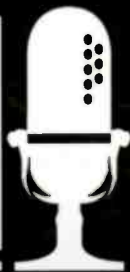


Radio



THE RADIO TECHNOLOGY LEADER

November 2008
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Vorsis is the first line of air-chain processors designed for today's 21st century radio listener. It's a complete ground-up rethinking of the tired and traditional approach that is inescapable with those well-known processors. Here we talk about a few of the innovations that make the flagship AP-2000 Spectral Dynamics Processor the incredible tool that it is. Many of these advances are shared among the entire range of Vorsis solutions.

Intuitive Interface and Operation

No processor can meet its full potential if it's not something that's easy to use or if the full

Think about having the full engineering control you've always dreamed of — being able to find the whispers as well as the screams in your station's sound, crafting an aural signature that's so good, so transparent, you will have people calling to find out how you do it.

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Vorsis completely rethought dynamics control — AGC and compression — and came up with a design that's intelligent AND amazingly flexible to control and shape your station's "sound."

Five-band AGC (four-band in the VP-8) ensures a consistent spectral balance. Vorsis' exclusive SST™ Sweet Spot Technology manages the behavior of the AGC in real-time so that



what the incoming level or era of the music.

Powerful Bass, Incredibly Clean Voice

Vorsis Bass Management System extracts and reveals the nuances in the program that are simply not heard in any

and use L+R to L-R signal ganging to prevent the image from wandering uncontrolled. It's already field-proven to manage wide discrepancies between the recording techniques of various eras (oldies to the over-mastered music of today) and even reduce multipath interference.

Surgical Limiting and Clipping

To some the idea of 31 bands is scary. Not to us. It's simply amazing what can be done with it. Limiting and clipping's primary purpose is peak control to increase loudness; the less audible in its action, the better. 31 bands allow surgical limiting — its dynamic operation is nearly inaudible to the ear so the resulting sound is louder AND cleaner. It also provides unprecedented opportunity to further fine-tune the sound. FM and HD/DAB have entirely different transmission characteristics, so Vorsis processors have completely separate limiting and final peak control sections for analog and digital broadcast.

Welcome to the 21st Century

Vorsis is the first processor designed for the needs of a modern radio station and its listeners. Visit the web to learn more and read our application notes and white papers. Call us to set up a demo today.

It'll make a HUGE difference in your station's sound AND your bottom line.



palette of controls are not accessible. The Vorsis GUI is designed for intuitive operation, from the front panel or remotely on your PC. No control is more than two clicks of the mouse away. The screens offer a logical layout with a virtual control surface above and monitoring graphs and meters below. You can see and hear the results instantly. Nothing is easier.

it always operates in its "sweet spot." The multi-band compressor, operating in concert with the AGC, provides unprecedented dynamics control. All operate in sum and difference — the highest signal controls the amount of processing. This is a completely new way to manage multiband dynamics to maximize the consistency of your station's on-air presentation — no matter

other radio processor. It puts deep pristine bass on the air without the distortions of common bass clipper technologies. VoiceMaster is a special Vorsis clipper management tool that has its own automatic processing chain dedicated to detecting and specially processing live speech signals, giving you the loudest and cleanest on-air voices ever.

Superior Stereo Enhancement

In rethinking Vorsis, it became clear that stereo enhancement HAS to be integral to the processing. It is, after all, a manipulation of the amplitude of the L/R difference signal that creates the perception of a wider sound field. With Vorsis, you'll get smear-free enhancement of the stereo image that can be as wide as you desire. But that's only the beginning — you can also control the stereo image width on a frequency-conscious basis

The Vorsis Lineup



AP-2000
Digital Spectral Processor for FM analog and HD/DAB
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- 31-band limiter/clipper



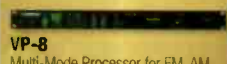
FM-2000
AP-2000 without HD/DAB section



AM-10HD
Digital Audio Processor for AM analog and HD
- 5-band dynamics controller
- 10-band limiter/clipper



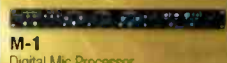
FM-10HD
Digital Audio Processor for FM analog and HD/DAB
- 5-band dynamics controller
- 10-band limiter/clipper



VP-8
Multi-Mode Processor for FM, AM, FM-HD/DAB, AM HD, MP3/AAC
- 4-band dynamics controller
- 8-band limiter/clipper



HD-P3
Production, HD, STL Processor
- 3-band AGC



M-1
Digital Mic Processor



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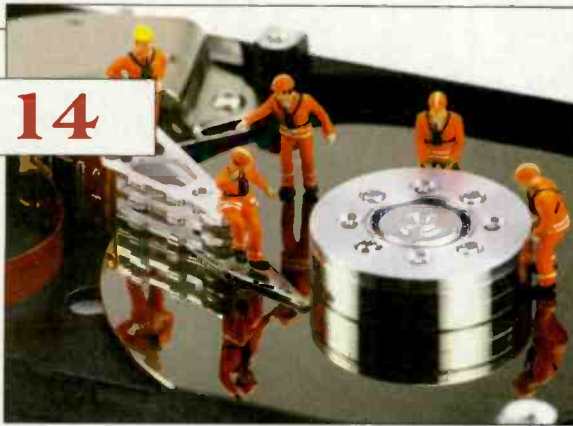
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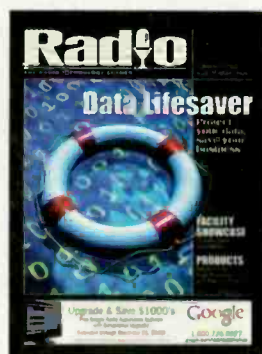
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ON THE COVER

Backing up and storing data is likely something we put off, which is a dangerous thing to do. Check out our story on page 14 for reasons to back-up now.

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Currents Online

Selected headlines from the past month.

NAB Names New Chief Operating and Financial Officer

Janet McGregor joins the NAB after 26 years at Lockheed Martin.

Radio Industry Veterans Join Nautel

John Bisset, Ellis Terry and Steve Schmitt leave Broadcast Electronics for Nautel.

Nautel Opens Office in Quincy, IL

The office expands Nautel's customer service team and presence.

Harris Recognized for Pollution Prevention

The National Pollution Prevention Roundtable recognized Harris and four other companies.

NPR Plans Captioned Radio Coverage of Presidential Election

The broadcast was coordinated by NPR, Harris and Towson University and rely on the data capability of HD Radio.

Dielectric Adds New Engineering Team, Expands Support

Dielectric's engineering team now includes Jim Chadwick and Gary Hazard.

Wisconsin Broadcasters Offers Broadcast Engineering Grants

Grants have been created to promote student internships and career fellowships in broadcast engineering.

Continental Electronics Acquired By Lone Star CRA

Lone Star, a Dallas-based private equity firm, purchased the 62-year-old company from New York-based Veritas Capital.

Broadcast Electronics Names Power as Manager, Mechanical and PCB Design

Eric Power previously worked for Dielectric as a product designer for four years.

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Site Features

Blog About Radio

We have two blogs dedicated to radio. *Talkback* is Editor Chris Scherer's view on events and issues in radio broadcasting. *Projects in Progress* is an ongoing update of a radio project. Right now we're following the WUVT transmitter project.

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The *Radio* magazine Forum is your stop for instant answers about radio. Join today and be a part of the discussion.

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Industry Events

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



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Rear panel of RoadWarrior LC



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Show support, get supported

We're in the middle of November, and most if not all the fall conferences are behind us. This year I attended the NAB Radio Show, the 125th AES and the Broadcaster's Clinic in Madison, WI. I like the fall conventions because of their smaller size, not just because of the reduced stress of the big show in April, but because the smaller conventions and conferences often provide a better chance to network. There are fewer exhibits, but that allows more time to talk to the exhibitors, talk to other attendees, and attend more of the sessions.

What's missing from the fall conventions? There are fewer sessions, and some are repeats from other shows, but they are usually worthwhile. And except for the AES, there are few new product introductions in the fall. Because the AES caters to the pro audio crowd and not specifically to broadcasters, the AES will have more new products on display. (I still wonder how many less than \$100 condenser mics we really need.) So overall, the fall convention experience can be just as valuable.

Most of the fall shows are regionally based, which adds the benefit of seeing people from your immediate area. You may see the guys from the next town at a monthly SBE meeting, but now you have a chance to attend a session together or visit an exhibitor's booth. This is a great opportunity to bounce ideas around.

This year, the larger fall conventions were held in Austin, San Francisco, Pittsburgh, Syracuse and Madison. I also know of some smaller but no less valuable shows in Columbus, Indianapolis and Anchorage.

When someone laments that attending the NAB Show in Las Vegas is too expensive or too far, I ask if he attends a regional show. Quite often a regional event is less than a 300 mile trip for many people, but the same excuse is given. "It's too far."

Does the event need to be held in your own back yard before you'll go?

This apathy has caused the demise of some previously popular events, like the SBE conferences

held in Seattle and Phoenix. I hope that one day they will return.

So while you may have missed your chance this year, I hope you'll take advantage of attending a fall convention next year. These conventions need your support, and you'll get something in return, so don't let the chance pass you by.

Not all the same

Waiting for the show to come to you is the tact of some traveling road shows I have seen. Some of these are very vocal about being purely educational, although it's easy to see through that disguise. Any opportunity to network with others in your profession is a valuable experience, and certainly take advantage of the situation, but take the program for what it's worth. Is it really an equal substitute for a regional convention? Even though it's billed as being educational and not a sales pitch, it is really providing a fair taste of the new technology, or a skewed perspective based on a pay-to-play business plan?

Some look more like Professor Marvel's caravan (that's a Wizard of Oz reference if you missed it) than an educational opportunity.

If it's all you can do to get to the event in your own back yard, take the opportunity. But don't ignore the possibilities of taking a little extra effort. The reward is much greater, and it's not flavored with some sweet-talking sales pitch.

Chris Scherer

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Photo: Jonathan Tichler/Metropolitan Opera



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Vertical radiators

By John Battison,
P.E., technical editor, RF

Broadcasting owes its existence to the works of Maxwell, Faraday, Volta, Ampere, Hertz and several other 18th century scientists. Their combined research showed us the way to develop today's broadcast system. Most of these men knew each other or were familiar with each other's work. In fact there was a certain amount of rivalry between them. In the days when this rivalry existed, an unknown friend with poetic talent published the following poem in Paris.

*Around the magnet, Faraday is sure that Volta's lightnings play,
But how to get them from the wire?*

*Ah! Take a lesson from the heart
'Tis when we meet, 'tis when we part
Breaks forth the 'lectric fire!*

Whoever this person was, he knew that breaking a circuit produced a spark!

From the fundamental laws developed by these scientists we have learned how to generate, control and direct electromagnetic radiation, which is

the heart of broadcasting today. However, sometimes we tend to forget some of the fundamental facts of electronic life involving radiation which, after all, are requisite for radio transmission. We talk about half-wave or quarter-wave radiators, their radiating characteristics and radiation efficiency, and it's quite easy to lose track of what we mean sometimes.

Maxwell developed two main equations that apply to most of our RF and audio broadcast operations in one way or another. He said a changing electric field will produce a magnetic field and vice versa. This is virtually the secret of

broadcast radiation. The changing RF current in the AM antenna produces a magnetic field in the area around the antenna. This in turn develops an electric field, which leads to another magnetic field and this phenomenon propagates itself through space. This apparently simple relationship leads to the creation of radio's essential induction and radiation fields.

One field, now called the induction field, is very important immediately around the antenna.

It consists of lines of force set up by the current and voltage in the antenna and contains only reactive energy because the two fields are 90 degrees out of phase. This field diminishes quickly and is approximately equal to the inverse square of the distance. Very close to the antenna the induction field is extremely strong and may induce very high currents or voltages in adjacent conductors. It is sometimes the cause of excessive interference immediately adjacent to a radio transmitter.

The field that we, as radio engineers, are interested in is the *radiation* field. It consists of an electromagnetic wave composed of lines of force that have become detached from the antenna. This field contains real power; both electric and magnetic fields are in phase and power is taken from the antenna and carried by this field. Its intensity is inversely proportional to distance and it diminishes far less rapidly than the induction field. Less than about a half wavelength from the radiator the two fields are equal. From here on the radiation field predominates and is vitally important for communication purposes.

For comparison purposes when discussing antenna efficiency it became necessary to establish a standard comparison value point at a fixed distance. The strength of a radio signal is measured in terms of the intensity of the electric field. It is the voltage developed in a wire 1 meter long in the parallel field of the signal. It is expressed in terms of volts per meter. Originally, a distance of 1 mile from the antenna was chosen. However, several years ago with the attempted national conversion to the metric system, the FCC decided to use kilometers in place of miles when comparing antenna. We presently seem to use a combination of metric and standard distance measurements, which can lead to errors if care is not used. I prefer to use miles rather than kilometers.

More power

One of the most important units in a radio transmitter engineer's daily life is antenna current. This is the measure of the RF current flowing in the antenna. Power is important to the station owner and he always wants more power. The only way to get more power is to increase the antenna current with a given antenna resistance.

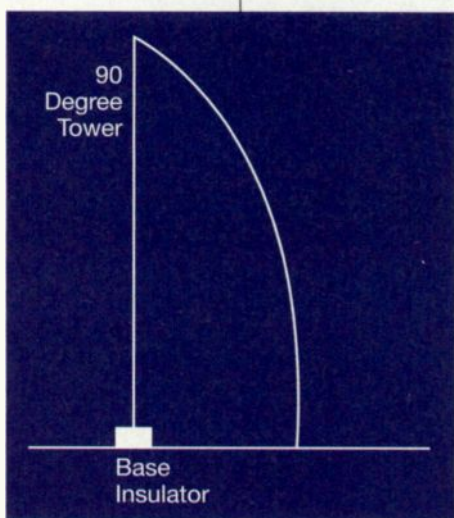


Figure 1. The current distribution across a 90-degree radiator decreases along the height of the structure.

