



# RADIOWORLD

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**INSIDE NEWS**

- Uncle Sam's radio engineers face familiar problems. — Page 4

**ENGINEERING**

- Turn your rat's nest into something to be proud of. — Page 14

**PINION**

- Inventor Nikolaus E. Leggett thinks a 'lighthouse protocol' would open up opportunities for many more stations. — Page 38

## Experts Explore RDS Today

The Landscape for This Familiar Data Service Has Changed Considerably

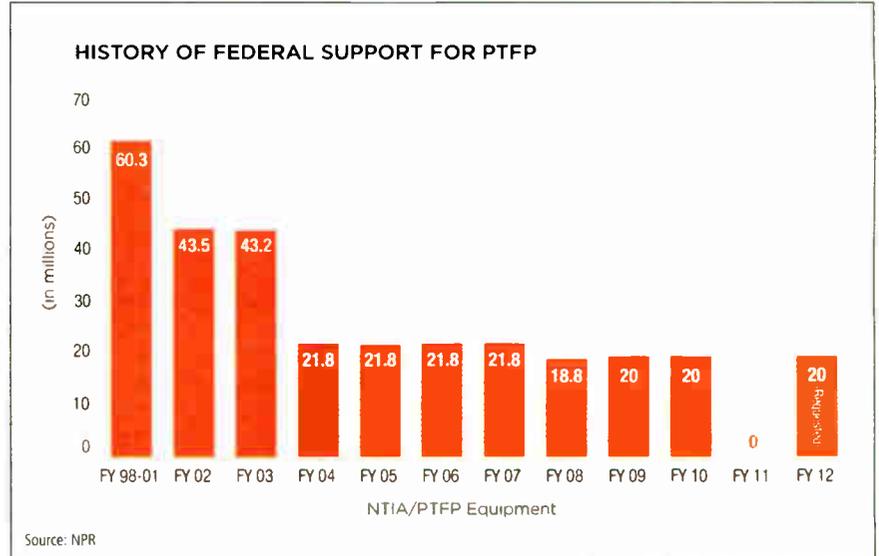
BY TOM VERNON  
The advent of RadioText Plus, the arrival of a new generation of car receivers and the inclusion of FM tuners

**RADIODATA**  
in mobile devices are among the reasons broadcasters may need to rethink their datacasting strategies. The RDS session at the spring NAB Show brought attendees up to date. Moderated by Steve Davis of Clear Channel, it featured Tony Peterle of Worldcast Systems; Alan Jurison of Citadel Broadcasting, who has written extensively about RDS in Radio World; and Jim Roberts of The Radio  
*(continued on page 8)*

## PTFP Shutdown Leaves Pubcasters Scrambling

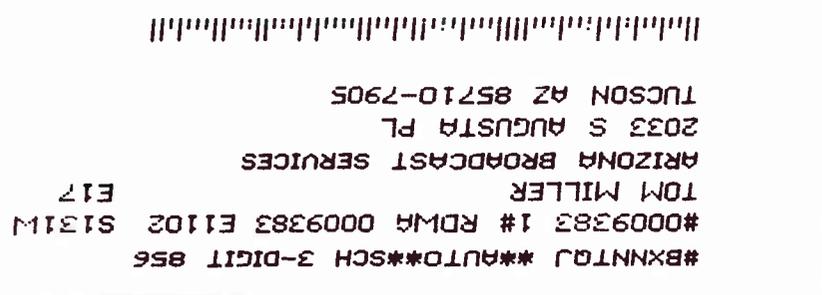
Public Radio Finds It More Difficult To Fund Equipment Projects

BY RANDY J. STINE  
**WASHINGTON** — A source of money on which many public broadcasters depend to address equipment needs is gone, leaving stations reviewing capital program this spring. Congress zeroed out PTFP funding for the current fiscal year in a continuing resolution to keep the federal government operational. While the Corporation for Public Broadcasting also funds a small portion



Amounts shown indicate total federal funding levels available for both radio and television PTFP grant awards by year. The 2012 figure is requested funding only.

expenditure plans and in some cases delaying projects indefinitely. The National Telecommunications and Information Administration lost funding for its Public Telecommunications Facility Program national matching grant of station operations, it does not provide grants strictly for equipment replacement. The elimination of PTFP comes at a time when CPB's digital conversion funds are squeezed — all having the  
*(continued on page 5)*



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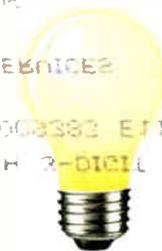
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## NEWSROUNDUP

**NAB:** The association's joint board has a new chairman. TV Board Chair Paul Karpowicz, president of Meredith Corp., succeeded Steve Newberry, president/CEO of Commonwealth Broadcasting. The board also indicated its approval of NAB President/CEO Gordon Smith by giving him a unanimous thumbs up for another year. Caroline Beasley was reelected radio board chair.

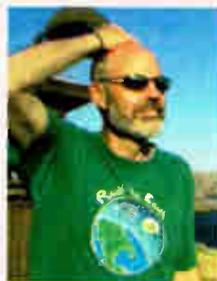
**FCC TECH EXPERTISE:** The Society of Broadcast Engineers supports a House bill to put more technical expertise on the staffs of FCC commissioners. Rep. Cliff Stearns, R-Fla., introduced House Bill 2102, a companion bill to Senate Bill 611, introduced earlier by Sen. Olympia Snowe, R-Maine. SBE leadership met with Stearns' Washington staff in March. The bills would authorize each commissioner to appoint a fourth staff member who is an engineer or computer scientist.

**FM TRANSLATORS:** The FCC said its Media Bureau and Broadcast Towers Inc., licensee of five translators in Florida, signed a consent decree. The agency stops its investigation into a series of BTI-owned translator moves from the Florida Keys to the Miami market, which other broadcasters called an abuse of the agency's translator process. BTI and its sole proprietor, William R. Lacy, agreed

to stop broadcast operations in Florida. The FCC canceled authorizations for the five translators. BTI agreed to spin off a sixth Key West translator that didn't move. The commission said Lacy had filed a series of minor change applications specifying roadside locations for the translators.

After an application was granted, it said, Lacy would drive to the location, park his truck and operate the translator for two to five hours using a telescoping antenna and portable generator. "Lacy then discontinued operations, disassembled the equipment, loaded it back up into his vehicle, and drove away," according to the agency. Clear Channel and WXDJ Licensing complained. The consent decree does not involve a monetary settlement because Lacy provided proof that he doesn't have the funds to pay.

**HADFIELD RELOCATES:** Pacific Northwest radio engineer Marty Hadfield has joined Clear Channel as DOE for the Seattle cluster, succeeding Ken Broeffle. Hadfield most recently was DOE for Alpha Broadcasting's Portland, Ore., operations where he oversaw studio facility upgrades. He has spent his broadcast engineering career in the Northwest, starting in 1976. That includes 17 years as VP of engineering for Entercom Seattle.



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Selected content from Radio World's "The Leslie Report" by News Editor/Washington Bureau Chief Leslie Stimson.

### SORRY TO SEE BAKER LEAVE THE PORTALS

I'm sorry to see Meredith Baker leave the commission two years into what is normally a five-year stint.

I've got no problem with Baker departing the agency to become chief lobbyist for NBCUniversal. Under new lobbying rules, she'll be barred from lobbying her former commission colleagues for two years — and longer if President Obama wins re-election in 2012 — but can start cajoling and persuading members of Congress immediately.

Before she went into public service seven years ago, the politically-connected Baker was a telecom attorney and



cell industry lobbyist. It's useful for an FCC commissioner to understand how business works, and Baker does.

Before she came to the Portals she was acting administrator of NTIA; she was also in charge of the set-top box coupon program for TV's digital transition.

But at the FCC, she's been part of a Republican minority in a 3-2 Democratic-controlled commission; her ideas, no matter how good they are, won't get the attention from within the agency or the public that the chairman's would. That must have been frustrating.

I'll miss her personally. She's smart and very well-spoken.

And of all the commissioners I've met and covered over the years, she has the best fashion sense. You don't often see a bureaucrat sporting peep-toe leopard print pumps with a basic Washington-wonk suit.

# At IBB, a Call for Rejuvenation

## Uncle Sam's Radio Engineers Face Familiar Problems

If you're a tech manager in a bureaucracy, you'll appreciate the headaches that confront engineers at the International Broadcasting Bureau.

Lack of standards, poor IT wiring, vulnerable points-of-failure, an inundation of new platforms and low morale might plague any organization. But we get an unusually frank look at such problems within the technical arm of U.S. international broadcasting thanks to an in-house report that came to light recently.

Plan." A Freedom of Information Act request led to its publication on nonprofit [governmentattic.org](http://governmentattic.org).

### 'SERIOUS IMPEDIMENT'

Intriguing is how he paints issues within IBB's two technology spheres — traditional engineering and IT —

**Mendes described a 'silent but ever-growing burden of a burgeoning distribution methodologies portfolio.'** Sound familiar?

It was written in 2010 by the new top engineer at the IBB, which supports the Broadcasting Board of Governors. That in turn runs Voice of America, Radio Free Europe/Radio Liberty, Radio Free Asia, the Middle East Broadcasting Networks and the Office of Cuba Broadcasting.

André V. Mendes set out a plan of how to "transform" their technical and IT operations. As I wrote on Radio World's website, the attention-grabber is a recommendation to lay out a plan to "sunset" U.S. shortwave operations; but there's lots of interesting reading in the "2010-2012 BBG Technology Strategic

and how those overlap, not always smoothly.

"Today's effective separation and isolation between engineering and IT constitutes a serious impediment to progress," Mendes wrote.

He laid out problems facing engineering staff, noting the proliferation of platforms they must learn — AM, FM, satellite radio, satellite TV, Internet and telephone-based content distribution — without cuts elsewhere (sound familiar?). He called it a "silent but ever-growing burden of a burgeoning

distribution methodologies portfolio."

He talks about the complexity of systems engineers must administer; declining financial resources; a disorganized, incoherent Network Control Center; and lack of a solid business continuity/



FROM THE  
**EDITOR**

Paul McLane



disaster plan.

Poignantly, he described a shift in job skill relevance among engineers as BBG's dependence on shortwave shifts to third-party operations, satellite and other platforms. "This issue is further compounded by the relatively difficult transition from a traditional RF, antenna, transmitter design and maintenance knowledge base to the technologies involved in digital satellite and IP-based networking systems."

He also identified a problem of low morale among engineers, calling the mood "palpable."

Meantime, while the IT side "manages to deliver a relatively high level of service," he identified multiple single points of failure in critical IT infrastructure; poor layout and maintenance; "nonexistent" business continuity and disaster recovery plans;

and other issues.

He wrote that the organization's network was dependent on a single enterprise-class Cisco core router whose failure would "severely cripple the entire agency" for an extended period. He provided photos as evidence that "the cabling infrastructure that supports the BBG network is in serious disarray," criticized past decisions regarding the agency's e-mail platform and spoke of "blurry lines of responsibility, finger pointing, morale issues and lower overall performance" in IT.

Overall, and without accusing individuals, he wrote that various circumstances had created an "organizational insularity" at IBB that called for a rejuvenation.

### PLAYING CATCHUP

On a broad level, he recommended that the organization consolidate platforms.

"In the engineering arena, this approach will be mostly focused on the usage of shortwave and the pragmatic analysis of its expected lifespan and overall scope of global operations but also will include continued migration to MPEG-4 compression technology and steady introduction of IP transmission protocols. In the IT arena, this process will endeavor to quickly reduce the number of computing and storage platforms."

He recommended use of server, storage

(continued on page 12)

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**THIS ISSUE**

JULY 1, 2011

**NEWS**

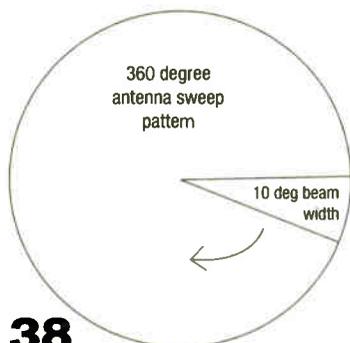
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**PTFP***(continued from page 1)*

effect of giving pubcasters fewer options to fund at least some portions of their cap ex projects with federal dollars.

