

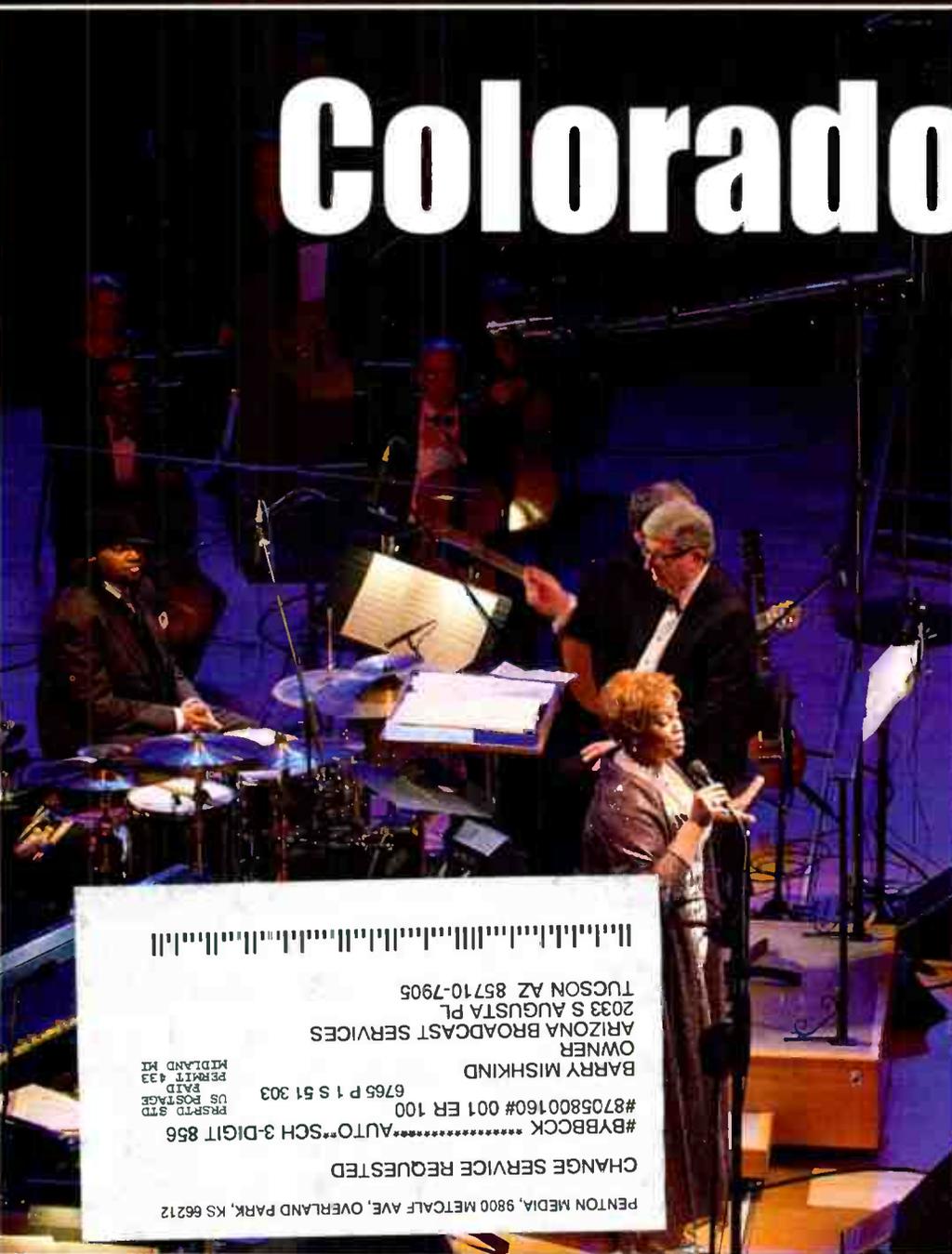
Radio 10

THE RADIO TECHNOLOGY LEADER

February 2011
RadioMagOnline.com

Colorado Jazz

KUVO records a surround broadcast



TRENDS IN TECHNOLOGY

Higher-power IBOC

FIELD REPORT

iZotope ANR-B & Sanyo Xacti

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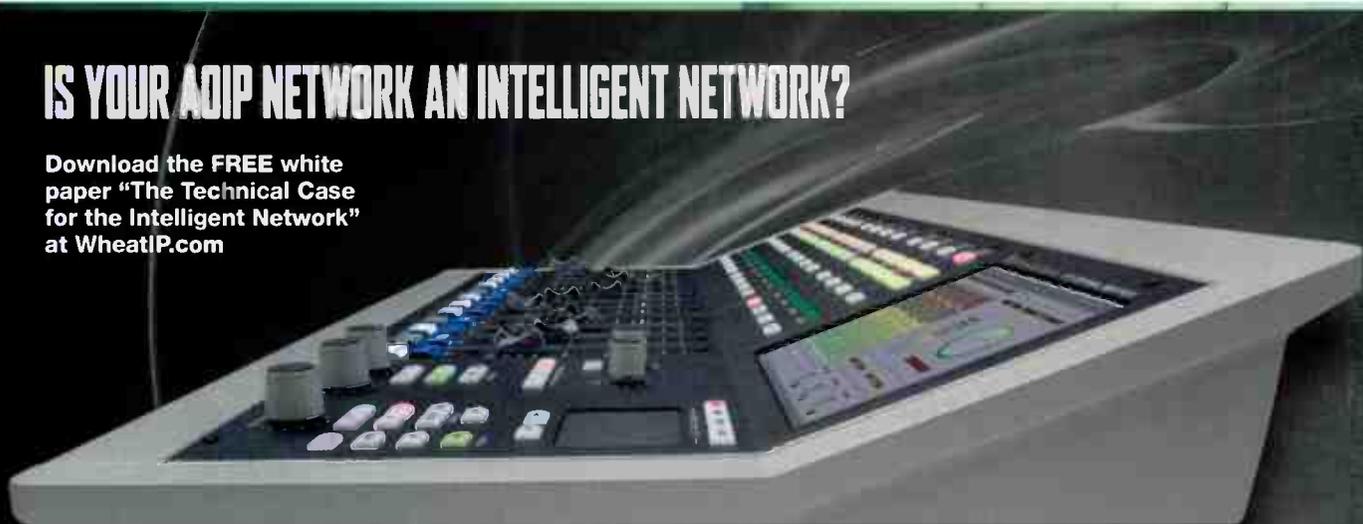


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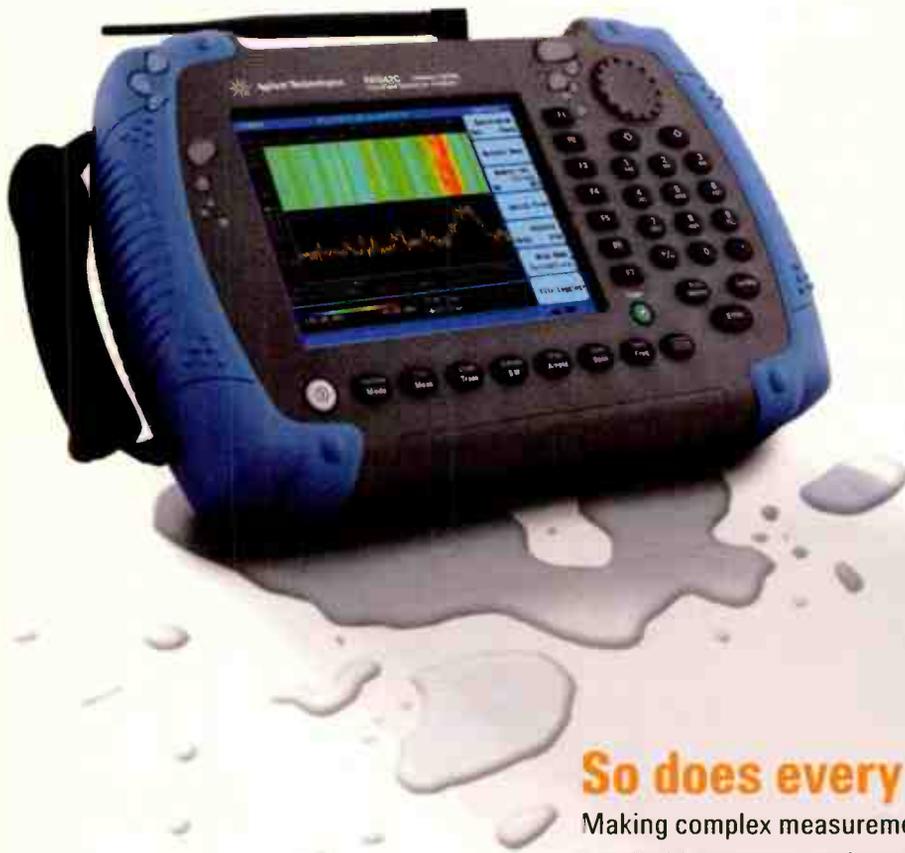
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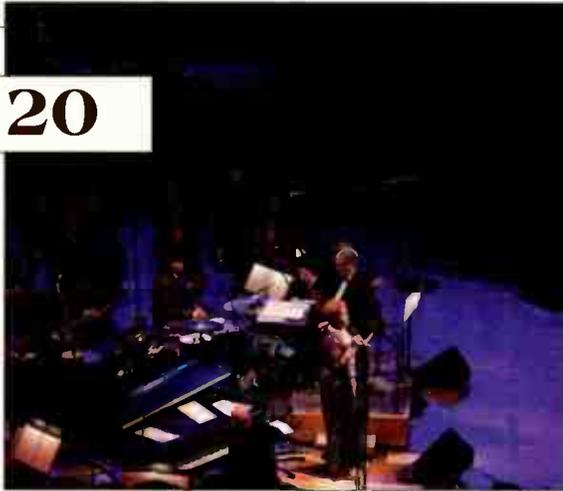
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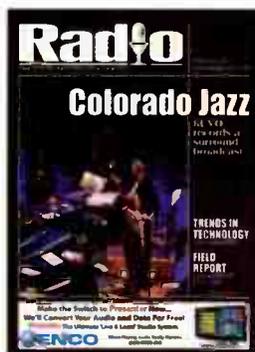
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Mike Pappas, chief engineer for KUVU, is once again on hand to broadcast the Colorado Symphony Orchestra. But this time the CSO is accompanied by Dianne Reeves and this time, it's recorded for surround.



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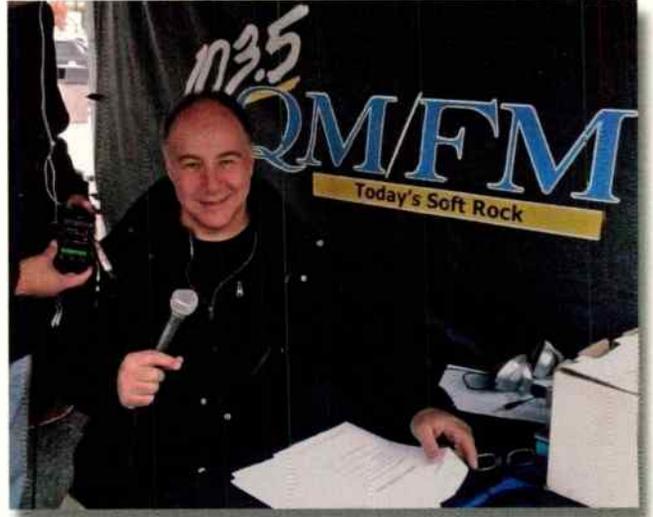
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Media Monitor's 2010 Radio Spot Ten



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Chris Larke, Broadcast Engineer, CHUM Radio Vancouver

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Currents Online

Selected headlines from the past month.

Cox Names Dave Siegler as VP of Technical Operations ➔

Siegler will lead all engineering and technical operations of CMG, and he will work with industry organizations to assist with industry initiatives.



Siegler

NAB Fastroad Investigates Transmitter Efficiency Ratings

The NAB Fastroad project funded the report, which includes a proposal for industry-standard energy efficiency rating for transmitters.

CBI 2011 Spring Convention Set for Times Square

More than 1,200 attendees are expected to attend the event.

Continental Electronics Acquires Weather Radio Division of IREC Crown Broadcast

Continental will initially fulfill an order for 42 fully redundant 300W and 1kW systems.

NAB, NASBA Create EAS Education Effort

The series of live-video presentations and online webinars will kick off with a live virtual town hall on Feb. 3, 2011.

Steven Johnson to Speak at 2011 NAB Show Technology Luncheon

Johnson is a social critic and technologist with writings that have influenced the way political campaigns use the Internet.

Sirius XM OK'ed for Hawaii and Alaska

Terrestrial repeaters have been authorized to operate in Anchorage, Fairbanks, Juneau and Honolulu.

Mike Dosch Named CEO of Telos Alliance

Dosch joined Axia in 1999 after working for PR&E as general manager and director of R&D.

Find the mic and win!

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Site Features

Lightning Basics

With all the mysticism stripped away, science clearly explains the causes and functioning of lightning. Ron Nott reviews the current best practices to mitigate lightning damage.

LED Obstruction Lighting Gives Back

LED lighting is now quite cost-effective. See how the costs break down for various installations.

Digital Radio Update Twice a Month

Stay up to date with the source of digital audio broadcasting news and information. The coverage extends to DRM, satellite radio and more. Subscribe today.

Choosing a Network Switch for AoIP

While all network switches carry Ethernet packets, there are limits to how many packets a switch can handle. Even an expensive business-class gigabit Ethernet switch may not be up to snuff.

