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August 2008
RadioMagOnline.com

Streaming audio

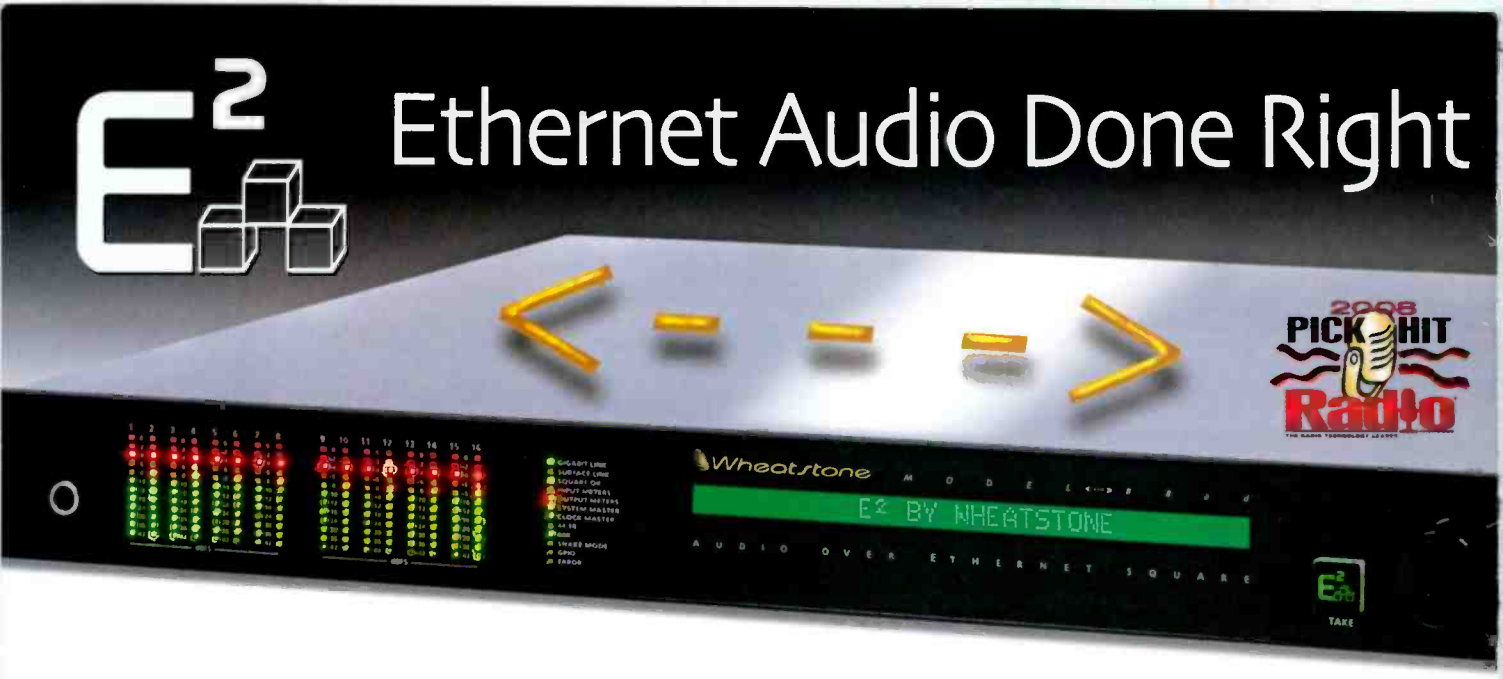
A rising wave in distribution

FACILITY SHOWCASE
Performance Radio Network

FIELD REPORTS
Zoom H2 & ATI ADAC-2

A Penton Media Publication

E² Ethernet Audio Done Right



2008 PICK HIT Radio

MEET THE SQUARE

The Wheatstone E² (E SQUARE) gives you the convenience of Ethernet audio without all the IP hassle. It just *knows*. The built-in Setup Wizard lets you configure an entire system with just your browser and a laptop. Unplug it when you're done and there's no PC between you and system reliability.

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88AD I/O: 4 analog plus 4 digital inputs and outputs—perfect for small studios or standalone routing.

88 I/O CONNECTIONS: E² has both DB-25s for punchblock interface and RJ-45s for point-to-point interface. All SQUAREs have 12 individually configurable opto-isolated logic ports that can be either inputs or outputs.

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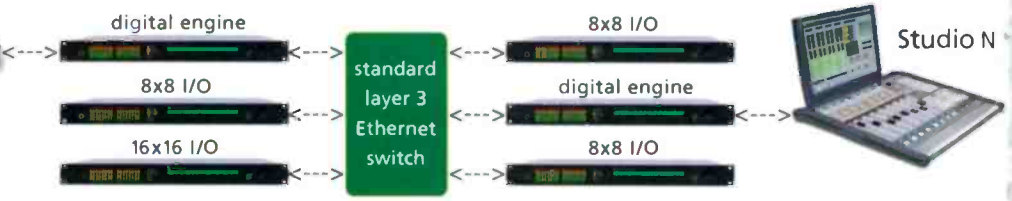

www.wheatstone.com

Wheatstone

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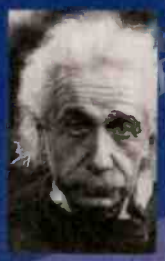

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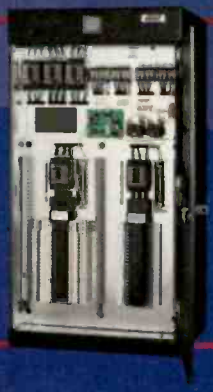

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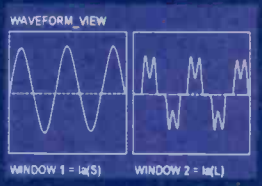

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Waveform before correction

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Power Quality Solutions Tailored To Protect *Your* Revenue Stream

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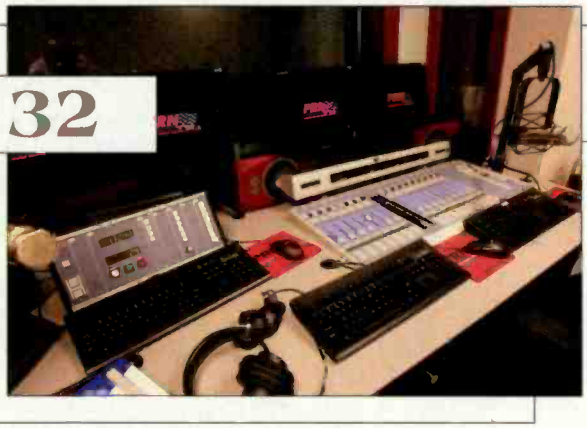

Features

Columns

Departments

ON THE COVER

Streaming audio is a wave that's picking up speed in the radio industry. Check out Doug Irwin's article on page 24 for tips on how to keep up. Cover design by Michael J. Knust.

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Currents Online

Selected headlines from the past month.

Coby Electronics to Unveil Portable HD Radio Receiver

The HDR-700 can operate on an internal, rechargeable battery. It also includes an SD card slot for MP3 playback.

Adam A5 Now Shipping

Powered by two 25W on-board amplifiers, the speaker uses Adam's Accelerated Ribbon Technology folded ribbon tweeter with a 5" woofer.

CAP Advisory Council Formed

Nine groups are represented by the council that was inspired by an implementation plan created by the Society of Broadcast Engineers.

Larry Cervon Dies at 86

The past president of Broadcast Electronics, Lawrence Cervon died on July 5, 2008, at his home in Laurel, NY. He was 86 and suffered from pulmonary fibrosis.

NAB Announces 2008 Marconi Radio Awards Finalists

The awards honor radio stations and on-air personalities for excellence in broadcasting in 21 categories.

Arbitron Adds PPM VIP Service

PPM panelists in New York, Houston and Philadelphia who live in households with a person age 18-34 in residence can use the personal digital calendar service to help keep track of their schedules.

HD Digital Radio Alliance Looks to Convert Consumer Awareness to Action

The Alliance has added a mobile marketing initiative and expanded online resources for retailers and auto dealers to the next flight of on-air radio ads.

Site Features

Recognizing Innovation

The Advancement in Radio Technology Awards recognize the top new products introduced over the past year, and you decide the winners. Vote now at RadioMagOnline.com.

Advancement in Radio Technology
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AWARDS

Stay Informed With Newsletters

The weekly Radio Currents, the twice-monthly Digital Radio Update and New Products Extra, and the weekly NAB Radio Update are loaded with information you can use.

Industry Events

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

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How is HD Radio really doing?

It's about that time when I take a survey of HD Radio's progress. We regularly see reports of statistics and projections relating to the technology, and local newspapers have some occasional coverage of it. Last month, Ibiquity President and CEO Bob Struble launched an online column to provide what he calls a candid inside view of what Ibiquity is thinking and doing to speed AM and FM's conversion to digital.

We can all see that HD Radio appears to be moving slowly ahead. Recent news headlines of sub $100 receivers and the first portable (albeit far from being as portable as an Ipod) receiver are good steps to making HD Radio accessible. Since I follow the progress closely, I looked forward to seeing something new in Struble's column for me to consider in the HD Radio rollout. Most of the information was an overview on what we already know.

As I expected him to say, he feels the HD Radio rollout is going well. He actually said that it was fantastic. He noted that almost 1,800 stations are transmitting an HD Radio signal, which reaches more than 80 percent of the population. He also stated that 50 percent of radio listening takes place on stations that have converted to digital.

1,800 stations is not quite 15 percent of all the stations in the U.S. And the "50 percent of all radio listening takes place on stations that have converted" doesn't mean all those listeners are listening to an HD Radio signal. Most of my radio listening is done in the car, but I still have an analog car radio like most people.

Struble touts that there are more multicast stations on the air, and Itunes tagging and traffic distribution provide new revenue streams. This is all good for HD Radio. There's no question that there is progress: A little here, a little there.

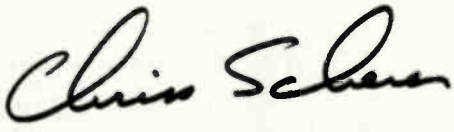
But the real indicator of HD Radio's acceptance is the view of the typical consumer. Regular people (those who are not in broadcasting) do seem to be more familiar with the term HD Radio than before, but they still don't fully understand what it is or what it means.

I'm glad to see prices for HD Radio receivers drop below $100. But Struble noted something that I continue to experience when I visit a consumer electronics store. He writes that the inexpensive receivers are available at more than 12,000 storefronts nationally, but you may have to ask a few times.

If consumers have to ask for it, they're probably not going to make the effort. I've said it before: HD Radio shouldn't be an option, it should be the norm.

Struble has a grasp of the reality, though. He says that we are still a long way from being done with this long-term project. Stations must continue to convert their transmitters and provide multicast services. Consumers need hundreds of receivers with HD Radio, not just dozens (that's making it the norm and not an option). Sales floor knowledge, merchandising and product demonstration needs to improve. He also wants HD Radio in every car.

Those are good goals, and I anticipate seeing how they will be accomplished. They're not new goals. It has taken some time to get to this point, so I look forward to his future columns and the efforts of stations and the HD Digital Radio Alliance in making them a reality. Keep working and keep pushing, Bob.



What's your opinion? Send it to radio@RadioMagOnline.com

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*Above: Heart 104.9FM DJ **Koketso Sachane** doing his show from the streets of Cape Town.*

*Top: **Saskia Falken**, Heart 104.9FM Mid Morning Mix host broadcasting from Table Mountain.*

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Inside IPv6

By Kevin McNamara, CNE

Think about how many devices we use in our personal and business lives that are connected to a network. When the Internet was first created, it was not intended for use by the general population. No one, including Al Gore, anticipated the Internet would find today's widespread use.

We are now running out of available IP addresses under the current addressing scheme called IPv4, which is limited to a maximum of 4,294,967,296 (232) addresses. This may seem like a lot of addresses, but consider that, according to the Internet Corporation for Assigned Names and Numbers (ICANN), the available IPv4 addresses will run out by 2011.

IPv4 vs. IPv6

There are many significant differences between the two addressing schemes, but the most obvious is that IPv6 was designed to handle about 3,403 x 10^{38} different addresses. That is approximately 1 trillion more than IPv4.

In terms of architecture, the two schemes are very different. IPv4 is categorized as classful, which essentially means that users requiring a static address were typically assigned a class B (65,534) or C (254) address. This is extremely inefficient, primarily because most assigned IP addresses were not needed. For example, if a company needs 300 IP addresses, it would waste 65,234 potential addresses. Now enter IPv6, which uses a scheme called Classless Inter-Domain Routing (CIDR), which permits the allocation of IP addresses to users based on the amount of addresses required. CIDR permits aggregation of contiguous addresses in a single supernet, which decreases the amount of data needed for routing tables or the complex sub-netting currently needed for some IPv4 configurations.

The key to CIDR is that all the routing information is included within the address using groups of CIDR blocks. It is prefix-based, which means that information about each packet, such as the address length, is specified in the header. For example, IPv4 information is included in the initial block, which ensures compatibility with IPv4 as well as IPv6 addressing.

The addressing will also look quite different. As a simple example, the well known private IP address (under IPv4) of 168.192.0.1, will be fe80::192.168.0.1. Several conversion calculators can be found on the Web.

IPv6 addresses are written in eight groups of four hexdecimal digits. One feature of this addressing scheme is that leading zeros can be omitted for each group, and if one group contains four zeros it can be replaced by double colons (::).