The PTFP shutdown means all grant applications for 2011 have been set aside and will be destroyed, though NTIA staff will continue to monitor previously awarded grants to ensure that taxpayer funds are used responsibly and efficiently.

Asked if the program might be re-funded, some observers in the non-com community described the chances as slim, at least in the short term. "Historically, once funding for a program is cut from the federal budget, it is difficult to get those dollars back," a National Public Radio executive said.

Advocates of the grants said funding has been under attack by some members of Congress, mostly House Republicans, for years.

**This will be a significant loss of funding.**

— Tim Warner

Federal funding for the Corporation of Public Broadcasting itself has come under fire by some in Congress. An appropriations subcommittee plan released earlier this year would have completely phased out federal CPB dollars within two years. CPB essentially was funded at the same level as last year in a continuing resolution passed in April.

Federal cuts also come at a time when many states are cutting funding levels for public broadcasting programs and operations. For example, Florida Gov. Rick Scott in May signed a bill that eliminates all state spending to public radio and television stations.

Noncommercial radio broadcasters will need to find other funding resources to move projects ahead, most likely from local fundraising, public radio observers said.

**HISTORY**

PTFP has played a major role in the development of public broadcasting infrastructure across the United States for nearly 50 years.

It began operations as part of the Educational Television Facilities Program in the U.S. Office of Education, which was signed into law by President John F. Kennedy in 1962. The goal of the program was to expand the coverage areas of pub-

**NEWS**

lic radio and television stations.

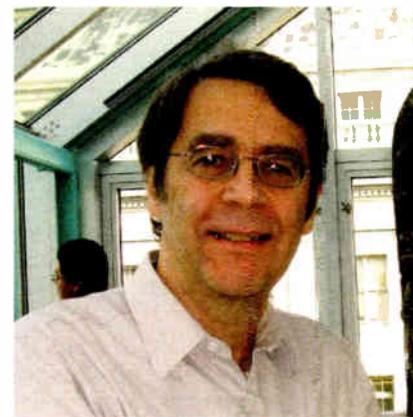
"With the program's assistance, public radio today reaches approximately 90 percent of the country's population," according to the NTIA website.

PTFP was a competitive grant program to help public broadcasting stations, state and local governments, native tribes and nonprofits build facilities for educational and cultural programs.

The awards were matching grants. NTIA-PTFP funds could provide no more than 75 percent of eligible project costs for a construction project that would extend public broadcasting services. For projects to replace or improve equipment, PTFP's general policy was to provide no more than 50 percent federal funding, according to the NTIA website.

The program received 225 applications from radio and TV stations for fiscal 2010, asking for a total of \$40.7 million; it awarded 126 grants totaling about \$20.5 million. For radio specifically, PTFP approved 73 awards totaling \$8 million in 2010, according to National Public Radio and previous Radio World reporting.

Typical is the grant application filed by South Dakota Public Broadcasting asking for \$272,000 in PTFP money for FY2011 to help build a full-power FM in Watertown, S.D. The public broadcaster operates 10 full-power radio



**Doug Vernier**

stations and another nine low-power translators in the state.

"We have benefitted greatly from PTFP through the years. All of our FM projects were built with the assistance of PTFP. We have had to place on hold an FM project planned for this year because of the lack of funding," said Don Forseth, technical services coordinator for South Dakota Public Broadcasting.

"We still hope to one day build the (Watertown) project, but it will have to be community funded. We have a local steering committee exploring ways to raise the money locally. The whole project is going to cost \$400,000. We

*(continued on page 6)*

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## PTFP

(continued from page 5)

had hoped to use PTFP money to cover the tower and antenna expenses.”

In addition, the loss of PTFP funding means emergency grants used by publiccasters when a major equipment failure hit in the past will not be available, Forseth said.

“We lost a tower once and submitted successfully to PTFP for emergency funds to rebuild. That won’t be happening anymore.”

Expanding new noncommercial service into underserved areas was the “highest priority” of the PTFP, said Tim Warner, president of Timothy L. Warner Inc., a consulting engineering firm.

“The federal government has just eliminated the single best source of funding to do that,” Warner said. “This will be a significant loss of funding. There is no other place to look for grants to fund equipment purchases for noncommercial broadcasters.”

Warner said many of his clients have put projects on indefinite hold because of the recent developments. Others continue moving forward but with drastically different government funding levels, he said.

“People are looking at every other conceivable source of funding, from foundations to other grants, but there is no one else doing significant grant writing for equipment because PTFP has always been there.”

Warner speculated that the end of PTFP funding was continued backlash against public broadcasting in the United States.

“There is an anti-public broadcaster movement. It’s a political attack on public broadcasting that’s coming at the same time as a downturn in the economy.”

### FUNDING LEVELS DROPPED

National funding levels for PTFP had declined significantly through the years. Appropriations had been averaging around \$20 million per year since FY2004, said Doug Vernier, president of V-Soft Communications, a broadcast engineering consulting firm.

Funding for PTFP was cut drastically from \$43.5 million in FY2003 — its largest regular appropriation ever — to \$21.8 million in FY2004.

“There was always a lot of competition for the money and that has increased as funding levels dipped through the years,” Vernier said.

“The grant applications had to be very detailed. It was a well-run program. I’m afraid it’s unlikely any money is going to come from the federal government anymore [for equipment]. Unless you are in a major city, it is increasingly difficult for stations to raise money for equipment needs.

“For those broadcasters holding CPs with the three-year window closing to get the station built, it will be devastating not to have grants for equipment available any longer.”

Vernier is the former director of broadcasting services for the University of Northern Iowa and used PTFP grants to expand the school’s broadcast services. He said the size of PTFP radio grants ranged from under \$100,000 to several million dollars, depending on the project.

“It’s very difficult for most public radio stations to find money for equipment these days because of the high cost of operations,” Vernier said.

But efforts to have PTFP funds restored in fiscal 2012 are already underway. National Public Radio has asked Congress to approve \$20 million in funds for PTFP for FY2012, said Mike Riksen, vice president of



**Don Forseth, technical services coordinator for South Dakota Public Broadcasting, stands in the server room of the Network Operations Center in Vermillion, S.D. He says the loss of PTFP funding means emergency grants used by publiccasters when a major equipment failure hit in the past will not be available.**

### WHAT DID PTFP FUND?

Here’s a sampling of radio projects awarded PTFP federal grants in 2010; dollar figures are rounded off:

- \$68,000 to Humboldt State University in Arcata, Calif., to purchase digital production studio and control room equipment for KHSU(FM).
- \$69,000 to Pataphysical Broadcasting Foundation in Santa Cruz, Calif., to replace analog on-air and production audio consoles with digital audio consoles for KUSP(FM).
- \$80,000 to Spokane Public Radio Inc to activate public station KPBW(FM), at 91.9 MHz, in Brewster, Wash., as a repeater station of KPBX(FM), Spokane, Wash.
- \$148,000 to Radio Bilingue in Fresno, Calif., to activate a public station at 88.1 MHz in Douglas, Ariz., as a repeater station of KSJV(FM) in Fresno.
- \$20,000 to Cumberland Communities Corporation in Knoxville, Tenn., for emergency funding to replace the transmitter for WDVX(FM), which was lost as the result of a lightning strike.
- \$19,000 to Grand Valley Public Radio in Grand Junction, Colo., to replace the existing transmission facility for KAFM(FM).
- \$52,000 to Hawaii Public Radio to activate a repeater station for KIPO(FM) at 89.7 MHz on Maui.
- \$112,000 to KUTE Inc., in Ignacio, Colo., to replace automation system, add generators at two transmitter sites and build a voice over studio at KSUT(FM).
- \$74,000 to Driftless Community Radio, Inc., in Viroqua, Wis., to activate WDRT(FM) on 91.9 MHz.
- \$50,000 to KDUR Radio in Durango, Colo., to replace audio consoles and associated equipment in production and control rooms for KDUR(FM).
- \$105,000 to San Diego State University Research Foundation for the digital conversion of KPBS(FM) in San Diego and KQVO(FM) in Calexico, Calif.
- Funding for nine new radio stations serving Native American communities in Arizona, California, Idaho, Minnesota, New Mexico and South Dakota.

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## RDS

(continued from page 1)

Experience/Broadcast Electronics.

Peterle began the session with an overview of the basics, reminding the audience that RDS data rate is quite slow, only about four times the speed of the old UPI teletype machines. From there it only gets worse as you factor in bits used for error correction, PI code, housekeeping and PS. This limited speed means that broadcasters may need to make compromises in order for all RDS services to function.

Peterle explained how group sequence determines the order and frequency of groups sent. For example, a station may transmit radio text (RT), group 2A; program service name (PS), group 0A; traffic message channel (TMC), group 8A; Open Data Applications Identifier (ODA), group 3A; and clock-time-date, group 4A.

With 20 percent of bandwidth allocated for each of the five group types, six of each group would be sent every three seconds. This is acceptable for TMC and RT, but will not work for scrolling PS, since six 0A groups in three seconds is not enough to defeat "scrolling-resistant" receivers.

The good news, Peterle added, is that groups 3A and 4A only need to be sent a few times a minute. By constructing longer group sequences, the impact of the 3A and 4A groups can be minimized.

Some data services such as emergency messaging need bandwidth when messages are being sent, but much less when the service is idle. Encoders with extended group sequence can reallocate bandwidth dynamically to emergency messages, and return it to other groups when the emergency buffer is empty.

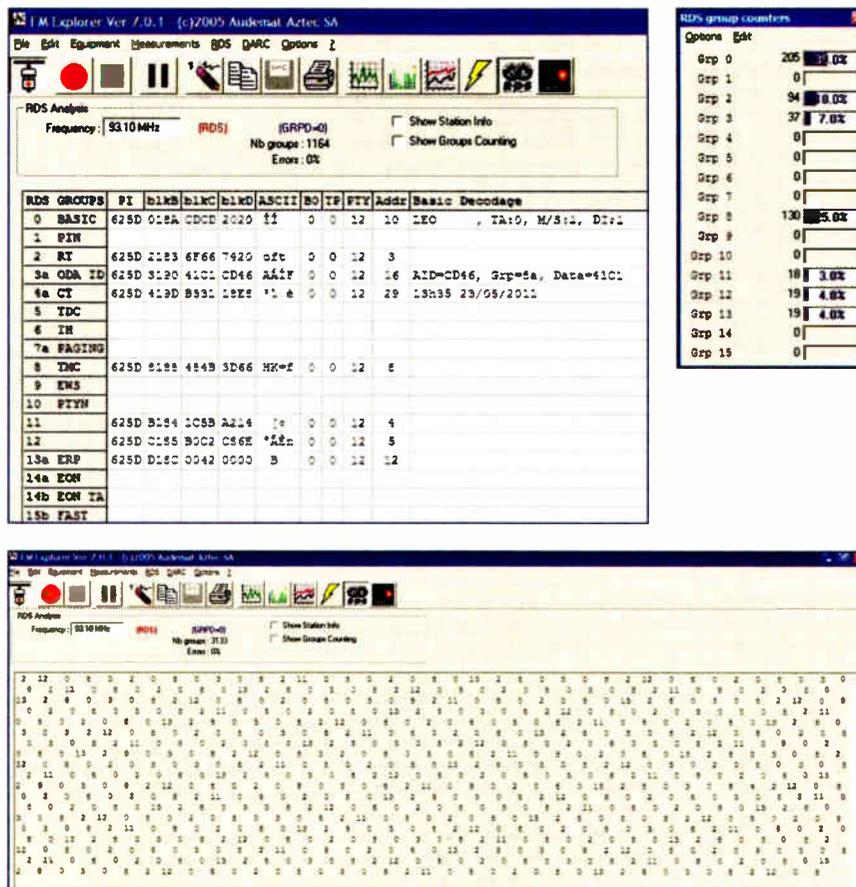
By managing the group sequence and the extended group sequence, a station has a better chance of providing listeners with a more robust RDS experience.

## DASHBOARD PHENOMENON

The RDS receiver landscape has seen many changes, according to Alan Jurison.

RDS is now almost exclusively an automotive phenomenon. Low- and mid-priced RDS table radios and portables seem to be disappearing, leaving text displays only on high-end receivers.