Industry Events

Get the inside track on upcoming conventions and conferences.



Simplicity Made Smarter



Pilot LOGITEK

D I G I T A L C O N S O L E

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The Pilot is easy on the eye and the budget and like the JetStream Mini, Logitek has built it with ease of use and durability in mind. The Pilot is a tabletop control surface that includes all of the basic engineering features your staff will need- and more- including 4 Program busses, 3 monitor sections and 24 mix minus busses. It is available in frame sizes for 6 to 24 faders.



JetStream MINI IP Audio Networking System

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Green transmissions

In January, the NAB Fastroad project released a report that investigates the improvements in broadcast transmitter efficiency over the past 30 years. The report was prepared by Cavell, Mertz & Associates (CMA). It's really no surprise that analog transmitters have improved their performance over the years, but until I read the statistics, I hadn't really thought about solid-state and tube designs being 30 percentage points more efficient today than the devices built in the 1970s. That's impressive.

Beyond that initial factoid, a good portion of the report discusses general transmitter efficiency for solid-state and tube designs, and analog and hybrid IBOC designs. The report has an added benefit of providing a review of the various IBOC generating schemes as well as some of the benefits of each method. The report even touches on alternative power options such as solar and wind.

The report reminded me that discussions about transmitter ac-to-RF efficiency have not been very common over the past few years. I have occasionally seen a statistic (especially if that transmitter manufacturer's value exceeds the competitors'), but in many cases the differences in efficiency between two current models is often close enough. A more dramatic comparison can be made between a current and a vintage model, and that data is useful in weighing ongoing maintenance and repair costs vs. operating costs vs. a new capital expenditure.

What interests me more is the proposal of the Transmitter Energy Efficiency Award (TEEA) rating. This rating is to assist broadcasters in deciding which transmitter to choose by including long-term energy costs. According to the report, the gold award would be available for the top 25 percent most efficient transmitters in each class, and the silver award would rank the top 40 percent most efficient in each class. Think Energy Star rating for a transmitter.

And from the "but wait, there's more" side of this story, CMA is developing a Web-based tool designed that will assist engineers and managers in the planning process to develop several what-if scenarios to see the variation in long-term operational costs vs. one-time capital costs. Users

will be able to evaluate the measured efficiency of their current transmitters as well.

I like the transmitter rating idea from the standpoint of being responsible stewards of our energy resources and our planet, and the report outlines the methods that would be used to create the ratings. But I don't see ideas on who would actually prepare the ratings. Ideally, a credible third party would evaluate the various models to avoid any bias, but such a party would incur costs in its research. Who will pay for the evaluation? In the end, it will be the broadcaster purchasing the transmitter. There are also questions about certifying the company making the evaluations.

And if the entire process is optional, I see only a limited use of the program. Maybe broadcasters are offered an incentive to purchase Gold TEEA transmitters. If they do, the FCC could offer a discount on regulatory or licensing fees.

Even without the efficiency seal, the online tool should be a useful resource for broadcasters.

Changes

By now you have heard the news that *Radio* magazine is now part of the NewBay Media group of publications. Many have asked what that means for *Radio* magazine going forward. Most importantly, we'll continue as we already are, just with a different owner. *Radio* magazine and *Radio World* are established, unique brands, and we will continue that way, although now the two publications have the opportunity to work together in new ways rather than constantly competing. *Radio* magazine will still provide the must-have radio technology information you seek.

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Next steps in launching a business

By Kevin McNamara

In last November's column I wrote about starting a business; continuing on that theme I will give you a few ideas of what is necessary to start your business and keep it operating on the right track.

Generally the basic motivation that causes people to start their own business is to control their own destiny, have more freedom and make more money. Most working people have this idea stuck in the back of their mind; usually it is a life-changing event, such as the loss of a job, which puts the idea into play. Whatever your reason is for starting it, the first year of operating a business is perhaps the most critical. In that time you will understand that

all of the "back office" work that was previously handled by some department in your previous job, now becomes your responsibility.

The simple fact is that you are now the front and back office of the business, and while the total value of the goods and/or service you provide might be a fraction of your former employer, you still have many of the same requirements

and processes to keep the business operating and profitable.

There are several studies citing statistics related to business start-up failure rates that go as high as 90 percent fail within the first four years; however, the latest statistics from the Small Business Administration (SBA) state that two-thirds of new employer establishments survive at least two years, and 44 percent survive at least four years.

Rather than write about the obvious requirements for operating your business, such as having the proper business licenses, insurance, tax, financial processes, business plan, etc., I want to focus on a few of the rarely discussed rules of running a business.

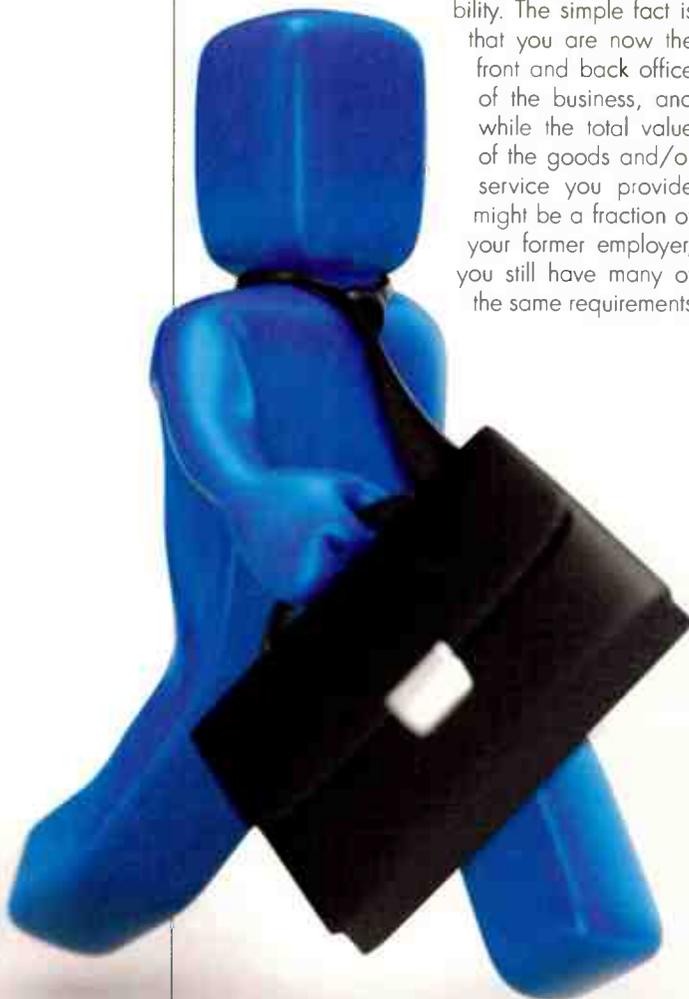
Falling in love with your customer

It is a very common mistake made by people who venture out on their own, particularly with some type of consulting or service type business. The way it starts is that an employee leaves his or her employer (for whatever reason) and ultimately ends up in some sort of outside contractor relationship with that former company, usually performing the same type of work he did when employed there. The familiar case is the engineer working at a station is laid-off due to a reduction in workforce, but is brought back a contract engineer.

While having a key customer that can provide a steady stream of revenue is a great way to start your business, you want to make sure you are marketing, actively going after and securing other potential opportunities right away. Never sign any contracts or agreements that limit your ability to work with another person or company.

Falling in love with technology

This is not about having all the latest toys, it is all about your mindset when it comes to building a business. It is about chasing opportunity, not chasing technology. Confused? Let me explain as it is a particularly interesting trait we see with people in the broadcast engineering business



as well as those in other technology sectors. I've been involved with the engineering side of the broadcast and wireless industries directly and indirectly for the past 35 years or so and in that time had the opportunity to meet many very interesting, intelligent and successful people. People in technology-related business basically fall into one of two categories: Those who make it their life's work to know everything about the latest cutting-edge technologies or standards and to make sure that everyone they come into contact with knows they have this above-average, almost super-human understanding of all things technical. Then there are the rest of us who have a good understanding (perhaps even some expertise) about certain core technologies, but are more interested in figuring out ways to turn the knowledge into an opportunity.

There is nothing wrong with having the ultimate knowledge of emerging technologies, especially if you live or work in the Silicon Valley or inside the 495 beltway in Massachusetts, but in general that knowledge doesn't translate well into money-making opportunities. My advice, emerging technologies unveiled today will probably not be available for an end-user for

five or more years down the road. Rather than becoming an expert on the latest creation, understand how it will impact your customers and position yourself (and your business) to deliver it when available.

Be in it to win it

Business isn't just about delivering services, goods or having a particular expertise; it is about playing "smart". It is knowing your customers and their specific needs. It is about knowing your competition; it is knowing how to price fairly. We live in an economy where everything is expected to be discounted. Do not fall into that trap, especially if you are providing a service. Cutting your rate just to get the business never works. Build a reputation for quality of work, responsiveness and customer service as opposed to the cheap guy.

It is about providing a superior level of service. It is about building relationships outside the business framework. It is about networking and building future business, but at the end of the day it is about making a profit. Always keep this in mind when pursuing new business.

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

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Congress modifies LPFM allocation rules

By Harry Martin

In December, Congress passed the "Local Community Radio Act" (H.R. 6533). The new law does the following with respect to low-power FM allocation standards:

- Eliminates third-adjacent separation requirements between (1) low-power FM stations and (2) full-service FM stations, translators and boosters.
- Prohibits the FCC from reducing existing first- and second-adjacent separations as provided in Section 73.807 of the rules.
- Authorizes the Commission to grant waivers of second-adjacent spacings when an LPFM applicant can establish that its proposed operation will not cause interference. The use of Longley-Rice and other terrain-sensitive models is specifically allowed. In 2007, the FCC separately proposed permitting second-adjacent waivers when an LPFM is threatened with displacement by a full-power station, but that proposal is still pending in the unresolved LPFM/Cap-of-10 rule making proceeding.

Dateline

The radio station license renewal cycle begins again in 2011, with the first batch of renewals due on June 1, 2011, for stations in D.C., Maryland, Virginia and West Virginia. Stations in those states must begin their pre-filing renewal announcements on April 1, 2011.

For noncommercial radio stations in Arizona, Idaho, New Mexico, Nevada, Utah and Wyoming their biennial ownership report deadline is April 1.

April 1 is the deadline for radio stations licensed in the following locations to place their Annual EEO Reports in their public files and on their websites: Arizona, D.C., Idaho, Maryland, New Mexico, Nevada, Utah, Virginia, West Virginia and Wyoming.

- Provides that any LPFM station operating pursuant to such a waiver must suspend operation upon notification by the FCC that it is causing interference to a full-service station, without regard to the location of the station receiving interference. The Commission is required to issue such notification upon receipt of a complaint of interference.

- Provides that full-service FM licensees in densely populated states such as New Jersey may ask the FCC to apply the interference remediation requirements currently applicable to translators and boosters to complaints of interference from new LPFMs on third-adjacent, second-adjacent, first-adjacent and co-channels. Under the new law, it

matters not whether the complaints occur inside or outside the protected contours of the interfered-with station. However, interference arising outside the relevant distance specified in Section 73.807(a) (1) (the applicable LPFM spacing rule) will not require remediation.

- Provides that FM translator stations, FM booster stations, and low-power FM stations remain equal in status to each other, but secondary to existing and modified full-service FM stations. This presumably creates parity among *applications* for new and modified LPFMs and FM translators despite language in the unresolved LPFM rule making to the effect that applications for new LPFM stations submitted in the anticipated LPFM new station filing window might be given priority over pending 2003 translator applications. This new provision is undercut, however, by ambiguous language in the new law, which implies that LPFM stations and applications, which provide or propose local programming, might be preferred over translators and boosters despite the law's parity provision.

- Provides that existing distance separations – even the repealed third-adjacent separations – will still apply to all full-service FM, FM translator and FM booster stations that provide radio reading services (RSS) by analog subcarrier. That provides a significant incentive for full-service licensees, in particular, to make room on their SCAs for RRS. Of course, the downside of this is likely to be increased reporting requirements to the Commission. Presently, licensees do not have to let the FCC know what they are transmitting on their subcarriers.

While the Local Community Radio Act has now been passed, the new law will not be implemented until the FCC completes the necessary steps to turn the legislative language into new rules. That process will likely be subsumed within the long-pending LPFM rule making proceeding that includes the proposed Cap of 10 on 2003 translator applications. No matter what procedural avenue the FCC uses to implement the Act, more delay can be expected if the agency decides to seek public comment on the rules needed to implement the new law.