IPv4 reserves a block of IP addresses for local use. These addresses start with 192.168.xxx.xxx. IPv6 also provides private addresses, known as Unique Local Addresses (ULA), all of which begin with the prefix fc00::/7. In addition, IPv6 utilizes a pseudorandom algorithm that provides another layer of protection against the possibility that other network devices will end up with the same address and cause network collisions.

Changeover to IPv6

The transition to IPv6 will require hardware and software upgrades. Routers, network switches and many network interface devices may need to be replaced or upgraded. Fortunately, many manufacturers can provide the upgrades through firmware and/or software upgrades. Most of the new versions of operation systems, such as Vista, Mac and Linux, already have the IPv6 client. You can get the network clients for most older versions of these OS from the manufacturer. These network clients install and configure easily and, in most cases, are independent of the IPv4 client, so compatibility across a network should not be affected.

The real challenge will be to make sure your entire network is capable of passing both IPv4 and IPv6 packets. Any device not properly upgraded will likely prevent IPv6 packets to pass, which would tend to isolate IPv6 traffic to only a portion of your network. While it is possible (and probably necessary) for the two protocols to work in the same network, you will need to pay particular attention to how they will coexist in an on-demand/streaming environment such as that originating from digital audio/video servers and workstations.

To make the transition easier, the Network Working Group publishes a document called *Basic Transition Mechanisms for IPv6 Hosts and Routers*, or RFC 4213, that describes different methods to make the transition to IPv6. Essentially

Internet Resources

Projections for IPv4 address exhaustion
www.potaroo.net/tools/ipv4/index.html

IP address conversion calculator
www.subnetonline.com/pages/subnet calculators/ipv4-to-ipv6-converter.php

RFC on tunneling and transition methods
www.enterpriseitplanet.com/networking/features/print.php/3678681

Understanding IP Addressing: Everything You Wanted to Know
www.3com.com/other/pdfs/infra/corpinfo/en_US/501302.pdf

Insight to IBOC
August 2008 Part of the *Radio* magazine DAB Answer Series

Considerations for Elevated IBOC Sidebands

By Tim Anderson, CSRE

Many questions are being asked regarding the widely reported efforts to increase the current standard one percent FM IBOC injection levels to 10 percent of the unmodulated FM carrier power. Station engineers are seeking guidance as they plan and design transmitter installations for today's one percent IBOC injection levels while protecting their investment if a power increase is authorized.

The first difficulty in accommodating increased IBOC sideband levels is that, because of the higher (up to 6dB) peak-to-average (PAR) AM component of the IBOC carriers, the transmitter must be derated from Class C saturated FM operation. The more the digital-to-analog carrier ratio is increased, the more the transmitter must be derated. In digital-only operation, the PAR is increased even further, but without the linearizing effect of the constant envelope analog FM signal, the maximum available TPO is further reduced. At the same time that the PAR is increasing, power output of the amplifier is also increasing and the RF intermodulation products must remain suppressed at the same level (74.4dB below the unmoduated FM carrier) as operation at one percent IBOC sideband injection. This means the transmitter linearity must improve by 1dB for every 1dB of increase in IBOC injection by the combined ratio of those increases to maintain NRSC mask compliance. Figures 1 and 2 illustrate the derating required for low-level combined and IBOC-only amplification modes. The tube amplifier derating curve is noticeably steeper than solid-state transmitters. This is because tube amplifiers must be run further into Class

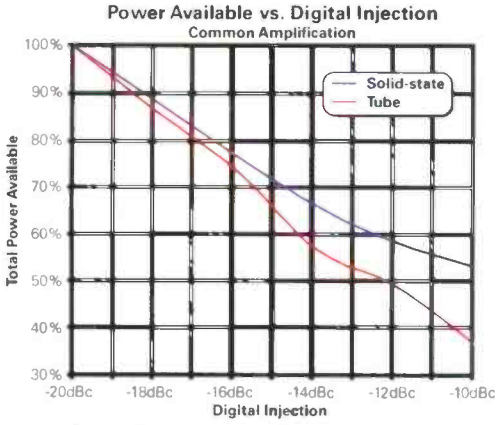

Figure 1. Transmitter derating for common amplification.

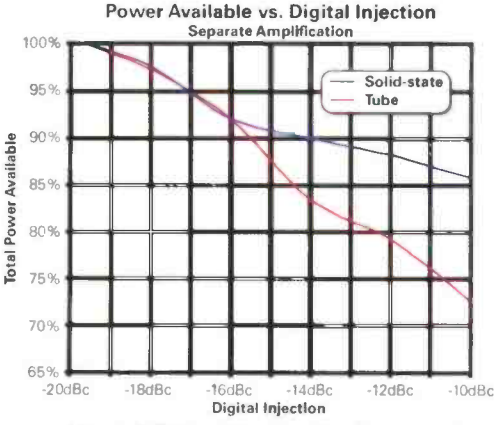

Figure 2. Transmitter derating for separate amplification.

The Broadcaster Traffic Consortium

By Chriss Scherer, editor

The Broadcaster Traffic Consortium (BTC), an alliance of several broadcast groups, is working with Navteq to provide real-time traffic and other location-based information for portable navigation devices and automobile in-dash systems via HD Radio technology. The radio groups that comprise the BTC are founding members Beasley Broadcast Group, Bonneville International, Cox Radio, Emmis Communications, Entercom, Communications, Greater Media, NPR and Radio One. The consortium has added Lincoln Financial Media, Cumulus Media, Hubbard Broadcasting and Cobalt Operating since initially forming. Paul Brenner is the administrative agent for the consortium and the VP of integrated technology for Emmis.

Brenner

Navteq has worked with radio groups to distribute its data services in the past, and the opportunity to use the data capability of HD Radio as a distribution system appeals to the consortium members as a way to promote HD Radio and add consumer value to the technology. For this purpose, Navteq was looking for a low-cost distribution method with a high return capabil-

continued on page 3

Inside

A special supplement to
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Monitor and alarm THREE separate AM, FM and HD Radio® Multicast broadcasts—*all at once*

TRIPLE PLAY!
DaySequerra M3

Your HD Radio™ station has lots of signals to monitor, and we've just made the task three times easier. Introducing the DaySequerra M3. It's 3—three—THREE monitors in one! Now you can monitor and alarm three separate AM, FM or HD broadcasts using only 2U of rack space.

The M3 gives you three frequency-agile AM, FM and HD Radio™ Multicast tuners, each equipped with separate analog and digital balanced outputs and six programmable dry, floating contact alarm relays—18 relays, total. Each tuner stores 20 AM and 20 FM presets, decodes HD-1 through HD-8 multicast channels and displays signal strength, multipath, HD Radio™ PAD data and analog RBDS data. Indicators report HD Locked, Multicast Present, Delay Bit Set and Tuner Alarm.

Audio output is uncompromised, with an over-sampled D/A converter driving Class-A biased audio outputs. HD Radio™ stereo separation is better than 90dB, and THD+N is less than 0.005 percent. The M3 gives you full-time digital audio, even when tuned to an analog station, so you can monitor or record any station's audio in the digital domain. "Split Mode" monitoring lets you easily pinpoint errors in analog-to-digital delay, level and phase matching. Each tuner has a separate menu-adjustable output level setting, and a front panel lockout feature keeps errant button pushers from changing your settings.

The M3 addresses the issue of alarms in an intelligent fashion and employs proprietary heuristic algorithms which won't be fooled by pink noise or tones, and will generate alarms when real program silence is detected in HD Radio™ or analog broadcasts. Unlike external silence-sense units, the M3 can also trigger an alarm on loss of RF Carrier, OFDM Lock, RBDS data stream, PAD data stream, Multicast Available, and Delay Bit. You can set sensitivity for both Audio and RF Carrier Loss, and set Alarm Delay for all alarms to match your format. Contact your authorized DaySequerra Distributor today!

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- Displays HD Locked, Multicast Available, Delay Set and Tuner Alarm
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- Three separate antenna inputs for multiple Rx antenna feeds; internal jumper links for single antenna feed
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IBOC sidebands

AB operation to achieve necessary linearity.

In determining the derating, measurements were made with a minimum of 3dB of headroom below the NRSC RF mask of -74.4dBc with the FM carrier modulated by a 1kHz monaural tone. A true RMS responding, calorimetric power meter was used to measure the total integrated power of the combined analog and digital RF components.

These derating figures are based on HD Radio MP1

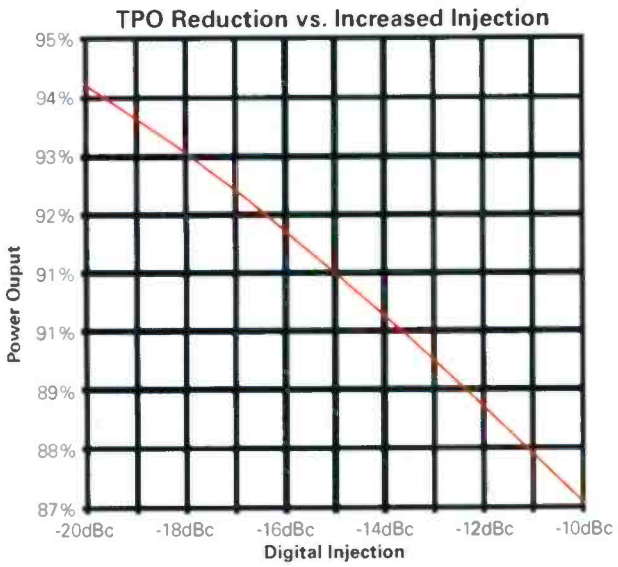


Figure 3. Output power reduces as digital injection increases.

mode. It should be noted that as the mode is changed from to MP2, MP3 or MP11 we must further derate the transmitter due to increasing spectral bandwidth density that increases the peak-to-average power of the IBOC sidebands. Figure 3 shows the derating necessary for MP11 versus increased IBOC sideband injection. At -20dBc, MP11 requires approximately six percent derating over MP1 and an additional seven percent (13 percent total) at -10dBc. MP3 requires derating of about half this figure.

The common method

Common amplification can remain a viable combining method for stations with a licensed TPO of 7kW or less using solid-state transmitters, and up to about 16kW licensed TPO using tube transmitters. In these cases, adding a second amplifier cabinet can achieve -10dBc and offers a straightforward upgrade path based on currently available technology. Higher power levels may be achieved at lower injection ratios.

Referring to Figure 4 (page 6), a station with a licensed analog TPO of 7kW, running IBOC at -20dBc using common amplification with a solid-state transmitter capable of 8kW combined power, would be able to increase IBOC injection to -10dBc by adding a second matching amplifier and a 3dB combiner for a maximum combined TPO of 8.5kW and an analog

Broadcast Traffic Consortium

continued from page 1

ity, which HD Radio provides. The partner broadcasters bring nationwide coverage through their stations at a sufficient enough bandwidth to enable Navteq to deliver its application.

The consortium is rolling the system out across member stations in nearly 60 markets. The software and system has been designed to enable to distribution of the data content. Participating stations are now installing the equipment with an eye on launching the services on HD Radio signals by October. Currently, 54 markets have services available via RBDS. Once the first phase of the HD Radio rollout is complete, phase two will bring the technology to the remaining top 100 markets. Phase two is expected to be completed in the first quarter of 2009.

BTC
Broadcaster Traffic Consortium

The BTC plans to continue providing the technology in additional markets beyond 100, but those plans have not yet been set.

The service is delivered to stations via the Internet to feed the HD Radio Importer. This service is unique in that Navteq is an Ibiquity partner. Instead of pushing the Navteq data into a data client to feed the Import, the Navteq stream directly interfaces with the Importer through an application port. The data stream is formatted by Navteq.

The data uses about 13kb/s in its current allocation. There are agreements in place to provide a higher data bandwidth, and that could be implemented later depending on the return on investment and trade-off between revenue and bit allocation. The key was to provide this service in addition to multicasting, so it is designed to not require a large portion of bandwidth.

Navteq is negotiating with electronics manufacturers to create products to use the service. The consortium's goal is to establish the data network. This eliminates the chicken-and-egg problem of not creating one until the other exists. With the network in place, electronics manufacturers can create consumer products.

As the HD Radio rollout continues, the BTC sees its role as developing the application-specific side of HD Radio. It can do this as a companion to the efforts of the NAB and the HD Digital Radio Alliance.

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

Insight to IBOC - a supplement to Radio *magazine*, August 2008,

Open Mic
A boost for Itunes tagging

In April Clear Channel announced that all of its HD Radio stations were transmitting Itunes tags on the primary channel. In June, the same capability was added to the HD2 signals at those stations. Itunes tagging is yet another feature in the list of enhancements HD Radio offers consumers. While there are only two manufacturers (Polk and Alpine) of tagging-capable receivers, Clear Channel expects the feature will be embraced by consumers. Radio magazine talked to Jeff Littlejohn, executive vice president of distribution development for Clear Channel Radio, about the Clear Channel announcement.

Littlejohn

Radio: *What did Clear Channel have to do implement Itunes tagging across all the HD1 and HD2 signals?*

JL: The UFID of the ID3 tag of each song is updated to include the Itunes Store ID. This is the biggest amount of work in the process.

Radio: *How did Clear Channel do this for all its HD Radio stations?*

JL: There are services, such as Jump2Go that can do this, but we at Clear Channel did it ourselves. Because we have common systems across our stations, it was relatively simple for us to do it across the board. We built a software system to map every song with its Itunes Store ID. Going forward, we update each song before it's added to a station's playlist.

We have the same automation system and the same Importer in all our stations. All the stations are connected via a WAN. We have a centralized platform to enter title and artist information. So for us, adding the tags was very simple for us. We also want to encourage and help other broadcasters in launching this technology.

