versions for depth and searchability, the added convenience of the podcasts open up more opportunities to stay informed where reading is impractical. Thanks for making a good resource even more useful.

Joe Plett
production director
Greater Media Boston

100 thanks

We saw the December issue featuring the superb *100 Years, 100 Innovations* article. Kay and I wanted you to know that we are very humbled by the recognition of your readers and expert panel. The honor of being mentioned for two separate inventions in a list including childhood heroes like Major Edwin Armstrong, Emile Berliner and the legendary Leonard Kahn is literally the stuff of dreams.

Michael L. Dorrough and Karen S. Dorrough
Dorrough Electronics
Woodland Hills, CA

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Leaky modulators

Just because I'm an incurable radio geek, I got curious about all those RF modulated Ipod/Sat adapters and their ultimate range. I've seen some things written about manufacturers exceeding the FCC accepted output of such devices and I thought it'd be interesting to see if I could pick up one in a nearby vehicle.

Leaving the office for the night, I set two presets on my radio: one on 87.9, and one on 88.1. I figured that these would be the most likely to produce a hit. I was prepared to listen to static all the way home if necessary, but not even a mile from the station, pow! I was listening to Sirius Raw Dog on 87.9. Not sure whose car it was coming from, it was loud and proud the entire time I waited for a red light. Next was some country music; rather weak, but it lasted for several miles as I snaked through the I-696 corridor. Again, I was unable to pinpoint the vehicle, but he must have been traveling with me for several miles. A few more hits came later as I waited at another intersection. A Chevy pickup listening to rap seared my brain until making a right turn, then it was gone. I heard several more like this. Another Sirius listener was spilling his Totally Seventies all over the freeway. I stayed with him for about 15 minutes.

All this may seem irrelevant to those of us in the commercial band, far up the dial from these little law-breakers. Unfortunately, many of these modulators are now being produced that are agile across the entire FM band. As someone who routinely dissects the faint details provided by listeners about their reception, I can't help wondering if these little wonders will be part of the problem.

Michael Kernen
chief engineer
Greater Media Detroit

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Contributor Profile

Meet the professionals who write for *Radio* magazine.
This month:
Field Report, page 88.

Sid Schweiger
IT Manager
Entercom
Boston

Schweiger's radio career spans 38 years, beginning in college at WVBR-FM, Ithaca, NY. He graduated from Emerson College in 1975, and was the GM and PD at WECB-AM. He has focused exclusively on engineering and IT since 1978, and took on his current duties as the IT manager at Entercom Boston in November 1999.

Radio
THE RADIO TECHNOLOGY LEADER

Written by radio professionals
Written for radio professionals

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ADVERTISER INDEX

This index is a service to readers. Every effort is made to ensure accuracy, but *Radio* magazine cannot assume responsibility for errors or omissions.

by Kari Taylor, senior associate editor

That was then

This is a look at the master control room adjacent to WTIC's sixth floor Grove Street studios in 1929. Engineer Bob Coe is at the controls. Programs from the studios were amplified and sent by telephone lines to the Talcott Mountain transmitter 12 miles away. At that time, the station's first RCA 50kW transmitter was on the air as well. WTIC is located in Hartford, CT.

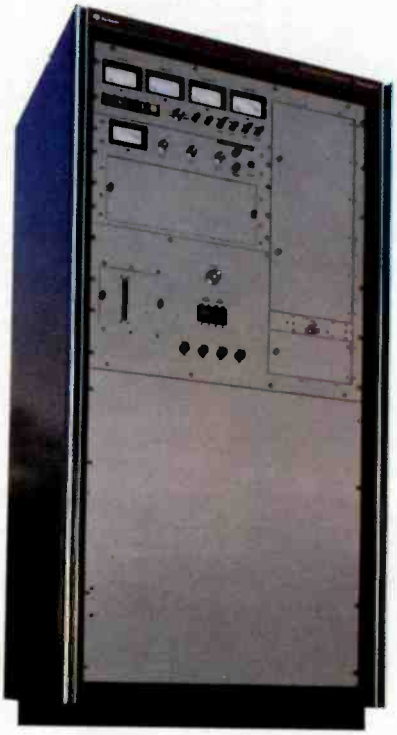
Photo courtesy of WTIC.

Sample and Hold

What do you like best about radio?

Source: American Media Services, January 2006.

Do you remember?



Collins announced nine new FM transmitters as part of the Generation 4 series in 1975. The transmitters ranged in output power from 2.5kW to 40kW. At the heart of the Generation 4 series was the Phase 4 exciter. The transmitters also featured discrete quad compatibility. The 831 series has survived well through the years. The same basic design is still in use in the Continental 816 series.

Condition your Signal

with the New Vorsis® HD-P3

What Is It?

A four-band parametric equalizer feeding a three-band limiter with adjustable crossover points, AGC and selectable filters for FM, AM or streaming audio formats. The HD-P3 includes a variable de-esser, an expander and dual digital outputs (one with user selectable HD latency FM delay), plus high pass, low pass and notch filters, *and* a signal de-correlator to optimize bass content. All this controlled by an ethernet protocol computer interface that lets you run one or many HD-P3s from your office or internet based locations.

What It's For:

Processing for your new HD signal, improving your existing FM or AM signal chain, preprocessing streaming audio-over-internet, a standalone HD processor or a realtime DJ monitor feed—and finally—a KILLER studio production tool.

What's It Like?

"PERFORMANCE WITH OVERDRIVE"

VORSIS® It's What's Next in Processing

a division of Wheatstone

THE TOOLS HAVE CHANGED...

BUT THE *MISSION* REMAINS THE SAME

Today's audio control surface has evolved to a very high degree. Yesterday's wish list is today's feature set: total router integration, routable audio and logic, total show recall, and a complete set of DSP audio processing are under the hood of this G7...

All in a package of stainless steel and aluminum designed for years of 24/7 service, with a familiar look and feel that will ***help your talent make years of great radio.***

Networked audio requires a higher level of expertise, experience and resources. Benefit from all three with *WHEATSTONE!*

WE MAKE THE GOOD STUFF Wheatstone

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