Martin is a member of Fletcher, Heald & Hildreth, PLLC, Arlington, Virginia. E-mail: martin@fhhlaw.com

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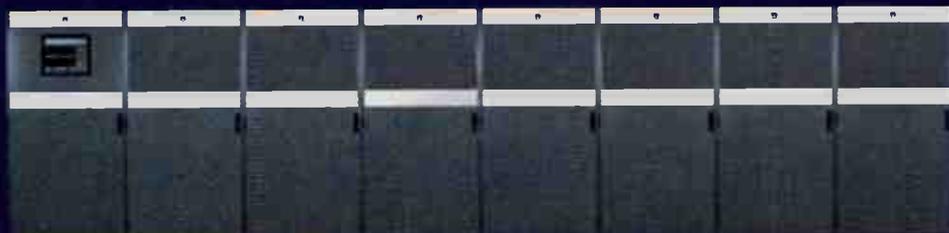


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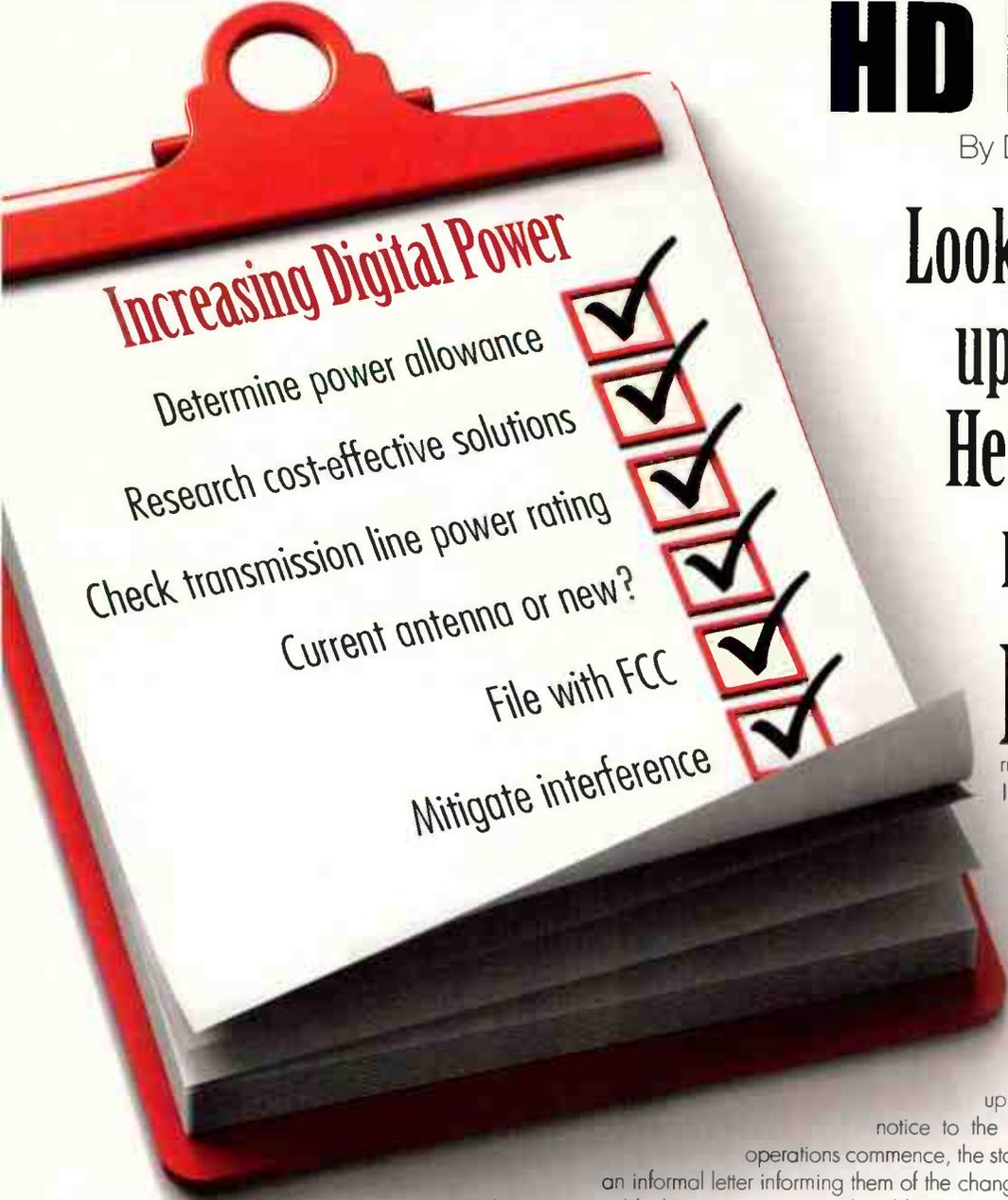
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HIGHER-POWER HD Radio

By Doug Irwin, CPBE AMD

Looking to add or upgrade IBOC? Here's what you need to know.



Increasing Digital Power

- Determine power allowance
- Research cost-effective solutions
- Check transmission line power rating
- Current antenna or new?
- File with FCC
- Mitigate interference

Does your 2011 project list include either adding IBOC for the first time, or otherwise taking advantage of the new rules with respect to the allowable IBOC power? If so this article is for you. In reality the solutions to either of those two problems are nearly identical – as usual it depends upon your transmitter site particulars.

Of course the very first thing to do is to determine just how much IBOC power you can now run. As of May 10 2010, most stations were allowed to run up to -14dBc without giving prior notice to the Commission. (After higher-power operations commence, the station has 10 days to send the FCC an informal letter informing them of the change.)

It is quite possible that your station may be able to run more than the "blanket" increase – in other words, some power level between -14dBc and -10dBc. Bear in mind that the results of those calculations may show that your station can run more power in one group of sidebands than the other. You will need to file a request with the Commission prior to increasing IBOC power to beyond the -14dBc blanket power level; see FCC Public Notice DA 10-866 for the fine details.

Site Control



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Once you've determined the amount of IBOC ERP that will be allowed, you will need to file an informal request of the Commission before doing so. It is also possible that -20dBc is the IBOC limit for your super-power station.

Interference

Before you plan out and build your higher-power IBOC transmission system it is important to know that there is at least the potential for interference between your new digital facility and an existing analog facility. The FCC Order 99-325 not only spells out the details of the IBOC power increase, but also the means by which interference from digital transmissions to analog transmissions will be mitigated. It is possible that you will need to throttle back to the original -20dBc level (but no lower) to mitigate the interference. That being said, paragraph 14 of the

order reads as follows: "Since the commencement of 1 percent FM IBOC Power operations in 2004, the Bureau has not received any well documented complaints of interference to analog FM stations from digital signals. Since May 2006, the Media Bureau issued a total of 15 experimental authorizations to permit operations at up to 10 percent FM IBOC Power, including authorizations for 10 grandfathered short-spaced stations with as many as four first-adjacent channel short spacings. Some of these short spacings are severe. These stations operated their FM digital facilities with different levels of increased FM digital ERP throughout the experimental period, with the preponderance of the time spent operating with the maximum permissible FM digital ERP of -10dBc. The Bureau did not receive any complaints of interference to analog FM stations from licensees of analog FM stations or the listening public as a result of the experimental operations."

Solutions

Once you've established the correct amount of IBOC ERP that you'll be able to run, it's time to figure out the most cost-effective way to do so. If you already have an IBOC transmission system going, it's obvious that the way to increase the ERP is by a change in the antenna system, an increase

Details on the power upgrade

fjallfoss.fcc.gov/edocs_public/attachmatch/DA-10-866A1.pdf

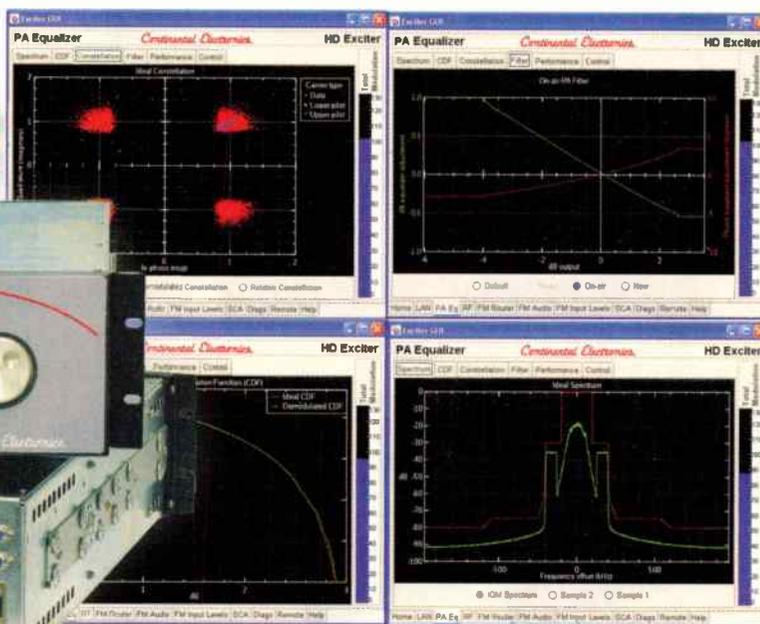
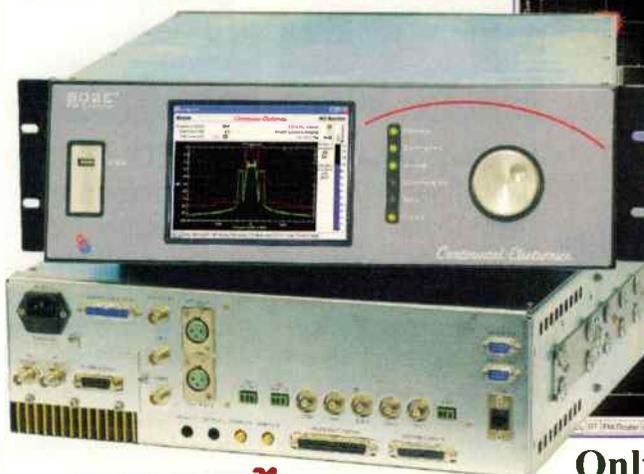
Details of variance in power level in FCC order 99-325

hraunfoss.fcc.gov/edocs_public/attachmatch/DA-10-208A1.pdf

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Injector choices



Shively digital injectors

ERI CD324-8DB

this -7dB injector, your analog transmitter would then need to have its TPO increased to 12.5kW. The digital transmitter's output (for -14dBc) would then need to be 2kW. Your "waste" load would then be dissipating 4.1kW. Compare this to the -10dB injector: Analog power would have been 11.1kW; digital power would have been 1kW; and the load dissipation would have been 2kW. So, if you built your original IBOC system with that much headroom and you have enough ac power to support the higher TPOs and you have enough air conditioning, then changing the injector may be an option for you.

in the IBOC TPO, or some combination of both. (It isn't that likely that when you built the original system that you bought components big enough to increase the ERP by four-fold.) There again, the station's transmitter site particulars may have worked out favorably. In New York, at least two stations that have increased their IBOC ERPs (WRKS and WBLS) and both were able to do so just by turning up the digital power. WRKS uses a Broadcast Electronics IBOC-only transmitter into an auxiliary antenna; WBLS just cranked up the IBOC power with its Nautel NV-15. Like WRKS and WBLS though, it's crucial to consult your antenna manufacturer to make sure that the antenna you currently operate can withstand the peak voltages associated with the new analog plus digital power levels.

As I wrote earlier the solution to getting a higher IBOC ERP is nearly the same whether or not you have a system already operating or you plan on building anew. Let's examine first some possible solutions assuming you already have it on the air.

Say, for example, that your station uses a -10dB injector. Would it be possible to simply change that coupler to one with greater coupling? The answer to that question is yes, but with caveats. Shively Labs makes a series of digital injectors with coupling values of -9dB, -8dB, -7dB and -6dB (part numbers 5636, 5646, 5656 and 5666 respectively). The major factor here is the amount of throughput loss from the analog input port to combined output port. Whereas the -10dB injector that many of us have used accounts for a 10 percent loss in analog power, injectors with greater coupling also cause more analog throughput loss. The Shively 5656 injector has -7dB of coupling; let's look at this as an example. According to Shively, this injector has an analog throughput loss of 20 percent and a digital loss of 80 percent. Let's say our analog TPO (before IBOC was added) was 10kW. In order to make use of

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ERI also makes a -8dB injector, model CD324-8DB. ERI's published specs for the performance of this coupler are different from that of Shively's equivalent.

Another thing to keep in mind when using one of these injectors is that the amount of isolation between the analog port on the injector and the digital input on the injector varies considerably with the VSWR seen at the output of the injector. This isolation is critical and must be at least 30dB (preferably more). Too little isolation between the digital input port and the analog input port (whether we are referring to an injector or

a dual-input antenna) will allow too much IBOC power to get back in to the analog transmitter, causing intermod products that will subsequently be radiated by the analog antenna. This isolation is a "figure of merit" for this type of injector and for the antenna systems that we'll discuss shortly.

One more factor to consider before raising the power for IBOC is the power rating of your transmission line; answer this question by talking with the line's manufacturer and/or your normal consulting engineer.

What if your station uses split-level combining? In order to increase the IBOC level you may need to decrease the analog portion in the output of the combined amplifier, and then increase the output power of your analog transmitter to make up for that. Is enough headroom available in each transmitter?

Does your station already make use of a combined amplifier? If so the obvious question (aside from the antenna power rating) is whether or not the transmitter has the capability to deliver the necessary amount of analog

power while increasing the IBOC level. Consulting the manufacturer is the first thing to do in this case.

If your station used separate antennas for analog and digital, then again, did you build a system with enough headroom to boost the IBOC ERP by four times (or more)? Likely you didn't; and if you didn't, then read on.