Radio: *Do you think tagging is a significant feature for listeners to embrace HD Radio?*

JL: I do. 65 percent of new music is discovered because of terrestrial radio. Peer-to-peer is number two, and other forms of media are a distant third. In addition, more and more people are buying music through electronic downloads. Tagging allows listeners to use these two methods together.

Radio: *Right now, tagging is limited to Ipods and Itunes. Do you see other media players and other music file distributors becoming involved in tagging?*

JL: This has to be much broader and include many broadcasters and distributors. This needs to be available in whatever way consumers want to get their music. If they want to go through Apple, great. If they want to go through other systems, we need to offer that. We should not try to force consumer habits, and we need to make sure this is broadly accessible to consumers. That's the only way the ecosystem really develops and becomes the killer application.

IBOC sidebands

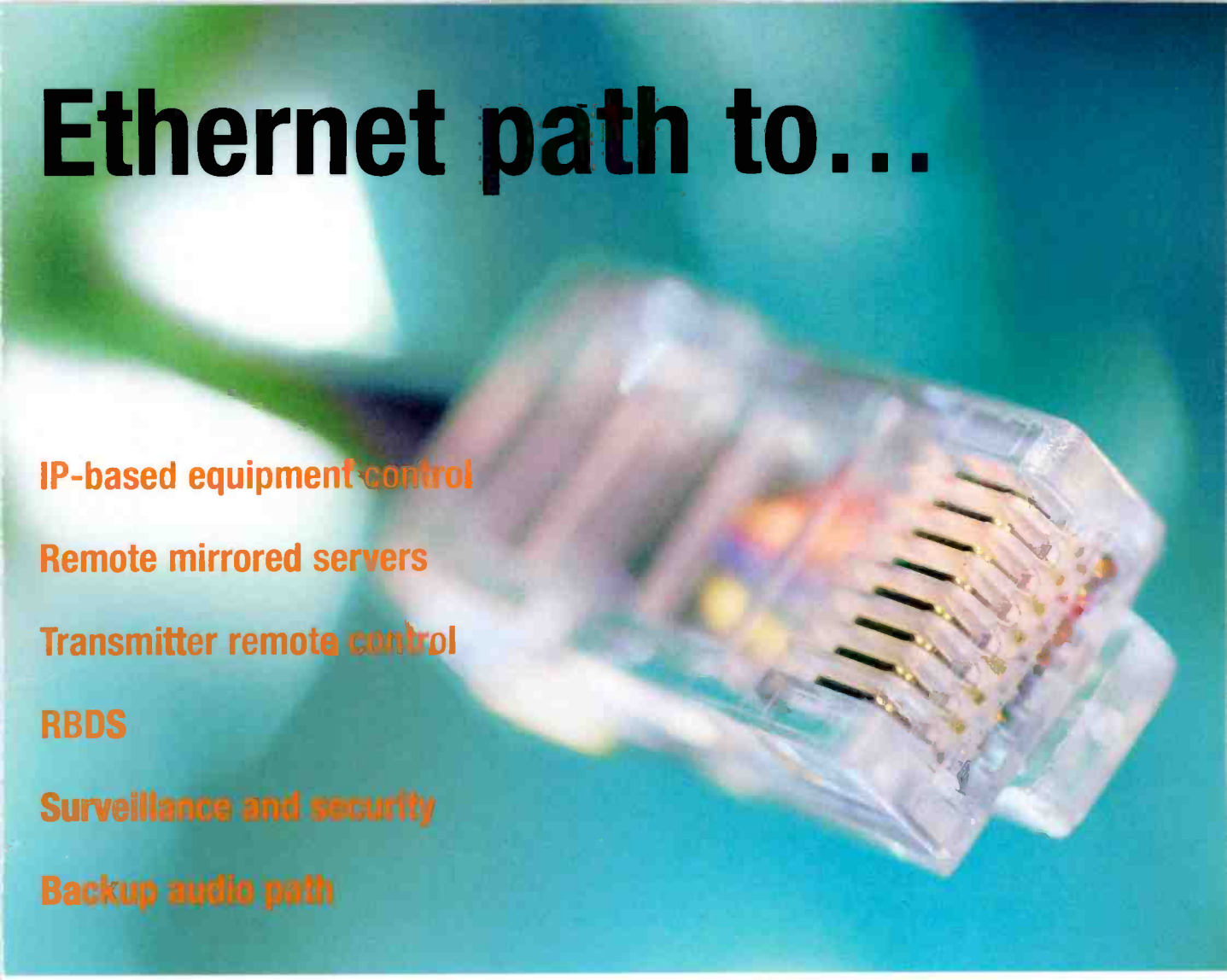
maximum of 7.6kW. At -14dBc, an analog TPO of 10kW is possible. For a station with a licensed analog TPO of 20kW running -20dBc of common amplification with a tube transmitter, adding a matching second amplifier through a 3dB combiner would only deliver a maximum analog power of 16.4kW. This would not enable the station to achieve -10dBc at full power. At -12dBc however, this configuration would be capable of about 23kW of analog power.

High-level combining, using separate amplification, becomes exponentially more inefficient to implement as the digital-to-analog ratio increases and is virtually impossible above 6kW licensed TPO at the -10dBc (10 percent) digital injection level. For a 5kW station running a high-level combined system using a 10dB combiner at -10dBc to produce the necessary 500W of digital signal, a 5,000W digital transmitter would be required as 90 percent of the digital power and 10 percent of the analog power must be rejected. A combined total of 5,500W would be sent to the reject load. The highest practical TPO currently available for a solid-state digital-only transmitter is 6kW. Tube transmitters are not optimal for IBOC-only operation because of the lowered efficiency at high PAR amplification. It is apparent that high-level combining is not practical in terms of capital expense or operating efficiency for higher power levels and significantly increased digital injection. However, this method of combining will likely remain a viable option for lower TPO requirements or at something less than -10dBc injection levels.

Space combining – using separate amplifiers and antennas for analog and digital – remains the most efficient and cost-effective method of combining digital and analog signals, particularly at higher power levels and higher digital injection ratios. For a 20kW ERP station to run IBOC at -10dBc, a 2,000W (after line losses) digital-only transmitter and a two-bay (gain of 1) antenna are the only requirements. Isolation between the analog and digital antennas must be increased by 10dB to 40dB of isolation, for -10dB IBOC operation. A ferrite circulator may be required to provide sufficient isolation between the digital and analog transmitters, which can be expensive, particularly at high power levels.

High-level combined stations currently operating at -20dBc will be able to use their existing digital transmitter for space combining as it is already operating at -10dBc with 90 percent of the power being sent to the reject load. Space combining is not without drawbacks. By regulation, the digital antenna must be within 70 percent of the analog antenna's height and within three seconds latitude/longitude of the main antenna. The gain and pattern of the digital antenna must be carefully matched to avoid inter-modulation effects and minimize ratio variances in the field. Various antenna manufacturers have dual feed and inter-leaved antenna

Ethernet path to...



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IBOC sidebands

systems that promise to handle the increased digital power and provide adequate isolation.

Split-Level or mid-level combining becomes a more difficult technique to implement because as sideband levels increase, the significantly higher PAR demands more of the transmitter's available power leaving very little analog power for the added efficiency gained by the split-level technique. There is still much research to be done in determining how viable SLC might be. Either way, it appears this is still better than high-level combining at lower injection levels of -18dBc or less.

For the most part, simply adding a second digital transmitter will, at the very least, support injection levels of -12 to -14dBc and in many scenarios, will make -10dBc. There will be tradeoffs as to what lengths one will be willing to go in order to make the full -10dBc level. It seems obvious that current combiner technology does not easily support the demands of increased digital levels. As sideband powers are increased, efficiency becomes a much larger concern. The inefficiencies of any of the high-level combining schemes make them unlikely candidates for significantly increased sideband levels. It is likely that antenna space combining will become a popular method of deployment due to its efficiency, particularly for high power installations.

Anderson is the FM/digital radio product line manager for Harris, Cincinnati.

Xmtr	Analog and Digital Common Amplification TPO in Watts																	
	-20dBc			-18dBc			-16dBc			-14dBc			-12dBc			-10dBc		
	Com	A	D	Com	A	D	Com		D	Com		D	Com		D	Com		D
ZX500	413	409	4	413	406	7	380	370	10	355	341	14	293	274	18	240	216	24
ZX1000	825	817	8	825	812	13	760	741	19	710	682	28	585	548	37	480	432	48
ZX3500	2800	2772	28	2800	2756	44	2579	2515	65	2410	2314	96	1985	1860	125	1629	1466	163
ZX5000	4125	4084	41	4125	4060	65	3800	3705	95	6550	3409	141	2925	2740	185	2400	2160	240
Z12HD+	6000	5940	60	5325	5241	84	4650	4553	117	3875	3817	158	3503	3282	221	3195	2876	320
Z16HD+	8000	7920	80	7100	6987	113	6200	6044	156	5300	5089	211	4670	4375	295	4260	3834	426
Z32HD+	16000	15840	160	14200	13975	225	12400	12089	311	13600	10178	422	9340	8751	589	8520	7668	852
HT/HD+	25000	24750	250	21700	21356	344	18600	18133	467	14300	13731	569	12300	11524	776	9100	8190	910

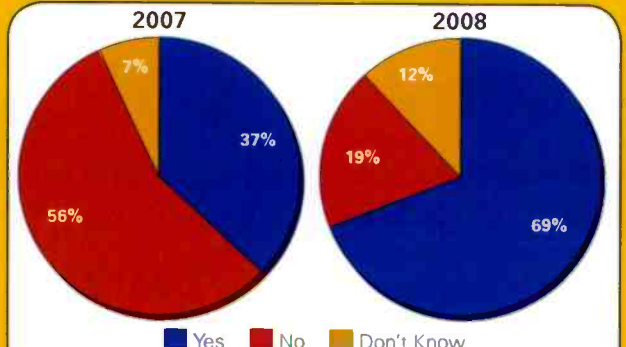
Figure 4. Comparison of transmitter power deratings for some Harris transmitters at various digital injection levels.

Sample and Hold

Youth Interest in HD Radio

By Chriss Scherer, editor

When it comes to predicting the future of HD Radio, many statistics will show that interest and awareness of the technology will increase over time. A true benchmark of any technology's success is the acceptance by the younger audience. Paragon Media Strategies has conducted two studies on how youth use radio and new media, and the 2008 data shows a promising future for HD Radio.



If I told you that HD over-the-air radio doubles or triples the number of stations you can receive and that HD could make AM sound like FM stereo and FM stereo sound like Dolby 5.1 Surround-sound, would that interest you in HD over-the-air radio?

The study covers several technologies, including CDs, media players, video games, cell phones, Internet radio and HD Radio. The survey asked an equal number of males and females divided almost equally between 14 - 18 and 19 - 24. The survey shows that general radio listening has remained about the same with this audience. The survey also shows that general awareness of HD Radio is increasing slowly.

When respondents were asked if they were interested in HD Radio based on it features, a large majority said yes, which is a significant change from the 2007 data.

Information such as this sheds an encouraging light on the future of HD Radio as the rollout continues.

Source: Paragon Media Strategies Second Annual Youth Radio and New Media Study, Spring 2008

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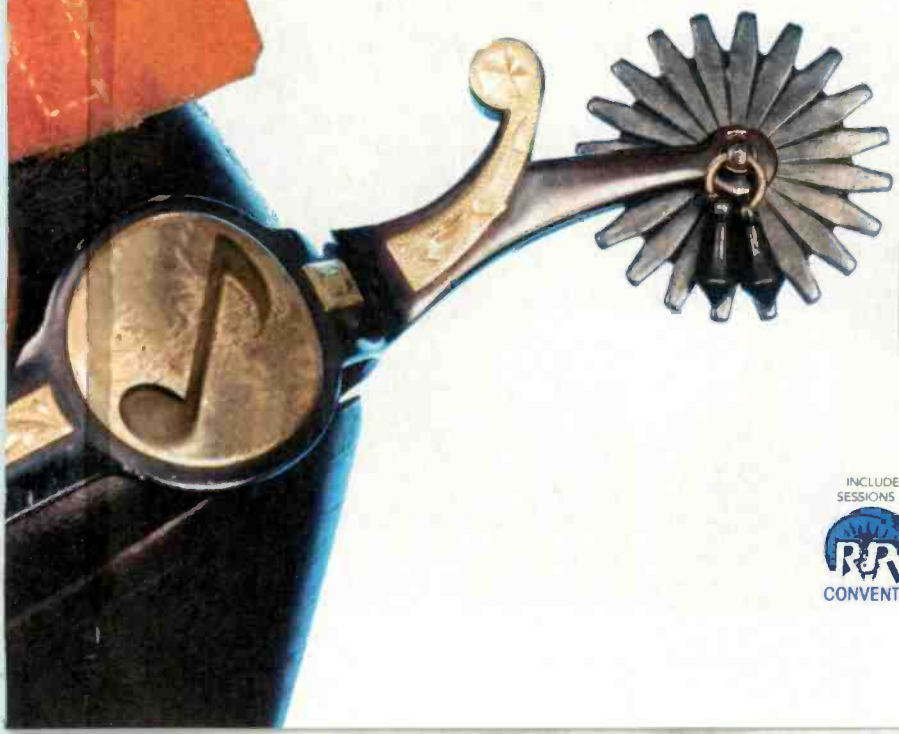
When it comes to return on investment, The NAB Radio Show delivers high-value information, networking opportunities and an exhibit hall packed with new innovations for HD implementation. Register today and you'll soon say, "Austincredible!"