Without resistance no power is developed. The equation $P = I^2 R_{ant}$ calculates the antenna power where I is the antenna base current, or the common point current in the case of a DA.

R_{ant} is the measured antenna or common point resistance, which includes ground system losses. The correct all-inclusive term is *radiation resistance*. It is commonly referred to as base resistance because that is the place where it is measured. Reference was made to base resistance, the proper term is base impedance because an antenna has inductive or capacitive reactance in addition to its very important resistance.

The most generally used broadcast antenna is the vertical radiator. Although it is commonly called a quarter-wave antenna, it is often several degrees plus or minus a quarter-wave in height. Sinusoidal current distribution is usually assumed and used in most antennas. However, occasionally measured antenna current distribution is required by the FCC in the case of unusual configurations.

An actual quarter-wave antenna will have approximately 37Ω base resistance and zero ohms reactance on its operating frequency. Immediate surroundings, as well as tower width, can have an effect on the base impedance.

The single 90-degree radiator actually operates with an imaginary 90-degree radiator below the surface completely separated from it. Figure 1 shows the current distribution at the base of the tower.

The important measure of a transmitter is its field strength at one mile. A 180 degree dipole has a resistance of approximately 73Ω . With 1 amp, two quarter-waves each with half the radiation resistance with 1 amp of RF will produce the same field strength, i.e. 37.4 mV/m. The power required is $I^2 R$ or $1 \times 1 \times 37 = 37W$.

If RF power is doubled, the field strength at a given point will increase by the square root of two. In other words, field strength increases by the square root of the power increase.

In order to match the tower's operating impedance to the 50Ω transmission line, an antenna tuning unit (ATU) is required. This is a network that transforms the 37Ω operating resistance to 50Ω and matches the $j0$ of the line and the measured antenna reactance. An L or a tee network may be used. I prefer a tee because it gives easier control of the match in my opinion, and this is often very important when tuning a directional antenna.

E-mail Battison at batcom@ohio.net.

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FCC clarifies “backfill” policy

By Harry Martin

When considering city-of-license change proposals, whether in the context of a minor change application or a rule making, FCC policy prohibits the removal of an FM channel from the community to which it has been allotted if such removal would result in the loss of the community's only local radio station, whether the facility is a commercial or noncommercial facility. In a recent decision the Commission ruled that this policy requires an actual licensed and operating station (rather than an un-built construction permit) remain available in the community if another station in the community wants to move out.

The new case comes from a small community in Texas, where the only station in town wanted to move to another town – so it could cover a larger area and population. A construction for a new noncommercial FM had been issued for the station's community of license, but the station had not yet been built. The station that wanted to change communities applied for the move anyway, arguing that the noncommercial “backfill” station was near completion and the spirit of the backfill policy had been satisfied. A waiver of the policy was requested in case the FCC disagreed.

a right to request a waiver, the staff determined the application was properly accepted for filing so the waiver request could be considered. And in the meantime, the noncommercial station had been constructed and had commenced operation, thus mooted the waiver request as well as the petitioner's argument.

This case could have gone either way. As of the date the community change was applied for, the proposal was defective, as was the waiver request. Here, however, because the backfill station had been fully constructed by the time the FCC got to the case, the defective nature of the waiver was considered moot and was overlooked. This hardly seems fair to the petitioner, but occasionally the FCC, as it did here, sees its public interest mandate more in terms of promoting new service than in adhering to hyper-technical interpretations of its rules and policies.

FCC acts against pirate stations

In September, the FCC issued orders and notices regarding nearly a dozen pirate radio stations identified by FCC agents. Most of the stations were using the FM band in locations in Florida, Ohio, Oregon and New York. Standard fines of \$10,000 were issued to those pirates.

While most of the pirates chose to operate in the standard FM broadcast band, one case involved unauthorized transmissions at 156.80MHz, a frequency in the marine band used by ships. Over a period of weeks, the Coast Guard responded to several false distress calls, and scrambled ships and aircraft to phantom emergencies. After multiple false alarms, the Coast Guard contacted the FCC to help determine the source of the false distress and mayday calls.

The FCC tracked the signal to a Largo, FL, trailer park where they learned that the local police had already arrested a 16-year-old boy. According to the police, in the boy's room they found multiple radios, a marine battery and a whip antenna. This resulted in incarceration in a juvenile facility. The FCC's \$18,000 fine against the boy was cancelled when the agency learned that he had been lacked up.

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

Dateline

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

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

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

A petition to deny was filed that argued that a newly-built CP is not the same as a licensed and operating station, and therefore the community-change application violated the backfill policy and should not even have been accepted for filing. The FCC's Audio Division agreed, holding that reliance on the un-built CP constituted an unacceptable backfill proposal. But since the applicant had



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DATA LIFESAVER

**How storage
and backup
will save your
business**

By Kevin McNamara

Data is a precious thing and will last longer than the systems themselves.

– *Tim Berners-Lee*

Without a doubt, we rely on data in virtually every facet of business and even in our personal lives. Music, pictures, video, financial data, e-mail – the list goes on. How this data is stored is largely determined by how critical the data is to the organization (or individual), and how long it takes to restore the data. Let's face it, in our society all data is critical, whether it contains corporate financial information or family pictures and videos.

Insight to IBOC

November 2008

Part of the Radio magazine DAB Answer Series

NPR Labs Weighs in on IBOC Coverage, Interference

By Mark Krieger, CBT

Recent publication and distribution of NPR Lab's Digital Radio Coverage and Interference Analysis Research Project (DRCIA) seems to reiterate a point once made by renown physicist Albert Einstein, when he suggested we ought to "make everything as simple as possible - but not simpler."

The comprehensive report, commissioned by the Corporation for Public Broadcasting in 2006 to answer question about IBOC DAB coverage, is a meaty piece of work. At almost 280 pages, it requires time to digest, which explains why project manager John Kean and other key NPR personnel have taken time to present their findings over an NPR closed circuit and at a Public Radio Engineering Conference in Austin, TX, just ahead of the NAB Radio Show.

According to NPR, CPB funded the DRCIA project with the primary goal of determining real-world coverage of analog FM and hybrid IBOC digital radio services, as well as interference occurring within and between both families of service. The study was recommended to the CPB in 2005, well before discrepancies in digital signal coverage had emerged as a significant issue in digital radio's rollout.

Laying the foundation

In their early phases of inquiry, it became obvious to NPR engineers that a better understanding of marketplace receiver performance was essential to building a profile of hybrid IBOC DAB coverage and interference issues. After testing and characterizing a sizeable number of both analog and HD Radio receivers, a mobile test bed was used to generate measured analog service coverage maps on a number of NPR stations around the country. Building on this work, researchers constructed similar field measurement sets using actual digital receivers and leveraged that data into the first predictive computer model for IBOC digital coverage.

Eventually, NPR Labs was able to generate both digital and analog coverage maps based on real-world receiver data and measured fields for 850 NPR stations nationwide - a remarkable achievement.

In addition, 75 of these stations had their digital coverage analyzed using both the normally

IBOC Around the World

By Doug Irwin, CPBE AMD

Those interested in the technology news of radio broadcasting are likely well aware that Ibiquty touts about 1,794 AM and FM radio stations in the U.S. now transmitting IBOC signals. Also, there are about 900 multicast signals being transmitted. So while HD Radio gains acceptance in the U.S., it is also making waves in other countries around the world. Let's take a quick trip around the world to look at more of the details.

Mexico's Comisión Federal de Telecomunicaciones (Cofetel) has recently authorized IBOC transmissions using the Ibiquty system for stations within 200 miles of the U.S. border. The official Cofetel statement can be translated to: "Considering the extent of the development and implementation of the IBOC system in the United States of America, Mexico is required to take decisive action so that the country's AM and FM radio stations in the zone located within 320km of the northern border of Mexico can transmit at the same technological level so that they can provide the benefits of quality service to the radio listening public."

Mexican stations that have purchased HD Radio equipment so far include XEEZ in Caborca, Sonora, and XHDL and XEDA in Mexico City.

Our Canadian colleagues have tested Ibiquty's HD Radio technology as well. A well-written technology review can be found

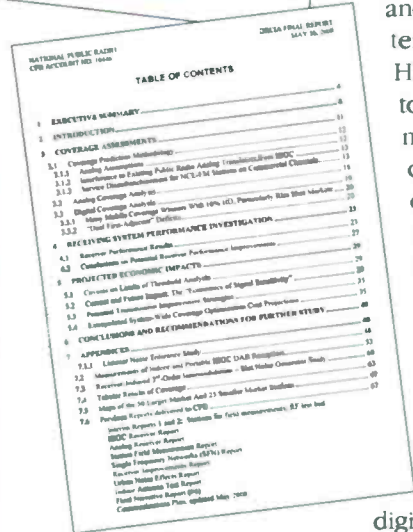
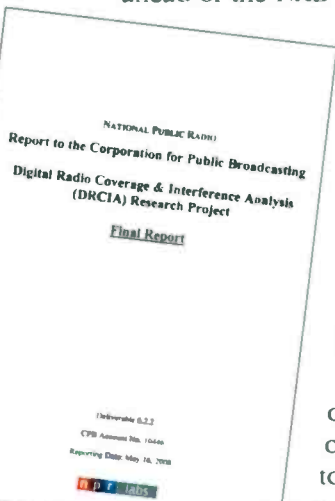
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Inside

Raised Awareness 6

A special supplement to

Radio
THE RADIO TECHNOLOGY LEADER



licensed value of 1 percent IBOC digital power, versus an elevated level of 10 percent. The latter level corresponds directly to an increase recently proposed to the FCC by the NAB and other interested parties.

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NPR Labs

Because the studies were detailed and relied on actual receiver data, an unprecedented multi-dimensional model of coverage based on analog/digital signal levels, as well as the effects of co-channel and adjacent channel analog/digital interference, emerged.

Findings

Among the points raised during the DRCIA project, one central observation stands out: Digital versus analog coverage ratios for IBOC hybrid stations are both individualized and variable, with interference playing a significant role in many cases.

Just as real-world digital transmissions don't operate in an RF vacuum, neither do digital RF components, particularly low-level sidebands occupying spectrum beyond traditionally defined channel limits. Thus, much of the variability in IBOC digital service coverage is linked to a couple key factors.

While raw field strength of digital carriers is important, the study suggests that first-adjacent channel interference is a significant player in the successful capture and decoding of digital signals. While FM IBOC digital signals can survive a considerable amount of interference from either an upper or lower 1st adjacent channel, simultaneous interference both above and below can degrade receiver performance by as much as an additional 10dB beyond that of a single interferer. This means that stations with short-spaced first-adjacent channels or in crowded urbanized markets may find their digital coverage well below expectation.

The DRCIA report looks at an IBOC digital signal's impact on adjacent channel analog reception as well. Even at current 1 percent levels, the interference potential of an IBOC digital signal for adjacent analog channels is significantly higher than that of an analog-only signal, while a 10dB increase in digital carrier power has a major impact on reception of adjacent channel analog signals. Tables of desired-to-undesired signal ratios for indoor, outdoor and portable receivers provided in the DRCIA final report make these points in striking fashion. One table is included here as Table 1.

Naturally, interference is only part of the overall coverage picture, and the DRCIA report goes a long way toward quantifying discrepancies between indoor vs. outdoor/mobile reception. Structure penetration creates a special set of issues for digital signals, as general findings of the report indicate that on average, current mobile digital coverage is about 85 percent that of the corresponding analog coverage, while indoor digital reception averages only about 38 percent that of analog. That's a gap that troubles many in the radio industry.

The report also introduces a number of less dramatic but significant points. Even though existing FCC rules covering adjacent-channel spacing and signal overlap were developed for an analog world, the amount of adjacent-channel digital interference that would result from universal FM

continued on page 6

IBOC Around the World

continued from page 1

in *CBC Technology Review*, July 2007. This article thoroughly reviews the technology, discusses how the test platform was built, and draws conclusions at the end. (Tests were carried out on CBLA-FM and CJBC-FM in Toronto). One such conclusion reads: "HD Radio technology is considered to be ready for operation in the United States. This service will probably be offered in Canada as well. However, current spectrum management regulations preclude the introduction of such service. Interference with existing analog FM stations is one of the issues the regulators will have to resolve when reviewing their spectrum management rules." The testing in Ontario went on between Aug. 30 and Dec. 20, 2006; and interestingly, the CRTC published notice 2006-160 addressing the implications of the use of the Iboquity's technology (among other things) on Dec. 15 of the same year.

Paragraph 55 of 2006-160 reads: "In light of the evidence presented in the course of this public proceeding, the Commission has concluded that, if the aforementioned issues can be addressed, particularly any potential interference to other stations, the use of IBOC technology, which enables the transition to digital without consuming additional spectrum and allows for the provision of supplementary program information and multicast services, could be considered for licensing." It should be noted that DRM was another IBOC technique under consideration by the CRTC.

Heading overseas

There is interest in Iboquity HD Radio technology in Europe as well. The European HD Radio Alliance had its first meeting in Lucerne, Switzerland, in October 2007. It probably isn't too much of a stretch to conclude the Alliance formed at the same location as the first HD Radio implementation in Switzerland: 88 Radio Sunshine.

Tests of the Iboquity system there were considered to be very successful, according to the station owners themselves.

Tests of the HD Radio system were also conducted in Paris by Towercast (a privately-held company that manages radio transmission facilities), NRJ Group and SIRTU, which is an association of some 120 local and regional broadcasters throughout France. According to Iboquity, though, the Ministry of Communications in France has excluded its technology from consideration as a means to "digitize" the VHF FM band there, in spite of claims by SIRTU (based presumably on the real-world testing results) that the technology would in fact work for that process.