Continental

Model	Maximum analog power at -20dBc IBOC level	Maximum IBOC only (-20dBc)
815HD5	3500	1500
816HD-20	20000	n.r.
816HD-25	25000	n.r.
816HD-28L	30000	n.r.
D816HD-20	44000	n.r.

n.r. = not rated

Broadcast Electronics

Model	Analog only	Maximum analog power vs. IBOC injection		
		-20dBc	-14dBc*	-10dBc*
FMi201	3000	2100	1500*	800*
FMi402	5000	3500	2500*	2000*
FMi703	10000	7000	5000*	4000*
FMi1405	20000	14000	10000*	8000*
FMi21T	30000	21,000	15,000*	n.r.*
FMi25T	35000	24,500	17,500*	n.r.*

n.r. = not rated

*Not yet shipping

Harris

Model	Analog only	Maximum analog power vs. IBOC injection					
		-20dBc	-18dBc	-16dBc	-14dBc	-12dBc	-10dBc
Z4HD+	5500	1634	1372	1239	1051	923	742
Z16HD+	10500	7921	6989	6048	5096	4393	3873
Z32HD+	21000	15842	13978	12096	10193	8786	7745
HPX30	31500	27723	25102	20778	18366	16555	14545
HT/HD+	35000	24752	21361	18144	13751	11570	8273

Nautel

Model	Maximum analog power vs. IBOC injection					
	-20dBc	-18dBc	-16dBc	-14dBc	-12dBc	-10dBc
NV3.5	3799	3723	3650	3411	3076	2715
NV5	5066	4964	4866	4547	4101	3620
NV10	10131	9928	9732	9095	8201	7240
NV20	20263	19857	19464	18190	16403	14479
NV30	30394	29785	29196	27285	24604	21719
NV40	40526	39714	38928	36379	32806	28958

Decisions

For many stations, making the jump to the -14dBc level (let alone the -10dBc level) is going to be like starting over again. Two major choices exist. Either you can decide to use your current main antenna for analog and IBOC, in which case you'll choose a transmitter that is a combined amplifier, having the analog signal plus the IBOC signal in its output; or, you'll opt to use your current analog transmitter, along with a smaller IBOC-only transmitter that feeds its own antenna. This antenna will have a power-gain that's the same or close to your main antenna. This is a good option for those of us who have used a -10dB injector previously, because this size transmitter will likely have enough output capability to accomplish the -10dBc level (that is assuming the digital antenna's power gain is the same as the analog antenna).

The major transmitter manufacturers that we know all have their own lines of IBOC-capable transmitters. Since the most basic requirement is being able to meet the TPO requirements, I'm including the latest information from these manufacturers — their published specs regarding their transmitter products (see page 18). As I wrote earlier, the other choice for increasing IBOC ERP is going with a different antenna. ERI has two different offerings. The first is called Lynx. This is a dual-input, dual-polarized antenna in which all elements are excited by both the analog and digital signals; power gain is the same for analog and digital. According to ERI it has the capability of achieving 40dB of isolation between the digital and analog inputs. The second is called Rototiller SA, which is a shared-aperture circularly-polarized antenna array. This type of antenna has the bays for the digital transmission interleaved within those of the analog antenna. The analog elements use opposite circularity than those of the digital antenna elements, providing the isolation needed. Shively Labs offers an interleaved antenna, their model 6813; Dielectric (SPX) also offers an interleaved

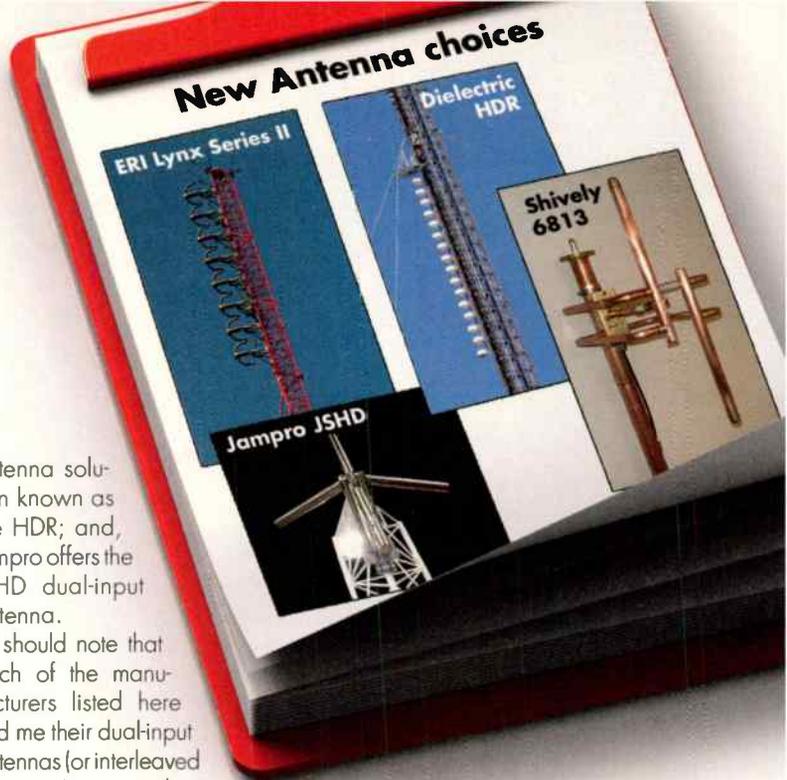
antenna solution known as the HDR; and, Jampro offers the JSHD dual-input antenna.

I should note that each of the manufacturers listed here told me their dual-input antennas (or interleaved antennas) are ready to handle the -10dBc IBOC power level.

Now that the new power levels for IBOC transmission have become clear, it's time for those of you who have been sitting on the fence with regard to IBOC to make the commitment to add it to your station.

It is much easier to put a digital transmission on-air now than it was five years ago; and even though many of our expectations haven't been met (at least in terms of overall listenership), I continue to be a firm believer in the efficacy of this technology to provide a better experience for our listeners. We need to do everything we can to retain the ears that are giving us their attention.

Irwin is transmission systems supervisor for Clear Channel NYC and chief engineer of WKTU, New York. Contact him at doug@dougirwin.net.



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An Orchestra and a Quintet

By Candace Horgan

Recording the Colorado
Symphony Orchestra and
guests in 5.1 for broadcast

A jazz quintet walks into a concert hall and meets a symphony orchestra. That's not the setup for a bad joke, but a concert put on at Boettcher Concert Hall in Denver on Dec. 14, 2010. The Colorado Symphony Orchestra (CSO) and Marvin Hamlisch paired with Dianne Reeves and her quartet to put on a jazz Christmas show.

On hand to capture the performance for radio broadcast was Mike Pappas, chief engineer at KUVU in Denver. Pappas had previously done a live radio broadcast of Yo-Yo Ma and the Colorado Symphony at Boettcher in 2009 (see article in March 2010 issue), and in 2004 had recorded a previous show with Reeves and the Colorado Symphony.



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An Orchestra and a Quintet

Unlike the 2009 show, the Reeves/CSO show was not broadcast live. Instead, Pappas recorded it using Logic for future broadcast in DTS 5.1. The primary challenge Pappas faced was integrating the mixes for the house, run by Reeves's sound engineer/tour manager Paul Boothe, and the radio. Pappas and Boothe coordinated on the microphone selection to create the best sound.

Pappas also helped select the FOH mixing console, a Digico SD7, and used the MADI interface to reduce

cabling issues. The SD7 was used in place of the Boettcher's standard desk, a Yamaha PM3500, an old analog console that the house engineer, Aric Christensen, normally uses. Christensen also worked with Pappas and Boothe on microphone selection and tech setup for the FOH mix.

Because the event wasn't typical, Christensen was comfortable with Pappas and Boothe selecting equipment. "For example, we used MKH 8040 digital microphones for over-

heads," Pappas said. "We did do one or two double mikings, but it wasn't much. He was perfectly happy with our choice of

Sennheiser MKH 800s on the piano. We had a couple of phone calls and swapped some Excel spreadsheets back and forth and got it all to work. We've got about 40 microphones that we are looking at, plus the front of house guys have about 50 that they are looking at, so we were able to get everybody on the same page.

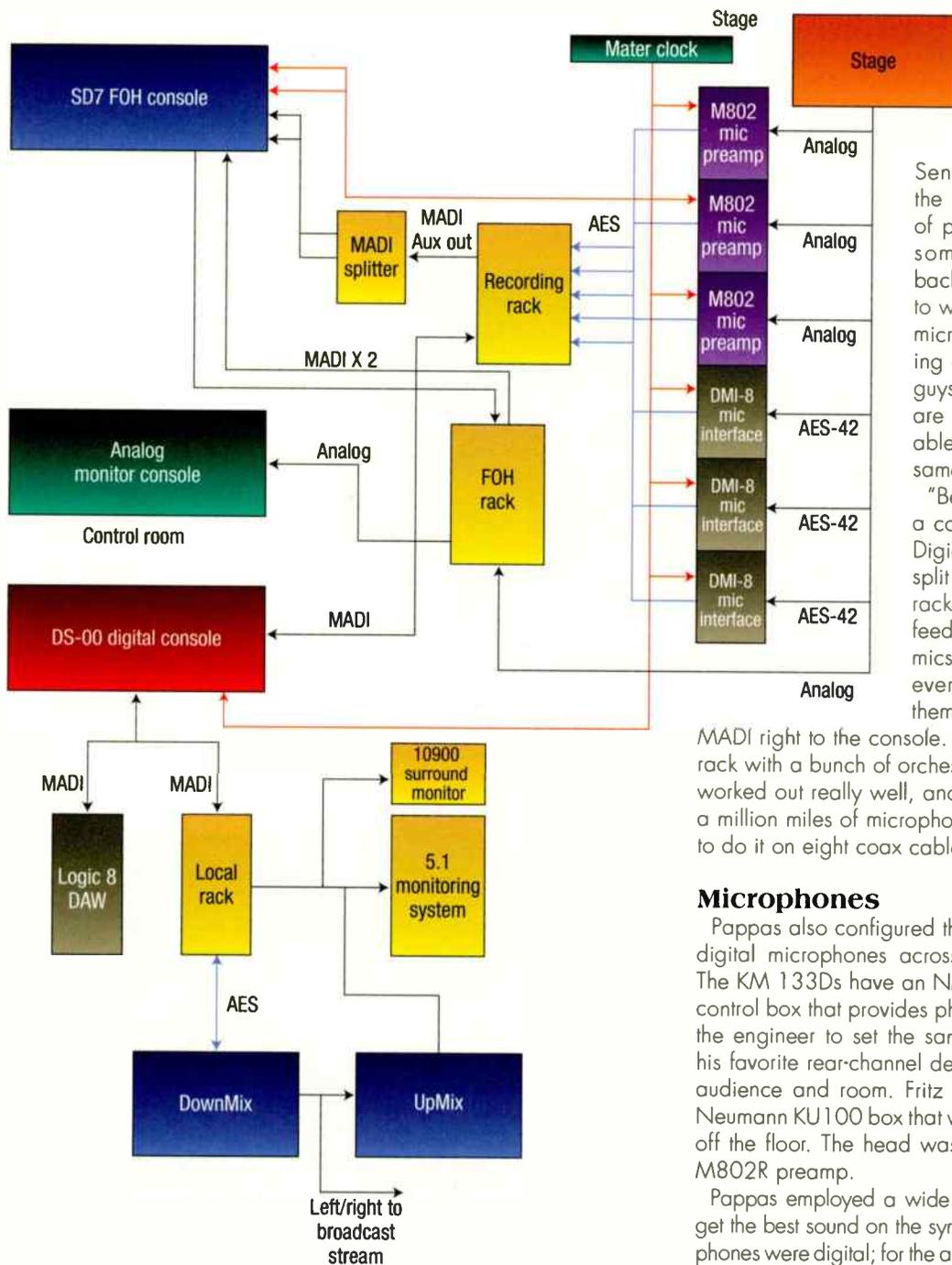
"Because they were running a console that has MADI, the Digico SD7, we were able to split our MADI feeds from our rack, which has all the trio feeds, Dianne Reeves' vocal mics, the wireless mics and everything else. We gave them a feed of that digitally via

MADI right to the console. Then they have their own rack with a bunch of orchestra stuff we don't need. It worked out really well, and instead of having to run a million miles of microphone snakes, we were able to do it on eight coax cables."

Microphones

Pappas also configured three Neumann KM 133D digital microphones across the front of the stage. The KM 133Ds have an NMIC DMI-8 eight channel control box that provides phantom power and allows the engineer to set the sample rate, and then used his favorite rear-channel device, Fritz, to capture the audience and room. Fritz is a stereo dummy head Neumann KU100 box that was hung about 10 meters off the floor. The head was powered from a Grace M802R preamp.

Pappas employed a wide variety of microphones to get the best sound on the symphony. Most of the microphones were digital; for the analog ones, he used Grace M802R preamps with built-in A/D converters. Pappas ran optical out from the Grace units, as well as the digital microphone control boxes, to an RME ADI 648 that takes them all and then creates MADI from it.



The Reeves Colorado Symphony Orchestra session block diagram shows how the mix was fed through DTS Neural Surround.

"We are using a pile of digital microphones throughout the orchestra," he said. "The first violins, second violins, violas and cellos, have Neumann KM 184 D digital microphones. The basses are captured with Sennheiser MKH 8040 digital microphones, and we're using a KM 133 D as a highlight microphone on percussion, which we thought was pretty fun, and then we are using a Neumann KMR 82 long shotgun microphone on the acoustic bass."

Mixing

Though Pappas has extensive experience mixing and recording, because of the potential for fires to break out, Pappas decided to bring in an old friend, Thucydides "Duke" Markos, to mix the show on a Soundtracs DS-00 broadcast console in the control room. Markos had five Avalon Acoustics speakers driven by Jeff Rowland Class D 1,000W amplifiers to monitor the mix, and tube traps to control room reverberation.