Most modern auto receivers feature



The RDS summary, top left, shows groups used and the current data in each. The group sequence display, top right, shows each data group type as it is broadcast. At bottom, the RDS group count indicates how much bandwidth each type of group occupies. These three images are from an Audemat Navigator 100 mobile measurement system.

bigger displays, with PS and RT fields shown together. Most support RT+. There is no standard for how RDS receivers display text, so it is wise to view your station's datacasting display on several receivers to make sure you're coming across the way you intend.

Jurison showed displays from several radios to make the point that broadcasters need to be clear about the differences between PS and RT.

With older, inexpensive receivers such as the DenonTU-1500RD, the display will not fit 64 characters, so it scrolls RT. Because the RT is scrolling, many confuse it with dynamic PS. These older receivers caused many broadcasters to be PS-focused.

Newer radios, however, support RT equally, if not better than PS. To ignore RT is to ignore the user experience on newer radios.

He adds that some stations are still doing dynamic PS and are not transmitting RT at all. The radio displays Jurison showed made the point that stations without RT do not present themselves well on the newer receivers.

He adds that some of these newer receivers do not show the PS, and if you have static RT, they can no longer see dynamic content such as song titles. Stations doing dynamic PS should be sending dynamic RT as well.

New receivers emphasize RT over PS, meaning that your station should evaluate the RT sending rate of your RDS encoder. Factory defaults often have slow RT send rates. Since receivers often wait for RT to be sent twice, the process slows down dramatically, sometimes taking as much as 15 seconds.

Jurison also reminded the audience of RF and FCC issues surrounding RDS.

Guidelines for injection level recommend between 3 and 11 percent. Too low a level, and receivers may not

decode RDS, while too high a level robs main channel modulation. With newer receivers, 6 percent injection is a good starting point. Levels should be set with a modulation monitor that supports RDS injection display.

FCC rules allow stations to increase total modulation 5 percent for each additional FM subcarrier, up to 110 percent maximum for two or more subcarriers.

The RDS subcarrier must be synchronized with the pilot. Sync problems can cause issues with RDS reception. When properly synched, the modulation peaks of the RDS subcarrier will be slightly reduced, leaving more room for main channel modulation.

One of the hot topics for RDS, according to Jurison, is interfacing with EAS units so that alerts may be broadcast in text form. A few stations have hacked custom solutions, but manufacturers are just beginning to develop firmware so that EAS and RDS units can talk to each other. No standard for interoperability exists yet.

Jurison said Inovonics has firmware available for download to enable its 730 encoder to interface with Sage and Digital Alert Systems devices. The EAS receiver truncates alert messages to 64-character format, and sends it to the RDS encoder via serial or TCP/IP connection.

## REVENUE ENHANCEMENT

Roberts began his presentation with tagging. Fifth- and sixth-generation iTunes devices support RT+ tagging of artist and song title. Affiliate tagging is no longer supported for RDS.

He then described revenue opportunities offered by RDS. They include high-impact ads, such as running messages all day for a single advertiser. An example would be ads for a flower shop right before Mother's Day.

Linked events involve running RDS text at the same time as a commercial. Messages may be the advertiser's phone

(continued on page 10)

## Confusion Between PS and RT

- Some stations are still doing dynamic PS and are not transmitting RT at all.
- Consider adding RT support, as your station's does not appear well on newer receivers.



Alan Jurison's presentation at NAB included a discussion about the confusion between PS and RT.

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World Radio History

## RDS

(continued from page 8)

number, a coupon code or Web address. With HD, graphics can be included.

Roberts adds that what stations should not do is clutter their RDS with an endless barrage of ads, or "radio spam," lest listeners become saturated and ignore RDS altogether.

**One hot topic, Jurison said, is how to interface RDS with EAS units so that alerts may be broadcast in text form.**

HD Radio offers enhancements, most notably the Artist Experience, which allows listeners to view graphics on receivers with compatible displays. Possible applications include station logos, album art and sponsor graphics. Artist Experience also will allow broadcasters to post advertising images linked to traditional audio advertisements.

In many cases, the data to be used for RDS may need to be enhanced. This is especially

true of information that was put on automation systems before the days of RDS. Examples include editing inappropriate song titles; adding missing information such as album names; and adding iTunes or other store ID.

Roberts adds that solutions include manual cleaning up the automation database; substituting a local database external to automation; employing a corporate database group-wide; and using third-party databases such as iTunes, Amazon or TagStation.

Opportunities exist to extend datacasting by exporting "now playing" data onto social networking sites. For example, stations can set up a separate Twitter account where listeners can "favor" certain songs.

Roberts concluded with applications of crowdsourcing in radio. New services give listeners the opportunity to make real-time decisions on what music airs on a station.

Key players in radio crowdsourcing include LDR.1, enabling listener input several times an hour; LDR.Takeover, allowing entire day-parts with listener control; Jelli, a syndicated platform which integrates with the station, enabling real-time engagement only when the show is on the air; and CrowdControl from The Radio Experience, which lets listeners vote for individual songs, or collectively program entire hours of your HD multicast channels.

*Tom Vernon is a longtime contributor to Radio World. Read Alan Jurison's RDS article series at [www.radioworld.com/article/99554](http://www.radioworld.com/article/99554).*

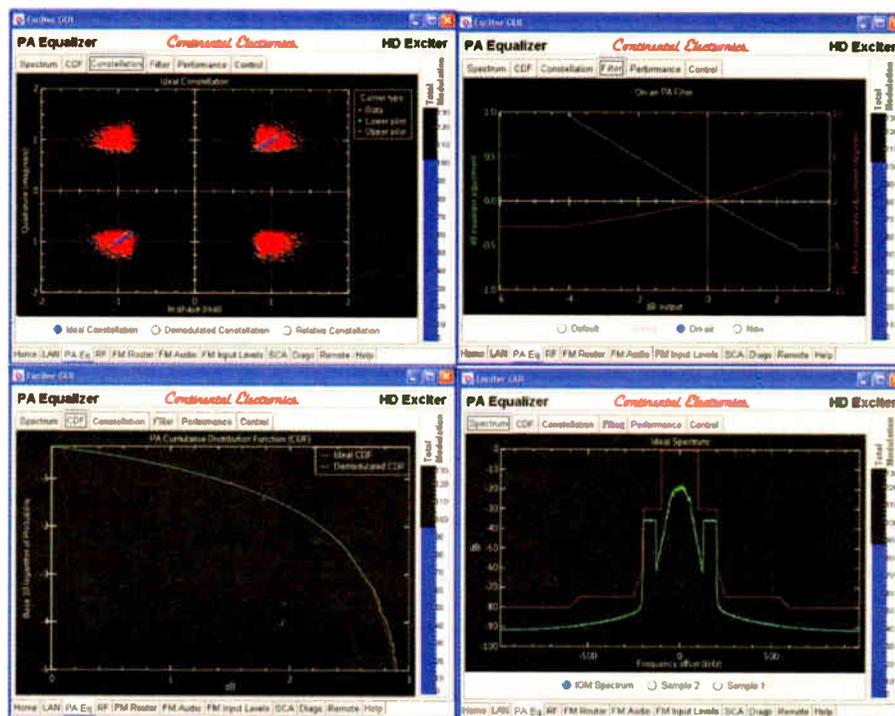
## NEWSROUNDUP

**FAIRNESS:** FCC Chairman Julius Genachowski told Congress he supports striking Fairness Doctrine language from federal regulations. House Commerce Committee Chairman Fred Upton, R-Mich., and Communications Subcommittee Chair Greg Walden, R-Ore., made the request. The doctrine required stations to air controversial issues of public importance and seek out opposing viewpoints. The FCC ruled in 1987 that it was unconstitutional and unenforceable, but language remained on the books, as did provisions involving personal attack and equal time, which the commission repealed in 2000.

**'REIMAGINED' WEBSITE:** The architect of the commission's revamped website, Steve VanRoekel, left his position as FCC Managing Director to take a job with the U.S. Agency for International Development. The exit comes as the FCC received complaints about the site's ease of navigation. The "reimagined" FCC.gov is part of Genachowski's effort to make the site easier for consumers to understand. VanRoekel told The Hill that other changes are coming to make the site easier for industry people to navigate. In the meantime, the agency gives users an option to access the former site.

**SCHILLER:** NBC hired former NPR executive Vivian Schiller to a new position overseeing the digital strategy of the news unit. NBC created the position of chief digital officer. Schiller, who starts mid-July, will oversee NBC News's strategy on websites and mobile devices. She resigned from NPR in March amid controversy over perception of political bias at the public broadcaster.

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## MARKETPLACE

**SOUND4 SOUNDS OFF:** The Sound4 Voice AD is a three-band, six-channel voice processor with analog/digital in and out, for use in live studios and adaptable to various kinds of voice. It runs on a Sound4 PCI express board card, powered with Shark DSPs. It is also available in a Livewire In/Out version.



The HQ Sound 192 kHz processing chain includes a three-band noise gate, advanced de-esser, three-band processor, four-band parametric EQ and brick-wall limiter for finalization. Its dedicated graphical user interface shows the six mics, status, characteristics and user names. Sound4 offers "Session Recall" so it is possible to save mics characteristics with loaded users presets and recall them by mouse click.

The Sound4 Voice AD uses Network Preset Management to centralize and distribute user presets on any Sound4 Voice processors connected to the network, and can manage an unlimited quantity of users.

Each processor can accommodate up to six microphones, which can be located in several studios. Studios may save and recall their own sessions.

Sound4 is a French company launched in 2007; its products include RDS, audio over IP and audio routing.

Info: [www.sound4.biz](http://www.sound4.biz)

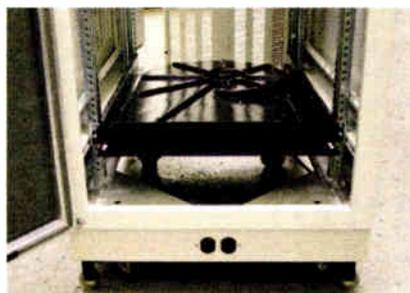
**BROADCAST BOX:** ARX presents the BSX 16, a splitter aimed at press and presentation rooms and events; it's active, rack-mounted, two-in and 16-out. Features include a bank of outputs that offer mic or line-level signals. Inputs have 20 dB pads. Outputs are transformer isolated for shutting down ground loop hums. All I/O is XLR. Inputs have gain and level controls along with 48 V phantom. There



is a PA output on the rear for powered speakers and a controllable headphone output on the front.

Info: [www.arx.com.au](http://www.arx.com.au)

**BLOWIN' THE WIND:** Rack, enclosure and accessories maker Crenlo introduced a large, 2RU horizontally-mounted ducted fan/blower for keeping equipment cooler. The



jumbo blower can move 250 cubic feet of air per minute. A dust filter is optional. Also new is an extra-long power strip/power distribution unit. Consisting of 24 outlets, in two separate circuits, it will handle 30 A duties and comes with mounting hardware. UL and ITE-compliant.

Info: [www.crenlo.com](http://www.crenlo.com)

## IBB

(continued from page 4)

and networking virtualization. He said BBG should colocate systems into data centers with multiple redundancy layers, and eventually migrate much of its application portfolio into cloud computing; he pointed out that BBG is already using the cloud in some applications.

He also laid out operational recommendations, starting in the first year with changing the name of the Office of Engineering and Technical Services (to Technology, Services and Innovation); setting up a new tech management structure; creating an application and database to manage transmission and content distribution assets; and creating a Security, Business Continuity and Disaster Recovery Office.

He called for continued migration to MPEG-4 content encoding; an upgrade of the Network Control Center; outsourcing of station operations in Bangkok and Udon in Thailand; and applying what is learned from that outsourcing to other shortwave operations. He recommended a big IT consolidation effort; fixing IT wiring; eliminating single points of failure; implementing a hosted e-mail, IM, conferencing and Blackberry server system; and expanding the use of internal intranet sites.

It's not clear how many of his goals, if adopted, were accomplished in the last 12 months. He also laid out broader goals for the second year.