One of Germany's privately held radio stations, Radio Regenbogen, began testing the Iboquity sys-

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

Insight to IBOC - a supplement to *Radio* magazine, November 2008, © 2008 Penton Media. All rights reserved.

IBOC Around the World

continued from page 3

tem last December. Testing of the system began in the Prague (Czech Republic) in February 2007, and in Poland at the beginning of 2006.

South of the border and east

South America has a considerable amount of interest in the HD Radio technology. According to Ibiquity, Continental Lensa, based in Santiago, Chile, became the first electronics manufacturer outside North America to be licensed to build HD Radio equipment. That may be in part because of the fast growth of HD Radio in Brazil. The Brazilian Alliance for Digital Radio is made of the major broadcasting groups there, including the Association of Broadcasters of Sao Paulo and the Brazilian Association of Radio and Television Broadcasters. One of the first stations to transmit HD Radio outside the U.S. is KISS-FM of Sao Paulo, which has been on the air since October

that the 370mW ERP was enough to provide a digital signal to 60 percent of the potential audience in Auckland. A further 12-month testing session was scheduled to begin in March 2007.

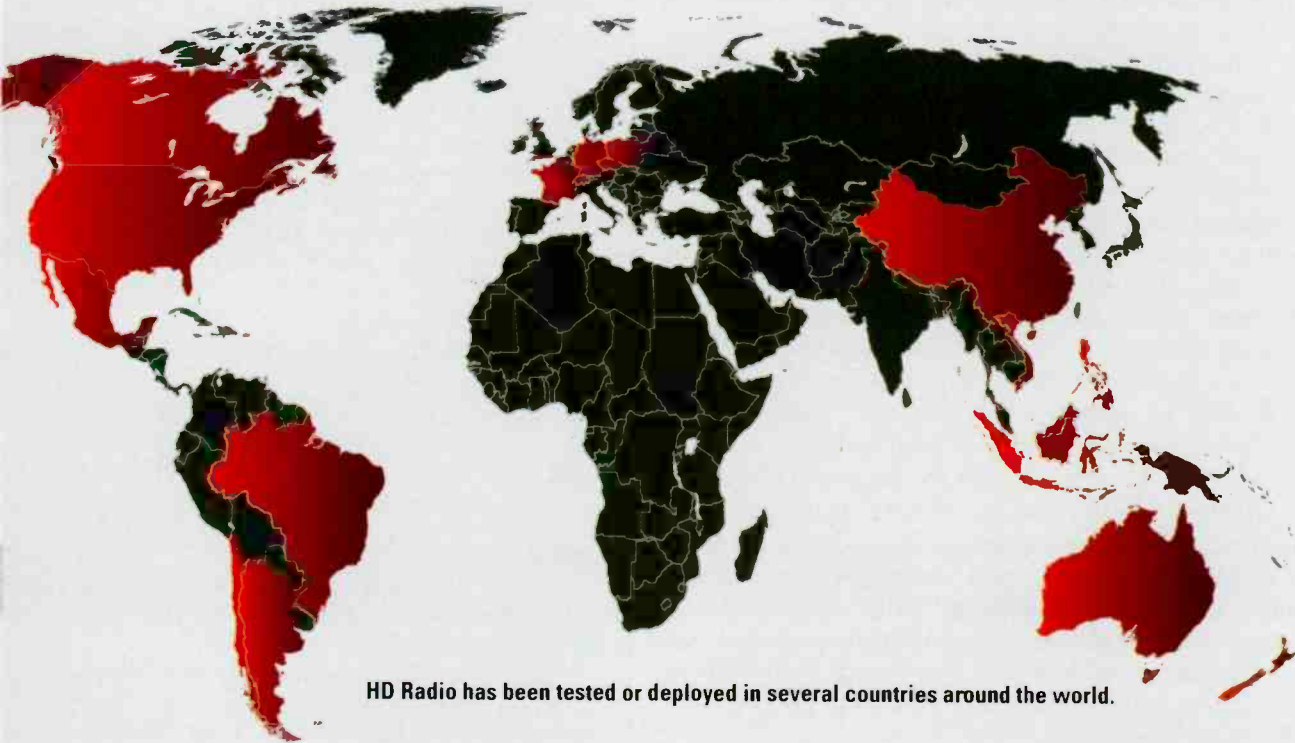
At least one test transmission of Ibiquity's technology has been carried out in Australia, and that began in September 2006.

Farther afield

HD Radio has come to Indonesia: Surabaya has its first AM HD Radio station on 1062kHz; Jakarta has JDFI-FM on 101.8MHz.

Metro Radio of Hong Kong demonstrated the HD Radio technology during the ITU Telecom World Conference there in December 2006. June 2008 saw the beginning of HD Radio transmissions in Hanoi, Vietnam.

Perhaps the biggest potential market for HD Radio is



HD Radio has been tested or deployed in several countries around the world.

2005. Now some 25 stations (AM and FM) are on the air throughout Brazil, providing HD Radio service to 30 million potential listeners.

Testing of HD Radio technology has been tested in Buenos Aires, Argentina, as well.

Turning our attention to the western Pacific, we see that HD Radio has generated a considerable amount of interest in that region of the world as well. The first HD Radio transmission in the Philippines occurred in November of 2005; however the first usage of the HD Radio technology in commercial radio began in 2006 when DWKC in Manila started testing its digital systems.

Testing of Ibiquity's technology has occurred in Auckland, New Zealand, from the Sky Tower. Initial results indicated

China, and testing of the system began there this past February, and is continuing throughout this year.

Historically the United States has been at the forefront of broadcast radio technology – first with AM, then FM and now with IBOC technology. Likely the cause of that is because radio has long been an important business in the U.S. – more so than any other country. The original idea behind the development of IBOC – making use of spectrum that was already available, but for digital modulation – makes complete sense to other broadcasters and government agencies the world over. The development and promulgation of HD Radio in the far corners of the world is good for the industry here in the States and shows that the business we all know has lots of life left in it. ▲

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NPR Labs

continued from page 3

IBOC hybrid digital operation at present levels would not be substantial, and would reduce coverage to indoor analog receivers by an average of about 6 percent. Only about 5 percent of FM analog translator input receivers would be affected, while mobile receivers would experience a negligible increase in objectionable interference.

But the digital/analog interference changes dramatically when a 10dB across the board increase of digital carrier is applied to a universal FM IBOC hybrid digital operation scenario. In such a case, analog coverage areas could drop by 26 percent on average, with 20 percent of stations losing as much as half of their current analog coverage. In return, digital mobile coverage would jump to about 117 percent of current analog coverage, while indoor coverage would be boosted to 83 percent of cur-

rent analog coverage. The result would be significantly improved digital coverage, but at a considerable loss of analog listeners. Surprisingly, commercial stations would suffer nearly as much as their NCE counterparts down the dial. And it's a trade off that NPR, regardless of their enormous investment in IBOC technology and infrastructure, appears flatly unwilling to endorse.

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The road ahead

As it turns out, the release of the DRCIA final report comes at a pivotal moment for digital radio decision-

Interferer	Analog		IBOC DAB @1%		IBOC DAB @10%	
	-60dBm	-70dBm	-60dBm	-70dBm	-60dBm	-70dBm
Cochannel	34	31	34	31	29	25
1st-adj.	-9	-8	12	10	21	20
2nd-adj.	-51*	-57	-50	-57	-50	-52
3rd-adj.	-51*	-60*	-50	-57*	-50	-52

Table 1. Comparison of desired-to-undesired ratios for mobile receivers at 40dB weighted quasi-peak signal-to-noise ratio. Measurements marked with an asterisk are estimated values due to ranges beyond the test bed capabilities, excessive receiver instability, etc.

Sample and Hold

Raised awareness

By Chriss Scherer, editor

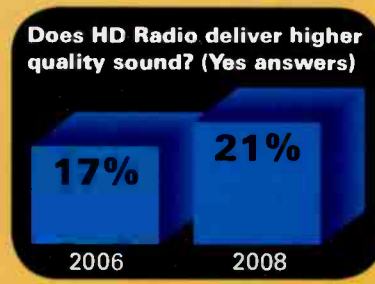
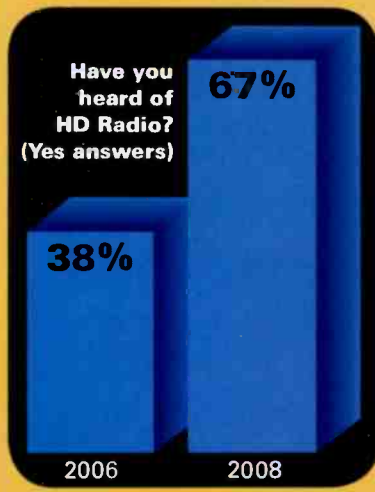
The HD Radio identity crisis is seeing some improvement. A September 2008 research effort by Mark Kassof and Co. reveals that 67 percent of 18-64 year olds have heard of HD Radio – compared to a similar study from 2006, which showed that 38 percent of people had heard of HD Radio.

Why the change? The study does not explore the specific reasons, but it is likely that the promos being run on radio stations are at least getting the HD Radio name in front of consumers. I have also seen articles on and mention of HD Radio receivers in consumer publications, including local newspapers and Popular Science.

With the improvement in recognition comes an increase in understanding of some aspects as well. Now, 21 percent of respondents indicate HD Radio delivers higher quality sound, versus 17 percent in 2006. Also, 8 percent now volunteer that HD Radio delivers more stations or choices, versus only 1 percent two years ago.

But with the good news comes some bad news. This recent research also finds continued misconceptions about HD Radio. In 2008, 7 percent indicate HD radio is satellite radio compared to 3 percent who said that in 2006. And 3 percent of the respondents think they receive an HD Radio signal even though they have not purchased an HD Radio-capable receiver.

And the consumer outlets that mention HD Radio are spreading the word, but many of them still refer to HD Radio as high-definition radio, despite the disclaimer that Ibiquity includes in its press releases: "Note to editors: "HD Radio" and the HD Radio logo are proprietary trademarks of Ibiquity Digital Corporation. All other trademarks are the property of their respective owners. The "HD" in HD Radio is part of Ibiquity Digital's brand name for its advanced digital AM/FM system. It does not mean hybrid digital or high-definition digital; both of these are incorrect."



Source: Mark Kassof and Co., 688 telephone interviews in the U.S. conducted from Sept. 4-7, 2008.

makers at the FCC. While the study casts doubt on a one-size-fits-all approach to digital coverage improvement, such as an unqualified 10dB increase of digital carrier power, it does suggest a number of individually tailored solutions. These include the use of new technologies, such as single-frequency networks, which can be used locally to exclusively boost the field strength of digital carriers and sidebands, providing coverage fill in problem areas, such as downtowns and office parks. Other suggestions include the use of directional antennas on digital signals only, relying on space combining to control digital signal patterns independently from analog. In every case, digital signal improvement would likely involve an individualized approach to coverage studies using a new, more sophisticated set of analytic and measurement tools.

In conclusion, the DRCIA final report has answered a lot of questions about IBOC digital coverage and its relationship with analog FM signals in a hybrid environment. Yet it also poses some new questions for industry and the FCC. Will the NRSC now be asked to take up the complex task of drafting standards and procedures for a digital signal upgrade path? If not, how can the Commission establish new rules that best enhance digital service, while protecting a vast majority of listeners still relying on analog FM service?

NPR Labs and the CPB have made a great contribution to the science of IBOC digital broadcasting with the release of the DRCIA final report. How effectively that knowledge can be put to use is left to our industry, working in close cooperation with an informed and open-minded FCC.

Read the full report at www.nprlabs.org/publications/reports/200807151043-DRCIAFinalReport-Full.pdf

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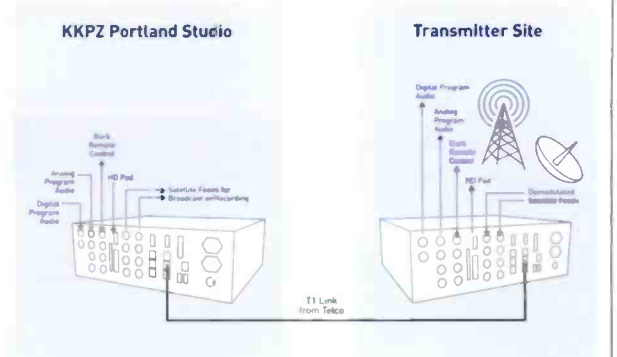
As well as linear audio and MPEG L2, the WorldNet Oslo also supports 16 or 24-bit Enhanced apt-X® offering cascade-resilient, near-lossless audio quality with under 2ms delay.

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"At Crawford Broadcasting, we are currently running the WorldNet Oslo in two markets, Portland and Detroit.

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In Portland, the station's satellite receivers are located at the transmitter site and so, in addition to the STL functionality, the WorldNet Oslos are also serving as multi-channel backhaul, bringing demodulated satellite feeds back to the studio for air and recording for later broadcast.

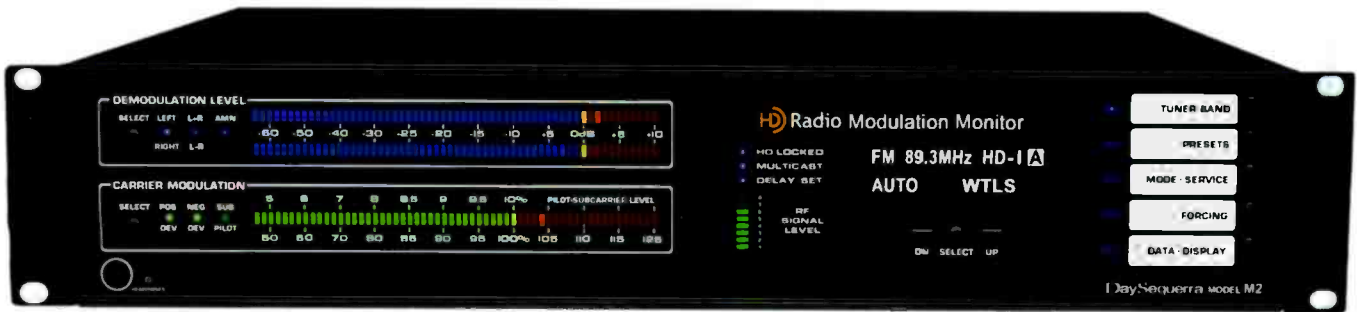
We're running Enhanced apt-X® coding which ensures our multiple channels of audio and data will fit easily in the T1 link without compromising the quality of our output. Additional card capacity in the units also enables us to run back-up feeds to the transmitter should the primary source fail.