"I've worked with Mike on surround mixes since 2004," Markos said. "For something like this, the strategy is a bit different, because we are dealing with a hall that is

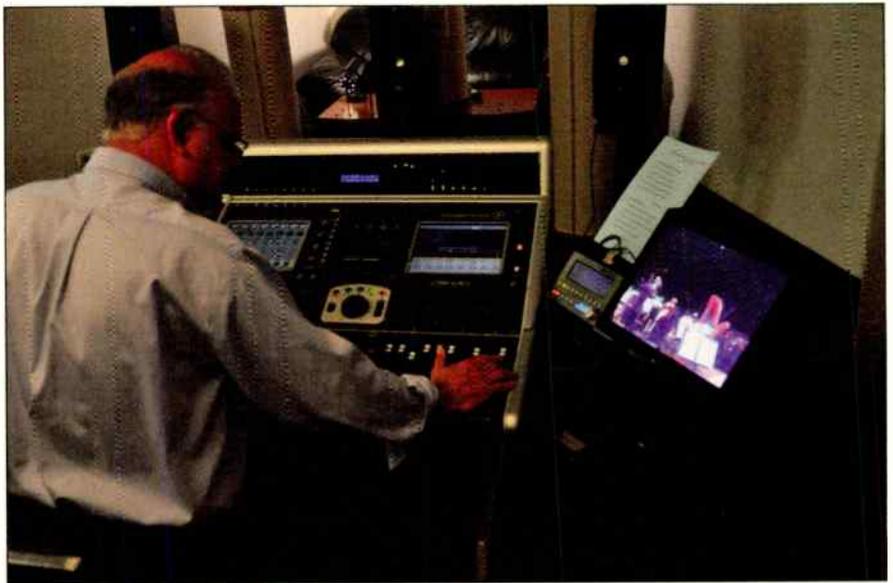


Photo by Candace Horgan

Thucydides "Duke" Markos works the surround mix on a Soundtracs DS-00 broadcast console.

designed for orchestral work, and it's not the best-sounding hall for classical music, and then when you add PA, it complicates things a lot. We have to find some kind of balance between getting that surround and making it sound coherent."

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An *Orchestra* and a *Quintet*

Markos used some compression on Reeves to help control the mix, as she is a very dynamic performer who continuously adjusts her microphone range to raise or lower her volume.

"It's really difficult, because you don't want to squash her down; you want to keep that dynamic range, so you really have to do some gain riding on her, and we do a tiny bit of leveling on her, but we try to do minimal processing on these recordings," Markos said. "We have an LA3A for a little bit of leveling. There's no compression on anything else.

The stage was configured with the orchestra surrounding the trio, so Markos was challenged to create that type of mix for the recording.

"In all of my live mixes, I try to pan them as they are live, because it helps to eliminate a lot of phasing problems," Markos said. "What we are basically doing is we have the orchestra surrounding the quartet, and we do everything audience perspective. So, for instance, we are panning the guitarist right, but not all the way right; we are panning him within the orchestra,



The Colorado Symphony Orchestra prepares to perform in Denver's Boettcher Concert Hall.

so the quartet is within the orchestra just like they are onstage, and with surround, we have the opportunity to also pan things depth-wise, so we are panning things depth-wise as they are onstage. The quartet is up front, as are the first violins, so we try and keep the relationship there, because it really does help keep the coherence of the sound."

Recording

Pappas and Markos recorded the show on a Mac G5 running Logic. Though Pappas has recorded in DSD before, including the Yo-Yo Ma show, with the large number of microphones on stage, he felt DSD was too much.

"The reason we picked Logic is it is very simple and very quick and it works

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Equipment List

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Grace Design M802, M103, m902, SB-66
Logitek Ultra-VU
Neumann DMI-8, HU-100, KM 184, KM133D, KM 184D, KMR 82, KMS 105
RME ADI 648
RTW 10900
Sennheiser MKH 800, SK 5000
Shure Beta 52, Beta 98, SM 57
Soundtracs DS-00



David Day and Duke Markos check the surround mix.

every time," Pappas explained. "We're recording to one single drive; we're not even doing a RAID. Knock on any cellulose product; it's never let us down. That's also being fed by an RME MADI card. You can put 56 or 64 channels of uncompressed audio on a single coax line. We have a send, a receive, and a clock, and away you go. I can run those 500' to 600' easy. We have 40 inputs, which for us is a huge amount to run. Doing that and split to the front of house and a

identical," said David Day, of DaySequerra.

"This is going to be broadcast as a DTS LT/RT that can then be decoded at the other end with a home theater receiver into 5.1 so you can get a near-discrete experience. The signal is stereo-compatible with all surround systems which total hundreds of millions of units."

Horgan is a freelance writer based in Denver. Photos by Darius Panahpour.

relatively compressed load in and rehearsal schedule didn't allow us to bring in the DSD machines and run it all."

Markos created an LT/RT mix and fed it through a DaySequerra DownMix surround encoder using DTS Neural Surround. After taking the mix back to KUVO to fine-tune it, it was uploaded to PRI servers for broadcast through Public Radio stations nationwide using DTS Neural Surround. The show was broadcast on Christmas Eve to an estimated 1.5 million listeners.

"On that console (DS-00), you can go back and forth between the discrete and processed feeds right off the board and they are virtually

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The AM Digital Data Service

By Doug Irwin, CPBE AMD

The AM Digital Data Service (ADDS) is a newly proposed system that would allow AM broadcasters to transmit low-rate data very much like FM broadcasters currently do with the RDS system. AM broadcasters would be able to transmit call letters and a station slogan, along with program-related data. The only way for an AM station to do that now would be by means of a complete AM IBOC installation. ADDS is a much simpler, less-expensive alternative that supports text-only transmission.

The development work was undertaken by iBiquity Digital and the NAB Fastroad (Flexible Advanced Services for Television and Radio on All Devices) initiative.

ADDS is designed to allow the transmission of text messages and data associated with the

program content. These text messages could include station service messages, alert messages and program service messages. These definitions are identical to the corresponding definitions in the AM IBOC service. In particular, there are two different categories of messages: SMS (Station Message Service) and PSD (Program Service Data). SMS includes: station call letters and station message.

PSD includes, but is not limited to: content messages, commercial messages, title, artist, album and genre.

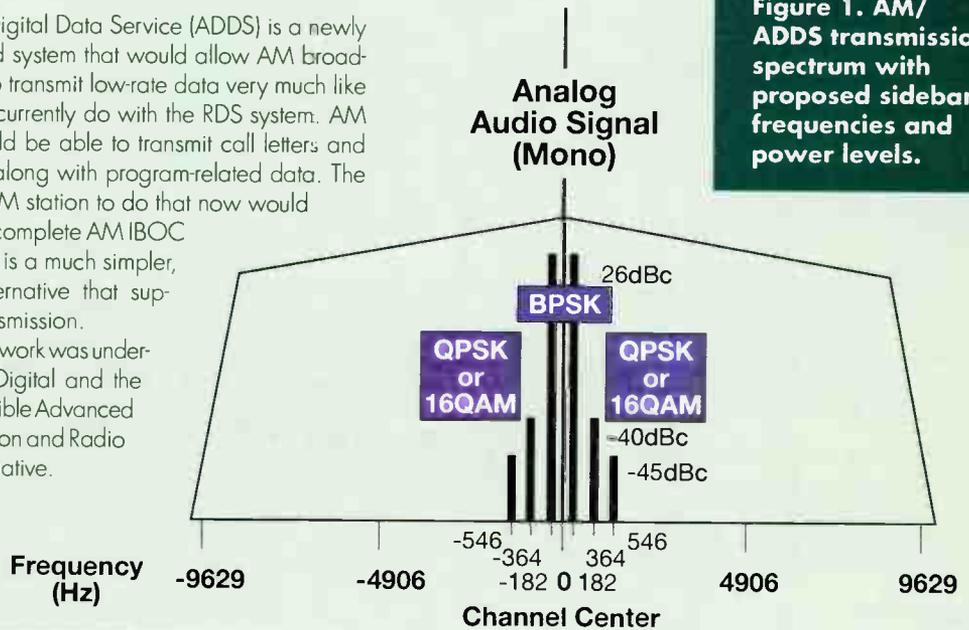
ADDS may also provide EAS messages and even interactive advertisements: According to the report, "These services can be layered in to the defined SMS or PSD data fields. Detailed definitions for these applications will require additional study and implementations."

Application

Now that we know what ADDS is designed to accomplish, let's take a look at how it works. Figure 1 (above) shows the spectrum of an AM/ADDS transmission with the proposed sideband frequencies and power levels.

As you can see, the proposed system uses pairs of digitally modulated subcarriers. Pair 1 is at 181.7Hz

Figure 1. AM/ADDS transmission spectrum with proposed sideband frequencies and power levels.



above and below the reference carrier frequency; Pair 2 is at 363.4Hz above and below the carrier frequency; and Pair 3 is at 545.1Hz above and below the carrier frequency. Pair 1 uses BPSK modulation; Pairs 2 and 3 can make use of either QPSK or 16-QAM. It should be noted that Pairs 2 and 3 are optional, and as you can see from Figure 2, provide extra data throughput capability. According to the report, the maximum coded throughput in the proposed system is 1,098b/s.

As part of its design criteria, ADDS would be scalable to the broadcaster's needs, and therefore two different protocol and subcarrier mapping options are proposed.

Mapping option 1:

- Subcarrier Pair 1/BPSK: Provides PSD information such as call sign, artist, title, genre.
- Subcarrier Pair 2/16-QAM: Provides SIS services (identical to those used for AM IBOC) that include station messages and emergency alerts.
- Subcarrier Pair 3/16-QAM: Provides supplemental PSD, such as longer message lengths for comments and commercials

Mapping option 2:

- Subcarrier Pair 1/BPSK: Provides basic station message service, such as station call letters and station messages.



Read the entire Fastroad report at: www.nabfastroad.org/AMDigitalDataSSSRpt.pdf

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Subcarrier pair/ Modulation type	Frequency	Power level	Raw throughput	Throughput w/FEC (Convolutional)	Throughput w/FEC (Golay)	Throughput w/FEC (Reed-Solomon)
Pair 1: BPSK	$F_c \pm 181.7\text{Hz}$	-26dBc	91.5b/s			
Pair 2: QPSK	$F_c \pm 363.4\text{Hz}$	-40dBc	344.5b/s	230	172	258
Pair 2: 16-QAM	$F_c \pm 363.4\text{Hz}$	-40dBc	689b/s	460	345	517
Pair 3: QPSK	$F_c \pm 545.1\text{Hz}$	-44.5dBc	344.5b/s	230	172	258
Pair 3: 16-QAM	$F_c \pm 545.1\text{Hz}$	-44.5dBc	689b/s	460	345	517

Table 1. OFDM carrier levels

- Subcarrier Pair 2/QPSK: Optional, and provides basic PSD information.
- Subcarrier Pair 3/QPSK: Optional, and provides for longer commercial and content messages

Performance

So naturally the question arises about the system performance with respect to an AM station's coverage. There is a trade-off in the system design between the strength of the OFDM sub-carriers (and thus the system's robustness) and the potential for interference to analog program signal itself. With respect to the carrier levels shown in Table

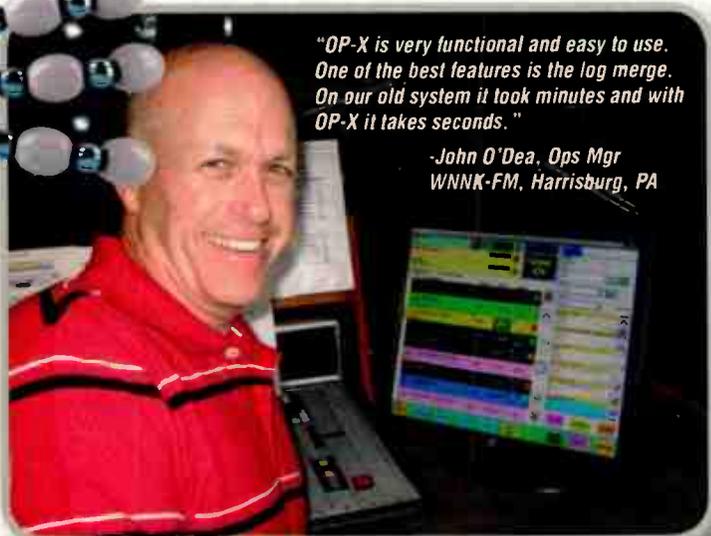
1 (above) mathematically it can be shown that the BER for Pair 1 is such that data can still be passed on them while the analog audio signal-to-noise ratio is far less than what is typically considered acceptable (26dB). The QPSK pairs (2 and 3) are still useable at an audio SNR of 1dB. In other words, the listener will have given up on the station (due to noisy conditions) before the receiver is unable to decode the digital signals.

With respect to the same OFDM carrier levels shown in Table 1 (left), how much interference (for lack of a better phrase) or noise will be noticed in the audio output of the receiver, by the typical listener? This is of obvious

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Insight to IBOC

Pair 1 level	Pair 2 level
-26	none
-27	-39
-27	-41
-27	-44
-29	-37
-29	-40
-26	-38
-26	-40
-26	-43
-26	-32
-26	-34
-26	-37

Table 2. Calculated transmission levels of pair combinations that will cause an apparent SNR in the audio output of the envelope detector of 54dB.

importance to an AM broadcaster interested in the capabilities of ADDS. According to the text of the report, "The proposed modulation for AM Digital Data Service will require digital sub-carriers transmitted under the analog modulation. These sub-carriers have the potential to generate noise on certain receivers tuned to the analog broadcast. Because the digital sub-carriers are transmitted in quadrature (complementary sub-carrier pairs) to the DSB analog audio signal, their effect on coherent AM detectors is theoretically null. A coherent AM detector will outperform the envelope detector."