### SLOW SUNSET

I never met André V. Mendes; indeed I learned while writing my online article that he is a former contributor to

**IT'S A FLUKE:** The Fluke 381 is a remote display true-RMS AC/DC hand-held clamp meter. The detachable remote/wireless LCD display operates up to 30 feet from the measurement



point. Measurement capability is 1000 A AC and DC current with fixed jaw; 1000 V AC and DC; frequencies to 500 Hz and True-RMS AC voltage and current for measurements on nonlinear signals. It features min., max., average and in-rush recording to capture variations automatically and 60 kohms resistance measurement with continuity detection. An iFlex flexible loop probe can be used for measuring items that a normal clamp can't.

Info: [www.fluke.com](http://www.fluke.com)

**DO THE SPLITS:** The U.S. operation of Germany's Stagetec offers the On Air 24 console, for small clusters and stations. The surface controls a digital network using a Nexus fiber-optic audio distribution system (router, I/O, processing) and Linux OS. Each modular four-fader bucket is linkable,



up to 24 faders. "Split-fader" modules can be installed in custom furniture. Each fader channel has rotary encoders, programmable buttons, OLED visuals and 100 mm Penney & Giles motorized fader. A separate monitor panel offers info on source and level controls, L/R and talkback, etc. The On Air 24 operates as stereo or 5.1 surround sound. DSP such as EQ, compressor, gate and delay are included. The surface is functional with Windows-based PC monitoring and remote control systems. Interfaces for major third-party automation platforms are available or can be customized.

Info: [www.stagetec.com](http://www.stagetec.com)

Radio World's sister publication TV Technology. But based on my limited exposure to the subject, his report seems an intelligent discussion of real problems.

I can imagine he upset some apple carts. Who wants photos of their bad wiring spread around the Internet? And whether Mendes and the staff have the chops to change an entrenched technology culture embedded within a federal bureaucracy is hard to predict.

As far as shortwave, Mendes did recommend that the organization create a strategy to "sunset" SW operations.

I think the term "sunset" is misleading because it suggests a finality that the report doesn't recommend. Mendes told me in a subsequent e-mail that shortwave "will remain an important medium for the BBG where it is a viable one, but its use will be driven by audience habits and the relative costs of transmission."

However, it's noteworthy that a top technical executive is using that language, and it shows the direction BBG management is likely to continue.

Expect more reductions of BBG-owned SW facilities; more outsourcing; more sharing of resources with other broadcasters; and/or more leasing of capacity from third parties. If you're interested in the fate of U.S. shortwave, all the more reason to read his report, which concluded among other things that "the decision process for station closing does not appear to follow an overt decision and stated plan to reduce shortwave usage."

You can read it in PDF format; visit [governmentattic.org](http://governmentattic.org), key phrase BBG Technology. Note that it is followed by separate earlier information about the organization's technology and new media efforts.





Why do Axia consoles do phones best?  
(Hint: who's *your* daddy?)



Other consoles treat phones like an afterthought. But Axia's parent company is Telos, so phones are part of our DNA. Consider our Element AoIP console, and the Telos VX broadcast VoIP phone system. Both amazing on their own. But when you connect them — magic. Total integration, so talent can run complex talkshows without taking their hands off the board. Effortless. A dedicated hybrid for each caller, each assigned to its own fader, with automatic mix-minus and talkback. Painless hookup via CAT-5 — no extra I/O or logic connections required. An all-digital path for crystal-clear caller audio, even from cell phones. That's the Telos connection. And only Axia gets it. Axia: the console that talks Telos.



[axiaaudio.com](http://axiaaudio.com)

# Mushroom Design Secures Equipment

## Why Let Guitarists Have All the Fun?

It's a great day when you find a product designed for another industry that can be used productively in broadcast applications. Power-All Power Grip pedal board tape, provided by Godlyke Distributing, is one.

### WORKBENCH

by John Bisset

Read more Workbench articles online at [radioworld.com](http://radioworld.com)

The original idea came about because musicians were using hook-and-loop fastening tape to secure guitar pedals to wooden boards. The adhesive would give up, and the pedals on the boards would fall off.

Power-Grip is simple and ingenious. Pieces of the tape mate to itself via rows of mushroom-shaped posts that form a much stronger bond than traditional hook-and-loop fasteners do. Plus, when its adhesive backing cures to the surface to which it is affixed, it's not going anywhere.

The tape is sold in 1 meter (39.37-inch) by 1-inch rolls, and can be ordered

online for \$14.95. On the website is a video that demonstrates the installation and results; see [www.godlyke.com](http://www.godlyke.com) under the Power-Grip pull-down.

So where can this be used around the station?

How about to secure that copy stand atop the console? The stand can be removed to get inside the board; otherwise it stays put. Or secure remote equipment accessories like power supplies to the sides of their respective units.

Wherever you need a strong bond, Power-Grip tape will work. Keep in mind that the adhesive backing is very strong and may remove paint from the surface when the time comes to pull it up.

**M**ost engineers look forward to doing a studio reconstruction project at least once in their careers.

Phillip Vaughan dropped off "before and after" pictures. He says Fig. 1 is representative of wiring at the facility, so you know he had his work cut out for him.

"It's amazing how bad the wiring can get around a station over the years,"

he says. One quick "temporary" wire here and there — well, we've all seen it. Phillip found himself approaching any

work on the studio blocks with trepidation, afraid he might take the studio down.

Tired of the situation, he drew up plans to rewire them. A complete overhaul would have been better, but this was the next best thing.

(continued on page 16)

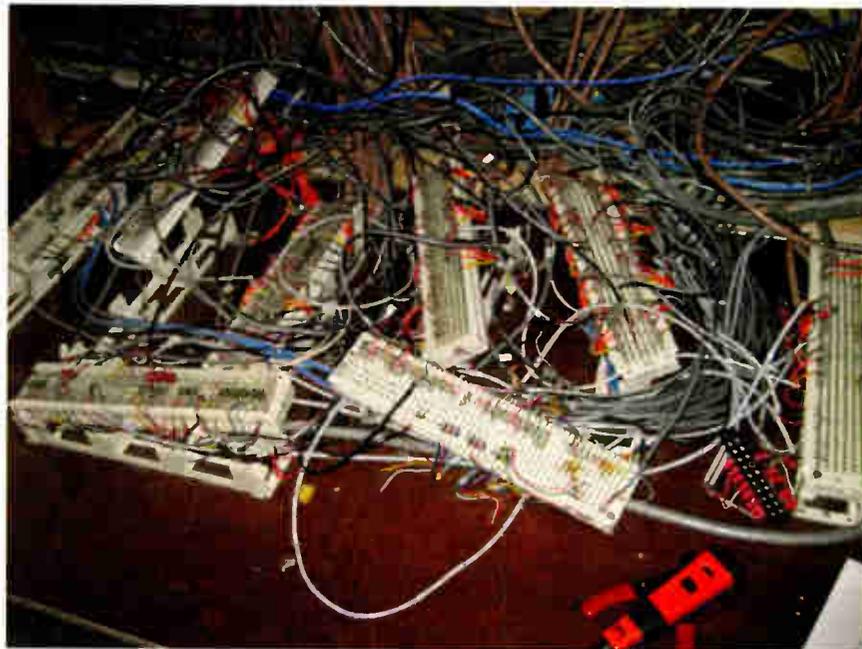


Fig. 1: A rat's nest like this might scare anyone off.

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they're available for use anywhere in your facility. And if you decide you want to use VoIP services, VX can do that too.

VX is so scalable, it can manage multiple simultaneous talkshows in the largest facilities. Yet it's cost-effective even for a few studios. Audio is clean and consistent, because dedicated, third-generation Telos hybrids manage each individual call. Even conferences are crystal-clear. You can deploy VX

"virtual phones" in production rooms, news workstations, or anywhere there's a PC with a USB mic and headset. Got a hot talkshow that suddenly demands more lines in a certain studio? Just a few keystrokes at a computer and you're set.

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## AUDIO LOGGING



PC Software for archiving and logging all of your stations audio.

# WORKBENCH

(continued from page 14)

Phillip was joined by two other engineers; they finished the studio wiring in one weekend, while the station broadcast from the backup air studio. Fig. 2 shows the result.

Phillip Vaughan can be reached at [philv@kfrog.net](mailto:philv@kfrog.net).

On another note, Phillip has noticed that about every piece of broadcast equipment built these days has a Web interface. Some of his monitoring equipment can give readings only through that interface; there's nothing on the front panel.

Personally, he would rather be able to just look at the front of a piece of equipment to get the info he needs from it. What do you think? Would you pay a little more for equipment that provides traditional front-panel metering, status and control?

**G**uy Berry, manager at Potomac Instruments, writes with a couple of cautions.

In this day of doing more with less, we may be tempted to skimp on test instrument calibrations. If you decide to use a calibration service not provided by the manufacturer, check it out. A bargain-basement calibration price may come back to bite you if the instrument is not accurate.

In the case of field intensity measurements, the cost could be enormous. This is not to say you should avoid non-manufacturer calibration services; there are a number of qualified services.

However, exercise due diligence. Speak to engineers who have used the service. Determine the company's procedures and how they compare to those of

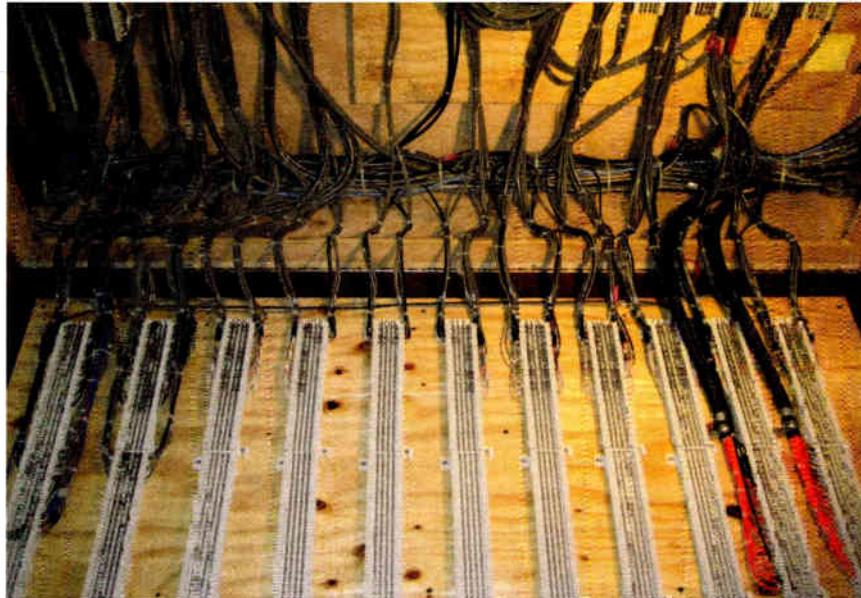


Fig. 2: Three engineers knocked the job out in a weekend.

the manufacturer.

Guy's caution is that anyone can twist a knob. Know what you are paying for!

His other nugget, especially for engineers maintaining older equipment, is to check the manufacturer's website for manuals and application notes before looking elsewhere. He points out that \$15 or \$20 sounds like a fair price for a manual offered by a third party — until you find out the manual is offered by the manufacturer for free.

As for Potomac Instruments, Guy reports the company has settled nicely into its new home in Frederick, Md. The building used to be the home of Bradley Broadcast, which is now a division of SCMS.

What makes Potomac's move especially noteworthy is that for the first time in some 40 years, production is located on one single floor, so product no longer needs to be carried up and down stairs.

Reach Guy Berry at [geb@pi-usa.com](mailto:geb@pi-usa.com).

**F**rom across the Pacific, Paul Sagi from Kuala Lumpur comments on our story in Radio World's May 4 edition. (You can find recent articles at [radioworld.com](http://radioworld.com) under Columns; click on *Workbench*. The article is headlined "Get to Know That New EAS Box.")

Paul writes that 1N4001 diodes are made for power frequency use. He feels their junction turn-off time may be a bit slow for audio use, thus with audio circuits Paul chooses 1N914 diodes.

The column also mentions a 4.7  $\mu\text{F}$  50V non-polarized capacitor. Paul writes that sometimes, non-polarized electrolytic capacitors are difficult to obtain; regular polarized electrolytic capacitors can be used instead.