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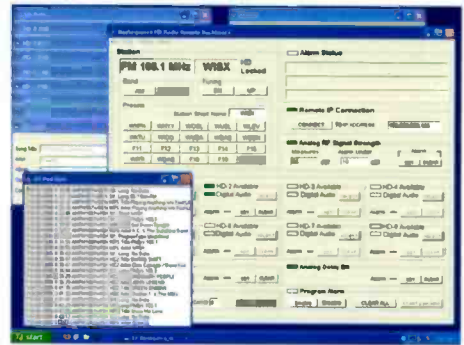
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DATA LIFESAVER

There are numerous published statistics, but the bottom line is that it is inevitable you will experience a failure causing a partial or total loss of data. In a broadcast environment, this could also mean interruption, or possibly complete loss of programming content. The good news is that there are several effective methods to back up data and the cost to implement some of them are well within the budget of a small business or individual.

SAN

The storage-area network (SAN) is the best solution from a data recovery and high availability standpoint, but it is also the most expensive and complex to implement. It is defined as a high-speed network of storage elements. In simple terms, imagine you have a PC with its hard drive located somewhere else. While you could achieve this over a traditional Ethernet network, performance and reliability would certainly be compromised due to constraints imposed by common networking technologies. SANs are dedicated high-speed networks optimized to transfer data with high reliability and very low latency.



It is inevitable
you will face a
failure causing
a partial or total
loss of data.

A minimum SAN is comprised of an array of storage devices interconnected to a server through two SAN switches.

The SAN data is transported over a network called the fabric. A basic SAN utilizes at least two fabrics, essentially two diverse network paths for redundancy. The real power of a SAN is that the fabric can consist of virtually any of the common transport methods utilized in traditional networking; however, the most common implementation utilizes optical-based fibre channel. It is also possible to locate the storage devices off-site using some form of Layer 2 protocol-based wide area network (WAN) transport technology such as ATM, Sonet, T1/T3, DSL, ADSL, etc. WANs utilizing frame relay would not be a good choice as it utilizes the Layer 1 protocol and, as such, is subject to delays and possible loss of data integrity.

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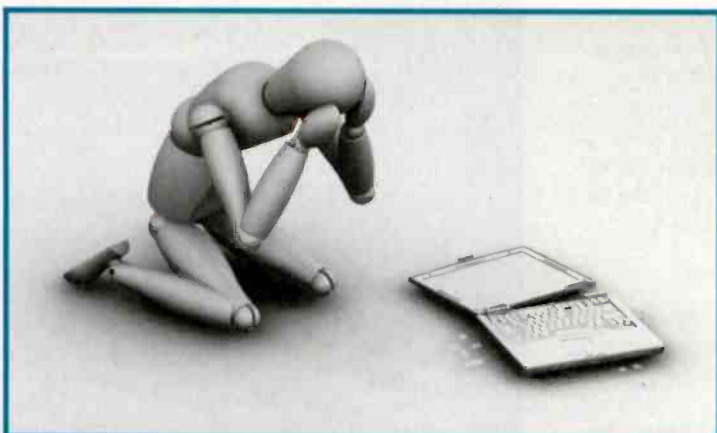
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DATA LIFESAVER



Stats to keep in mind

- In a 2007 Datamonitor study, one-third of IT executives believed a major data-loss incident would cause the company to go into bankruptcy.
- In another study, 93 percent of businesses that lost data for 10 days or more ended-up filing for bankruptcy within a year; 50 percent of those businesses filed for bankruptcy immediately.
- Based on a study by Dell and the Ponemon Institute, 12,000 laptops are lost in airports each week; two-thirds of these are never returned. Recent statistics from the FBI claim a laptop is stolen every 12 seconds and, once gone, there is only a 3 percent chance of return.
- Surprisingly, there is not a lot of substantial research on hard drive failure, but some studies indicated that as many as 14 percent of hard drives fail each year. Contrast that with manufacturers published mean time before failure (MTBF) specifications that indicate failure rates below 1 percent.

Hardware devices called host bus adapters (HBA) are added to the servers. HBAs provide the interface between the fabric and the server, as well as facilitating any digital (i.e. optical to digital) conversion processes. In addition, the storage devices utilize a storage processor (SP), which handles all the interfacing tasks between the storage device and the fabric. The SP also manages the configuration of the disk arrays within the storage device.

Due to the fast access, high reliability and high availability of a SAN, chances are you may already have a SAN-based disk arrays as part of your audio storage system.

If the SAN is connected with an optical fibre-channel backbone, the system will also benefit from the natural isolation from lightning and other electromagnetic induced disturbances found with copper cable systems.

NAS

Network-attached storage (NAS) is the easiest and cheapest method to implement dedicated shared network storage. As the name implies, NAS is simply a server exclusively dedicated to file sharing across a network.

The server in this case can be as simple as an old PC configured with the operating system, or a stand-alone device housing a single disk drive or array of drives. It also serves to manage the network connection and user access functions.



Designing a reliable backup storage system

- What data will need to be accessed and/or backed-up?
- How much storage is necessary?
- How many users will need access?
- Transfer speeds, especially if applications and other data will be accessed directly from the remote disk drives.
- Where will the remote drives be located? In the same building, offsite, etc.
- What is your budget?

Of course, each situation is different, but these are a good starting point for your plan.

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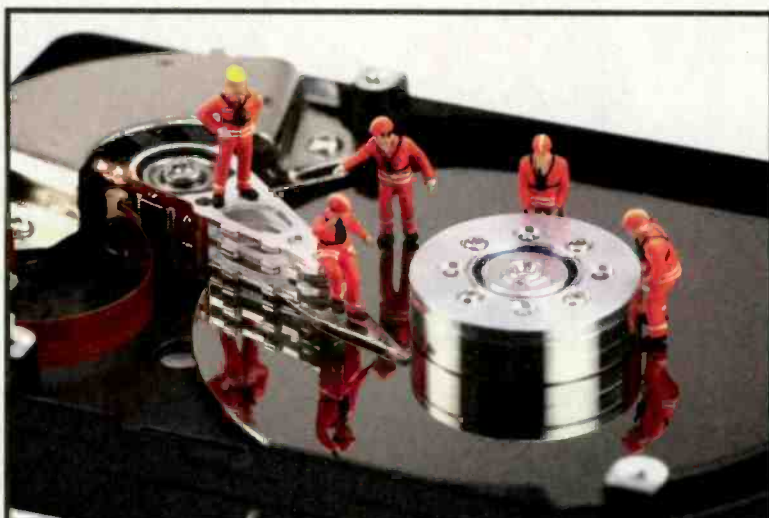
Eventide is a registered trademark and MicroPrecision Delay is a trademark of Eventide Inc. ©2005 Eventide Inc.

The cost of dedicated NAS has dropped significantly over the past two years. It is not unusual to see NAS devices with 1 terabyte (TB) of storage for under \$800. There are a number of different flavors of these devices, including those that provide everything but the disk drives. These are good choices, if you want to select your favorite drive type or already have some unused drives that can be repurposed. These frames may permit a mixture of 3.5" and 2.5" drives; however, most are designed for one or the other type only. Also pay attention to the interface types supported; for example, most new NAS devices support SATA or SCSI, but older IDE interfaces may not work. Setting up one of these NAS devices is fairly simple: assign an IP address, define user access rules and make sure the appropriate PCs on the network are configured properly to see the drives. If the network has a firewall configured, you may also need to open up the appropriate IP address and ports as necessary.

Now, let's say you have little or no budget, but still need to have some network-attached storage. Look no further than your stash of older PCs taken out of service. Did you know these make excellent NAS devices? Yes, you could always set up the file sharing on an unused (or even a used) PC so files can/are/will be shared with others across the network, but this has problems: 1) The PC operating system is managing a number of functions, not just the file sharing, therefore the end result of being slow, 2) If someone else is also using that PC, it gets even slower, and 3) PC operating systems tend to lock up easily when memory resources are taxed, thus access to the drives will be impossible.

The solution to this problem is to reformat the drive in that PC and load a dedicated NAS operating system. There are several of these to choose from and most are free. A program called Free NAS can be downloaded at www.freenas.org; this is one of several open source programs that turn a PC into a dedicated file server. Others include Open Filer (www.openfiler.com), Sun Open Storage (www.sun.com/storage/openstorage) and NAS Lite (www.serverelements.com).

Most of my current projects require that I setup a temporary office when managing large deployments of cell towers. I use Free NAS to enable file sharing and storing of project data between my contractors, customer and other disciplines with excellent results. The actual network operating system is very small and can fit on a flash drive, or any other drive for that matter. You can use



Recovering Lost Data

Having a good backup system and process is critical, but what happens if data is lost? A 2007 Harris study revealed the following:

- 38 percent of data loss is due to drive failure, 30 percent of that is due to drive read issues due to corrupt or degraded media
- 13 percent due to corruption due to software or viruses
- 12 percent due to human error

Of course, this doesn't include fire, water damage, physical destruction, electrical destruction and theft. Other studies indicate of all data losses, only 80 percent of recovery is possible in most cases.

just about any PC (Pentium 2 or higher recommended) with a minimum of 96MB of RAM. If you want higher performance, or will have more users accessing the server, it is recommended that you use a more current processor and increase the RAM. Free NAS, as well as most of the other open NAS software, also supports multiple drive configurations including RAID. Setup is a breeze and it works great! The documentation is well written and will get you started quickly.

Here is an idea: if you have a laptop or two sitting around (P2 or higher,) reconfigure them with Free NAS. Then you can load them with all (or portions) of your music library. They could be used along with a network of other laptops to create an emergency backup in the event your facility suffers extreme damage. This type of network can also be used for long term remotes where having data handled on a local server might make sense, i.e. database for a telethon, bit libraries.

Data recovery

While the subject of data recovery can fill a separate article, you should be aware there are methods to recover data that go well beyond commonly available recovery software. This software may be effective on data that has not been overwritten with other data and on drives that have not suffered physical damage. Beyond that circumstance, you should be aware that there are companies that specialize in repairing hardware damage such as replacing new heads, drive electronics,

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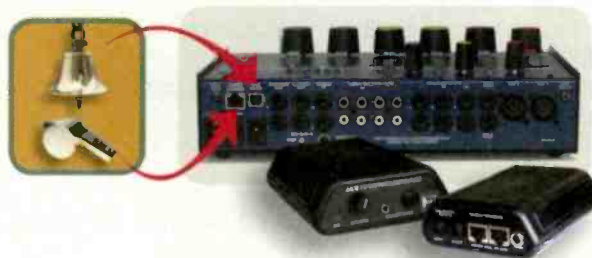
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servos, etc. For more complex repairs a few companies specialize in forensic recovery of information. These are the same companies used by the government to gather information from drives so they can prosecute bad guys. They are expensive and not 100 percent likely to be successful, but if you really need to get the data, it may be worth the expense.

One final note, make sure your drives are formatted as NTFS or XFS, as opposed to the traditional Fat 32 format. These formats utilize a concept called journaling, which create restore points over time. You may be able to roll-back these drives to a point before the crash occurred, thus only losing data from the current day back to the restore point.

The bottom line here is to make sure you have a good backup system and make sure there is a process in place to ensure the backups are timely and the integrity of the backup data is routinely checked.