Since an envelope detector is considered to be the worst case, the effects of the OFDM sub-carriers in the output of such a detector were analyzed. Again through mathematical analysis it is shown that (in an envelope detector) that the level of analog audio corresponding to 181.7Hz is -52dBc (which I presume means below the output of a single tone, amplitude-modulated at 100 percent). It is further assumed that, due to audio processing, that the program audio average is -13dBc. This then leaves an audio SNR between the 181.7Hz tone and the rest of the audio program of 39dB. Factoring in the difference between the human ear's sensitivity to 181.7Hz to and 1kHz (15dB) you are left with an apparent SNR of 54dB. When Pairs 2 and 3 are also transmitted, more "noise" shows up in the output of the

Pair 3 level	Degradation in apparent audio SNR (in dB)
none	0dB reference
none	0
-45.5	0
-44	0
-43	0
-40	0
none	1
-44.5	1
-43	1
none	3
-40	3
-37	3

envelope detector; and since the frequencies of Pairs 2 and 3 are higher, their presence in the audio output of an envelope detector is more noticeable to the ear. In fact, the ear is about 6dB more sensitive at Pair 2 than it is at Pair 1, and about 9.5dB more sensitive at Pair 3 than at Pair 1. So in consideration of those factors, the transmitted levels of sideband Pairs 2 and 3 are lower than that of Pair 1. See Table 2 (above) for the calculated transmission levels of the pair combinations that will cause an apparent SNR in the audio output of the envelope detector of 54dB. Notice you can also increase the levels of Pairs 2 and 3 for slight degradations in the overall SNR.

Without ever having heard an ADDS system on the air, I can't say unequivocally that I would be able to hear this noise, though I believe I could. However, the real question is whether or not the average listener could – and even if they could, would it be objectionable to them?

All the technology described herein is 'heavily borrowed' from AM IBOC (according to the report). As such, it seems reasonable that transmission equipment, and perhaps more importantly, compatible receivers, could be readily manufactured and gotten in to the hands of consumers. One of the first things I notice with an RDS-capable receiver or an IBOC receiver (AM or FM) is the scrolling message, which, though simple, seems very necessary now. Without even a call-letter display, the vast majority of AM receivers seem very old-fashioned indeed. ▲

Irwin is transmission systems supervisor for Clear Channel NYC and chief engineer of WKTU, New York. Contact him at doug@dougiwin.net.

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Tips, tricks, hints and more

By Doug Irwin, CPBE AMD

Maximizing LAN bridge data rates

Last month I talked about LAN connectivity and data rates. I covered several ways to verify that the Internet service provider is delivering the full access rate you think you should have. I discussed using a LAN bridge to connect a remote site (such as a transmitter) to the station. It's important to remember that all the links you use for this connection are in series with one another and that ultimately the speed will be limited by the slowest link in the chain.

At your HQ you may have a T-1 to your ISP, but if your LAN bridge to the transmitter site is limited to 512kb/s (as an example) then the speed you mea-



sure will never exceed (indeed it will be somewhat lower) 512kb/s.

So let's say now that you've studied the response time of your gateway, and that the speed to an outside speed test site is consistent with what you would expect on your remote LAN. You find that connecting to the Internet seems slow. Trying various URLs yields nothing. What could be the trouble?

As you are likely aware, a big part of using the World Wide Web (does anyone call it that anymore?) is making use of DNS (Domain Name Server) to resolve a URL into an actual IP address that your host then uses as a destination IP address when it builds up packets that go out over the Internet. When you open a browser and enter a URL, a certain amount of time goes by before a response comes from whatever DNS is used by your local computer. Some DNS servers respond faster than others, and if you happen to be pointed at a slow one, then this can slow down your entire experience on the Web.

There again you can do a little research in figuring this out (unless you know it already).

In that same command window, at the prompt type in <ipconfig /all>. Sift through that information and you will see what DNS addresses are in use. After finding that you can ping using that DNS address, and see how short and consistent the amount of ping time is. You'll also notice in the ping results a column labeled TTL, which means time to live. Every time your packets traverse a router, that number is decremented by one. My default TTL for pings is 64 when packets are sent, so I can just subtract the TTL number I get back from 64 to see how many routers my packets have traversed. The lower, the better; it means you are that much closer to the DNS server you nominally use. So, ideally you'll pick a DNS server with a fast ping time, and a TTL that is decremented minimally. Alternatively, you can try another DNS server all together just to see if your

DNS Server List

Here are the top two calculated DNS servers for your IP: 63.251.62.33 [Update your IP Location](#)

63.251.62.33
63.251.62.33
69.111.95.106

Note the Third IP is one of our test IP's if you have room for three IP's Use of the third IP helps us in our test.

Tired of changing your DNS get the [DNSServerList.org AdapterConfig-Beta tool here.](#)

[Halloween-Costumes-For-Sale.net](#)

The above three servers were drawn from this list. It is constantly updated, times stated are -8GMT

UNITED STATES (US)	T	0.23	2010-08-13 12:59:40
UNITED STATES (US)	T 66.146.160.12	0.31	2010-08-15 18:31:30
UNITED STATES (US)	T 74.143.31.19	0.07	2010-08-17 20:28:54
UNITED STATES (US)	T 207.158.39.6	0.34	2010-08-15 12:59:47
UNITED STATES (US)	T 75.116.63.158	0.27	2010-08-11 22:36:04
UNITED STATES (US)	T 75.101.149.182	0.12	2010-08-17 15:42:44
UNITED STATES (US)	T 140.242.16.102	0.24	2010-08-15 17:47:50
UNITED STATES (US)	T 205.160.52.53	0.26	2010-08-14 13:20:11
UNITED STATES (US)	T 75.116.127.156	0.26	2010-08-17 18:04:04
UNITED STATES (US)	T 156.154.71.22	0.17	2010-08-15 12:59:42
UNITED STATES (US)	T 69.25.160.15	0.16	2010-08-17 20:59:05
UNITED STATES (US)	T 69.25.160.20	0.2	2010-08-13 11:37:21

overall results are faster. Try looking at [DNSServerList.org](#) ([www.dnsserverlist.org](#)) or alternatively use Google's free public DNS of 8.8.8.8 or even Level 3's DNS at 4.2.2.3. I find those to be much faster than the one my ISP normally uses. Change your DNS on your computer if the address is static, or at the DHCP server on your LAN.

Irwin is transmission systems supervisor for Clear Channel NYC and chief engineer of WKTU, New York. Contact him at doug@dougirwin.net.

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World Radio History



iZotope ANR-B

By Chris Wygal, CBRE

Once heard a radio personality say, "You can judge a person's intelligence in opposite proportion to his or her tolerance of noise." This quote stuck with me. As engineers we obsess over noise. It's our job to eliminate it. To parallel the quote above, engineers could say the following: "Allowing noise in a broadcast air chain proportionately insults the intelligence of the listener." Bold statement? Probably, but realistically an engineer should continually strive to keep their audio plants working in pristine sonic condition. When audio chains are left unmaintained we assume our audience to be lazy listeners. We can even drive people away, especially the audiophiles in

the audience. In addition, sonically shaping and fine-tuning audio is difficult when a chronic noise floor exists. Some noise however is unavoidable. Various programming material or live feeds can be inherently noisy, or have a constant noise floor. Or worse, HVAC noise is sometimes unavoidable. That's where ANR-B from iZotope comes into play. It's an adaptive realtime noise suppression system and it makes handling noise much easier.

iZotope is a familiar name in software applications for audio professionals. ANR-B however lives in a 1RU space with analog and AES XLR outputs. It is designed for placement in an audio chain

unmistakable voice and guitar. Keep in mind, this was done in real time.

Standing in my basement about 12' from an air-handling unit, I opened a handheld mic and interviewed Hershey, my chocolate lab. In normal circumstances, the air handler would have been a distraction during a news interview. However with marginal use of ANR-B suppression, the air handler virtually disappeared without compromising my voice material. It samples and removes steady-state noises, and if any added hiss or rumble develops over time, it will be dealt with accordingly.

Other noises

I asked our production director to talk on a handheld mic in a room with servers, HVAC fans, and a rack full of noisy equipment. With ANR-B in line, the noise was effectively eliminated. He even situated himself next to the air conditioner output. What had been unusable audio became perfectly suitable in a live interview situation, for example.

Outside the radio station, I popped the hood on my truck and started it. I again asked our production director for some help. He took the mic and actually stuck his head down near the engine and began talking. I regret not having metered the loudness of the engine, but I can attest that the engine noise was considerable. ANR-B was most impressive during this test. The suppression level was manually raised to 80 and the tradeoff between noise reduction and artifacting was superb. Virtually no artifacting and the truck engine was nearly gone.

In each of these tests, a trial-and-error method was used to test the adapt and train modes on each audio channel. Adapt mode is optimized for speech. ANR-B continually diagnoses the noise and speech characteristics and recognizes the difference between the two. This allows for noise attenuation without compromising the dialog. Adapt mode also adjusts for changes to steady-state noise sources over time. If HVAC rumble gets louder and quieter, ANR-B will adjust.

Pressing the train button quickly takes a snapshot of the actual noise. This feature is best used in manual mode (adapt mode off) and it defines the noise for ANR-B to reduce. Training and adapting can be done simultaneously and can be done independently on each input channel.

Performance at a glance

- 1RU size
- Eliminates steady-state noise
- Stores several user profiles
- AES or analog I/O
- Clock sync
- Minimal buttons and switches for easy use

that suffers from steady-state and slowly changing noises of all types. 60Hz hum, buzzes and hisses are popular problems. But what happens when a news feed comes in with unbelievable noise from a nearby generator or engine? I recently put ANR-B through a relentless field test. Let's start with the easy stuff.

Working with the King

I have some digital recordings of Elvis classics. The 1960s tape noise is miserably apparent, especially on "Love Me Tender." I was curious to see how ANR-B handled this situation. Keep in mind that this unit is a noise suppression system, not a noise elimination system. Frankly, the suppression can be cranked up to 100 (on a scale of 0 to 100), and the tape hiss will disappear. However, a tradeoff between *no noise* and digital artifacting must be considered and ANR-B makes the tradeoff easy to manage. Concerning the Elvis material, the hiss was at least 50 percent suppressed without considerable (if any) degradation to The King's

Back to normal

"Deathly quiet" is the only term I know to explain ANR-B's reduction in op amp noise. Dialog and music was untouched and the noise floor disappeared. The system is very intuitive. Not too many knobs and buttons. From left to right ANR-B has two channels that can be used for two mono sources or one stereo source. This is facilitated by the analog or AES ins and outs on XLR jacks on the back. It has RJ-45 LAN and RS-422 connections.

The link button allows the unit to be operated in stereo mode using one set of controls. Setup opens a menu on the display for accessing internal settings such as input and output type, LAN settings and firmware management. Each menu item can be scrolled through using the data wheel next to the display. The preset button opens a list of factory presets including ISDN (50Hz-8kHz) and cell phone (220Hz to 3.8kHz) filtering, along with presets for landline and music. These provide fine-tuned noise reduction and can be applied to 20 user-defined presets for different applications.

Each of the two input channels have the adapt and train buttons plus bypass and residual controls. Bypass removes the ANR-B channel from

the audio chain, and holding the residual button allows for monitoring the noise being eliminated. If program material is heard on the residual output, using less suppression is necessary. Each channel has a suppression knob. Finally each channel has 10-segment input (with clip indicator), output and noise reduction meters.

It is vital to mention that noise reduction is a crafty art form. No two environments are alike, so proactively learning to experiment with the combinations available on ANR-B is important. Also remember that the system performs best when audio input levels are as strong as possible. With that in mind, iZotope's ANR-B can be the best 1RU investment installed in a problem audio chain. 

iZotope

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

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

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Sanyo Xacti ICR-XPS01M

By Gil T. Wilson

Looking for a portable digital recorder can actually be harder than it looks. There are many on the market and what you want to do with it determines which product you purchase. My latest product research has landed the most versatile unit I have found. This time around I'm sharing the Sanyo Xacti, ICR-XPS01M.

Out of the box this unit is sleek and small, but don't let the size fool you, this little baby is full-featured. Measuring 1.5" W by 3.8" H and only 0.4" thick, it's the thinnest recorder I've tested. It brings touch technology to the recording field.

The Xacti not only records, but features an FM tuner (handy for off-site monitoring), with 20 station presets. You can even record the FM broadcasts on the unit itself. It can also function as an MP3 player. The unit takes micro SD cards for storage and accepts up to 8GB cards (it comes with a 2GB card).

Recording

When recording, the unit comes with three preset recording "scenes":

- Interview: 64kb/s MP3, low mic sensitivity, mic ALC on, stereo
- Meeting: 192kb/s MP3, high mic sensitivity, mic ALC on, stereo
- Music: 44.1kHz PCM, high mic sensitivity, mic ALC off, stereo



sampling rate enabling sound reproduction up to a maximum of 21kHz. MP3 captures high sound quality of 44.1kHz, 320kb/s sampling, which enables sound reproduction up to a maximum of 20kHz.

There are also three "scenes" for line-in capabilities of this recorder:

- Headphone: Optimal setting for connecting the headphones socket with an audio cable
- Portable: Optimal setting for connecting the line-out terminal of a portable CD player with an audio cable
- Component: Optimal setting for connecting the line-out terminal of a component stereo system with an audio cable

Scene tests

I decided to run a test for each of the recording scenes and found uses for other features that surprised me. First, on the interview scene, I sat with my subject and used the preset scene. The recorder was held at arm's length between us and the voice levels were even throughout the interview. I rotated the recorder and audio was maintained at an even level and quality. The two microphones are built in to the top of the recorder and perform superbly. During all my recordings I was pleased that extraneous sounds were not a problem.