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it describes three primary methods: Dual Stack, Tunneling and Translation.

Dual stack is simply a method where an additional software client supporting the IPv6 protocol is loaded to the device. This may be a software or firmware upgrade. You are familiar with this from loading different network clients on your PC. There might also be a new client written that supports both IPv4 and IPv6 in a single client.

IP tunneling is a method that encapsulates a packet and allows it to be routed to a specific destination, essentially creating a dedicated pipeline or tunnel from two points. As it turns out, this is also a very efficient method to carry IPv6 packets over IPv4 networks. The IPv6 packet is encapsulated within an IPv4 packet at the entry point. When the packet reaches the destination, the IPv6 packet is stripped. The configuration information is maintained at the destination. This is called configured tunneling.

Translation is a method that uses an external black box to handle the exchange of packets.

IPv6 advantages

The abundance of available addresses will finally make it possible to have direct access to individual devices tied to any network with relative ease. At the station level, implementing IPv6 should be relatively easy, providing you take the time to survey and evaluate each device connected to your network. Make sure you contact the manufacturer of any digital audio system or other IP-based equipment to find out what upgrades are required to support an IPv6 infrastructure. If your equipment is older and not going to be supported, don't worry. Realistically, you have some time before an upgrade to IPv6 will be needed, but make sure you provide for replacing that equipment in the next capital budget. If you are part of a larger group, the IT department will probably publish a timeline showing how the organization will migrate to IPv6, but it wouldn't hurt to ask the question if you haven't received any notices.

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

IPv6 Advantages

Easy configuration – Local devices will recognize each other and auto configure as necessary.

Ability to create ad-hoc networks quickly – good for rapidly connecting local devices and creating a temporary network

Supporting 3G and newer wireless telephone networks – Each telephone can have one or more dedicated IP address.

Will support larger packets up to 32Gb each – Yes this is correct you are currently limited to 64kb with IPv6.

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FCC will extend CPs for small businesses

By Harry Martin

In March, the FCC adopted numerous policy and rule changes dealing with media diversity. Some of these initiatives were mere proposals, but others were incorporated into the agency's rules effective July 15, 2008.

CP Extensions. One of the new rules permits an 18-month extension of a construction permit when it is sold to a small business as defined by the SBA. To meet the SBA's definition of small business, a radio station owner must have revenue of less than $6.5 million per year, and a television station owner must take in less than $13 million per year. To avoid abuse of this definition by larger companies creating new subsidiaries with little or no revenue, the FCC also adopted control tests requiring that certain percentages of equity and voting power reside in the qualified permit-holding entity.

For someone holding a close-to-expiring permit, this new provision provides a powerful incentive to sell the permit to a small business. An 18-month extension is available for any CPs for new TV, AM, FM, translators, boosters, TV translators, Class A TV and even LPFM stations. The extensions do not apply to construction permits for modification of licenses of already-existing broadcast stations.

Dateline

October 1 is the deadline for submission of biennial ownership reports by radio stations in Colorado, Minnesota, Montana, North Dakota and South Dakota.

On October 1, radio stations with more than 10 full-time employees located in Colorado, Minnesota, Montana, North Dakota and South Dakota must electronically file their Broadcast EEO Mid-Term Reports (Form 397) with the FCC.

Also on or before October 1, radio stations licensed in the following states must place their annual EEO Reports in their public files: Alabama, Colorado, Connecticut, Georgia, Maine, Massachusetts, Minnesota, Montana, New Hampshire, North Dakota, South Dakota, Vermont and Rhode Island.

Although the precise procedures for obtaining a construction permit extension have not yet been spelled out, it appears that requests for the extension will be part of the normal application process for assignment/transfer of the permit. In the application, the proposed buyer should notify the FCC that it is seeking an extension and must submit evidence to the FCC that it qualifies as an eligible small business under the SBA revenue limits and the control tests. After the sale is completed and an official consummation notice has been filed, the staff will update the FCC's database to reflect the extended expiration date.

Importantly, no extension will be issued until *after* the transaction has been consummated and the permit is held by the small business – and no extension can be granted if the permit has already expired. That means that anyone hoping to take advantage of this new provision should be sure to get the necessary assignment/transfer application filed and granted with enough time to get the deal closed before the permit is set to expire. (Normally, that kind of application takes at least 45 to 60 days to get granted in simple, uncontested situations.)

Increased EDP in Qualified Entities. Also effective July 15, the FCC relaxed the limits on financial involvement for multiple-ownership purposes, permitting station owners to invest to a greater degree than previously permitted in small business entities acquiring other stations in their markets. Specifically, an investor otherwise ineligible to acquire new stations in a market would be permitted to invest in a small business entity acquiring a market station, provided the combined equity and debt interests of the investor, under certain circumstances, do not exceed 80 percent.

Racial Discrimination Banned in Commercial Contracts. Under another new rule, discrimination in broadcast station commercial-time transactions will be formally prohibited. This rule will require renewal applicants to certify that their advertising contracts do not discriminate on the basis of race or gender and those contracts contain nondiscrimination clauses. According to the Commission, the goal here is eliminate "no urban/no Spanish" provisions that are purported to have been included in advertising contracts in the past.

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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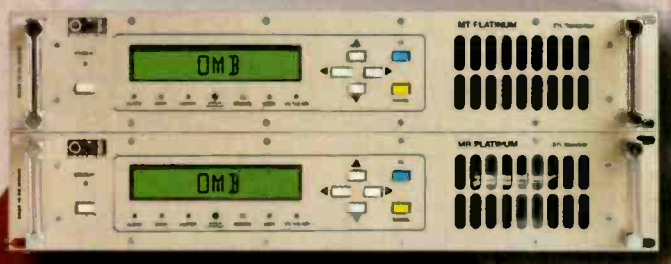

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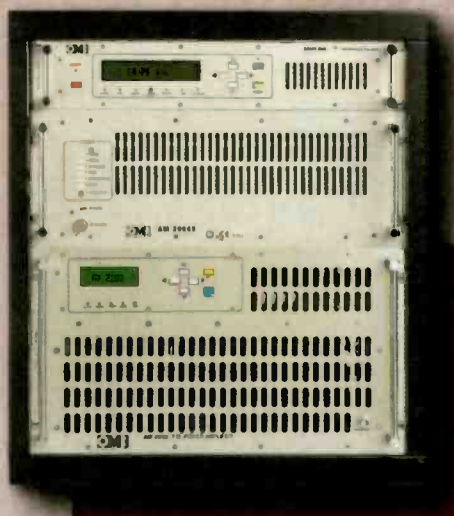

EM 2000

is a 2000W FM transmitter made up of the EM 25 DIG exciter (or EM 20/30 exciter) and the AM 2000 FM amplifier. AM 2000 includes eight 300W high-efficiency MOSFET technology amplifying modules, fed by 2 independent switching power supplies, which are made to withstand the working conditions. The amplifying modules work independently thanks to a power combining structure that provides high isolation between them.

EM 10000

is a 10000W FM transmitter made up of the EM 350 COMPACT DIG exciter and three control units which combine the power of six AM 2000 FM amplifiers. AM 2000 includes eight 300W high-efficiency MOSFET technology amplifying modules, fed by 2 independent switching power supplies, which are made to withstand the working conditions. The amplifying modules works independently thanks to a power combining structure that provides high isolation between them.

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Embracing the rising wave in distribution

By Doug Irwin, CPBE AMD

If you aren't already streaming audio from your radio station, you probably will be soon. The PPM is about to become currency in New York City (along with other major markets) and Arbitron is now measuring streaming audio use just like it measures over-the-air radio use. Obviously it's imperative to give any potential listener the best opportunity to listen to your station, and it's clear that station management in PPM markets are going to want to make sure online listeners are counted. But still – even if you are in a smaller market – you're undoubtedly just as concerned about reaching listeners in any way you can.

And I believe it is important that we as terrestrial broadcasters, with respect to competition from the satellite broadcasters and more and more Internet-only content providers, leverage our broadcast technical facilities, our expertise in generating programs and other content, and our native promotional facilities to stay in the lead. We've been at this broadcasting game a long, long time after all.

Hopefully I've gotten you to jump on the streaming audio bandwagon; and if so, you'll soon realize there are many questions to ask:

- How do I actually generate the stream?
- What encoding software should I use?
- At what data rate should I encode?
- How many listeners should I be prepared to handle?
- How much will this cost?
- How do I accomplish spot-insertion, to make a business of it?

A streaming review

My first experience with streaming audio was at KKSF in 1998. It was the dot-com boom in San Francisco, and having a website and streaming audio was important so that KKSF would be recognized as being technically hip. It was fun to add a new way for listeners to get the station; it was amusing to read e-mails from around the country and world from people who were listening in. Via SNMP we could remotely look at our streaming server, seeing how many users were being served, and when. However, from a business standpoint, it wasn't much more than a curiosity. It cost a certain amount per month, and there was no return on investment. Even its promotional value was intangible.

Soon after the dot-com bust, and the recession that followed, union announcers that voiced spots that were now being heard

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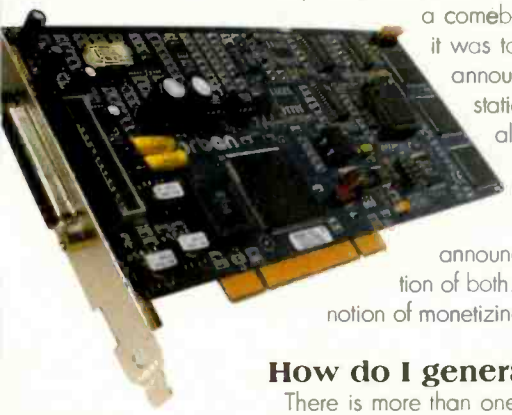
over the Internet insisted they be paid more for the spot reads. That, in addition to poor economic conditions, caused many streams to be simply turned off. The first streaming audio era, which peaked during the dot-com boom, reached a nadir during the dot-com bust.

The recession of the early 2000s came to an end, of course. Broadband Internet connectivity became practically ubiquitous, and interest in streaming audio made a comeback. This time around, though, it was taken more seriously. The union announcer issue still existed, and so stations that streamed audio generally prevented the spot blocks from being sent over the Web stream. Some stations inserted simple fill-music, some public service announcements. Some did a combination of both. However, before too long, the notion of monetizing the streams came back.



Orban Optimod PC1100

How do I generate the stream?

There is more than one way to do this, but I think it's important to reiterate at this point that you will generally make use of the same audio source you already use for terrestrial broadcasts. (This is one advantage that we have over the newcomers to the business. We already have the infrastructure.) The most common method for generating the stream is to make use of another PC with Windows Media Encoder. Audio is fed into the computer through the sound card. The most common way to improve the quality of the audio stream generated in this manner is to make use of a better-quality sound card. (This is where the disciplines of IT and what is more traditionally known as radio engineering really dovetail). This stream should also be separately processed for the bit-reduced stream that will be created.

Orban makes the Optimod PC1100, which is a sound card and audio processor that goes in the PC itself. Control of this card's functionality is done via a GUI operating under Windows. All the processing is done on the card itself through the on-board DSP. The card includes both analog inputs/outputs as well as AES ins and outs. Install this card in the streaming PC and provide every listener with processed audio (for many of the same reasons we have to process audio for our terrestrial stations).

Omnia makes a software version of its Omnia.3net, known as Omnia A/X. This software runs on a PC in conjunction with a separate sound card, using the CPU to carry out the processing algorithms. A GUI controls all the processing functionality. There again, if this software is installed on the streaming generator, all the streaming audio listeners will enjoy the benefits of processed audio.

Neural Audio offers its Neustar 4.0, a single-rack unit audio processor specifically designed to run in front of bit-rate reduced codecs. (It can operate in a stand-alone

Omnia A/X

fashion or in conjunction with audio processors). Its stated design purpose is to reduce objectionable artifacts in the audio created by the encoding/decoding process. A software version is available as the Neustar SW4.0

Connection

Once the stream is generated, it will likely be connected to a location with a very high-bandwidth Internet connection. This connection can be via LAN, WAN or the Internet itself. The reason behind this is simple: The streaming server itself *has* be where it can handle mountains of data. For example, back in 1998, at KKSF we generated the stream at the studio and then pulled the stream from our ISP where our streaming server PC was physically located. During the business day, we limited-out at 300 users, each getting a 32kb/s stream for a total of nearly 10Mb/s. That kind of data rate in to a radio station was unheard of in those days (and would be uncommon even now). All we had between us and our ISP was a single T1; nothing else was needed since our streaming server was located at the ISP where there was tons of bandwidth available.

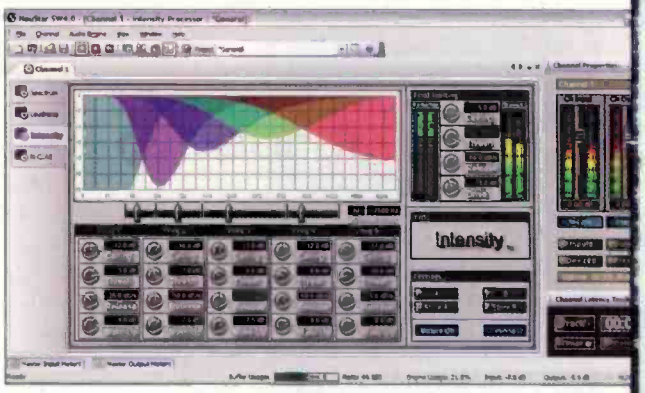
Today, being connected to a single streaming server at one location that happens to have a fast Internet connection isn't enough. Today most large organizations handling streaming content make use of a content distribution network (CDN). A CDN is a network of servers that provide content to end users. The servers are located at diverse geographic locations, and share the content to be served via one or multiple connections between themselves. It's the job of the CDN to see that the end user gets content in the most optimal fashion, from the server best suited for the particular job. In the case of KKSF in 1998, if we had lost our T1 connection, all Internet streaming would have been down. Likewise, had there be an issue with our streaming server or even with the network connections at the ISP, then all streaming would have been down. Back then it didn't matter too much, but today that would be unacceptable. Furthermore, the more hops the end-user is away from the actual streaming server, the slower and less reliable that connection is likely to be. If the stream the listener wants has to connect to router A to get to router B to get to router C to get to router D to finally get to the server, it's probable there will be slower and less reliable performance than if he can connect to the server through only two hops. The CDN works to optimize the performonce between the server and you. At the same time it provides redundant server possibilities (getting around the KKSF problems described above). I'll talk about some large CDNs later.