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



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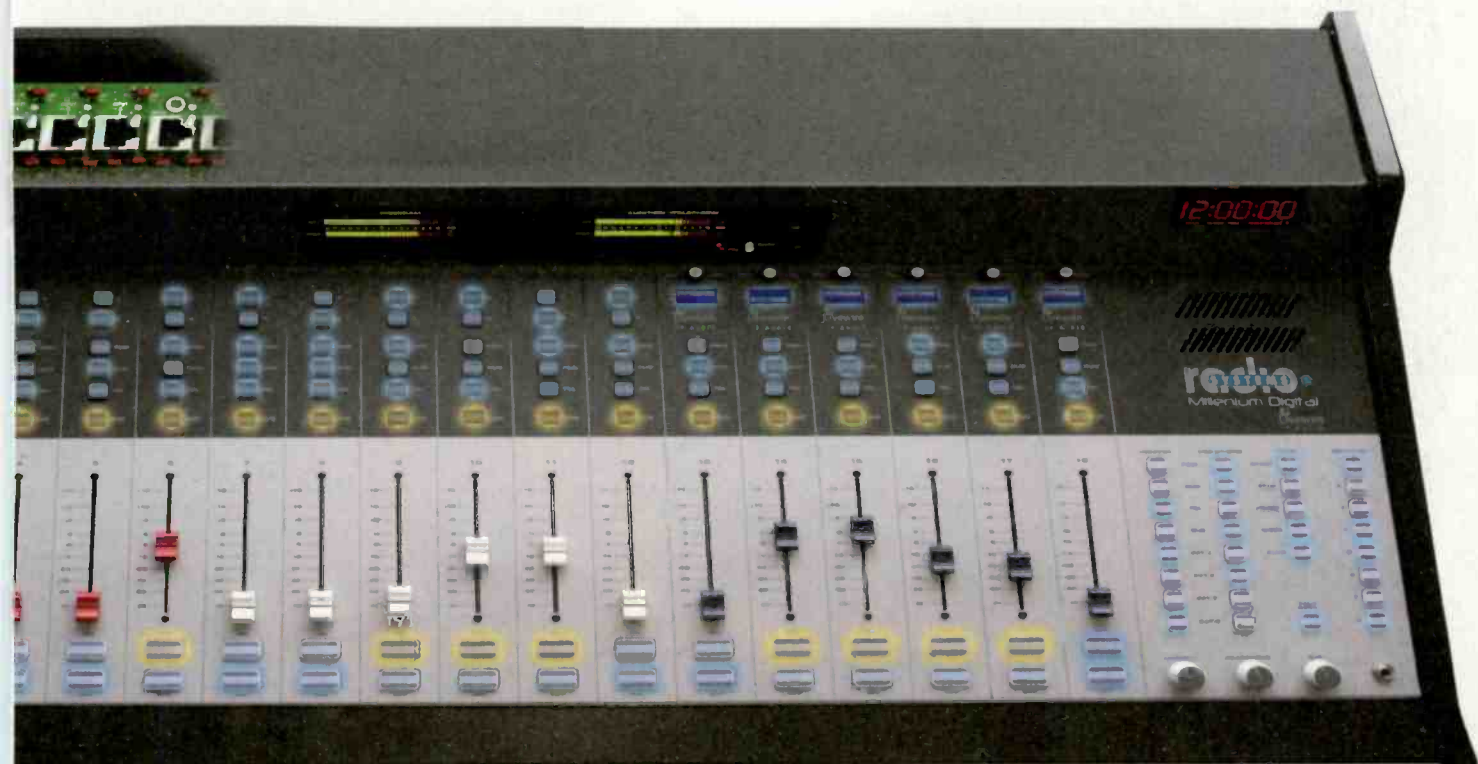
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Dave Ragone and Scott Padgett are the morning hosts on 93.9 The Ticket.



EYE ON RADIO

By Jake Robinson

Sports talk radio becomes sports talk TV

In today's ever-changing content environment, an engineer needs to be prepared for any request that comes their way. The latest HD Radio equipment, streaming technologies, alternative content systems and the ever-evolving IP audio revolution is enough to keep any skilled engineer on their toes. So what does one do when asked to design and build a TV studio right in the middle of his radio station? Run with it. That's exactly what Cumulus Media-owned WQKC-FM did. This past September, engineer Rik Pike and I turned WQKC 93.9 The Ticket into a fully functional TV studio.

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The Ticket is a high-energy, locally focused sports talk radio station in Louisville, KY. It is home to a fast-paced talk show hosted by nationally known athletes, Kentucky sports heroes and local celebrities Dave Ragone and Scott Padgett. Every morning Dave and Scott bring

a unique take on the sports world to the Louisville and Southern Indiana airwaves. The station partnered with Cascade Media's CW network affiliate, WBKI-TV to simulcast the show on television.

The show would originate from the existing WQKC air studio. The medium-sized studio was already built around Graham Studios Radius-XP furniture in the traditional U-shaped configuration. The board operator or show producer faced the three talent microphone positions. All LCD touch-screens and monitors were mounted on Ergotron arms for ideal positioning. This type of studio layout allowed for excellent eye contact and interaction between the personalities. Because the furniture was an island design, it also provided easy access to wiring. Adding a TV show to the mix would however, prove to be a difficult task. The limited floor space did not allow for any tripods or camera mounts and four other live shows needed to broadcast daily from the studio without interrupting their workflow. A TV producer workstation



From this view, this looks like any other radio studio.

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The four cameras are mounted out of the way and are barely noticed.

needed to be constructed, and the show needed to be delivered in real-time to WBKI-TV. The engineers from both WQKC and WBKI-TV put our heads together to come up with a plan that satisfied the needs for both the radio and TV stations.

Robotic mounts

In the air studio we chose small footprint cameras with RF-controlled robotic mounts. These were installed high on walls and on top of the equipment countertop rack. Three of the cameras were used for close-up shots, however one was fitted with a wide-angle lens for a bird's-eye view of the entire studio. The robotic mounts allowed the TV producer to be the camera operator and obtain different shots without being in the studio. Full wall-to-wall graphics with station and sponsorship logos were positioned directly behind the hosts, providing a backdrop for the set that included a wall mounted 42" LCD TV. To enhance the show, LED lighting was chosen for its brightness, low power and heat requirements. It was important that all video and control cabling was out of sight and hidden from any camera shots. Standard construction cable TV-type wall plates gave the install a clean look. Quality LCD wall mounts and hidden receptacles added to the design. Finally, a smaller 19" LCD TV was installed on

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the side of the countertop equipment rack to provide the hosts with a preview video feed.

For the video control point, a cubicle formerly used for call screening was removed. This sat directly outside the studio and provided the space to build a complete video control center. An Omnitax Presto workstation was

chosen for its small footprint, dual four-space equipment racks and countertop for video monitors. A Panasonic WJ-MX30 digital A/V mixer was chosen as the primary controller for video and camera sources. Two Lietech Xpress 12x1 video routing switchers were installed to accommodate for all of the video sources. Ikegami rackmount quad LCD screens provided individual camera preview shots. An Ashley LX 308B line-level audio mixer was used to provide the video producer with audio monitoring selections. Two standard DVD players and a Dell PC with a composite video card were used to provide additional graphics and video footage. Plenum-rated RG-59 cabling and Canare true 75 ohm BCP-C1 BNC connectors helped provide clean video signals at all connections. A Telos Switch Console with Assistant Producer software was installed at the Dell workstation and provided the call-screening needs of the station. The workspace ended up providing easy and ergonomic operation by one or two people.



The TV producer station is in the adjacent room.

Simulcasting

To deliver the video and synchronized audio to WBK-TV, a pair of Terrawave Communications TV-400 IP-based STL transmitter/receivers were used. The Terrawave accepted a standard-definition video input, balanced stereo audio inputs and converted the media to IP. Because the STL was bi-directional, a confidence return feed was delivered back to WQKC

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The static camera on the back wall provides a view of the entire studio.

via the TW-400 outputs. To handle the bandwidth requirements, a 10MB synchronous point-to-point fiber circuit was constructed by the local telecom company and installed with Cisco 2400 routers at each end. The signal quality was excellent and delivered in real time with extremely low-latency.

One of the difficulties of simulcasting the live show was handling local content. Each station needed to run separate local commercials, liners, news-feeds and promos. To achieve this, we treated the TV station like an affiliate. A mix-minus was set up, providing the TV station with only the program material it needed. Liners and radio-only audio elements were excluded from the mix. WQKC uses the Broadcast Software International and Cumulus developed automation system, OpX to

generate relay closures that would trigger the TV stations commercial breaks.

The plan was to extend these closures over the STL to WBKI-TV; however, a small problem arose when we discovered there wasn't any available bandwidth to send them separately as a data channel on the Terrawave. Instead, the program audio was fed through a pair of Circuitwerkes SEN-6 Subaudible tone encoders. These would trigger the TV station breaks by placing relay closure commands to activate the subaudible tones in the automation playlists at the exact time of the radio commercial breaks. The Circuitwerkes encoders would inject the tones at low level into the program audio delivered to WBKI. At the TV station a Mueller T25-35SA subaudible tone decoder was installed to decode the tones and trigger the breaks. The result was a flawless and completely synchronized video and audio feed that met the needs of both stations.

Merging radio shows and television isn't always an easy task. The end result can be very rewarding, as it was for WQKC-FM and WBKI-TV. Delivering the functionality needed for a quality television product while not intruding on a busy radio workspace was an important aspect to the design and installation. In the end, they met the challenges and needs of the constantly evolving content environment while most importantly, keeping the listener and viewer in mind.

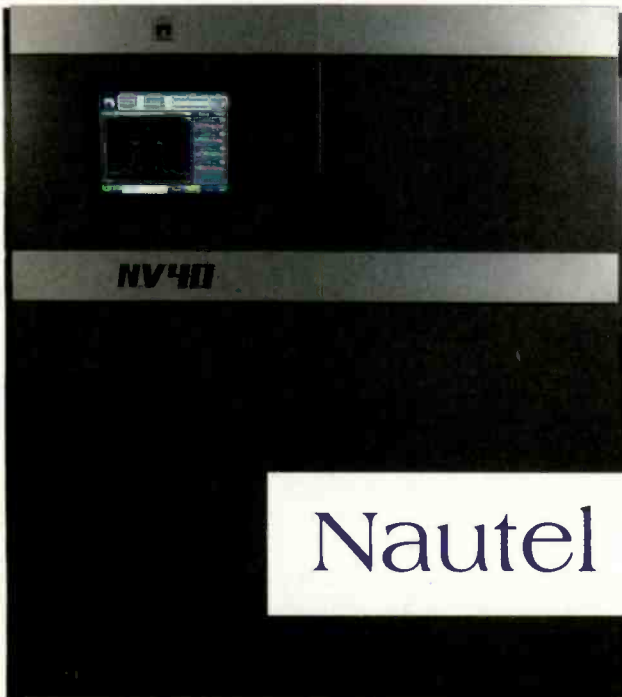
Robinson is the manager of engineering and IT for Cumulus Media, Indianapolis, IN and Louisville, KY.

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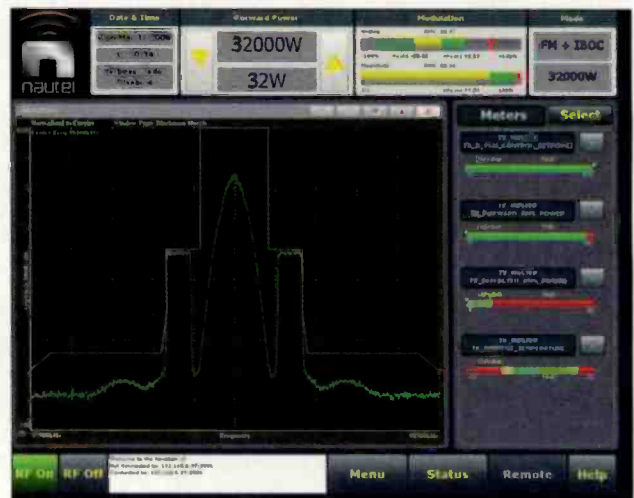
Nautel NV40

By Mike Woods

Nautel's design philosophy for RF transmitters has always been to use solid-state technology. The improved redundancy and safety associated with multiple parallel amplifiers is obvious; the primary challenge in designing solid-state products has always been economics-related because the cost of solid-state is proportional with power whereas as tubes are not. For many years, 10kW has been accepted as the practical economic threshold of solid state but the momentum of HD Radio at increased power levels enticed us to challenge the norms. We wanted to design a solid-state 40kW unit that would rival tube systems' prices but provide HD Radio readiness and all the redundancy associated with Nautel broadcast transmitters. Rack size, weight, cost and serviceability were just a few of the issues on the design considerations list as this product entered development.

Design of the Nautel NV40 transmitter began in 2006 and was completed in early 2008; the transmitter was introduced to the market at the 2008 NAB Show. The NV40 offers 44kW maximum power (analog). Its footprint is half that of comparable transmitters, while including an integral exciter with adaptive pre-correction. The unit's linear broadband design allows the exciter to select the required presets for operating frequency and output power level, enabling the transmitter's use anywhere in the FM band. The product also offers advanced instrumentation and management via a user-configurable front panel touchscreen. The transmitter is digital-ready, allowing a simple plugin upgrade to the HD Radio Engine.

A 40kW transmitter manufactured with old technology would be at least 120 inches wide; the NV40 is about half that at 65" wide. Our major goal was to make the technology cost go down to the end user while making the package the smallest in the industry. One major challenge in reducing the size was the combining and packaging of the cooling systems and amplifiers and putting them into a small enough space. To achieve this, we designed a power module with eight amplifiers, each providing about 375W, for 2,500W nominal power and 3,000W maximum power per module. The module is slim, providing a single RF input, a single RF output and cooling fans/heat sinks all in the same module. This transmitter has 16 RF power modules comprising a total of 128 amplifiers, for a total of 44kW in analog mode.



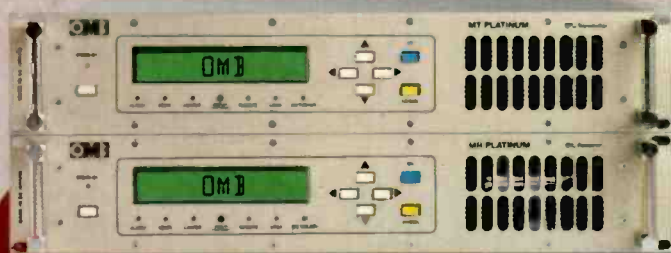
The advanced user interface (AUI) can be used across both AM and FM platforms.