During a remote broadcast at a community festival, I ran across a great use for several features at once on this recorder. The scenario is a remote broadcast at a community festival. The talent can use the device as an off-air monitor using the FM feature, and also record the air checks of the remote broadcast. As any remote broadcaster knows, finding the right people to interview at the same times as the on-air breaks can be difficult and sometimes impossible; with this device in hand the interviews can be recorded at any time and played back on air with a connection from the headphone out to a line-in on the mixer for the broadcast.

The next scene I tested was meeting. This scene worked very similar to the interview in that sound

Performance at a glance

Up to 56 hours of use

Up to 544 hours of storage

FM radio with station presets

Quick button preset recording scenes

Line and mic inputs

Built-in mics and speakers

Touchscreen control

The ALC works well. Some recorder ALC circuits are set as a hard limiter that mashes the audio. Not in this case. I never turned the ALC off except when recording live music. The circuit kept all ambient sounds and only boosted the necessary voices and sounds. In one instance there was a large fan cooling a transmitter 8' from my interview and not once did we hear that fan. I even intentionally did not talk for 20 seconds to see if the ALC would boost that sound, but it never went above acceptable ambient noise.

The ICR-XPS01M offers two recording formats: Linear PCM, which records original sound without compression; and the highly versatile MP3 format. Linear PCM records at 44.1kHz, 16-bit

from all directions was treated equally. But in recording in a conference room with about 10 people speaking, all voices came through clearly.

Finally I tested the music scenario at a local concert in which the bands wanted a live recording. The fullness/richness of the recorded show was astounding. The bands and I were completely impressed by the recording quality. I liked that the record level could be easily set using the touchpad. Simply touch the record button and the device is in standby, then by touching the pad the level can be adjusted up or down while viewing the numerical reading. Once the level is set, press the record button again and it's good to go.

Using micro-SD cards, the unit can take up to 8GB of storage. 2GB can be 1 to 3 hours of recording depending on the sample rates used. The cards are easily inserted and one could have a library of songs on one card, thus functioning as an MP3 player, and then when the recorder is needed, swap out the cards for recording purposes.

The unit is rechargeable by connecting via USB, much like major brand MP3 players. Depending again on use and sample rate of the

recording the battery at full charge can last up to 56 hours. According to the manufacturer the charge from dead to full charge is 150 minutes. The USB is used to transfer files to and from a PC, and it will charge the unit during the transfer.

The red backlit dot matrix LCD screen is very easy to read and all the features easy to understand. At a glance one can see how much recording time/space is left, battery level and the many audio settings.

This unit is a must-have in the arsenal of any audio production professional where field recordings are standard. For those who are not sure, give it a try, you may surprise yourself with the opportunities created.

Wilson is an announcer, producer, webmaster and promotions guy at WAKO-AM/FM, Lawrenceville, IL.

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NEW PRODUCTS

by Erin Shippo, associate editor



Multi-pattern condenser mic Blue Microphones

Reactor: A multi-pattern, large diaphragm condenser microphone, Reactor unites an innovative pattern selection method with a swiveling capsule head for precise positioning. Featuring Blue's condenser capsule and proprietary pre-amp circuit, Reactor allows for noiseless live switching between the three distinct patterns (cardioid, omni or bi-directional). Reactor's capsule technology delivers a full sonic signature with a detailed top end, texture mids and a full bottom end. Like all of Blue's studio microphones, Reactor employs fully discrete, Class-A solid-state components.

818-879-5200; www.bluemic.com

USB recording interface Alesis

iO2 Express: A compact, audio-recording interface, the iO2 Express

is a two-channel USB device for Mac and PC-based systems that enables recording at up to 24-bit resolution for input into virtually all DAW, recording, and performance software.

Discrete-design preamplifiers and true 48V phantom power ensure the capture of a microphone's complete signal. It features high quality analog-to-digital and digital-to-analog converters and plug-and-play with virtually any computer. The iO2 Express is USB bus powered. It has two input channels with XLR mic input, a 1/4" TRS insert and 1/4" TS jack.

800-5-ALESIS; www.alesis.com; info@alesis.com



Safety/security equipment Belden



Compression Connectors and Tools:

This line of F, BNC and RCA Compression Connectors and Tools, along with the availability of either standard or custom-configured Cable Assemblies, is used in combination with Belden Coaxial Cable for reliable signal performance and easy installation. The Compression Connectors are fine-tuned to Belden Coaxial Cable tolerances. The Compression Connector Tool also ensures a secure, positive compression. The connectors exceed SCTE standards for signal ingress, egress and water migration. Connector performance is assured through three 360-degree compression rings and a visual confirmation of cable entry. For the BNC and RCA connectors, a pop-up pin visually confirms a proper termination and contact point. The line features a compression tool and two stripping tools.

800-BELDEN1; www.belden.com
info@belden.com



Mic stand adapter Primacoustic

TelePad: Made from high impact molded plastic, the

TelePad, easily mounts iPhones on a mic stand or boom attachment with an adjustable clamp. The iPhone slides and locks into place and the cradle can be rotated 360 degrees and/or adjusted to the desired angle for viewing. The TelePad come with extra padding to fit slightly smaller phones or devices. The TelePad-3 fits iPhones 2G, 3G, 3GS and the iPod Touch 1G, 2G and 3G. The TelePad-4 fits the iPhone 4.

604-942-1001; www.primacoustic.com
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Outdoor facility cages Fibrebond

HVAC Security Cages: Fibrebond equipment shelters offer a number of benefits that translate to cost savings, time savings and safer working conditions for field technicians. Concrete equipment shelters offer the advantages of: reconfiguring equipment without adding additional cabinets; upgrading networks without renegotiating land leases, installing foundations, or changing site footprints; protecting equipment from temperature fluctuation, severe weather, vandalism and theft; and supporting field engineers by providing a safe, secure, climate-controlled working environment.

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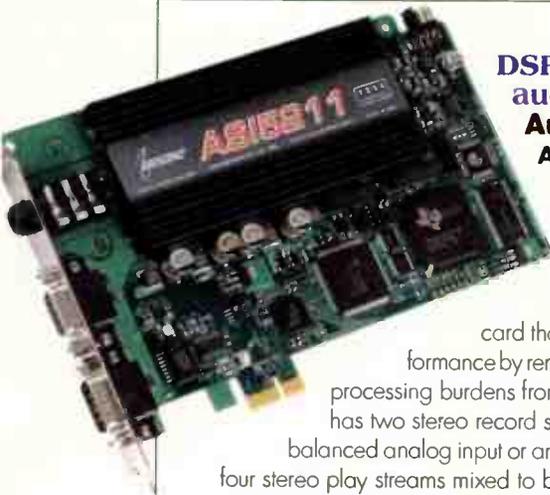
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iQ. It's about time.





**DSP-based audio card
AudioScience**

ASi5211: An update to the ASi5111 card, ASi5211 is a PCI Express (PCIe) version. It is a professional grade DSP-based audio card that ensures glitch-free performance by removing time critical audio processing burdens from the PC. The ASi5211 has two stereo record streams fed from either a balanced analog input or an AES/EBU digital input, four stereo play streams mixed to both a balanced analog output and an AES/EBU digital output, and a microphone input with low noise pre-amp and 48V phantom power supply. The analog input/output level on the ASi5211 has been increased to +24dBu. A noise gate has also been added. Finally, the new GPIO on the ASi5211 adds two opto-isolated inputs and two normally open relay outputs.

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**Dual-active fibre RAID SAN storage
Enhance Technology**



UltraStor ES3160 FS: With Microsoft Multipath I/O and Windows server clustering validation, the UltraStor ES3160 FS offers 4x 4G fibre channel connectivity and makes high capacity storage available for share in a SAN environment with multiple servers and workstations. It is equipped with dual-active RAID controllers and dual 500W redundant power supplies. It utilizes 16x hot-swappable disk trays with up to 32TB and is expandable up to 60TB total storage capacity via 3x ES3160 JS enterprise JBOD storage systems with SAS hard drives. IT administrators can add more storage capacity as their business grows

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**Recorder
Samson Technologies**

Zoom R24: The R24 recorder adds a sampler/drum machine, eight additional recording tracks and six channels of phantom power to its R16. It combines four production tools in one device and is a digital multi-track recorder with 24-track playback and 8-track simultaneous recording, an audio interface, a control surface and a drum pad sampler. The new sampler function consists of 24 built-in voices that can be triggered using eight pads and three bank keys to assign sounds to each track and create loops. It records on SD memory cards and supports cards up to 32GB for more than 100 track hours of recording. In addition, the R24's USB audio interface allows users to record tracks to any Mac or PC and utilize the system's control surface capabilities to manage the functions of most DAW software programs, most notably the included Cubase LE 5.

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

**Digital live sound mixer
Soundcraft USA**



Si Compact Series: With full DSP functionality built into a small-footprint chassis, the Si Compact provides up to 40 inputs to mix in three frame sizes, the smallest of which is also rack mountable. Motorized faders with Soundcraft FaderGlow operate on two layers. It also features a full encoder set for all the functions on a channel, from input gain through EQ and dynamics to bus controls. Si Compact is available in 16-, 24- or 32-mic/line input formats, with four stereo returns. Features include four separate Lexicon FX processors with dedicated FX buses in addition to the main mixes, and BSS Graphic EQ for every bus.

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

**Silence switcher
Sonifex**

RB-DSD8: An 8-channel silence switcher, the RB-DSD8 accepts analog and digital inputs and acts as a single 8-channel silence detector, or as multiple smaller stereo silence detectors, allowing silence switchover for 5.1 and 7.1 signals. Designed to switch from one input (or set of inputs) to another in the event of loss of audio, the unit is ideal at transmitter sites, or after the master output of a studio, to switch in another audio source, or simultaneous broadcast, should a master source fail. The unit can switch on loss of level of the main input, on loss of level on one channel of the main input or on loss of synchronization lock of a main digital input



+44 1933 650 700; www.sonifex.co.uk; sales@sonifex.co.uk

**Uninterruptible power supply
OnStat Power**

Silent Sentry: Silent Sentry is a battery-operated wall-mounted system that features a low-profile design that can be mounted on or between wall studs with a protrusion of less than 4.5". It can be installed in tight spaces, in utility closets or behind doors. The "electrician-friendly" design features a built-in sub-panel with branch-circuit protectors in the hardware series.

203-324-9595; www.onstatpower.com
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**UPGRADES
and UPDATES**

The **Airtools** Voice Processor 2x now allows users to import or export specific presets without disturbing any other existing settings. (www.symetrix.co)... **RCS** has released version 2.10.3 of NexGen Digital, which adds the ability to capture pad data via DRR, send emergency spots straight to air and more. (www.rcsworks.com)... **Comrex** has released version 2.8 firmware update for the Access IP codecs, which adds support for select 4G wireless devices in the U.S. and the inclusion of AAC coding algorithms on all new Access codecs that ship with 2.8 firmware. (www.comrex.com)... **Telos** Nx6 and Nx12 users can download software version 1.5.0r, which includes support for Axia iProbe remote administration and Call Progress, Tone Detection enhancements. (www.telos-systems.com)



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NEW PRODUCTS

Recording interfaces Mackie

Onyx Blackjack and Blackbird: These interfaces combine Mackie's Onyx mic preamps with Cirrus Logic AD/DA converters and workflow-friendly features. The Onyx Blackjack is a compact desktop 2x2 USB interface. Its two mic preamp channels feature built-in DIs. Separate level control for studio monitors and headphones, along with true analog hardware monitoring take the guesswork out of zero-latency recording. The rackmount Onyx Blackbird delivers studio-grade recording via eight Onyx mic preamps. A 16x16 FireWire interface, Blackbird also features 8x8 ADAT and word-clock I/O. There are two "Super Channels" on the front panel with dedicated low-cut switches, phantom power and true hardware monitoring options for quick zero-latency tracking. The other channels utilize the Blackbird Control DSP Matrix Mixer for quick setup of independent mixes and the ability to route any input to any output.

800-898-3211; www.mackie.com; productinfo@mackie.com



Find the mic winner December issue

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of WHIF-FM, Palatka, FL.

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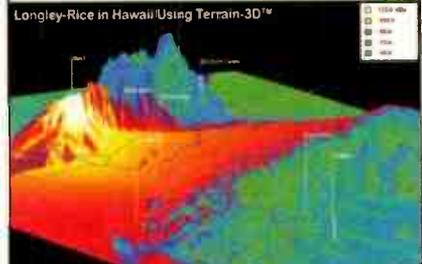
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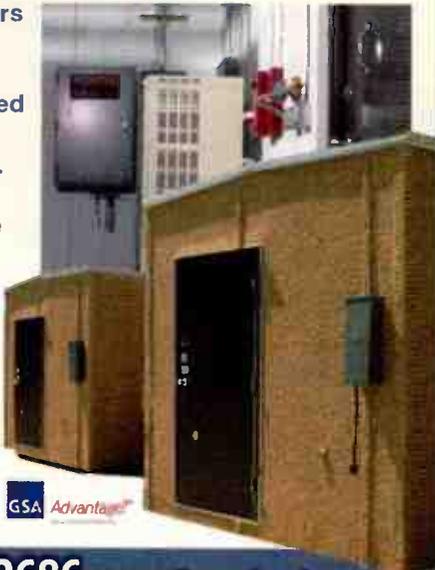
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Contributor Pro-file

Meet the professionals who write
for *Radio* magazine.
This month:
On Location, page 20



Candace Horgan
Freelance writer
Denver

Horgan is a freelance writer, editor and photographer based in the Denver area. She has covered music and sound for many publications, including the *Denver Post*, *Mix*,

Guitar Player, *Acoustic Guitar*, *Strings and Fiddler*. Her interest in live sound and recording was sparked by seeing the hordes of tapers at Grateful Dead concerts. She is also the archivist for the Cowboy Junkies.