However, this common approach isn't the only way, as I wrote earlier. You could use hardware specifically designed to do nothing but stream audio. Stream On provides a service that directly communicates with Imediatouch and delivers a stream via Ogg Vorbis. The company provides a preconfigured Linux PC that requires only an audio source and an Internet connection.

Encoding

Which streaming encoder should I use? Obviously to make it easy for users to access your stream you should use an encoder that can be decoded by the most ubiquitous players. Hands down, the most ubiquitous player is the Windows Media player. That is not to say that you should avoid others, just make sure at the minimum you accommodate that one.

At what data rate should I encode? Here is where streaming audio varies radically from what we are familiar with as terrestrial broadcasters. Of course, if you look at the cost of running a 100kW radio station (for example) you'll note the cost is the same whether there is one listener or 200,000 listeners. Streaming audio costs are opposite of that. You can look at the cost of streaming audio in terms of the number of bits used over some period of time. So, multiply the number of users or streams (call this factor A) by the number of bits per second (call this factor B) by the number of seconds (call this factor C) that each user stays connected. Since you multiply factor A by factor B by factor C to get the answer, it's obvious that making any one (or all) of them smaller will in turn reduce the product (A)(B)(C). Since you are trying to get as many users to stay connected as long as possible (assuming you're selling spots for your stream) then the obvious way to reduce the overall cost is by cutting down on the number of bits per second in each of the streams, right? But wait. There is a direct correlation between the quality that each user will enjoy and the data rate of the stream. The higher the data rate, the higher the quality. So if you reduce the quality of the product (if it sounds lousy) then it's likely you'll have fewer users. I won't pretend to tell you the best rate to encode; however my experience is as follows: 128kb/s is excessive for 99 percent of the users; 64kb/s will sound very good for the vast majority of users; 48kb/s will be fine



Neural Neustar SW4.0

for most users. (By the way, I mean stereo encoding. If you stream at less than 48kb/s, then by all means encode your stream as a mono source.) If you expect many users to use dial-up modems to log on then make sure you include an option for a slow stream.

Running a business

How many users should I expect? How much will this cost? How do I make a business of it? The number of users to expect of course depends primarily on the market size you are in. With the promotion of your stream over your terrestrial signal and on your website you can expect the number to grow over time. Make sure to remember there will be a peak number of listeners during office hours. Some CDNs charge on a per-user basis with a max number of listeners, some charge flat rates, some charge for a certain amount of throughput on a per-month basis.

Another important cost consideration is the (relatively) new licensing fees in effect for streaming audio. The licensing fees you pay for the terrestrial station do not cover what goes out over your audio stream. Many of the CDNs have royalty payment plans that can be included in your monthly streaming expense.

Making a business out of streaming audio and growing the station's revenue is really the name of the game (at least for those of us in the commercial radio space). This is not an article about the effectiveness of one type of ad versus another, and so I won't (and can't) say which one is best. However from an engineering standpoint, you should be prepared to accommodate ad replacement over the audio stream. This will likely require some changes in the technical facility.

Ando Media offers an ad-replacement system that works through PC that performs the streaming audio function as well as the spot blocking/ad replacement function. This streaming computer (living somewhere in your technical facility) communicates directly with the station's play-out system and thus knows when the spot block is playing, and when to play out the replacement spots. Liquid Compass is one large CDN that makes use of the Ando technology.

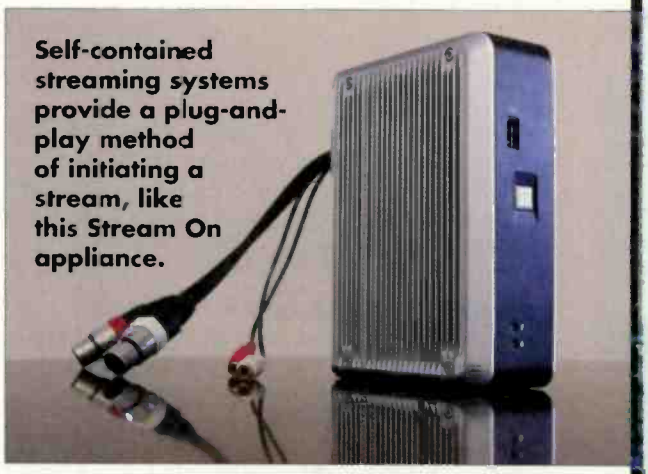
Spacial Audio is yet another player in the ad-replacement game, and its system also works by placing a PC at the station. This PC plays the role of streaming encoder as well as the function of ad replacement. Again, this PC knows when to perform the spot replacement, by way of communications directly with the station's play-out system. Jetcast is one streaming provider that makes use of the Spacial Audio technology.

Stream Audio also offers an ad-replacement system, but it works differently. The streaming encoder lives at the station, and by communicating with the play-out system, tags the elements that play in that stream. When the stream is received at the Stream Audio network operations center, the tags are read and interpreted,

and at the appropriate point in time, an ad-streaming server (that lives in its NOC) substitutes the replacement spots. Conceptually, it's the same as the other systems I've talked about but the technology behind it is somewhat different.

So as you can see just the vendors mentioned here all have similar technology and all have common requirements when they're placing gear in your technical facility:

- The necessary audio feed from your on-air studio
- Communications link with your play-out system
- Physical space in the plant for placement of the streaming computer



Self-contained streaming systems provide a plug-and-play method of initiating a stream, like this Stream On appliance.

Resource Guide

Providers of streaming services, ad insertion and streaming processing

Abacast
360-834-5229
www.abacast.com

Akamai Technologies
877-425-2624
www.akamai.com

Ando Media
847-892-0117
andomedia.com

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

Burst.com
415-391-4455
www.burst.com

End to End Technologies
801-756-9133
www.audiocompass.com

Jetcast
917-338-1487
www.jetcast.com

Kencast
203-359-6984
www.kencast.com

Liquid Audio
650-549-2000
www.liquid.com

Liquid Compass
303-839-9400
www.liquidcompass.net

Live365.com
650-345-7400
www.live365.com

Mediaspan
877-691-8888
www.mediaspanonline.com

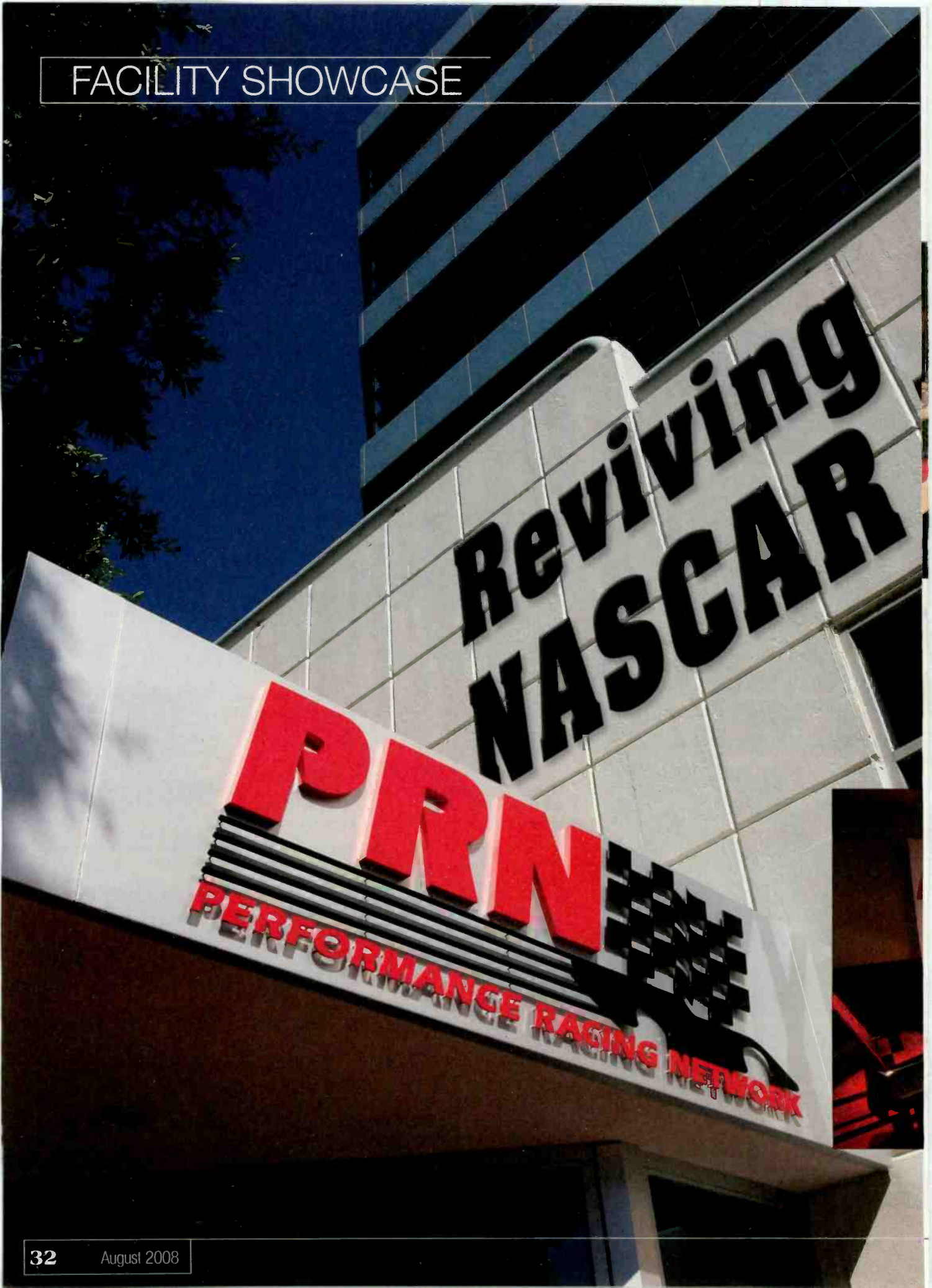
- A high-speed, reliable network connection so the stream can be further distributed by way of the CDN you choose. Preferably this would be a WAN connection, but the Internet could be used as well.
- A means by which remote technicians from the CDN can gain access to your network in order to provide technical support

After your streaming audio gains some traction with an audience, or after you start encoding it with PPM, you will likely want to monitor the stream in some fashion to be sure the PPM can be decoded. In New York we've recently installed PPM decoders for our streaming audio, and we now monitor it constantly, along with our terrestrial signals.

Entertaining an audience with streaming audio makes use of technology that is very different than what we've become accustomed to over the years. However, as more of our current audience, and hopefully a new audience use us in this fashion, it's imperative we learn the techniques and gain the experience necessary to keep them as listeners. Our competitors are, and we can't afford to be left behind in the proverbial technological dust.

Irwin is chief engineer of WKTU, New York.

Reviving NASCAR



Radio

Performance Racing Network speeds into a new studio

By Harrill Hamrick

In 1988 I received a call from Performance Racing Network's new manager, Doug Rice. He wanted me to take a look at the equipment PRN had at the time. I found a mixer with bad inputs, a reel-to-reel tape recorder that tended to drag, two cart machines, and an old footlocker full of equipment in various states of repair.

In those days PRN only broadcast the NASCAR races at Lowes Motor Speedway, so its technical needs were relatively small. The engineer at that time, Bill Files, had very limited resources. He did the best with what he had, often home brewing headphone amps and other devices that either weren't available commercially or considered too expensive.

Studio 1, across the glass from control room 1, uses the rich wood and bright colors to welcome visitors to the facility.

Reviving NASCAR Radio

Under Rice's leadership, PRN has grown tremendously through the years. In 1993, PRN added a weekly call-in talk show, hosted by 1972 NASCAR Sprint Cup Champion Benny Parsons, who passed away in 2007. That show was produced in the Lowes Motor Speedway's 7th floor conference room using equipment we had to set up every Monday. In 1996, a small studio was built, and additional shows were added. A small production studio was added in 2000.

Control room 1 also serves as the technical operations center.

Today PRN produces four weekly talk shows, a daily four-minute news program and a two-hour NASCAR-themed country music program. PRN also broadcasts the NASCAR Sprint Cup and Nationwide Series races at the six other tracks owned by parent company Speedway Motorsports (SMI).

Make a move

By 2006, PRN needed additional studio space. At first the plan was to move into an existing office space, utilizing as much of the original structure as possible. As the project progressed, it became clear the existing space was going to need a good bit of work. The CEO of SMI, O. Bruton Smith, placed the project in the hands of Jim Guess with SMI Development. The architectural firm AI Design Group was brought in to completely redesign the space.