FM TRANSMITTERS

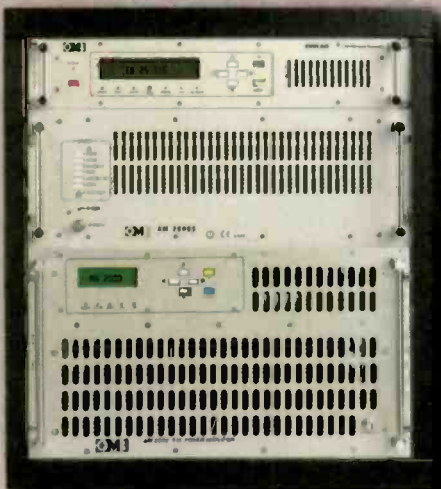
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EM 2000

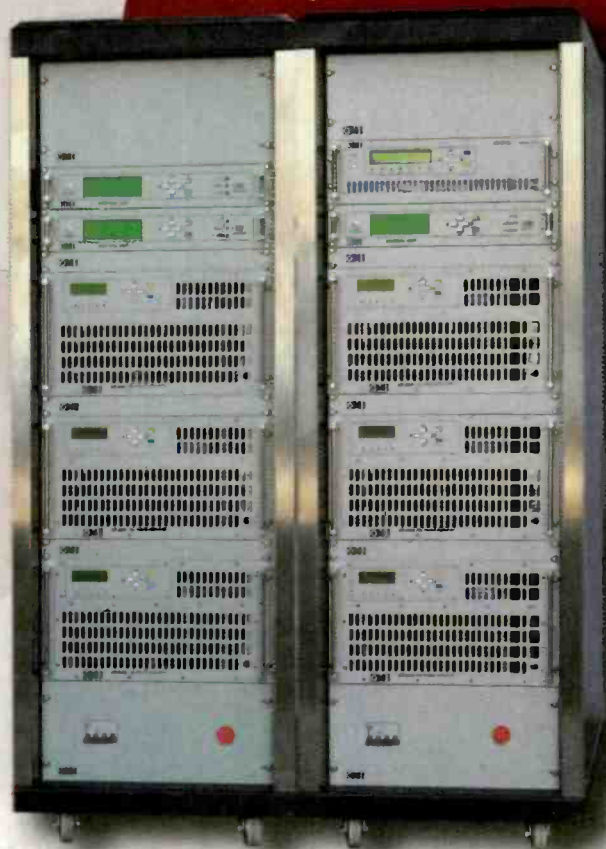
is a 2000W FM transmitter made up of the EM 25 DIG exciter (or EM 23/30 exciter) and the AM 2000 FM amplifier. AM 2000 includes eight 300W high-efficiency MOSFET technology amplifying modules, led by 2 independent switching power supplies, which are made to withstand the working conditions. The amplifying modules work independently thanks to a power combining structure that provides high isolation between them.

EM 10000

is a 10000W FM transmitter made up of the EM 25C COMPACT DIG exciter and three control units which combine the power of six AM 2000 FM amplifiers. AM 2000 includes eight 300W high-efficiency MOSFET technology amplifying modules, led by 2 independent switching power supplies, which are made to withstand the working conditions. The amplifying modules work independently thanks to a power combining structure that provides high isolation between them.

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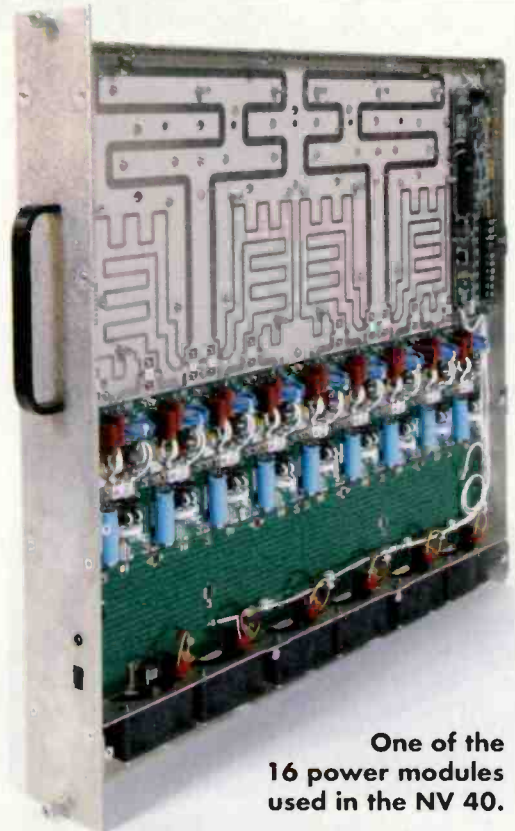
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The combiner was another challenge for us. Rather than re-invent the technology, our innovation came in the execution of the combiner including the connection of the hybrid coupler devices, again with the goal of optimizing the overall size. Our engineers came up with a scalable combiner that combines power amplifiers and matches impedance (many 50Ω inputs to one 50Ω output) to a 10kW harmonic filter. We use four of these filters in the NV40 and can use them to easily create a variety of other power output levels. This streamlines things considerably in both engineering and production, with the benefit to the end user of helping to keep product costs attractive across the entire line.

The power supply was another way we improved this product. Tube transmitters use a single, heavy, iron power supply. In this transmitter, we can use switch-mode power supplies and scale them to the required level. This keeps the weight down and reduces shipping costs. All the low-voltage power supplies are fully redundant, and everything is hot pluggable, allowing for fast swap-out if needed. Two power supplies are provided for each RF module, with each supply operating four amplifiers in the module.



One of the 16 power modules used in the NV 40.



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Taking control

As the NV40 was being designed, we were also working on the new NX family of AM transmitters. This parallel design allowed us to create an advanced user interface (AUI) that could be used across both AM and FM platforms. Characterized by a large touch screen display and embedded instrumentation along with metering and status indication plus a TCP/IP interface, this GUI serves as the dashboard for the transmitter. One key feature is the built-in spectrum analyzer. It isn't the first time a manufacturer has added a spectrum analyzer to a product, but in addition to monitoring the exciter, the spectrum analyzer covers the entire transmitter. It's completely automated with a top-down interface; the user selects the desired mode to run and it pops up. Not only does the AUI offer the full-function spectrum analyzer, it provides comprehensive system monitoring and control down to the individual module level and also offers a constellation view of the HD Radio signal.

The transmitter's integral exciter does not have its own user interface; because it is integrated into the transmitter there are no pots or other adjustments and all exciter adjustments are done through the front-panel user interface. The exciter produces about 200W of RF power, which then goes to a 16-way splitter and is fed to the RF amplifiers,

eliminating the need for an IPA module.

Above the RF Power Module section is the Control Board, which brings in all of the RF, dc and temperature probes; it does the appropriate monitoring and protection of the transmitter and it streams that data to the front-panel user interface. On the right hand side of that board is the Remote Interface board, which is completely user configurable. All of the telemetry, status and controls can be dictated by the end user so they can get exactly what they want in the way of monitoring. It can be adjusted for single ended or balanced control. On the Control Board are some rudimentary user controls should the front panel user interface become inoperable for some reason.

As with the Nautel V series transmitters, the NV40 is designed for digital operation, but now we have the capability of higher power levels with the 10dB change in injection levels. The transmitter can use Nautel's Power Boost technology in hybrid HD Radio systems to achieve higher digital power levels with greater transmitter efficiency. We also have the ability to equalize combiner systems with our adaptive equalization feature. This provides correction for phase and magnitude response in the combiner system, and it does it automatically.

Woods is the head of development for Nautel Limited.

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TECHtips

Tips, tricks, hints and more

By John Landry, CSRE

Green is the word these days – using renewable things and recycling the used ones. It helps the planet; sometimes it helps the wallet. The concept is not a new one, especially to radio engineers. One colleague used to call it “junking.” The more adventurous call it “dumpster diving.” There are a lot of useful things thrown out as trash every day. While much of it really is garbage, even a slight glance at another man’s trash can yield an unexpected treasure.

The first and safest place to look is in your station’s trash. How much of it could be re-used? What wears out most often? And what is no longer needed?



You can never have enough hardware. And some pieces, especially small pieces, are often near-impossible to find. Anytime you discard something, harvest any screws, nuts, set-screws, small springs, clips and e-rings. While you may not think of their use right now, at some point during a minor repair when a little clip flies off and can’t be located, at least you have one place to look for another one. In the U.S., many metric screws and nuts are difficult to find (and the reverse applies in Europe – a regular 8-32 screw may be impossible to find in a hurry in Berlin or Paris).

Many solid-state components are no longer being produced. Once common, ICs and transistors are getting hard to find and often they are expensive. Anytime a piece of equipment with socketed ICs is discarded, save the ICs. Likewise, save any transistors and voltage regulators accessible and easily removed. As an example MPS-U95 transistors, 7407 chips, LM340T steel regulators, and TO-66 sized transistors are immediately saved. Op-amps in metal cans or 14-pin dual types (UA-739/TBA-231) are also desirable since a lot of vintage equipment uses them. Similarly, any memory chips probably have some value and those should be saved.

Inductors and transformers are of limited use, but you should save anything that might be needed to repair another unit like the one you are scrapping (such as a module from an audio console). Potentiometers and switches should only be retained if you know you will need them. Capacitors should not be saved. They fail the most and replacements are still easily obtained.

Rubber drive parts such as belts, idlers and rollers from tape machines have little use and are probably no longer good.

Anytime you see a large dumpster it might not be a bad idea to peek inside to see what’s being thrown away. Most of the time it is construction debris and there is no further reason to look. Other times you can be surprised. Some of the things I have found in the past year on the street include: a dumpster full of Dell computers identical to ones we still use at work; a pile of 3’x6’ blue tinted Plexiglas panels; a Carver stereo receiver that worked; two guitar amps (one missing a speaker); filing cabinets (four- and five-drawer); office desks; a pile of hundreds of 16-inch transcription record sleeves; a two-color date stamp that says “NEED BY 10 a.m.”; laserjet printers; keyboards (that work); a three-speed dual record changer; a box of 50 chrome C-90 cassette tapes; hamper of several thousand CD jewel cases (more than I could take home); And most notably, a lifetime of tech manuals from the past 30 years by all of the major electronics component makers. Sadly, that last dumpster had been out in the rain. A treasure-trove now rendered as trash. Luckily even wet paper can be recycled.

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

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Primera Technology Bravo SE

By Gordon S. Carter,
CPBE CBNT

Have you ever seen a piece of equipment and thought it might be useful to someone sometime, but certainly most people would not have enough need to buy it? Wouldn't it be great if you could rent the equipment just long enough to use it, and then return it?

The Bravo SE automated CD ripper from Primera Technology can be rented from the company's website. Primera is best known for its CD duplicators and printers, and the Bravo CD ripper is based on one of its automated duplicators.

The unit arrives with software, hardware, cables and simple instructions. You will need a PC running Windows 2000, XP or Vista (sorry but the software does not run on a Mac), a USB port and an Internet connection.

You will also need either iTunes or Windows Media Player software installed on your computer. It even comes with pre-paid return shipping.

Setup is quick and simple: Install the PTRip software, connect the unit to your computer, and install the appropriate drivers.

You can put up to 20 CDs in the unit. Once you have your iTunes or Windows Media software options set, the unit will take the top CD from the stack, read the disc information and access the online CD database (CDDDB in the case of iTunes) for information. If no disc information can be found (i.e. you made the disc yourself), the unit will not rip the CD. If the data is found, it will rip the CD, and save the tracks to the location and in the format selected by your program. An on-screen log keeps you informed of the current status and what has happened with the previous discs. This makes it easy to identify those that did not rip. If the software finds a CD in the stack that has already been ripped (the files are in the destination folder on the hard drive) it will not rip it again.

After setting up the unit, I grabbed a stack of CDs and tried to rip them. The computer I was using was running Windows XP Pro, and had both



that was not found in the database.

When I tried Windows Media Player,

things did not work as smoothly. First of all, when the disc was put in the drive, it began to play. If it ripped the CD, it did so in real time. Also, several more discs were not found in the database. After experimenting, I contacted Primera's tech support. They were pleasant, but unable to provide much help. They explained that iTunes and Windows Media Player do not use the same database, so there will be differences in what they find, especially for newer CDs. Most of the CDs I was using for testing were new arrivals. We were not able to resolve the issue with the CD playing. We tried turning off autoplay for the CD (it was already off, but we did it again), and several options within Windows Media Player itself. Nothing seemed to work. Since everything worked so well with iTunes, I suspect these issues are strictly within Windows Media Player.

After I returned the unit I received an e-mail from Primera about the Windows Media Player issues. It was suggested to close Windows Media Player when trying to rip the CDs. I was not able to verify this, but it might work.

Performance at a glance

Identifies CDs with CDDDB

Works with iTunes and Windows Media Player

Rips multiple CDs automatically

20 disc capacity

Weekly rental program

iTunes and Windows Media Player installed. When you start the PTRip software it asks you to select either iTunes or Windows Media Player. After you select the software a screen pops up telling you to change some options in the software and then click OK to start. I tried the same set of CDs with both programs to see how it worked.

With iTunes everything worked smoothly. It took approximately five minutes to rip a complete CD, including retrieving the data from the Internet. All the CDs I tried ripped just fine, except one

Maybe by now you are wondering what practical use this device is for the typical radio station. Most stations only get a handful of new CDs added to their playlist at a time, which would make this a bit of overkill. Primera advertises this as a tool for consumers to use to load their CDs onto their computer or portable media player. However, with a little imagination and ingenuity it could be useful under some circumstances.

Primera Technology

P 800-797-2772

W www.primera.com

E sales@primera.com

Both iTunes and Windows Media allow the user to select the format in which to save the audio, all the way from rather poor MP3 up to uncompressed WAV files. Since the metadata is stored with the audio, it is possible to use this when importing the audio files into a station's hard drive playout system. It is beyond the scope of this review to tell you how to do this, but many of the automation manufacturers

have tools to allow you to automatically ingest WAV files with metadata. If your station is changing format, replacing its automation system or hard drives, or otherwise has a lot of material to ingest, this just might be the answer for you.

I would suggest that if you are using this device, use the iTunes player instead of Windows Media, at least for now. I would hope that Primera can address the Windows Media Player issues in the near future, or at least put some warnings in their documentation. Otherwise, this is an excellent unit with a very attractive rental arrangement.

Carter is chief engineer of WFMT Chicago.

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

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

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



PT Publisher software for Bravo SE



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Rode Procaster

By Jon Specht

The Rode Procaster is a broadcast quality mic. It has a similar look to the EV RE-20 that's been the standard for the last 35 years in both AM and FM on-air studios and production rooms. The Procaster's claim is "a no compromise performance for applications in broadcast environments," not to mention the production rooms with its dynamic high output capsule. And it has an internal pop filter.