Here's what you do. To use ordinary polarized capacitors in place of the 4.7  $\mu\text{F}$  capacitor, simply connect the negative leads of two 10  $\mu\text{F}$  25V capacitors to each other (putting the capacitors in series to halve the capacitance). Solder the two positive leads into the circuit, and the problem is solved.

Paul had some experience with the white barrier terminal connector shown in the article photo, reproduced here in Fig. 3. It works; but the popular green Phoenix connector, also seen in the photo, is better.

That's because the screws of the white connector rub against the wire as they are tightened and may break or

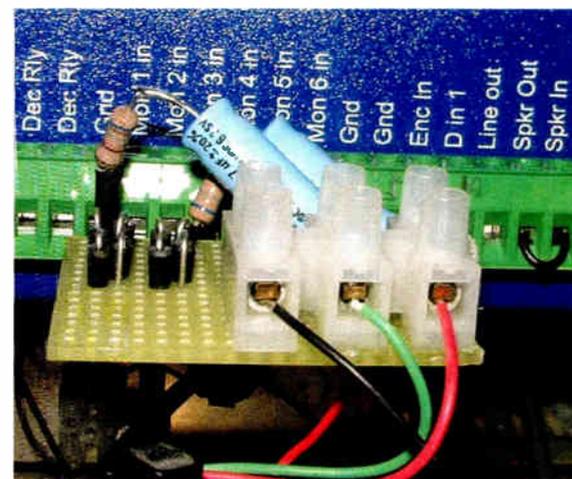


Fig. 3: Green trumps white in one reader's choice of connector.

weaken the wire, leading to later failure, especially in mobile applications. The Phoenix connector, on the other hand, clamps the wire without rubbing against it, hence Paul's preference.

Reach Paul Sagi at [psagi92@gmail.com](mailto:psagi92@gmail.com).

Contribute to *Workbench*! You'll help your fellow engineers, and qualify for SBE recertification credit. Send *Workbench* tips to [johnpbisset@gmail.com](mailto:johnpbisset@gmail.com). Fax to (603) 472-4944.

Author John Bisset has spent 43 years in the broadcasting industry, and is still learning. He works for Tieline Technology, is SBE certified and is a past recipient of the SBE's Educator of the Year Award.

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WORKBENCH

by John Bisset

EVERY ISSUE  
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# Simplicity Made Smarter



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Less than a decade ago building infrastructure at even the most modest radio facility was difficult and costly. Today, AoIP is making it possible to replace miles of cables and closed systems with routers that use standardized network protocols. The **JetStream Mini** brings you the benefits of this new technology, and nothing is easier to use, faster, or less expensive. Add a **Pilot** control surface that includes the basic operating features your staff will need and you have the most cost effective AoIP networked audio system available.

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**Logitek**

# KRLD'S Dougherty Transmitter



## ROOTS OF RADIO

BY JOHN SCHNEIDER

While we normally publish historical images in their original glorious black and white, I just couldn't resist the urge to "colorize" this photo.

The image is a merger of two side-by-side black and white views of the Western Electric 407A2 50 kW water-cooled Dougherty transmitter at KRLD in Dallas, taken sometime during World War II. The colors are accurate where known, and a best guess was made when they were not.

Of additional interest are the "8-ball" microphone on the desk and the gun rack on the wall, an indication of the wartime security conditions that existed at many

major broadcast facilities during those years.

The photos were taken at the KRLD site on Saturn Road in Garland, Texas, still in use today. The site was built in 1940 when the station was authorized to increase its power from 10 kW to 50 kW.

These images are two of a number of old KRLD images that were rescued and posted on the Internet by Andrew K. Dart, reproduced here with his permission. They originally were provided to him by Leslie Turner.

You can see many more of Andrew's KRLD images at [www.akdart.com/vtr/vtr.html](http://www.akdart.com/vtr/vtr.html). There are also images of this same transmitter model at WHAS in Louisville at [www.qsl.net/wb4wsb/whasam/am.html](http://www.qsl.net/wb4wsb/whasam/am.html).

*John Schneider is a lifetime radio history researcher. This is one in a series of photo features from his collection. Write him at [jschneid93@gmail.com](mailto:jschneid93@gmail.com). Comment to [radioworld@nbmedia.com](mailto:radioworld@nbmedia.com).*

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# FEATURES

## WHO'S BUYING WHAT

A **Harris HPX20** tube transmitter is now serving **KAVX(FM)**, heard in the Lufkin/Nacogdoches region of eastern Texas and western Louisiana. The transmitter is capable of HD Radio and FM transmission, though the station is airing only FM for now. It replaced a QEI transmitter. ...



**Tim Swanson** is chief engineer for **KAVX**, now using a **Harris HPX20**.

**Ohana Broadcast** in Hawaii took delivery of **Axia Audio** consoles and networking gear. The equipment is for six studios that will serve five FM stations in Honolulu: **KQMQ**, **KUMU**, **KPOI**, **KDDB** and **KKHA**. They chose **Axia Element 2.0** mixing consoles with **PowerStation** console engines. **Axia** said was its first installation in Hawaii. ...

**American General Media** has installed **Specialty Data Systems'** broadcast management software **SDS Symphony** at its 21 FM and seven AM radio stations in California, New Mexico and Colorado. Separately, **Blackburn Radio Inc.** installed **SDS Symphony** at its 14 radio stations in Ontario. ...

**Brigham Young University** greeted 2011 with new studios for its radio and television facilities. **Brandon Smith** is chief technology officer for **BYU Broadcasting**. **Russ Berger Design Group** designed the technical spaces. **WideOrbit** automation and **Axia** consoles are among the equipment choices in the radio studios. ...

**ESPN** purchased a **Telos Hx2** digital hybrid telephone interface through dealer **Broadcasters General Store**. ...

**Barix** said **Total Star Network**, a radio broadcast network of eight stations in England and Spain, switched from leased line and ISDN transport to a **Barix** audio over IP distribution network. The broadcaster told **Barix** it will

**BYU Broadcasting** has a major new facility including two on-air radio studios, three TV studios, three audio post production studios, a recording studio, four voice-over rooms, 15 video editing rooms and six master control (distribution) rooms.



© 2011 Alan Blakely

save \$10,000 annually on program distribution costs and in some cases improve audio quality. ...

**Main Line Broadcasting** went with the **Abacast** Digital Radio Platform for its online radio offerings. **Main Line** operates 19 stations in Kentucky, Virginia, Ohio and Maryland. ...

**Myers Information Systems** won a contract to implement its **ProTrack** Radio management suite for **Ave Maria Radio** in Ann Arbor, Mich., which airs Catholic programming. ...

**NEW**

**ARRAKIS SYSTEMS INC.**

**NEW**

## NEW~WAVE Automation

integrates with Arrakis ARC consoles



Windows 7 compatible

the **BEST** automation in Radio... period!

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3 play... On Air Line, Alternate, & Cast  
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Voice track recording for perfect Automation

Powerful Music scheduling  
Supports Traffic & Music libraries  
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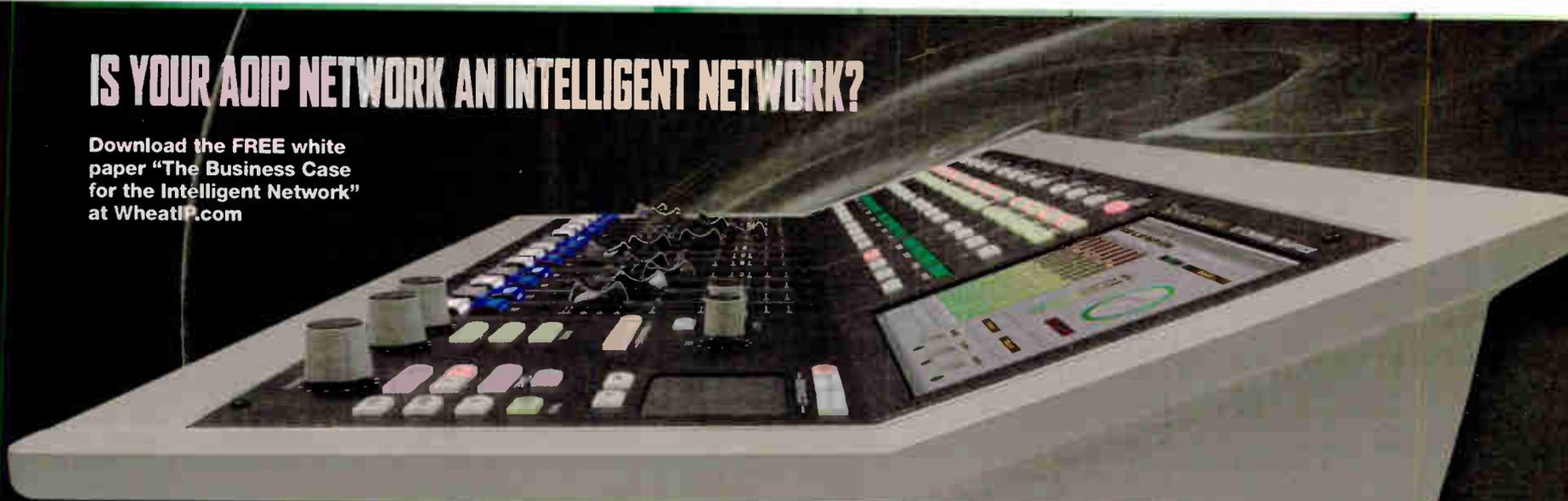
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# WQMV Expands Reach With Harris

PR&E NetWave Digital Console Serves Ambitious AM Station

## USERREPORT

BY R. DEAN DUKE  
General Manager  
WQMV(AM)

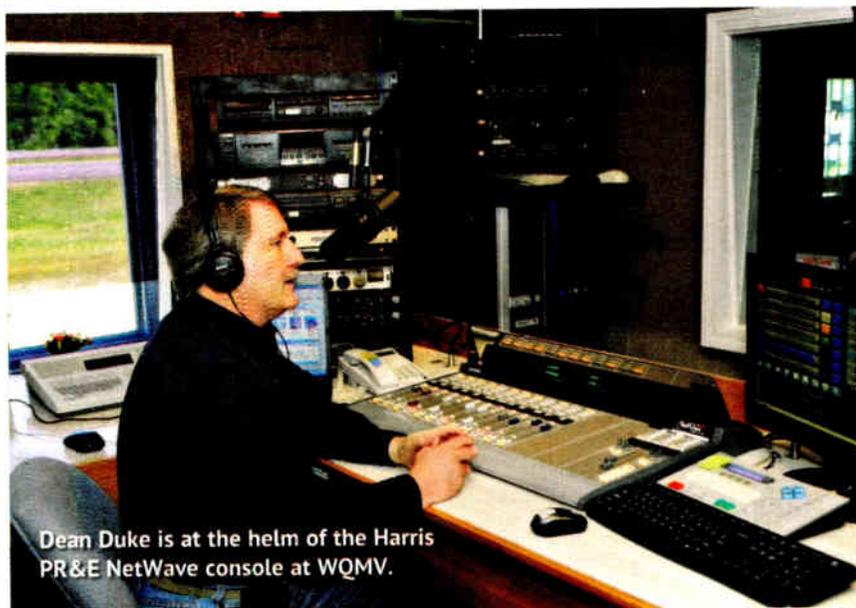
**WAVERLY, TENN.** — Survival in AM radio today means reaching a broader audience beyond local listeners. This includes streaming over the Internet to potential global audiences. We also have to make the most of whatever innovative opportunities come our way.

The Harris PR&E NetWave digital audio console is one innovation that is supporting our growth at WQMV(AM) 1060. NetWave enables us to serve our traditional audience and stream two channels over the Internet (accessible from [www.wqmv1060.com](http://www.wqmv1060.com)). Soon, we'll also be delivering WQMV's audio over our local government access cable channel on Comcast. More important, we can produce and deliver all four live radio channels from one NetWave console, run by a single operator.

### BUDGET CONSIDERATIONS

We purchased the Harris PR&E NetWave digital audio console in December 2010 after considering four competing consoles, and installed it in January of 2011.

Our Harris reseller, SCMS, recommended NetWave after listening to



Dean Duke is at the helm of the Harris PR&E NetWave console at WQMV.