Architect Ron Culpepper had vast experience designing space that required excellent acoustics. Ron was able to layout

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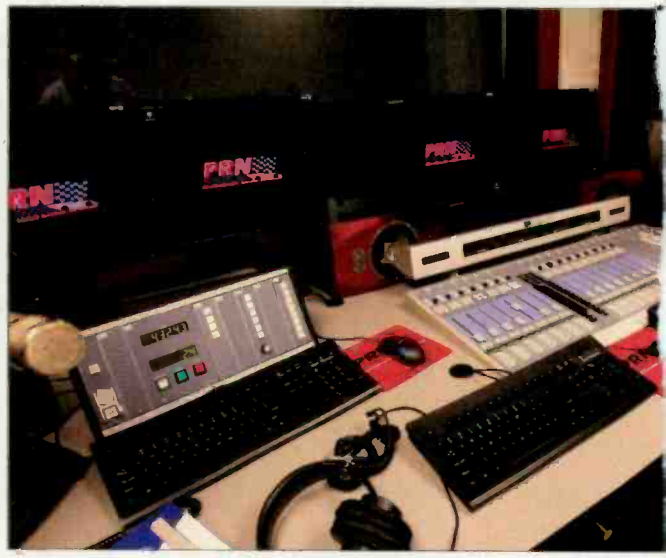
Reviving NASCAR Radio

rooms that met PRN's need for two studios, two control rooms and two production rooms within the amount of space allowed. He was also able to build in acoustic treatments that made the studios sound much better than the old one, and Culpepper pulled off the magic within our budget.

With the floor plan in place, it was time to purchase furniture and equipment. After looking over different console systems and consulting with a number of studio integrators, PRN chose Sierra Automated Systems for consoles and RAM Systems as the integrator.

The SAS system is a versatile router that allows for audio devices to be shared among all the studios. Talkback

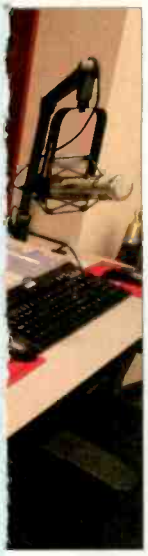
Control room 2 is a mirror image of control room 1.



Control room 2 counter with producer's turret.

and intercom functions are built into the system, it is also easily expandable for future needs.

RAM Systems was able to completely integrate design, installation and construction of control room furniture. Owner Ron Mitchell along with his team, Dave Dybas, Bob Larson, Bill Ryan and Rich Anderson were onsite for the installation.



Different but the same

Control rooms one and two are virtually identical, as are production one and two. Each has an SAS Rubicon SL console and a Rio Link. Because of space limitations, control room one is also the technical operation center (TOC) where the SAS 32KD routing switcher is located. All the Rio Links connect back to the 32KD.

The ability to produce multiple live shows at the same time was a necessity. Each control room has two Telos Xstreams ISDN codecs. One is a program line, fed by an Eventide BD600 delay and a DBX 1066 compressor/limiter. We connect to ABC Satellite Services in New York, which distributes our programming. The other Xstream is for occasional remote feeds.

Each room has a Telos Twox12 phone system equipped with ISDN capability. Each mic is fed through a DBX mic processor. The 360 Systems Digicart E is used for commercial and sound bite playback. Adobe Audition is used with each computer for audio editing and production.

The studios have five mic positions. Electro Voice RE-27 microphones were the preferred choice, along with Mika mic arms with an on-air indicator. Each position has the ability to talk back to the producer in the control room. Computer monitors are set up so the host and guests can both see the Telos Assistant Producer call screening system. The host also has access

Equipment List

360 Systems Digicart E
Adobe Audition 3.0
ART SLA1
Comrex Matrix
DBX 1066, 286A
Dorrough 1200
E-V RE-27N/D
Eventide BD600
Fostex 6301B, RM-2
Henry Engineering Matchbox HD
RAM SPC2000, furniture
SAS Riolink, Rubicon, 32KD
Tannoy Reveal 6
Tascam DV-D01U, MD-350, 322
Telos Zephyr Xstream, 2101, Assistant Producer
Tieline Commander
Yellowtec Mika

Reviving NASCAR Radio

to the Internet at his position to retrieve quick updates.

The production rooms also have Telos Xstreams. Telos phone interfaces from the old studio are being used in each production room. The TOC includes a Comrex Matrix with both POTS and ISDN capability as well as a Tieline Commander with IP connectivity. An ESE master clock provides time code to slave clocks in each studio.

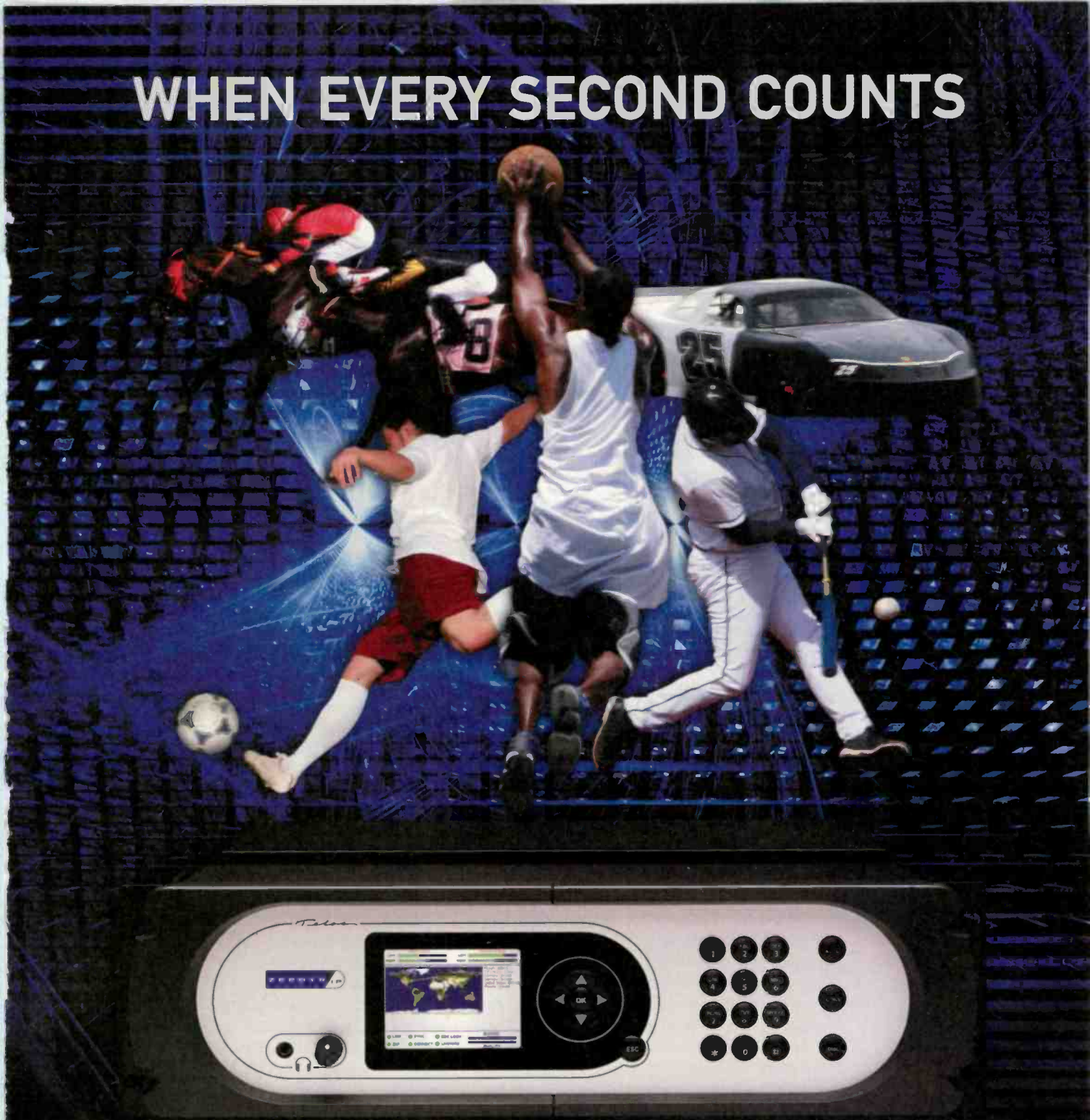
The new PRN studios were built with the future in mind. As the network adds additional programming, the platform of the SAS System will allow for expandability as needed.

The transition to the new studio has not been without its challenges, but fortunately, those have been minor. The improvement in the sound of the studios and the versatility of the equipment has made the transition well worthwhile. That old footlocker that held the equipment back in 1988 is nowhere to be found.

Hamrick is a contract engineer in Mooresville, NC.

Like the control rooms, production room 1 and production room 2 are mirror images of each other.

WHEN EVERY SECOND COUNTS



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Tips, tricks, hints and more

By John Landry, CSRE

Serial data explained

Even though there are faster and easier ways to connect data devices, many older protocols, particularly RS-232, live on. I have always relied on two things when dealing with RS-232: my LED data tester, and the technical support documents available online from Black Box. A loopback plug is also helpful 25 percent of the time.

The most common reason for an RS-232 link not working is simple: The transmit and receive pins are reversed. A quick check with the data tester will indicate which device is transmitting on which pin. Simply hook the tester up to one device only and note whether pin 2 or 3 is lit on the tester. Then unhook that device and connect to the other device. If the same LED is lit, then the TX and RX pins on one end of the cable will have to be swapped. If handshaking is used, then the CTS/DSR and CD pins will also have to be swapped.

An RS-232 tester quickly identifies the correct signals.

Other data protocols, such as RS-442/485, RS-512, X-21 and V.35, are also commonly found. Similar testers exist for these protocols as well.

A reference of connector pin-outs is available at the Black Box website: www.blackbox.com/Tech_Support/Technical-documents/data-interfaces.aspx

Satellite dish tune-up time!

Summer is a good time to make sure all satellite dishes are in good repair and aligned properly. With expansion and contraction, as well as vibration, the alignment might have changed slightly. Further complicating matters are the new generation satellite receivers, which use smaller (and sometimes weaker) RF signals than the receivers they replaced. If a new receiver has come to your station in a box recently, and it is having reception issues, you probably need a tune-up at the antenna even if your old receivers are working just fine.

Checking satellite antennas during the Summer is a good idea.

Make sure the satellite dish is round by checking two cross measurements. Some fiberglass compounds disintegrate after 20 or so years and can warp. Inspect the feed horn for obstructions and check the support spars to make sure all adjustments are protected against rust. The spars should never require adjustment unless they have rusted and broken. The feed line from the dish inside should be either rigid feed line (Heliax) or quad-shielded weatherproof trunk coax (RG-11). Make sure the short coax jumper to the LNB is in good condition and if necessary, replace or install a waterproof seal around the connectors. Coax-Seal is a putty-like substance designed for this purpose. Another effective method of waterproofing the coax connection is to tightly wrap vinyl tape (such as 3M-33) and apply a coating of clear spray paint to it.

One important point often overlooked is the center of the box date and time. The satellite is not completely stable in orbit and it wobbles around. At specific times it is in the center of this wobble, and that is the correct time to make adjustments. For the most common radio network satellite, AMC-8, the center of box information can be obtained from SES Americon's website or by calling its operations center. Another important part of dish alignment is accurate reading of the satellite signal level. Most receivers do not give a true time reading of the RF level. The best way to read the signal level is with a spectrum analyzer. Small ¼ turn adjustments can make many decibels of signal change obvious on the analyzer. Another useful way to make this measurement (although not as accurate) is to use an obsolete analog satellite receiver (such as a Scientific Atlanta DATS or 4595 SEDAT receiver). While these receivers no longer decode audio, they will detect RF signal and give you an accurate meter-type reading.

Once the satellite dish is peaked in place, lock down any locking hardware, and if possible mark any moving parts for future reference. Also it is a good idea at this time to check the other end. How many receivers are being used? How many times has the signal been split? Less is better and amplified splits are sometimes distorted splits, resulting in lower signal quality readings and sometimes dropouts in the audio.

When aligning a receive antenna, be sure the satellite is in the center of its orbital location.

Landry is an audio maintenance engineer at CBS Radio/ Westwood One, New York.

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Zoom H2

By Chris Wygal

Until recently, the idea of a four-channel surround recording on an affordable handheld device was unheard of. In response, Zoom created the Handy Recorder H2. While the Zoom H2 is a musician-friendly device, radio stations that need top-quality audio recordings quickly and efficiently will find the Zoom H2 a valuable tool.

The bluegrass festival

The West Virginia Vandalia Festival is where bluegrass musicians gather "impromptu" to play and sing. I carried the Zoom H2 in my front pocket at the event, anticipating finding a group to record. Sure enough I came across some dueling mandolins. I set the H2 to record in 4-channel surround mode and held it between the mandolin players as they faced each other. The front and rear stereo mics accurately reproduced rich stereo recordings of each mandolin. Atop the H2, two matched stereo microphones are housed in 90-degree cardioid (front mics) and 120-degree cardioid (rear mics) W-XY patterns under a typical microphone screen. A foam windscreen is included. The rear mics are well-suited for sources where a wider stereo range is needed, such as audiences or singing groups. The front mics have a tighter pattern, which complements small groups or vocalists.

I also came across a bluegrass group under a tree rehearsing. Three vocalists, two guitars, two mandolins, a banjo and a stand-up bass began picking and grinning while I stood about 10' away. The front mics responded surprisingly well to the stand-up bass, while clearly reproducing all the instruments and vocalists. The rear mic pair reproduced the audience of 50 nicely. The wallet-sized H2 performed equally to a multi-microphone live recording session.