Written by radio professionals
Written for radio professionals

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ADVERTISER INDEX

	Page Number	Advertiser Hotline	Advertiser Website
Acoustics First	31	888-765-2900	www.acousticsfirst.com
Agilent Technologies	3	800-829-4444	www.agilent.com
Armstrong Transmitter Corp.	30	315-673-1269	www.armstrongtx.com
Arrakis Systems	26-27, 51	970-461-0730	www.arrakis-systems.com
Axia	41	216-622-0247	www.axiaaudio.com
Belar Electronics Laboratory	46	610-687-5550	www.belar.com
Broadcast Bionics	25	888-363-4844	www.phonebox.com
Broadcast Software Int'l	33, 44	888-BSI-USA-1	www.bsiusa.com
Broadcast Tools	15	360-854-9559	www.broadcasttools.com
BW Broadcast	21	+44-208-253-0290	www.bwbroadcast.com
CircuitVerkes	46	352-335-6555	www.circuitwerkes.com
Coaxial Dynamics	39	440-243-1100	www.coaxial.com
Comrex	9	800-237-1776	www.comrex.com
Continental Electronics	16	800-733-5011	www.contelec.com
DaySequerra	32	856-719-9900	www.daysequerra.com
Digital Alert Systems	19	585-765-1155	www.digitalalertsystems.com
DM Engineering	47	800-249-0487	www.dmengineering.com
Enco	1, 17	800-ENCO-SYS	www.enco.com
ESE	30	310-322-2136	www.eseweb.com
Global Security Systems	40	601-709-4240	www.gssnet.us
Graham Studios	37	866-481-6696	www.graham-studios.com
Kintronic Labs	24	423-878-3141	www.kintronic.com
Lightner Electronics	39	866-239-3888	www.LightnerElectronics.com
Logitek	7	800-231-5870	www.logitekaudio.com
Mooretronix	47	800-300-0733	www.mooretronix.com
Myat	23	201-767-5380	www.myat.com
Nautel Electronics	13	902-823-5131	www.nautel.com
Nott Ltd.	45	505-327-5646	www.nottltd.com
Omnia	35	216-622-0247	www.omniaaudio.com
Progressive Concepts	45	630-736-9822	www.progressive-concepts.com
Ramsey Electronics	45	800-446-2295	www.ramseybroadcast.com
RF Parts	47	800-737-2787	www.rfparts.com
RVR USA	18	877-902-3669	www.rvrusa.com
Sage Alerting Systems	31	914-872-4069	www.sagealertingsystems.com
SCMS	11	800-438-6040	www.scmsinc.com
Smarts Broadcast	43	800-747-6278	www.smartsbroadcast.com
Telos Systems	29	216-241-7225	www.telos-systems.com
The Studio Hawk	47	662-324-2769	www.thestudiohawk.com
Thermobond	46	800-356-2686	www.thermobond.com
Tieline Technology	5	317-845-8000	www.tieline.com
Transcom Corporation	47	800-441-8545	www.fmamtv.com
V-Soft Communications	45	800-743-3684	www.v-soft.com
Wheatstone	2, 52	252-638-7000	www.wheatstone.com

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



by Erin Shipps, associate editor

That was then



When Vern Thompson opened his November issue of *Radio* magazine, he turned to his favorite page: Sign Off. There he saw his friend Mike Moore. Thompson lives about 8 miles north of Moore's station (WLOE). He decided to send us a photo of his own. Vern wrote, "It was taken during my days at Colorado College while working at KRDO 1240 in Colorado Springs. It was owned by Joe Rohrer. He acquired WLCX in La Crosse after leaving KRDO. Whenever I had a problem at my stations KBBV/KTOT at Big Bear Lake, CA, I would ask, *What would Joe do?* The control room and Studio A and the 250W RCA transmitter pictured here was taken from Studio B. The 175' free-standing tower was located a block away on the roof of the Antlers Hotel garage fed by a long coax. KRDO had mobile two-way radio cars, a city bus fixed up as a mobile studio and control room with an ART-13, a 100W transmitter on 2,790kHz, to send the programming to the studio."

Sample and Hold

Media Monitors' 2010 Radio Spot Ten

Media Monitors has released the 2010 Radio Spot Ten showing the leaders in radio advertising in the last year. Little has changed in the rankings since 2009, although Media Monitors chose to include the HD Digital Radio Alliance this year. Last year it was omitted because the ads are not revenue-generating ads. The Alliance spots run in unsold inventory.

Geico held on to the #1 rank, running 350K more ads than last year. The Home Depot remained at #2 with 250K more spots. McDonald's and Verizon stayed at #3 and #4, while the HD Digital Radio Alliance took the #5 rank. Last year the #5 spot was held by AT&T, pushed to #8 this year. The Alliance bumped Autozone to #6, while Wal-Mart followed at #7. Kohl's moved up a notch, replacing Safelite Autoglass at #9 and Subway nabbed #10.

While totals from 2008-2009 stayed level, Media Monitors expected an increase in 2010. They got it. Top 10 advertising spots went up 828,751 from 2009-2010. However, the 2010 total does include the noted HD Radio Alliance change, which probably contributed to the increase.

2010 Rank	Advertiser	Spot Count	2009 Rank
1		2,298,351	1
2		1,959,994	2
3		1,267,093	3
4		1,193,995	4
5		1,135,215	N/A
6		905,369	6
7		772,087	7
8		687,930	5
9		586,650	10
10		563,457	

ARRAKIS SYSTEMS INC.

MARC-15-15
on sale \$6,499



15 channel modular console
supports two phone hybrids
USB sound card modules
control room & studio

ARC-8
only \$799



2 mic, 4 stereo line,
PC USB, and Phone input
both balanced & unbalanced I/O

XTREME
automation
only \$400
per month

Live On Air,
Hard disk & Satellite,
16 stereo input switcher
with logic

ARC-10
three models



ARC-15
only \$3,495

1-5 mic inputs,
PC USB, and Phone inputs
both balanced & unbalanced I/O

ARC-10U: \$1,599 unbalanced
ARC-10UP: \$1,999 unbal w USB
ARC-10BP: \$2,495 balanced w USB

2 mic inputs,
PC USB, and Phone inputs,
both balanced & unbalanced
models.

'ACCENT'
studio furniture



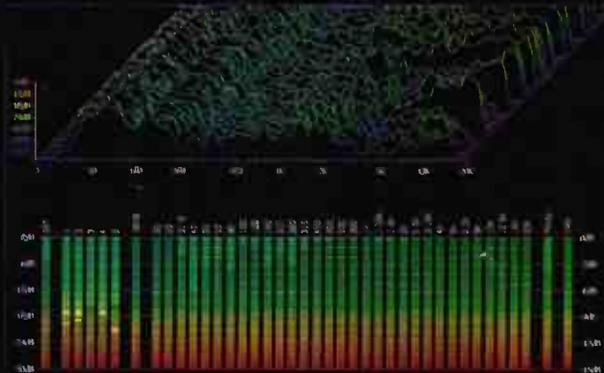
all ARC consoles feature
built in PC USB sound cards
and come with 'Xtreme-Studios'
live on air software



ACCENT is a contemporary blend of brushed metals, pleasing colors, and interesting textures. The metal structure is artfully integrated into the visible design decor of the cabinetry. Cabinetry and electronic equipment complement each other to create a bold visual environment for talent, guests, and clients alike.

www.arrakis-systems.com

all prices are mrrp



"I am giving the VORSIS development team a BIG thumbs up as this product stands out as a very SUPERIOR audio processor design."

"This processor is amazing!"

"I have the HD output feeding our web stream encoder, and two national program hosts at remote locations in the US have told us 'your audio stream sounds incredible!'"

"I can say that the VORSIS processor does NOT sound like the 'O'ther guys! It sounds far better and has a very unique 'signature'. I really, really like how this processor sounds! Every other station in the market sounds like crunched up FM radio while our station is loud now and yet it still has 'life' with CD quality dynamics and punch."

"I've listened to the station since the first few days after the format flip (which was a month ago yesterday), and the one thing I notice most is that the new VORSIS processor's audio quality is always terrific, regardless of the source material."

"If the VORSIS that I heard while you were testing processors last night is your final air chain (it was) it might just be the cleanest and best sounding FM I've heard since...well, forever. Great work!"

"Thanks for a great sounding box that makes us sound bigger than the so called big stations!"

"Your Sweet Spot Technology AGC has the most invisible gain correction that I have EVER heard in ANY on air processor. Listeners have been calling to compliment us on the improvement in our on air sound."

"We've used your product close to a year now and-it's just out of this world. When we put the VORSIS box online our audience noticed the difference instantly and started calling asking questions like 'What's going on? What did you all do? Your sound is clear, crisp, and bright and the audio sound level is great now!!'"

"The music sounds great, and this box can be tweaked to anyone's preference. There is a lot to discover in this machine....but our single biggest achievement has been achieving the clearest, cleanest 'voice' I have ever heard come from an FM processor."

Real Comments From Real Users About VORSIS

Just wait until they get their hands on AirAura™



phone 1.252.638-7000
www.vorsis.com | sales@wheatstone.com

"I am extremely impressed with the unit's capabilities and how well it performs with our NPR talk/Classical format."

"What an amazing difference in sound quality!!! This is a brand new FM station and comparing it to the other new station in town using the Other brand of processor our client is louder, cleaner, and even legal. Wheatstone definitely has a winner here with VORSIS."

"This is a great sound and we are so, so pleased with our new VORSIS on-air processor. You just threw down the gauntlet to the processing industry with this new unit! Nobody can match a sound this loud, this clean, and this unique! Now everybody gets to chase after us for a while. Thanks VORSIS!!"

"Our signal used to virtually disappear in downtown New York when we went on night pattern because of the extremely high level of man-made noise. Now when we're on night pattern our coverage in downtown is actually better than when we are on day pattern, the other brand of audio processor and a 10X higher powered transmitter! We're buying a second one to put on our day-time transmitter!"

"You have to be kidding! I have NEVER heard FM audio sound this good, this detailed, this smooth, this clean, and this loud (how did you do it??). Very nice work!"

"Love the box!!! Overall the sound of the station is vastly improved. It's loud, wide and clear."

"I guess the only word for VORSIS is 'WOW'. It's got some great bottom end, and it's more transparent than any processor I've heard."

"The AGC/Compressor/SST combination is simply amazing. We play classical COs. Older classical COs were mastered at a much lower level than current ones. Announcers don't compensate and never will. Your processor is able deal with what amounts to probably 40-45dB (or more) "average" level variations and hold them perfectly in the sweet spot with virtually no squashing, pumping, sucking, or other usually audible artifacts of such wide range level control. In short it does its job perfectly every time."

"This box sounds much better than any other processor I have ever tried. Ever!"

"I love classic rock and it's the program format on the station that I own. No other processor that I've tried (and I think I've tried them all!) sounds as good on this format. We're nice and loud and still cleaner than the other stations in the market. We were surprised to hear the intentional dynamics of songs actually get on the air - other processors just flatten them out or turn them into a sea of mush. For the first time ever we're also hearing subtle nuances in songs that we used to think we knew every single note of. What an amazing air sound! No.... What an amazing processor!!"

"Your equalizers are actually useful and unlike other processors do not grunge-up the sound merely by enabling them."

"The SST algorithm is the least audible of ANY processor I have ever had experience with. I'm not sure how you did it or exactly how it works but its automatic "leveling" is excellent - no pre-processing whatsoever is necessary with SST."

"The high end of this processor is very open sounding - there is no fake "sparkle" with the HF EQ either. Perfectly clean and natural sound. And did I mention LOUD?"

"Finally! A processor that deals effectively and transparently with oversibilant announcers and audio levels that usually go all over the place! (I especially love the tweak-able multiband thresholds!)"

"Why haven't the other audio processor companies been able to make an AM box that sounds this good? I can't think of a positive superlative that is big enough to describe how pleased I am with our AM sound now. Our coverage seems to have increased by quite a bit too!"

"Our multipath is Gone! GONE! As an engineer I have difficulty believing a processor can make this much difference in apparent coverage area but the listening is the proof. We've had several listeners call and comment that their reception has greatly improved and even I've noticed vast improvements when driving through what were previously horribly multi-path prone areas. I'm not sure why, but it sure does work!!"

"This box has great metering and excellent analytical tools - you get good visual indication of everything that is happening inside."

"The unit's stability has been flawless, not even a tiny glitch. We have it set up to time-sync and it works great. The scheduler-based (and SILENT!!) preset switching is perfect! Unit sounds very accurate sonically and is very easy to set-up."

"We are now VERY unique in our audio. Compared to other stations in the market, we are as loud yet maintain legal modulation (at least 4 stations in our market run with 130%+ modulation). We're not "squashed" sounding at all and if you compare us with the other stations (all formats) we're clearly a dynamic and clean stand-out signal on the dial now."

NOTE: We aren't naming names because everyone who is reaping the rewards of sounding better appreciates their anonymity (with respect to the competition). We won't blow your cover, either.