Photo by Melinda Proctor

our goals and aspirations. Though it was slightly above our planned budget, SCMS made the case that it provided all the capabilities today to expand our operation rather than having to worry about adding onto the system down the road.

The NetWave is based on next-generation, cutting-edge technology. It gives us the capability, reliability and quality to reach a broader, potentially global Internet audience while better serving our local communities. As the emergency broadcaster for our county,

we need a console with solid dependability, especially given the sudden storms and floods that can plague our region.

While we transmit at 1,000 watts by day, our power drops to only 4 watts by night, making it difficult for listeners in our coverage area — Waverly, McEwen, New Johnsonville and other communities in Humphreys County, Tenn. — to receive a strong signal. The cyber radio channels give our audience the flexibility to listen with the excellent audio quality they expect.

Our previous audio console could at best give us mock stereo — essentially two channels of mono. The NetWave produces clear, crisp digital stereo audio, which is critical for those listening through multiple speakers on their desktop PCs or Internet radio systems.

With only nine full-time staffers, we couldn't accomplish all of the tasks necessary to manage multiple stations were it not for this board. Like many AM radio stations, we also have space and budget constraints, and this system packs a lot of features into a small form-factor.

The WQMV program day is a fresh, original format mixing oldies, Billboard hits and eclectic songs from the mid-1950s through mid-1980s. We also offer live news, sports call-in shows and live remotes of high school football and basketball games. We can run two feeds through NetWave if there are two games at the same time, with digital outputs feeding two separate cyber channels so fans can choose the live game they want to hear.

Live inputs to the board include: on-air announce microphones, one guest microphone and several mics in an adjacent guest studio. We also feed two CD players, a 360 Systems DigiCart system for commercials and promos and a computer automation system, which feeds digital music selections from our 6,000-title library.

Telephone calls run through the board, and callers receive a mix-minus output so they don't hear their own voices feeding back when we talk to them live. A 360 Systems ShortCut digital recorder, another NetWave input, can record calls so the auxiliary console in our production area can edit them for later replay. NetWave also has add-on interfaces for the phone line and a profanity delay.

Local sports remotes come into the studio over a high-quality digital phone, cellphone line or phone hybrid. We also air live football games on

*(continued on page 24)*

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World Radio History

# Axia Audio Element Leads New Studio

## Wisconsin Badgers Like Their 'Studio Without Holes'

### USERREPORT

BY **MATT ROCKWELL**  
Chief Engineer  
WSUM(FM)

**MADISON, Wis.** — The tradition among broadcaster is to have a lot of wires in the walls.

A few years ago, WSUM, the University of Wisconsin's student FM station, finally gained a new permanent home on the campus after near a decade of residence in off-campus studios.

In a multi-studio facility, it is a useful thing to have all audio available everywhere, so "more wires," right? Not with Axia Audio's Livewire IP technology network.

#### IP AUDIO

Axia Audio has a line of consoles called Element which transport their audio via Livewire's audio over IP technology. The concept is to convert the audio to a multicast IP stream and move it to and from the network when the audio is created or required.

At WSUM, Axia's Livewire IP technology creates a core audio plant on economy of scale network switches supplied and managed 24/7 by the UW's Department of Information Technology.

The combination of additional network switch capacity, a private VLAN exclusively for audio streams, and extra Cat-6 cable installed (which made the

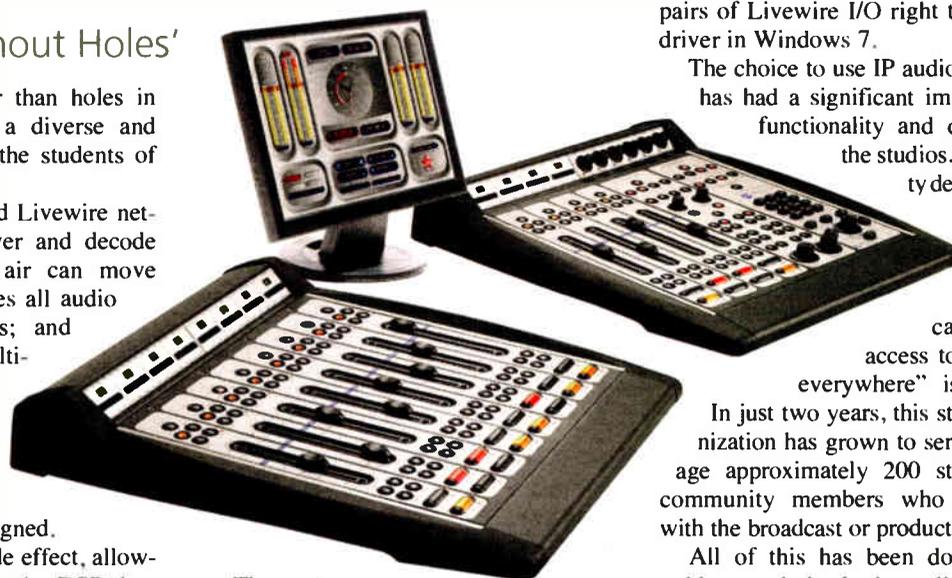
architects much happier than holes in walls) has resulted in a diverse and expandable facility for the students of the university.

A properly configured Livewire network can encode, deliver and decode audio faster than the air can move the vibration. This makes all audio available in all places; and because the audio is multi-cast, distribution amps will never be needed. The network switches just deliver the information to all devices where the audio is assigned.

This has another nice side effect, allowing all consoles to move the DSP they require to an external box located somewhere other than a nice, quiet studio.

WSUM's new facility has an Axia Element console in the main studio serving the FM and our Web stream.

The main studio sits suspended four stories over the University of Wisconsin's east campus corridor and boasts four guest positions, each with a control panel, a host position and a turntablist workstation with a Rane TTM57 digital crossfade mixer and turntables. The host has access to a pair of production CD players, a pair of DJ CD players, MiniDisc, cassette, CF recorder, two directly tied and automated turntables and a custom panel with ins and outs via XLR, RCA, 1/8-inch, 75 ohm AES, 110 ohm AES and a USB interface for computers or things like handheld recorders.



The custom IRU I/O panel also contains a USB connection to the dual-monitor host computer with Axia's IP-Audio Driver software, which sends audio to the network over Ethernet, replacing the need for PC sound cards.

Also part of the WSUM facility is a news booth with visual access to the main studio with another Axia Element console. A production studio with the same capability as the main studio is driven by an Element console. The facility also has three breakout rooms with Radio Systems Millennium Livewire consoles.

Finally, a live production studio contains a Yamaha M7-CL48 console. This has a 16-channel in/out AES card directly wired to an eight stereo-channel Axia AES/EBU Digital Audio Node for network input and output. The studio's

computer also has Axia's multi-channel audio driver, which brings multiple pairs of Livewire I/O right to an ASIO driver in Windows 7.

The choice to use IP audio at WSUM has had a significant impact on the functionality and diversity of the studios. As a facility designed to be a learning lab as well as a broadcast studio, access to "all audio everywhere" is essential.

In just two years, this student organization has grown to serve on average approximately 200 students and community members who participate with the broadcast or production.

All of this has been done without poking any holes in the walls.

For information, contact Clark Novak at Axia Audio in Ohio at (216) 241-7225 or visit [www.axiaaudio.com](http://www.axiaaudio.com).

## HARRIS

(continued from page 22)

the University of Tennessee's Vol Network and Tennessee Titans NFL football games on both the Titans Radio Network and ABC Radio. Additionally, we air syndicated shows from Citadel Media.

The NetWave has many operators, given our numerous music blocks and locally produced shows such as "Vols Calls," "Humphreys County Sports Wrap-Up Show" and "Tennessee Valley Views." Each announcer can monitor each channel and drop-in commercials while on the air.

The engineering staff built a high-performance network between studios. Studio guests can hear the air signal and our production tech can record and transfer local spots to our DigiCart for seamless on-air use. The NetWave audio levels are preset to an optimal range so the announcers never have to worry about adjusting levels on any input signal. Audio quality remains even from one show to the next.

I have found that NetWave is an ideal choice for an AM operation looking to expand operations and deliver a high-quality, "cyber" radio product. It's a robust, innovative, dynamic solution that has proven to be an excellent investment and platform for future growth.

For information, contact Harris at (800) 231-9673 or visit [www.broadcast.harris.com](http://www.broadcast.harris.com).

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# Sandusky Seattle Goes for WheatNet

## Wheatstone AoIP Technology Makes Cluster's Transition Smooth

### USERREPORT

BY **ROB PURDY**  
Engineer  
Sandusky Broadcasting

**SEATTLE** — As studio engineer for Sandusky Broadcasting in Seattle, I'm responsible for the studio facilities for a five-station cluster consisting of stations KLSY(FM), KIXI(AM), KLCK(AM), KKNW(AM) and KRWM(FM).

For several years, going as far back as 2007, we had been looking to upgrade and modernize our studios using networked digital audio technology. The system we had in place had some age on it and some of the parts were becoming difficult to obtain, making maintenance harder. We knew we would need to remedy that situation if we were to keep our systems reliable and remain competitive.

#### TECHNOLOGY

We originally had looked at TDM networking technology. However, as we continued to evaluate options and the newer audio-over-IP-based technology

began to enter the marketplace, I saw that it had distinct advantages in our application.

For us, reliability is key. The ability to build a network from small, intelligent building blocks using off-the-shelf wiring and switching components — in other words, an open IP infrastructure — meant that we could design a system with essentially no single points of failure.

After evaluating the various networking technologies and finding that Wheatstone's WheatNet-IP fit our needs most closely, we contracted with Jim Hibbard and Kat Coffey of Pacific Mobile Recorders of Sacramento, Calif., to provide us with a turnkey installation.

This was to be no simple task; new furniture from Studio Technologies was being installed to accommodate the new consoles and equipment, and all five of our stations needed to remain on the air during the project.

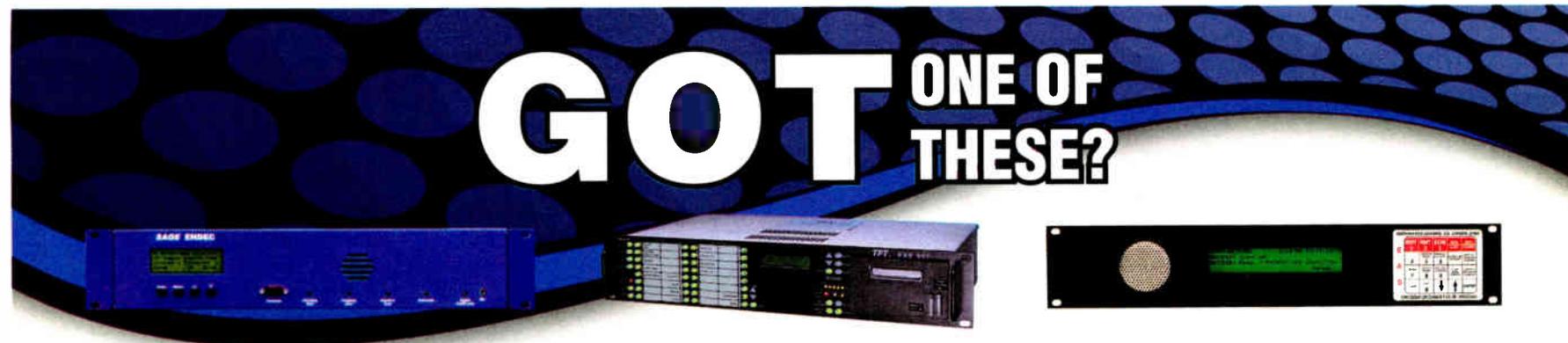
Equipment was ordered in late 2010, and by January 2011 the consoles and routing equipment were on-site and ready for installation. We decided to equip our five on-air studios with larger, full-featured Wheatstone Evolution-6 20-fader



consoles; these would give our air talent the versatility to deal with any type of broadcast. Each of these was equipped with a mix engine Blade and two IP-88ad

Blades, for a total complement of 16 analog and 16 AES inputs and outputs local to each console.

For our auxiliary studios, we chose



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12-fader Evolution-1 consoles; these compact units contain their own metering and control displays and give us a comprehensive set of features in a small footprint.