Over the last several years, Rode has come up with a line of several mics for every type of recording. The Procaster is Rode's answer to a new mic for radio's on-air studio. Most radio stations and satellite radio stations still use a non-condenser mic for on-air purposes. This is the new version of that mic. With a familiar end-fed design, announcers will easily embrace it. It has a tight polar pattern with a design for ambient noise. Plus it comes with a 10-year warranty, which is kind of unheard of in the mic business.

Being a dynamic mic, the Procaster needs no external power, just the industry-standard three-pin

This is a relatively heavy mic, not wimpy at all. The optional shock mount holds it securely in the intended position.

The Procaster is made by Rode in New Wales Australia. Ken Sparkes, the voice of Australia, says, "The Rode Procaster is one of the few microphones to come on the market in recent years that I believe will become an industry standard for on air excellence." Time will tell if this will come true, but I agree that the mic has the potential to become the radio industry standard with time.

And it's true, it does have that on-air radio sound. For the price – about half the street price of the popular choice with a similar look – it's a good choice for a dynamic mic. It's bright with a full body sound of a high-quality broadcasting microphone.

Specht is the creative services director of KCFX-FM and the image voice for 17 TV stations and four radio stations.

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Performance at a glance

- High output dynamic capsule
- Cardioid pattern
- Frequency response 75Hz to 18kHz
- Internal shock mount and pop filter
- 320 ohm output impedance
- 10-year warranty

XLR output. With the built-in wind screen, the mic is one of the ultimate broadcast quality mics for the 21st century. With no phantom power and no battery, it's a plug-in-and-go mic.

The mic is shipped with the RM2 stand mount, which secures the mic with a screw-on assembly at the base. An optional shock mount, the PSM1, attaches in a similar way and uses a spider-cage design commonly seen on other studio mics. The bands on the shock mount are not proprietary like some other mic shock mounts. While I doubt the bands will break, they can be easily replaced with generic alternatives found at local music and pro audio stores.

Rode

P 877-328-7465

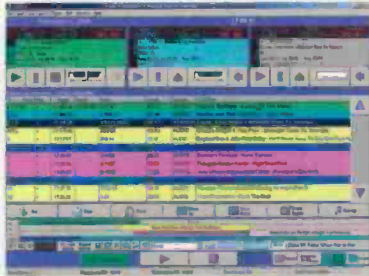
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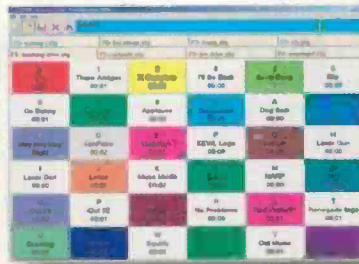
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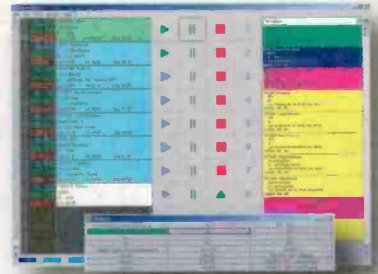
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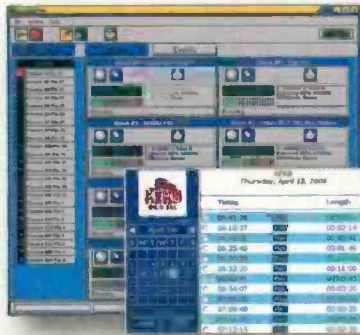
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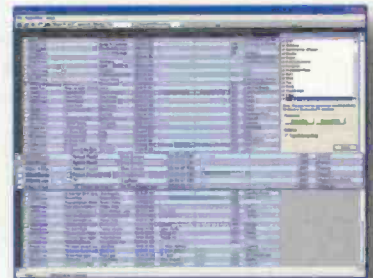
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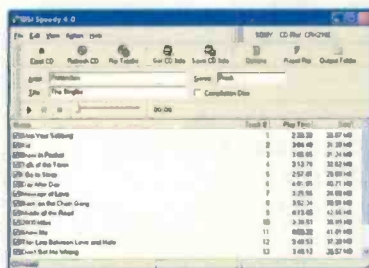
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NEW PRODUCTS

www.RadioMagOnline.com

by Erin Shipps, associate editor

Broadcast headsets Beyerdynamic



DT 790 and DT 797:

The basis of these new headsets is the DT 770 PRO with the addition of a pivoting gooseneck microphone boom, and one of two microphone capsules. Both models have been built to thrive in highly noisy environments. The DT 790, with dynamic microphone (hypercardioid), is specially designed with sound engineers in mind, while the DT 797, with condenser microphone (cardioid), has been developed for use by commentators in live broadcasting situations. The powerful headphone systems feature a frequency response of 5Hz to 30kHz, providing an exceptionally balanced sound characteristic. The sound insulating housing and soft-skin ear pads provide isolation from ambient noise and the microphone boom makes sure the dynamic microphone can always be optimally adjusted into any required position. The microphone boom can be used at left or right side or can be moved into standby (upper) position. The single-sided cable will be available with a wide variety of connectors to accommodate any application.

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

LED lamps Ledtronics

3D A19-style LED bulbs:

The 3D A19-style LED bulbs offer vivid, colorful lighting in many versatile applications. The series comes in a UV-protective, plastic A19-shape globe covering that allows the LED light to shine in multiple directions (three dimensions) while still being protected from the environment. These hardy bulbs are perfect in any situation that allows for standard 26mm Edison screw base 120Vac attachments. These A19 incandescent replacement LED bulbs combine today's advanced Indium Gallium Aluminum Phosphide and Silicon Carbide/Gallium Nitride LED technology, standard electrical bases and a design that maximizes illumination. They have a power draw of just 3.6W to 4.32W, up to 11-year LED operating life and seven sunlight-visible LED light colors from which to select.

800-579-4875; www.ledtronics.com; webmaster@ledtronics.com



Surround mixing console Klotz Digital



Decennium 5.1: Klotz Digital has streamlined the Decennium to fulfill the requirements for a wide range of surround 5.1 applications, making it a valuable tool for radio surround productions. Moreover, the console was also redesigned for easy operation of surround sound in live broadcasts. Surround, stereo, and mono sources can be mixed and processed together. Depending on the current requirements, 5.1 surround sources can be assigned either as single audio channels on separate faders, or as a combined 6-channel-block to any single fader, allowing easy cross fades. It is fitted with a central DSP and control section, programmable function keys, and master fader. An LCD screen is integrated to display audio level meters, all important console functions and parameters. Additionally, a totally new fader module with motorized faders has been developed, offering a couple of new functions such as virtual multi layers, source related signal indicators, and improved access to buses.

678-966-9900; www.klotzdigital.com
sales@klotzdigital.com

Pro audio receivers International Datacasting

Expanded SFX: The latest family of IDC's IP-based DVB-S/S2 digital audio receivers for professional radio broadcast networks is now available in a two-stereo pair configuration with an integrated hard drive for split copy insertion. Audio codecs include MPEG2 Layer 2, 3 and AAC, as well as MPEG4 LC-AAC, HE-AAC/AAC Plus versions 1 and 2 plus enhanced Aptx. Livewire from Axia is also included for low delay and high reliability distribution of digital audio over Ethernet to minimize cabling and eliminate audio distortion caused by high electrical noise environments.

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NEW PRODUCTS

Signaling device

Axel Technology

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Harris Z/DX transmitter interface

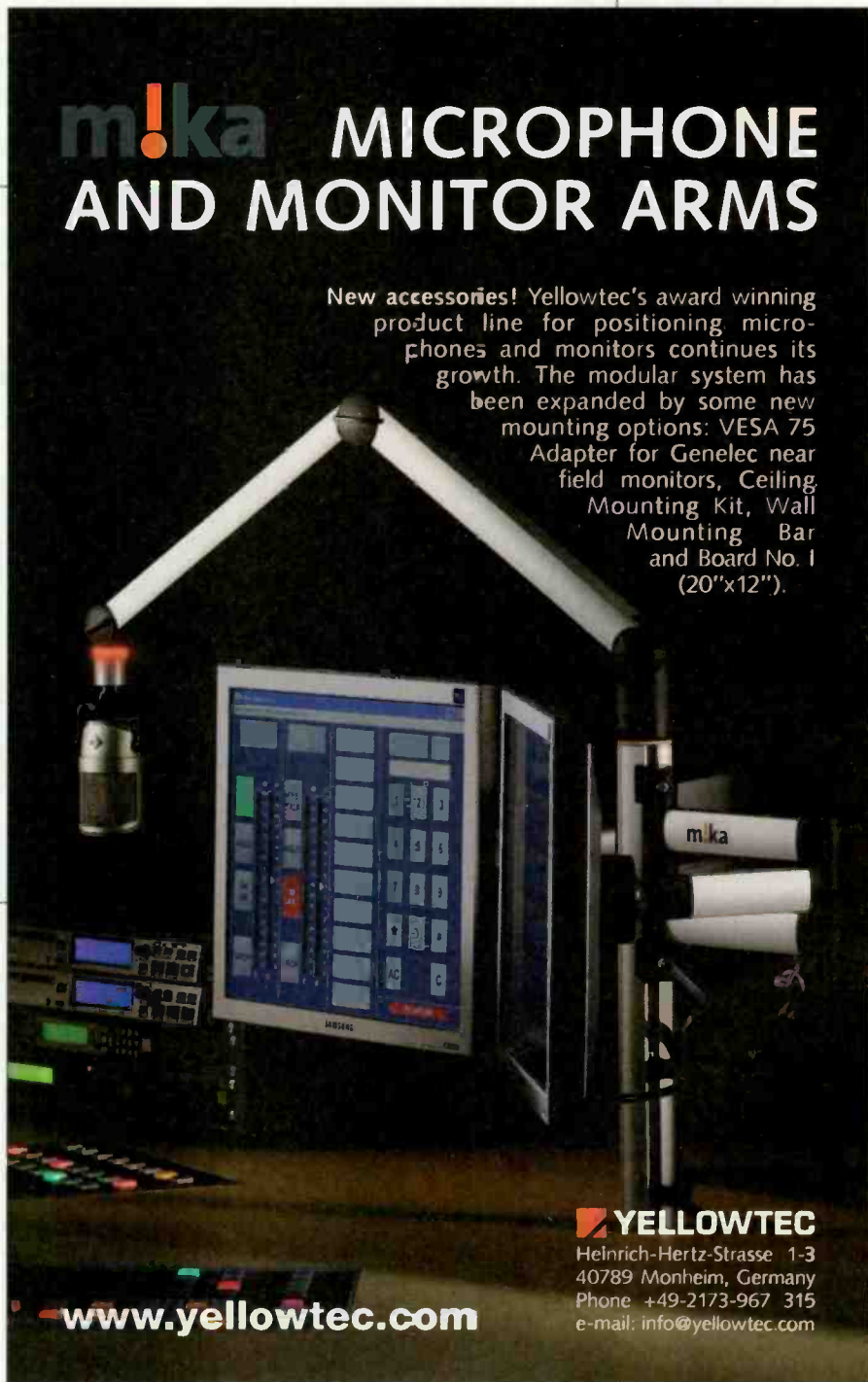
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NEW PRODUCTS

Audio codecs Mayah Communications



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Find the mic winner September issue

Congratulations to

Jim Morris

of KBXB, Sikeston, MO.

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The mic icon was in the display of the Sony reverb to the right of the console.

www.heilsound.com

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Voice casting Vcreative

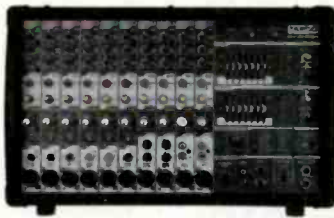
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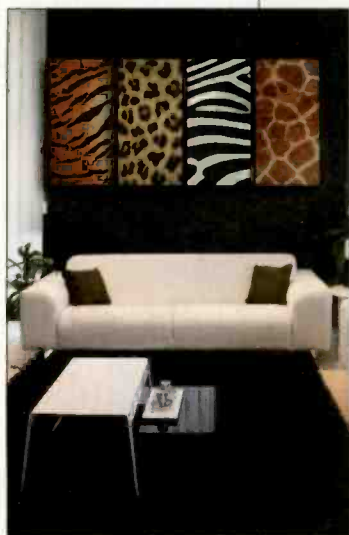
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Digital dual mixing deck Hercules



DJ Console Rmx: The Hercules DJ Console Rmx is a digital audio console designed for mobile and advanced DJs. The console includes a number of quality features such as a solid metal casing with non-slip pads, broad surface, accessible buttons and knobs, precise and comprehensive controls, a built-in audio interface with four inputs and four outputs. The console comes with Virtual DJ 5 DJC Edition software, which includes features and settings specific to the Hercules DJ Console Rmx. It is a MIDI controller compatible with other MIDI-controlled software applications allowing DJs to mix the music files stored in various formats including MP3, AIFF, WAV, WMA, OGG and CD Audio and iTunes.

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Revenue Stream: Revenue Stream is a subscription-based service available to broadcasters and service providers who wish to offer premium audio and video content over the Internet. Revenue Stream allows programming to be monetized over the Web in lieu of an ad-supported model. For the Revenue Stream service, Stream Guys currently supports Windows Media audio/video and Icecast MP3 audio, with QuickTime and Wowza-enabled Flash audio and video support in the works. Stream Guys can enable subscription controls for existing streams or launch a completely new service, using its existing aggregated server infrastructure to provide a robust streaming platform for global internet delivery.

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**Scalable UPS
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Essentially a single channel of the Mic Pre IV, the Mic Pre One features switchable phase, 20dB mic input pad and +48V phantom power, plus a selectable 1/4" line/hi-z instrument input, all utilizing relays with gold bi-furcated contacts. Two large knurled aluminum knobs control the variable high-pass filter (0-200Hz) and continuously variable input gain, which is complemented by a full-width, 20-segment bi-color LED meter. The rear of the unit offers a Jensen transformer-isolated mic input and fully-balanced XLR output, plus a 1/4" line output. A fourth connector introduces dc power from the external power supply to the unit.