Performance at a glance

Compact size

Multiple channel settings

Front and rear W-XY stereo cardioid mic patterns

External mic and line inputs

USB file transfer and SD card storage

Up to 24bit 96kHz sampling rate

Flexible AGC

Chromatic tuner and metronome

Windows XP and Vista and Mac OS X compatible

The Zoom H2 is powered by two AA batteries or a supplied 9Vdc power supply. It is packaged with a desktop stand and a mic stand adaptor. The H2 comes with a 512MB SD memory card, which can provide more than 1,000 minutes of recording (64kbp/s stereo MP3) depending on the format selected. It will also accept a 16GB SDHC card. Earbuds, a USB cable and stereo Y-cable are also supplied for in-ear monitoring, file transfer to PC or Mac, and stereo line-level recording respectively.

Under the hood

The Zoom H2 has seven front-panel buttons located below the backlit display screen. Power, volume and mic gain switches are on the sides of the unit, along with jacks for phones/line out, power supply, external mic, line in and USB. The display screen indicates remaining and elapsed time, level meters, battery status and the name of the file being recorded. By simply pressing the record button twice, the unit records per the users' preference either a stereo track using the rear or front mics, or a stereo track using a combination of all four mics. The unit will also record in mono. When the H2 is set to 4-channel surround, two separate stereo tracks are created. The two tracks can then be combined using non-linear editing software and mixed accordingly. The H2 uses USB connectivity for file transfer to PC or Mac, or the SD card can be removed and placed in a card reader. The H2 can also act as a real-time USB audio interface for PC or Mac. Monitoring recording levels and playback is done via the headphone jack.

A mono or stereo external mic and a stereo line level device can be plugged in to the H2, which will deactivate the internal mics. The mic gain can be adjusted via a switch on the side of the H2. When AGC (automatic gain control) is selected, the mic gain switch is bypassed. The H2 is equipped with two AGC settings, three compressor settings and three limiter settings.

Settings

The H2 is initially set from the factory to record stereo 16-bit 44.1kHz WAV files. Of course, the H2 will record file types ranging from 64kb/s MP3 to 24-bit 96kHz WAV. Files within the H2 can be

renamed, deleted, split, normalized or converted from WAV to MP3. BWF (broadcast wave format) files are created by the H2. For example, cue points created by hitting the play button during record on the H2 are BWF compatible, meaning most editing software used by broadcasters will recognize the cue point. This allows for easy indexing during editing.

By pressing the menu button on the front panel, low cut, record format, AGC, file menu, monitor, 3D-panning, pre record and auto record are some of the features readily available. 3D-panning lets the user adjust the balance between the four mics while in 4-channel surround mode. The H2 has a two second pre record function that helps remedy a slow finger when pushing the record button. Auto record can be set to begin and stop recording when levels reach a prescribed threshold for unmanned operation.

Zoom

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W www.samsontech.com
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The Zoom H2 is equipped with a chromatic tuner and a metronome. These features are excellent for musicians who want to record themselves with pitch and tempo in mind. The metronome is monitored via the headphone/line out jack on the H2.

For radio stations that make a habit of capturing ambient audience sounds, live music performances, news conferences or any other audio where sources come from all around, the Zoom H2 facilitates these needs with perfection. The two top-quality cardioid microphone pairs, all housed in the ultra compact H2 body capture clean, transparent genuine audio. The W-XY phasing is perfect, eliminating phase cancellation concerns and effects. The H2 is easy on batteries, and with a 2GB card in 4-channel surround mode (16bit at 44.1kHz), will record for 96 minutes. The H2 easily interfaces with Windows XP and Vista, and Mac OS X or later. In addition to capturing musicians and other ambient sources, consider a simple interview: No more passing a handheld mic back and forth. Set the Zoom H2 between interviewer and interviewee, and away you go.

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

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

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

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

ATI ADAC-2

By Jeff Smith, CEA CBNT

Most broadcast facilities need to convert analog audio to digital or digital to analog. Many times this may need to happen in a critical air or program chain so a high quality, reliable conversion is needed.

ATI has come through with its ADAC-2, two-channel, 24-bit, 192kHz analog-to-digital, digital-to-analog and sample-rate converter. The 1RU device has a front panel that is easy to read and understand. It allows users to toggle between all three options with a single pushbutton. The mode button lets you switch between A/D, D/A, and SRC setups. The front panel also has a bright level meter, gain adjustment and clearly displays sample rate, word length and input selection.

Moving back

The rear of the unit is just as nicely laid out. Everything is clearly labeled and the connections are not crammed together making it easy to dress cables to the unit. There are balanced and unbalanced analog, transformer-isolated AES-3, S/PDIF digital, a Toslink optical input, BNC outputs for sync and an XLR input for sync in. The stable, low-jitter, internal clock can be set up with a variety of sync inputs, including word, bit and external source. It also has an internal power supply and does not rely on wall warts or any other kind of external transformers.

With all that said, the audio performance of the ADAC-2 is just as impressive as the layout of the unit. The sample rate conversion portion of the unit can take place at 16, 18, 20 or 24 bits at sample rates from 32kHz to 192kHz. The unit also has plenty of headroom with a dynamic range greater than 100dB and a THD of less than 0.003 percent. The digital to analog portion is different from the ADC in that it will auto select the sample rate of the incoming digital source. It also has an even lower THD of less than 0.001 percent.

Audio quality like this makes using the ADAC-2 for applications like STL and EAS conversion worry-free. I have used them to convert a digital program chain to analog to feed analog STLs. I have also used the D/A-A/D to insert an analog audio processor into an entirely digital air chain. The ADAC-2 allows me to take my digital program chain, convert it to analog, feed my audio processor and then take analog out of the processor and convert it back to digital to feed the air chain. In this application the unit's audio quality really shines. There is no noticeable loss or noise in the back-and-forth conversion. That is mission-critical when it comes to program and air chains.

ATI worked with Day Sequerra's engineering department to develop the ADAC-2. The unit shows the commitment from both companies to help redefine what many people think of ATI from years ago. It sports an ATI Digital Audio logo, signifying a high-end digital product. This is really a quality A/D-D/A-SRC unit from a whole new ATI.

Smith is the broadcast system supervisor, Clear Channel NYC, and chief engineer, WWPR-FM.

ATI

P 856-719-9900

W www.atiaudio.com

E sales@atiaudio.com

Performance at a glance

- Three independent signal paths
- Dedicated I/O for each converter section
- SNR >100dB
- Sample rates from 32kHz to 192kHz
- Up to 24-bit word length
- Front-panel lock
- Stores and recalls three separate setups
- XLR, RCA and Toslink audio I/O

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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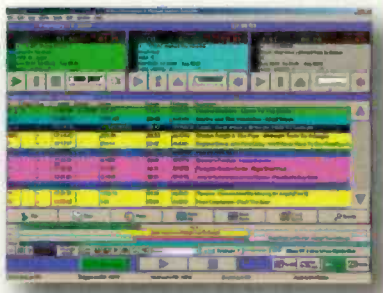
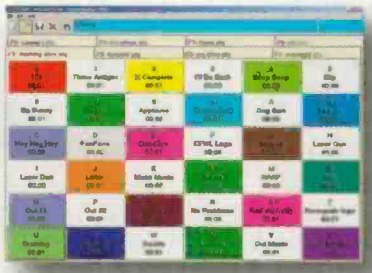
1-888-274-8721
www.bsiusa.com

Radio Automation



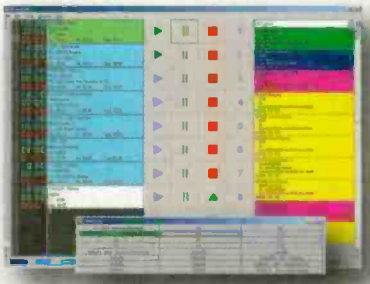
Simian - radio automation and digital play out system

Instant Audio



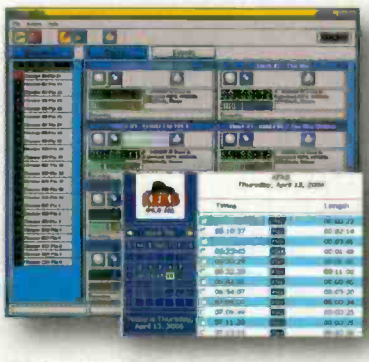
Stinger- instant acess to 288 'rapid fire' audio files

Digital Cart Player



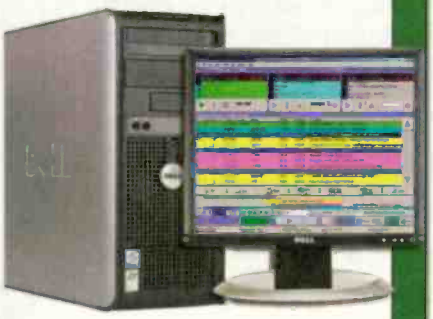
WaveCart - the original on-screen cart machine

Audio Logging



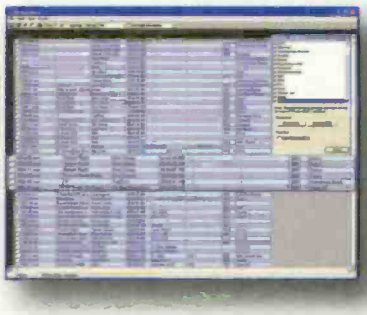
SkimmerPlus - professional audio logging and skimming

Full PC Systems



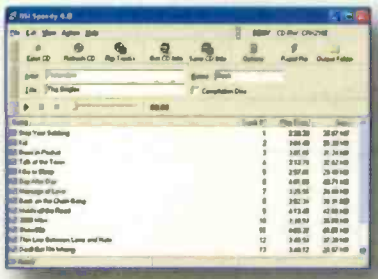
Complete PC systems - with hardware and music

Music Library



MusicStore - thousands of ready to play (tagged) songs

CD Ripping



Speedy- professional CD to PC ripping and file tagging

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Trigger & Relay Devices - for GPI/O & remote control

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Fax: 541-338-8656
www.bsiusa.com sales@bsiusa.com

BSI

by Erin Shipps, associate editor

Portable PA system
Samson Technologies

EXL250 Expedition Express: Designed to be lightweight and compact, the new Expedition series delivers excellent sound dispersion, thanks to sleek, molded cabinets with substantial internal bracing to support its thick sidewall construction. The Expedition enclosures feature an improved, custom-designed 12" low frequency driver. Their 1" titanium compression driver with an elliptical wave-guide horn controls dispersion for a linear response. Other features include Speakon connectors, convenient fly-points, steel grill and a scuff-resistant textured finish. The most comprehensive version of Expedition, the XPL300, is a powered loudspeaker with a built-in four-channel stereo mixer, 24-bit digital effects processing and Ipod dock.

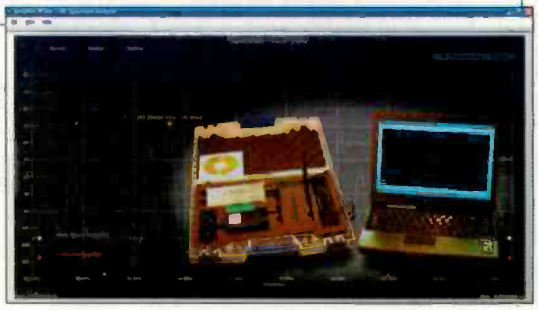
631-784-2200; www.samsontech.com
info@samsontech.com

RDS/RBDS encoder
Inovonics

Model 720: A third-generation product in the Inovonics line of RBDS encoding and decoding products, the 720 has a front-panel LCD screen to allow users to scroll through and confirm all setup and operating parameters without the need for a computer on site. Incoming data from station automation can be seen on the fly, and scrolling song titles and other messages are displayed exactly as they are seen by listeners. The 720 automation command set remains compatible with earlier models for seamless integration along existing encoders, and a new no headers mode allows use with unformatted, satellite-streamed song title feeds. Intuitive, self-guiding software, built-in data diagnostics and transmission safeguards make installation virtually foolproof.

800-733-0552; www.inovon.com
info@inovon.com

PC-based RF spectrum analyzer
Kaltman Creations



Invisible Waves: These PC-based RF spectrum analyzers offer automatic charting of open white space for wireless microphones, in-ear monitors, remote control or IFB. The first in the new series of analyzers is the Invisible Waves model IW1800. The IW1800 covers the frequency span of 100kHz to 1.8GHz for VHF and UHF analysis and extending into the lower gigahertz ranges. Future models will include the Invisible Waves model IW4000, which will cover the span of 100kHz to 4GHz and the IW7000 covering the frequency span of 100kHz to 7GHz. Resolution bandwidth (RBW) in all models is 1kHz with a typical sensitivity of -120dbm.

678-714-2000; www.kaltmancreationsllc.com; sales@kaltmancreationsllc.com

Case-securing foam
Specialized Products

Custom Foam Inserts: Once a customer has selected an SPC case to fit his requirements (size and type), SPC will then custom build the secure tool or equipment inserts for an exact fit from a variety of high-quality foam type options. Tools and test equipment, which can also be purchased through SPC, are carefully measured and specified for precise die-cut mounting to ensure a firm and secure fit in the foam inserts. In selecting their custom foam tool inserts, SPC customers can choose from soft polyurethane and denser, more rigid polyethylene foam. Options include cross-linked polyethylene, anti-static and military-grade foam with a choice of density and thickness. SPC can help in selecting the best foam-type for a specific application. Once specifications are provided and a layout created, the die-cut process stamps custom-shaped steel rules through the foam. A test sample is provided to ensure expectations are met. Upon approval, SPC processes the order – usually within two weeks with a 25-piece minimum.