In our production rooms, we made an even bolder move: There are no consoles at all.

Instead, we're using Wheatstone's Glass-E virtual consoles, which emulate a full E-series control surface in software. These use the same IP-88e mix engine Blade as the other consoles, and we provided an IP-88a analog Blade also to provide 8 x 8 analog I/O local to the room.

Each of our studios — on-air, auxiliary and production — is equipped with its own Cisco 2960G switch. This topology allows each room to function independently in the event of a network disruption.

#### INTERFACING

We also chose to use WheatNet-IP driver software on our Broadcast Electronics AudioVault machines to eliminate the need for sound cards, and we were able to directly interface AudioVault control to the WheatNet-IP system via Ethernet as well.

During the installation, the flexibility and power of the audio-over-IP routing system became very useful. After outfitting our technical operations center with the WheatNet-IP Blades necessary to handle our air chains, Jim Hibbard designed routing salvos to allow fast, easy switching between main and auxiliary studios for each station.

We built the auxiliary studio for each station first. When complete, we used the salvos to switch on-air operations to that auxiliary studio while the on-air studio was rebuilt. We then used another salvo to move operations back to the main studio.

Because we were remodeling existing rooms rather than moving to new facilities, it took some time to plan and carefully implement this phased rebuild. One of our stations, KKNW(AM), was actually moved from one studio to another in the middle of two back-to-back remote broadcasts. We began work in February of 2011, and the system was substantially complete by mid-May.

Transitions like this are never easy on the on-air staff, but this one was smoother than most. Since the move, our people seem happy. Our production people are particularly pleased with the way the Glass-E virtual mixer interfaces allow them more room to work, because they don't need to have a bulky console taking up space in their areas. As for me, my peace of mind comes from the fact that our facility is now based on off-the-shelf IT infrastructure and is as future-proof as it can possibly be.

For information, contact Jay Tyler at Wheatstone in North Carolina at (252) 638-7000 or visit [www.wheatstone.com](http://www.wheatstone.com).

## TECHUPDATE

### ARRAKIS ARC-8 AIMS AT LOW COST

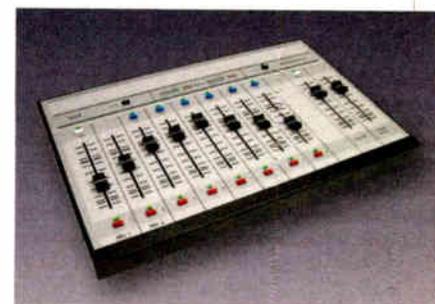
With a single stereo mixing bus, the ARC-8 from Arrakis Systems can handle fast-paced live on-air, production and remote applications.

Two mics support a host and guest talk format. The mix-minus bus (for an external hybrid) supports telephone talk formats or call-ins. The "Talk" button on mic Channel 1 feeds the mic to the caller and the caller to the console cue system.

The ARC-8 also has a built-in USB sound card on Channel 8B to play in digital directly from PC audio software. The program output from the console records in digital over the USB directly to PC recording software.

Arrakis provides Digilink-Xtreme software with the system to get users on-air and doing production quickly. The board is easy to install, with both professional balanced and consumer unbalanced input and output jacks, according to the company.

For information, contact Arrakis Systems in Colorado at (970) 461-0730 or visit [www.arrakis-systems.com](http://www.arrakis-systems.com).



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**SAGE**

# Allen & Heath XB-14 Shines for QRock

Small-Form Mixer Is the Right Size for Internet Rocker

## USERREPORT

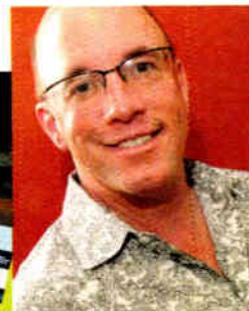
BY JOHN VAN PELT  
Program Director, Engineer  
QRock

**RALEIGH, N.C.** — QRock is a full-time, Web-only radio station created as a tribute to Myrtle Beach's old WKZQ(FM), "Rock 102."

At QRock ([www.qrock.com](http://www.qrock.com)) it's always sunny and you're always at the beach. "Bringing the best summer of your life, back to life," is our motto for an eclectic 1960s–1980s mix.

We found out about the XB-14s as they shipped, pleased to learn that Allen & Heath was entering the broadcast market. We were looking for a mix of small form factor, functionality and price; the XB-14 nailed all three. The installation was easy and the XB-14 has the right number of inputs and outputs we needed.

Useful features include separate host and guest headphone feeds (with host talk-to-guest and PFL to guest), mic channels with monitor mutes, dual inputs on stereo channels, external monitor input (for air monitor), USB audio in/out and other additions like



wise. Each channel has an aux feed (we use reverb on our mics) and three bands of EQ, which we use to clean up bad feeds and for effects every day.

With XLR, 1/4-inch and RCA connectors, these boards set up quickly and are suitable for small studio and remote applications. Plugging in an iPod or other consumer piece is easy; the connectors are on top of the board. The USB audio out is great for recording phoners and other off-air bits. The USB audio in is like getting a free computer soundcard for another playback source. The telephony channels are way cool for phone calls and studio-to-studio interactions.

We have studios in Minneapolis; Raleigh, N.C.; and Myrtle Beach, S.C., and we're able to do jock crossovers like we're together in the same studio. We also use the telephony channels and Skype to let announcers in one studio participate in interviews with guests in the other studios hundreds of miles away.

We think Allen & Heath has come up with a real winner for Internet radio stations, college stations, LPFMs, etc. who need a small rig at an unbeatable price.

For information, contact Allen & Heath/American Music & Sound in California at (800) 431-2609 or visit [www.allen-heath.co.uk](http://www.allen-heath.co.uk) or [www.americamusicandsound.com](http://www.americamusicandsound.com).

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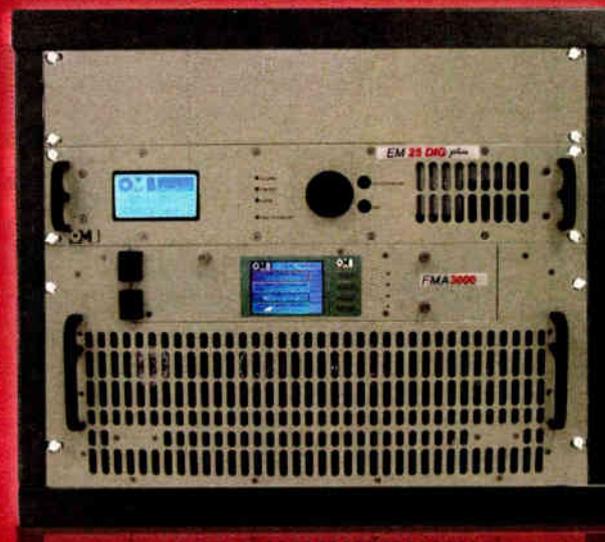
### CONNECTING

We like the programmable "On" switches on each channel. Level LEDs and PFL for each channel take a lot of guesswork out of what's happening, level-

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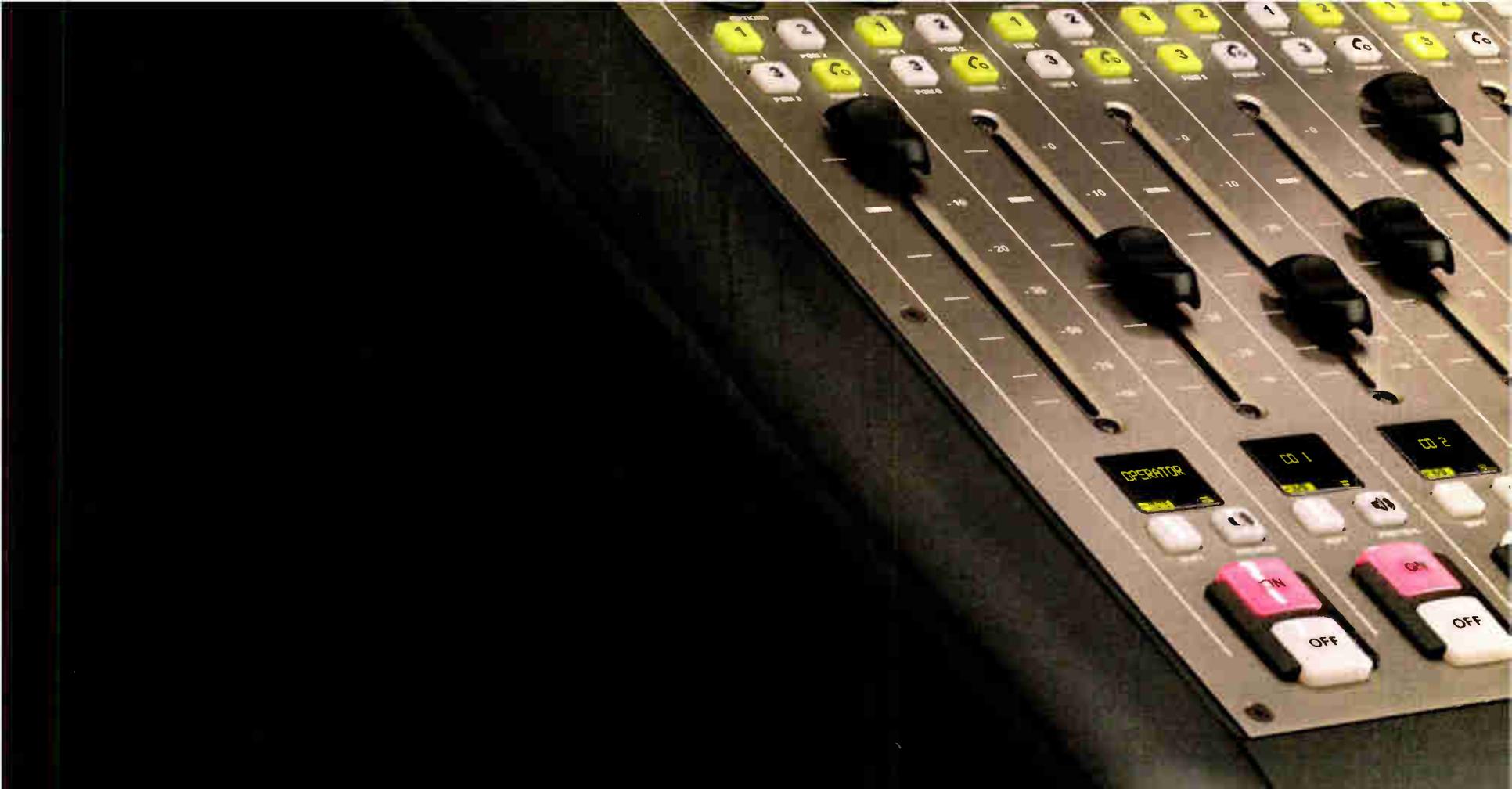
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iQ. It's about time.