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XY Stereo microphone
Audio-Technica



AT8022: The AT8022 is designed for broadcast and professional recording, offering a coincident capsule configuration that allows for a smaller housing. It is ruggedly constructed to protect against damage from day-to-day use during field recording. The microphone is also fully RoHS-compliant. It offers an 80Hz high-pass filter for easy switching from a flat frequency response to a low-end roll-off, and comes equipped with a professional stand clamp, windscreen and soft, protective pouch. The AT8022 operates on either a 1.5V AA battery or 11-52Vdc phantom power and is supplied with two cables (one balanced, one unbalanced). This mic is ideal for use with handheld digital recording devices, and its compact, lightweight design works well for stereo field recording. Its innovative capsule configuration produces an accurate stereo image in a smaller housing.

330-686-2600; www.audio-technica.com
sales@atus.com

Portable mixer
Pioneer New Media

DJM-700: The DJM-700's high quality construction utilizes a high-rigidity chassis that minimizes noise from unnecessary vibration, as well as a dual shield structure to eliminate entry of digital noise and full balanced output circuitry. Internally, the DJM-700 sound quality is re-enforced with a high quality 96kHz/24-bit digital sampling system. Analog signals from the player pass through the mixer at the shortest signal route, digitized by a high quality sound A/D converter and reaches the digital mixing stage with the best possible state. The mixing is carried out by a 32-bit DSP with ideal filtering to produce the best sound without deteriorating the sound quality.



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P.I. Engineering



Y-mouse: The Y-mouse series of dual port adapters includes the USB Adapter (converts standard PC mice and keyboards to USB); Dual Mouse Adapter (use both a mouse and a trackball on a single PC port); Dual Keyboard Adapter (use two keyboards on the same PC port); Dual Monitor Adapter (connect two monitors to a single computer video port); as well as special versions, OEM products and accessories.

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Basic NEC with Broadcast Applications

Author: J.L. Smith PE – Publisher: Focal Press/Elsevier

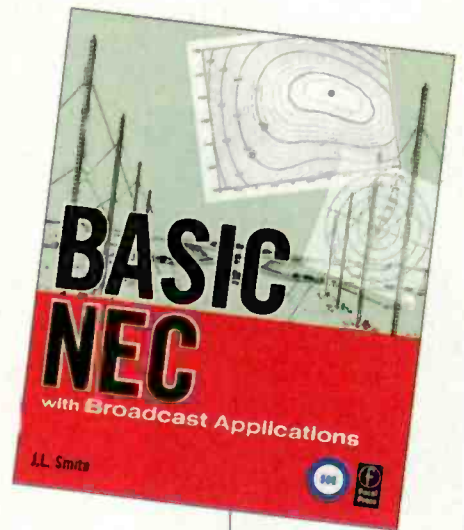
By John Battison, technical editor, RF

This book is strongly recommended; it is a new and almost unique tool for the radio engineer. NEC-2 was developed at Lawrence Livermore Laboratories and is available as a free download. It was later somewhat eclipsed by NEC-4. This book is a comprehensive document explaining and showing how to use NEC-2 to design directional antennas. Much of the material included can be used in connection with NEC-4 programming.

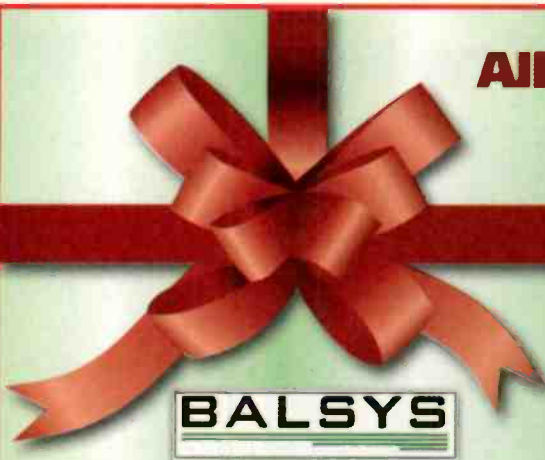
Apart from the very clearly and explicitly presented method of using NEC-2, the book includes a CD that demonstrates its use and provides a usable tool for directional antenna design. But it does not stop there. NEC-2 tends to be less than user friendly to the broadcaster; therefore, this book leads the user by the hand through the various steps in creating a DA, and also makes it possible to fine tune an existing DA by investigating each portion of the design and achieving the best possible circuit values. Computer application is easy, does not require the use of Fortran and the program runs happily on XP.

Included in this valuable book are many applications and test questions. The answers to these questions will be found in the CD together with explanations. It is obvious that the book was written by an engineer for the engineer engaged in the design and operation of directional antenna systems.

The author has had a long broadcast career and entered the field in 1946. He later became manager of broadcast systems engineering for Collins Radio. He is now retired after participating in many FCC actions and international coordination projects.



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MXL Microphones**

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Holophone**

Portamic 5.1: Like the H4 Supermini, the Portamic features a 2.5"x1.5" mic head with six separate mic elements arranged to correspond with the typical 5.1 speaker setup in a studio or home theater. This patented design allows users to easily capture, from a single point source, a discrete surround recording that gives listeners the experience of sitting in the best seat in the house. The Dolby Pro Logic II encoder allows the mic's six audio channels to be encoded to two channels. The surround-encoded audio is output to both a stereo mini plug and six-pin balanced mini XLR. To ensure a quality recording even in loud environments, the mic features a unity gain control and a 12dB pad.

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



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[in-ti-grey'-shuhn] - noun

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Two-channel mic pre
Automated Processes Inc.



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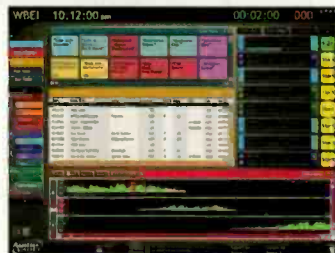
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Broadcast Electronics**



Audiovault V-Flex: This platform addresses the operational challenges of multicasting, voice tracking and Web streaming with personalized setup, advanced segue editor, sophisticated asset management, multi-thread interactive collaboration and more. Personalized studio mashups combine studio tools and applications from more than one source into a single workspace. Announcers and producers can profile workspaces unique to each show, workstyle or for operational continuity throughout the studio environment. V-Flex lets users choose and define task icons from a large pallet of operating functions. Advanced segue editor offers seamless voice-tracking and localizing multiple stations from a centralized studio.

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UPGRADES and UPDATES

Audio-Technica has released a straight-cable option for its flagship ATH-M50 headphones. The ATH-M50s is identical to the original except for the cable. (www.audio-technica.com)...**Neutrik MR-Pro** will include extended mass storage RAM capacity of 512MB to store 16 times as many test signals. All earlier MR-Pro units can be factory upgraded with the new memory. (www.nti-audio.com)...**Orban** has released version 3 of its 1010 Opticodec-PC streaming encoder, which now supports the Real Time Messaging Protocol (RTMP), the protocol that Adobe Flash Media Server 3 uses to stream data, audio and video via the Internet, as well as Icy Shoutcast, Icecast 2, and standards-based RTSP/RTP MPEG-4/3GPP protocols. (www.orban.com)...**Izotope** is now shipping its ANR-B Adaptive Real-time Noise Reduction Unit. (www.izotope.com)

**Composite low pass filter
Broadcast Devices**

LPF-100: This stereo baseband low-pass filter is a 10th order, linear phase electronic filter designed to reduce baseband noise levels while not materially affecting stereo performance or modulation depth. The LPF-100 can be used when noise from studio to transmitter links, processing equipment or stereo generator anomalies interfere with SCA performance or where noise levels are high enough to induce multi-path-like effects in received signals. Poor phase response results in poor stereo separation due to pilot phase error. Poor amplitude balance causes cross talk between main and sub channels resulting in poor stereo separation. The LPF-100 offers minimal group delay error and good pass band amplitude response. Phase and amplitude errors are within the correction range of most modern stereo generators. Minimizing noise in the stereo base band has another important benefit in today's digital broadcasting environment. Less transmitted noise from your analog transmitter means better mask performance when adding in band on channel digital broadcast carriers to an existing system. Less interaction between analog and digital signals is a plus for better digital performance.

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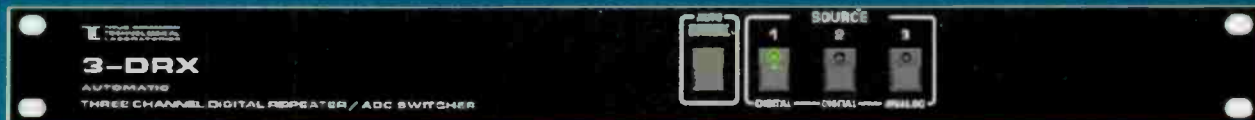
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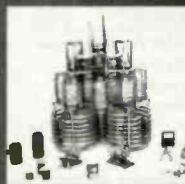
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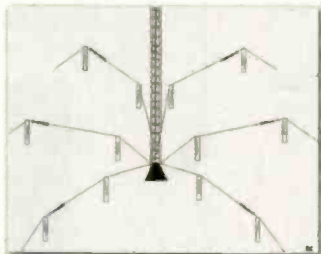
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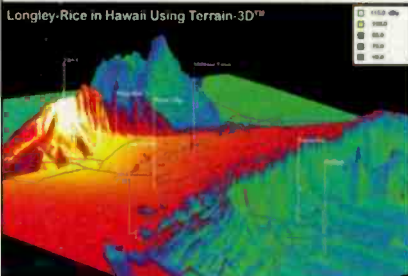
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Contributor Pro-file

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



Jake Robinson
Manager of
Engineering and IT
Cumulus Media
Indianapolis &
Louisville, KY

In 2003 Robinson began his radio engineering career with WZPL/WTPI/WXNT in Indianapolis

after 10 years as a decorated music recording engineer and producer. He moved to Susquehanna Radio in 2004 and then to Cumulus in 2006 after it purchased the company. He also owns Indy InfoTech, a technical and IT consulting company catering to Media, Broadcast and recording studios.



Written by radio professionals
Written for radio professionals

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by Erin Shipps, associate editor

Do you remember?

In the mid-1970s, Harold Hallikainen modified a Moseley TRC-15 remote control with what was named the TEL171. It proved very popular and was eventually manufactured and sold with TRC-15s by another manufacturer. Hallikainen's story:

Back when I was the chief engineer for an AM/FM station, we were inspected by the FCC. The DJ on duty had a lot of trouble reading the meters. Besides the zero and calibrate controls, and their interaction, DJs just could not read meters. Also, the TRC-15 had several scales, some of which were two times another scale. So, I'm with the FCC inspector at the transmitter site where we're running a Bauer 707. The inspector drops it to night power (250W), then calls the DJ and asks for the meter

readings. The DJ gives him day (1kW) readings by reading the wrong scale (since all readings were about twice the night readings during the day). The inspector was not impressed.

My first modification to the TRC-15 was to replace the calibrate control in the circuit with a fixed resistor that made the meter read high (excess gain). I then put the calibrate pot across the meter, making it a shunt gain control. The interaction between the controls was gone. You adjust the zero, then the calibrate, and the the zero was still good.



Hallikainen's modified Moseley TRC-15 with his TEL171.

But, DJs still could not read the meter. Since the TRC-15A uses a voltage to frequency converter to send the voltage samples to the studio, I tried using a frequency counter at the studio. This was complicated since I had to subtract the zero frequency and adjust the timebase for scaling. It was really too complicated (microprocessors were new at the time).

So, I then discovered the MC14433 dual slope A/D. This output a multiplexed BCD reading from -1999 to +1999 for voltage inputs of -1.999V to +1.999V. I ran through 3 CMOS chips to a UART. The logic had a digit counter and a multiplexer. When the ADC finished a conversion, it reset the counter and routed one of the ADC digit select lines to the strobe input of the UART, causing the UART to send the BCD for that digit along with a two bit digit identifier (the counter value). The output of the uart went through an optical coupler so the ADC section could float, then to an XR2206 FSK modulator.

The studio had an LM3900 based band pass filter to get rid of the TRC-15A control tone, then an XR2211 FSK demodulator, then into a UART and some more discrete logic that sorted out the digits and sent them to the front panel display board that had CD4511 BCD to 7-segment LED latch/driver chips. The display board also had a bipolar PROM that we'd program for each station that would place the decimal point in the proper location for that particular metering channel.



The rest of this story is online at www.RadioMagOnline.com

Sample and Hold

Radio Listenership Still Strong

Naysayers beware: American's are still listening to the radio.

According to an American Media Services nationwide telephone survey, radio listening continues to remain strong and Internet radio is gaining popularity.

64%
80%
73%
39%
48%

American adults listen to the radio daily

Turn on the radio when they get in their cars

Listening the same or more than they did five years ago

Listened on the Internet in the past week, up from 23% six months ago

Expect to listen to radio over the Internet in the future, up from 38% six months ago

Source: American Media Services



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



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



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



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



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



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

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

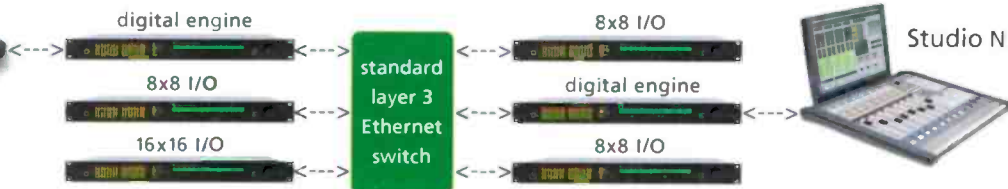
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Studio 1



E-SERIES control surface

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