800-866-5353; www.specialized.net

NEW PRODUCTS

IP audio endpoints
Digigram

PYKO: This range of IP audio endpoints and software can build manageable digital audio networks. PYKO devices will either convert analog or digital audio sources to MP3 or PCM IP streams or play such streams from the network or from locally stored MP3 files. Units are housed in robust, rack-mountable casings with balanced I/Os on terminal block connectors and eight GPIOs.

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

Bi-amplified active monitor, subwoofer
Genelec

6010A, 5040A: The 6010A system has been designed for computer sound systems, workstations and other close-proximity listening applications requiring a low-profile monitoring system. Designed as an active loudspeaker, the 6010A contains proprietary drivers, advanced power amplifiers matched to the drivers, active crossover filters and protection circuitry. The 6010A has a die-cast all-aluminum minimum diffraction enclosure, which features large internal volumes, softly curved edges and outstanding mechanical strength. Each monitor features a 3" bass driver along with a 3/4" high-frequency driver loaded into a new Genelec advanced Directivity Control Waveguide. The free-field frequency response is 74Hz - 18kHz. Maximum peak SPL output per pair with music material is 102dB. Bass and treble drivers are each powered by 12W amplifiers.

508-652-0900; www.genelecusa.com
genelec.usa@genelec.com

Resource management
Scheduall

Media Manager: By connecting workgroups, enhancing communications, minimizing duplication of efforts and reducing human error, Scheduall assists operational productivity and the financial visibility of a project. Scheduall delivers automated cost controls, the ability to monitor budgets and provides management with tools to make informed decisions about the profitability of their operation. The Scheduall application is a real-time enterprise resource management tool that simplifies the administration of facilities, equipment, asset libraries, personnel scheduling, bidding, billing and payments for the broadcast, media and entertainment industries. Scheduall can interface with back-office accounting, human resource and ERP systems providing cost control and reporting functionality that drives unparalleled business analysis and increased efficiencies.

800-334-5083; www.scheduall.com

Access portal
Telular

SX7: This unit provides a fixed connection to the 3G cellular network. The SX7 utilizes CDMA and GSM networks and is available through several cellular carriers like AT&T and Sprint. The SX7 can power phones up to five REN through just one phone jack.

800-229-2326; www.telular.com

Audio level processing system
Audessence

Pod Blaster: This entry-level digital audio processor is designed for podcasters, broadcast studios and program production applications, but can also be used for dual microphone level control. It features analog and digital inputs and outputs, GUI set-up via USB and nine pre-set audio profiles. The Pod Blaster produces smooth professional sound, ends listener annoyance and tune-out due to sloppy levels, allows every presenter the freedom to concentrate on the content, improves audibility and clarity of the program and eliminates overload distortion and damage.

+44 1444 880 444; www.audessence.com

Audio interface
Circuit Research Labs

Audio Bridge: The Audio Bridge features a multi-format audio interface with analog, AES3, USB 2.0 and IP audio connectivity. Each input can be routed to virtually any output. It features high-resolution 24-bit analog-to-digital and digital-to-analog conversion with selectable conversion rates up to 192k samples per second. The USB port supports streaming audio to or from Windows or Mac PCs. Audio Bridge has correct interchannel clocking that achieves perfect time alignment and phase. The Audio Bridge offers a high quality integral headphone amp to monitor any source and a simple, intuitive menu interface for configuration and status information, all in a compact 1RU chassis.

480-403-8300; www.orban.com
sales@orban.com

Portable USB microphone
Blue Microphones

Snowflake: The Snowflake is based on Blue's Snowball professional USB microphone. Blue has combined a USB bus-powered capsule with a class compliant design to make the Snowflake plug and play. The mic folds into a single compact case, which also houses a USB cable for easy transport in a laptop bag or even a pocket. Unfolded, the case serves as a desktop stand or a laptop clip.

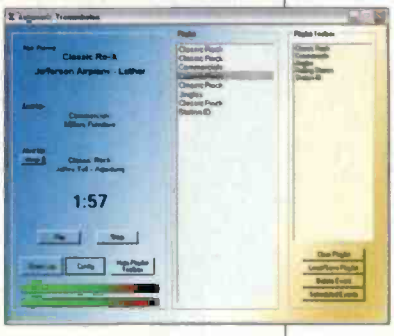
818-879-5200
www.bluemic.com

UPGRADES and UPDATES

One of the most often used pages on the **V-Soft** website is the free Zip-Signal utility, which has been updated with the most recent Zip Code database, links to the FCC CDBS database and has fast access. (www.v-soft.com/ZipSignal/)... The U.S. Consumer Product Safety Commission and **Radio Shack** have recalled two models of dc power supplies sold between Oct. 2004 and Jan. 2007. Radio Shack part numbers 22-507 and 22-508 with date codes from 08A04 through 01A08 are affected. (800-843-7422, www.radioshack.com/recall)...**Coby Electronics** will release the first portable HD Radio receiver, the HDR-700, this month. The battery-powered unit features a splash-proof housing, integrated rechargeable battery and an SD card slot for MP3 playback. (www.cobyusa.com)...**Adam Audio** is now shipping the A5 powered monitor. The A5 features two 25W amplifiers to power the folded ribbon tweeter and 5" woofer. (www.adam-audio.com) ■

Automated broadcasting software
Fifty Thousand Watt Software

Automatic Transmission: Ideal for low-power stations, college stations and Internet broadcasting, recordings are simply organized into file folders: a typical installation will have several folders for different types of music, plus folders dedicated to commercials, jingles, weather, etc. A playlist directs the program to randomly select recordings from a particular sequence of folders. Recordings in each folder can be weighted so that some songs or commercials play more often than others. A no-repeat option specifies a minimum amount of time before a recording can play again. In addition to a music rotation, Automatic Transmission can be programmed to play particular recordings at a specified time. It will smoothly transition from a music rotation to timed broadcast, and then back to music rotation. For Internet radio use, the program can broadcast song titles, so the text can be viewed on the listener's computer.



763-390-4046; www.50kws.com; sales@50kws.com

Audio recorder
Edirol

R-09 HR: With a wider dynamic range, higher bit and sample rates than other recorders, the R-09HR supports up to 24-bit/96kHz linear PCM recording. I.A.R.C. is a newly developed, dedicated analog circuit optimized for recording with the R-09HR's onboard A/D converter. Electrolytic capacitors provide stable, reliable power with an independent power source for the analog circuitry, and another power source for the digital circuit board, thus eliminating dc interference between components in the R-09HR. The I.A.R.C. also contributes to high quality, low noise MP3 recording. When recording, there's no extra equipment to buy or cables to connect. A stereo microphone is built into the unit, complete with a dedicated analog input control, mono/stereo selector, low-cut filter, limiter/AGC and a gain boost. The onboard electret condenser microphone elements are very compact, ultra-sensitive, and placed to capture three-dimensional sound naturally and accurately.

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

Signal processor
Vorsis

FM2000: Modeled after the Vorsis AP1000 31-band audio processor, the FM2000 includes all of the features of the AP2000 except the digital processing chain with its own dedicated digital output. This product targets customers who seek the performance specifications of the AP2000 but do not require the digital processing chain.

252-638-7000; www.vorsis.com; sales@vorsis.com

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Contributor Pro-file

Meet the professionals who write for *Radio* magazine.
This month:
Field Report, page 44

Jeff Smith, CEA CBNT Supervisor of Broadcast Systems, WWPR Chief Engineer, Clear Channel, NY

Smith started in radio engineering full-time in 1991 as an engineer for WCTC and WMGQ, Greater Media's stations in NJ. He went on to work as Metro Networks northeast engineering manager based in NYC and then as director of broadcast systems for Nassau Broadcasting overseeing engineering issues at all 55 Nassau stations. He is currently secretary of SBE15 and chairman of the SBE's Industry Relations Committee.

Radio
THE RADIO TECHNOLOGY LEADER

Written by radio professionals
Written for radio professionals

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ADVERTISER INDEX

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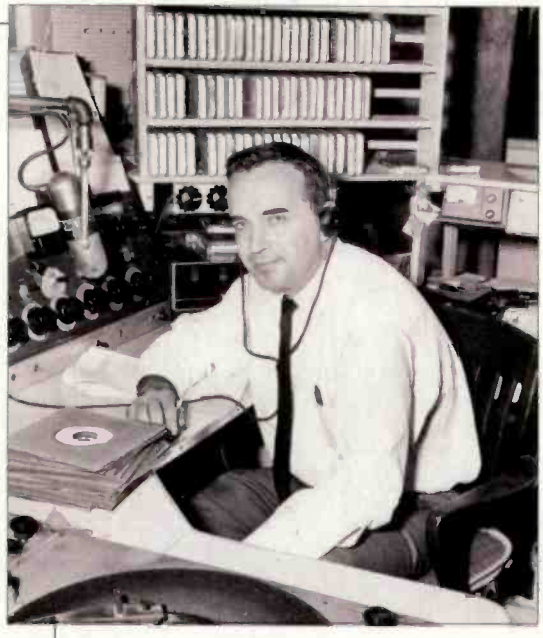
by Erin Shipps, associate editor

That was then



Legendary morning announcer Claude Tomlinson in the studio circa 1956. He remained with the station until 1992.

In November, Arcadia Publishing Co. of Charleston, SC, will release *Images of America: Knoxville's WIVK* by Ed Hooper. This book delves into the history of Tennessee's country music station, WIVK. It includes 200 photos (some never-before-seen) of the station from 1953 when Jim Dick founded it, through today. Photo information courtesy Ed Hooper. To order this book visit www.wivk.com.

The first WIVK studio on Gay Street above a hardware store, where it remained until moving to Bearden Hill.

Tomlinson who first signed WIVK on the air in 1953.

Announcer Ken Russell, known as Cousin Ken, started at WIVK as a fill-in in the 1950s. He had an ear for local talent that made his program one of the station's most popular.

Sample and Hold

Top 5 Radio Market Revenues by CAGR Rank

SNL Kagan has identified small-to-midsize markets in the Pacific region, especially in metro areas with large Hispanic populations, as having the greatest growth potential. In its report, "Radio/TV Station Annual Outlook: Market-by-Market Revenue Projections", the company took into account overall broadcast revenue trends, market demographics and expected ad revenues from the presidential election in determining a market's growth potential.

CAGR Rank	Market	2007 Market Rank	CAGR 2007-2012	Retail Growth 2007-2012
1	San Diego	17	2%	11.9%
2	Riverside-San Bernardino-Ontario, CA	26	1.9%	10.1%
3	Stockton, CA	79	1.9%	11.9%
4	San Jose, CA	35	1.9%	8.9%
5	Fresno, CA	66	1.9%	10.7%

Source: SNL Kagan

E² Ethernet Audio Done Right

MEET THE SQUARE

The Wheatstone E² (E SQUARE) gives you the convenience of Ethernet audio without all the IP hassle. It just *knows*. The built-in Setup Wizard lets you configure an entire system with just your browser and a laptop. Unplug it when you're done and there's no PC between you and system reliability.

SQUAREs are totally scalable: use one as a standalone 8x8 studio or transmitter site router, with browser access from anywhere. Plug two together and have a standalone digital snake. Add a fanfree mix engine and build yourself a studio using analog and digital I/O SQUAREs.

All the power is *in* the SQUARE. Distributed intelligence replicates all configuration data to every unit. Profanity delay and silence detection are done *in* the SQUARE. Even virtual mixing (w/automation protocol) —it's *in* there; all with real front panel meters, 32 character status indicators and SNMP capability.

88D I/O: 8 digital inputs and outputs. You can headphone monitor and meter any of the SQUARE's inputs or outputs in real time. The 32 character display gives you all the information you need about your audio and system configuration. And because you can operate in either 8-channel stereo or 16-channel mono mode, 16 channels of metering are provided.

88E DIGITAL ENGINE: Just plug an E-SERIES control surface or GLASS E computer interface into this engine and get all the mixes, mic and signal processing you need. Fanfree, so it can stay in the studio where it belongs.

88A I/O: 8 analog inputs and outputs. You can bring a new SQUARE up in seconds and of course use the front panel encoder for your X-Y control. Front panel status LEDs give you continuous link, status, and bit rate information as well as confirmation of any GPIO activation.

Because the E² system doesn't rely on a third party GUI, tech support is straightforward (and 24/7). Likewise, system operation doesn't require external PCs for continued full functionality. Best of all, 1 Gigabit protocol eliminates the latency and channel capacity restrictions associated with older technology.

E-SQUARE is Ethernet audio done RIGHT!

88AD I/O: 4 analog plus 4 digital inputs and outputs—perfect for small studios or standalone routing.

88 I/O CONNECTIONS: E² has both DB-25s for punchblock interface and RJ-45s for point-to-point interface. All SQUAREs have 12 individually configurable opto-isolated logic ports that can be either inputs or outputs.

STUDIOS DONE EASY!

www.wheatstone.com

Wheatstone

AIR WARRIOR

A modern air warrior needs all of the power and control he can muster to bring to the battle. **When it's you against the other guy, the VORSIS AP-2000 has it ALL.**

NOT AN ACE YET? The AP-2000 comes preloaded with over 70 presets tuned to do battle. Try a test flight with the latest VORSIS 31-band digital processor—and join the broadcast elite!

Wes Davis
Jim Hibbard
Owen Martin
Chip Morgan
Matt Lightner
Jim Loupas
Bruce Roberts
Floyd Turner

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DIGITAL SPECTRAL PROCESSOR

www.vorsis.com