axiaaudio.com

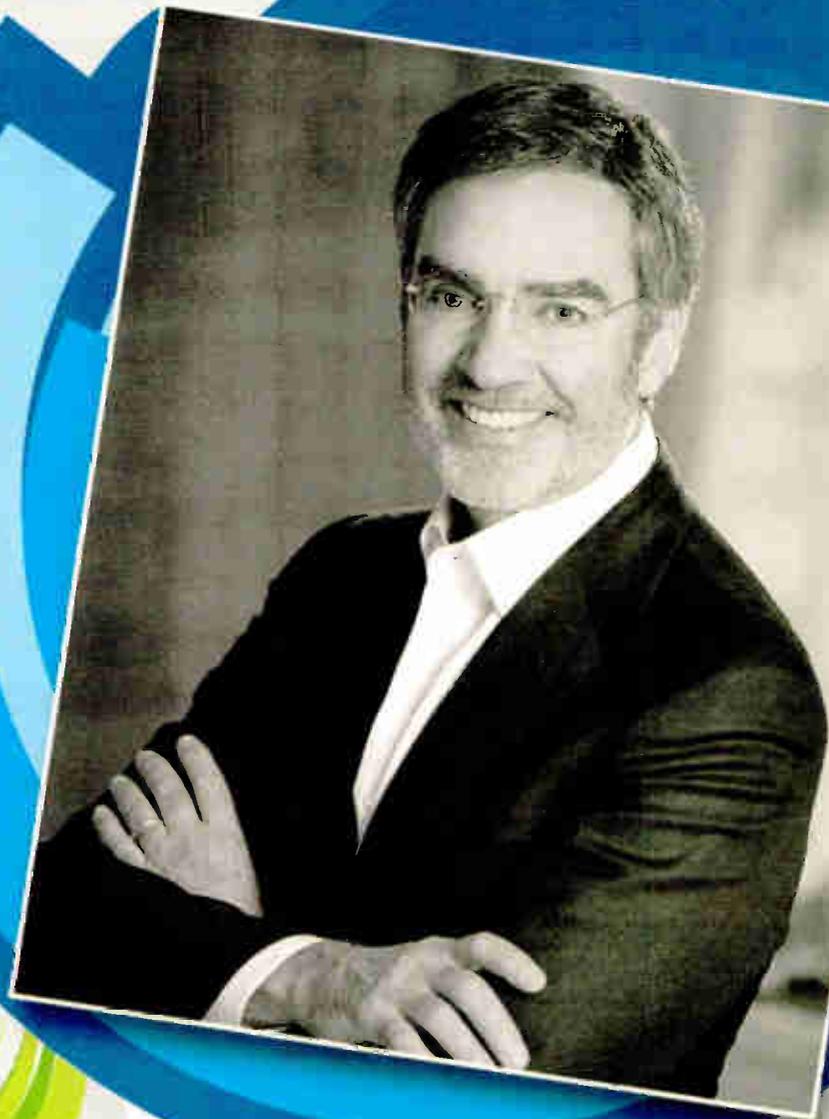


# "TOTAL RADIO" SUPER SESSION

Thursday, September 15

## Featuring Clear Channel's Bob Pittman

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**TECHUPDATES**

**AXEL TECHNOLOGY ADDS OXYGEN 4 DIGITAL**



Axel Technology's latest in its Oxygen 4 line of mixers is the Oxygen 4 Digital.

The Oxygen 4 Digital is a digital, standalone mixing console powered by Texas Instruments DSP processors. It has 18 digital and analog inputs, a crosspoint router, 32-bit processing, sampling rates up to 96 kHz, sample rate converters on digital inputs and EQ and dynamics on every channel.

These tools can be accessed from the control surface and from a PC connected to the mixer via an IP network.

The Oxygen 4 Digital variation is designed as a rack-mounted digital "engine" with separate eight-fader control surface. The 2 RU engine handles audio processing and routing. It has four microphone inputs, two mono and five stereo inputs, seven digital stereo inputs and outputs with a sample rate converter. Dedicated analog outputs are for program, submix, aux, monitors and headphones. The 32-bit internal DSP uses floating-point calculations. Audio signals preserve their 24-bit resolution from the input conversion.

The audio paths in Oxygen 4 Digital are programmable due to the presence of an input router. This eliminates the need for an external patch bay.

By using an Ethernet connection, users can control any Oxygen 4 Digital from anywhere there is an IP-connected computer. All features can be managed by software. A memory card slot users can save desk configurations for recall and individual settings.

Axel Technology was founded in 1996 in Bologna, Italy. Its products include broadcast audio processors, RDS/RBDS encoders, telco hybrids, air lights and traffic/billing systems.

For information, contact Axel Technology in Italy at 011-39-051-736555 or visit [www.axeltechnology.com](http://www.axeltechnology.com).

**HENRY STEREOSWITCH UPDATE**

The Henry Engineering StereoSwitch has been a popular audio switcher/router. The most recent version is called "StereoSwitch II."

This is a three-input stereo audio switcher/router for switching balanced audio sources. It uses passive relay switching, so there should be no degradation to the source audio. Because the



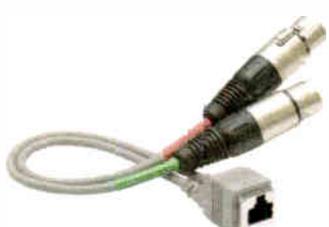
switching is passive, it also can be used "in reverse" as a router, to send a single stereo audio source to one of three destinations.

StereoSwitch II can be controlled remotely via any GPI interface, e.g., an external contact closure (switch), logic signal or DC voltage. The control input may be momentary or maintained. The new version also includes pushbuttons on the front of the unit, so source/destination selection can be activated locally.

The unit also has power-up programming, which allows the user to select which source/destination is selected when AC power is applied. Another new feature is "auto-return" mode, which can be used to force the unit to preselect the "A" input by default if no other input is selected.

StereoSwitch II has a built-in AC power supply (no wallwart) and is 1/3-rack wide. Up to three units can be mounted side-by-side in a 1-RU rack space. A rack-mount shelf is optionally available.

For information, contact Henry Engineering in California at (626) 355-3656 or visit [www.henryeng.com](http://www.henryeng.com).



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## TECHUPDATES

### NEW PACKET ENGINE FOR THE PLATFORM

The Platform is a new broadcast console from Radio Systems. The company describes it as "visually stunning" and offering "a new approach to on-air mixing and production."

The control surface links to the engine mainframe via a single Ethernet Cat-5 cable, which also supplies power. And up to four surfaces (of four to 24 channels) can be connected via a standard Ethernet switch to a single engine, lowering system-wide cost.

A 7-inch touchscreen controller presents the operator with current and upcoming "apps" including scene



settings, aux bus settings, audio processing and remote control functions. Robust configuration screens allow the facility engineer to define system settings and complete input source functionality.

Standard to the Platform is "Event Controller," a remote control system that allows every console function to be remotely triggered or engage an action via any number of filters such as time-of-day through external GPIO connections.

Under the hood, DSP SHARC technology provides horsepower including 128 x 128 matrix switching and dozens of mix-minus and virtual mixer busses. New for 2011 is a smaller 3 RU "Packet" engine for cost-saving installations requiring less I/O.

Because the Platform is a Radio Systems product, connectivity is via StudioHub+ plug-and-play cabling, with every RJ-45 jack powered for support of StudioHub+ active peripherals. In the tradition of StudioHub+, the Platform uses multiple industry standards including Ethernet, CopperLan control and POE, which add to console performance and flexibility while increasing compatibility and lowering costs.

The Platform includes software clients that allow users to run virtual "Glass-Screen" versions of console surfaces in neighboring talk, production and edit studios and anywhere that there is an Internet connection.

For information, contact Radio Systems in New Jersey at (856) 467-8000 or visit [www.radiosystems.com](http://www.radiosystems.com).

### LOGITEK RELAUNCHES ROC CONSOLE

Logitek has reintroduced the ROC console name into its product line, on a redesigned series offering AoIP functionality and operational features suited to a variety of radio and TV uses.

It is designed to operate with the JetStream Mini AoIP audio networking platform. The new ROC series is available in configurations of six, 12, 18 or 24 faders, OLED displays and a reverse-printed overlay that provides an attractive finish while protecting the surface.



RGB-addressable lighting allows users to set up customized light colors in on/off and softkey buttons; an optional onboard router control panel offers simple source/destination selection for five routing locations. Optional softkey panels are available to handle user-defined functions; 12 GPIOs are provided on the wall- or rack-mountable power supply.

The JetStream Mini is the heart of Logitek console systems; this is a user-configurable audio node that handles console functions as well as IP audio networking. Audio mixing, routing and processing are accomplished in a fanless, convection-cooled 2 RU enclosure. Users can mix and match analog and digital I/O cards to create the best combination of sources and destinations including mics, CD players, studio monitors and more.

Incorporating Logitek's JetNet network conduit, the JetStream permits direct network transfer of audio from hard disk playout systems and other Logitek JetNet partners without the use of sound cards.

For information, contact Logitek in Texas at (713) 664-4470 or visit [www.logitekaudio.com](http://www.logitekaudio.com).

### SONIFEX S1 PROMISES NO COMPROMISES

Sonifex describes its S1 Radio Broadcast Mixer as a high-performance, compact, low-cost, fixed-format mixing console with a "no compromise on quality" approach. It's aimed at bringing features to small-scale commercial, community, educational and student radio stations that need a versatile, reliable radio broadcast mixer.



It has both analog and digital inputs and outputs, allowing simultaneous local and Internet broadcasting.

The S1 provides five mic, four mono line, 10 stereo analog, two stereo digital, one telco and one stereo clean-feed inputs, between which users can switch.

Outputs consist of one balanced stereo analog XLR program output; one digital stereo program AES/EBU or phono S/PDIF output; two balanced stereo aux outputs on a nine-pin D-sub socket; one mono clean feed output on balanced XLR (for use with a telephone hybrid); one stereo clean-feed output on stereo balanced XLRs (for use with an ISDN/IP codec); and monitor outputs for presenter headphones, guest headphones and loudspeakers.

Additional outputs are provided for talkback on a nine-pin D-sub connector and metering using a 15-pin D-sub socket.

The digital outputs can be referenced to an internal clock source between 32 and 96 kHz or external synchronization sources can be connected via S/PDIF, AES/EBU or BNC word clock. The illuminated Digital Sync LED shows when the digital output is locked to an internal or external clock.

The S1 is a fixed format free-standing mixing console with overall dimensions of 17.5 x 15.75 x 6.1 inches. It can be fitted flush into a desktop, or with the addition of optional 9 RU rack ears, into a rack; it can be controlled remotely via free Sonifex SCi software.

For information, contact Sonifex/Independent Audio in Maine at (207) 773-2424 or visit [www.sonifex.co.uk](http://www.sonifex.co.uk) or [www.independentaudio.com](http://www.independentaudio.com).

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**TECHUPDATES****SAPPHIRE SPARKLES FOR RADIO**

The sapphire is Lawo's latest offering for radio broadcast consoles.

Available in configurations from four to 60 motorized faders, this modular system facilitates a variety of console sizes with optional additional rotary controls, displays and keys. This is particularly useful when the sapphire is used as a production console or in TV newsrooms where a more channel-oriented workflow is required.

The sapphire is based on Lawo's DALLIS I/O system of I/O modules. With as many as 128 available inputs, the system can mix upwards of 80 signals. With the MADI option, more sources are available and can be routed via the included 384 x 384 matrix.

The sapphire has networking features that allow for studio connectivity and studio arbitration. Logic states can be exchanged throughout the network, sources can be shared and intercom functionality is built into the system.

The console can be monitored and serviced remotely. Thus, multiple studios can be administered via one technician, even through WAN connections.

A preconfigured, 12-fader tabletop version of the sapphire, with 40-channel I/O, GPI and four MADI ports, is available. Combined with the touchscreen software VisTool and the Nova29 as the central router, the company says, sapphire presents a comprehensive solution for live on-air, remote vans or TV production and editorial facilities.

For information, contact Lawo in Ontario at (888) 810-4468 or visit [www.lawo.ca](http://www.lawo.ca).

**ON AIR 24 IS MODULAR, SCALABLE**

The On Air 24 is a digital mixing system aimed at the radio broadcast market from Stagetec.

It is a modular, flexible and scalable system with control surfaces laid out to the user's specification for combo, studio or edit operation. The work surface consists of self-contained fader modules (four in each and up to 24 per system) and a monitor module. These modules can be flush-mounted into existing studio furniture.

The GUI software runs on a PC linked via Ethernet to the controller unit mounted in the system frame. Once set up and running, the GUI simulates the control elements so operators have access to every control found on the physical control surface including metering, faders and encoders. Thus, a minimum physical console layout with four channel strips, two encoders and some buttons can have the power of the full On Air 24 console in the background.

Operation complexity can be adjusted on a user-by-user basis and logic control can be configured for various functions such as fader start, mic mute (cough button) and auto crosspoint switching. The system also allows for remote control operation over Ethernet.

According to Stagetec, the On Air 24 benefits from the flexibility and resilience of the Nexus digital routing system offering, significant I/O interface possibilities. The Nexus also makes it easy to integrate the On Air 24 in a standalone studio or into larger broadcast facilities where multiple systems can be networked.

For information, contact Stagetec USA in Georgia at (888) 782-4391 or visit [www.stagetec.com](http://www.stagetec.com).

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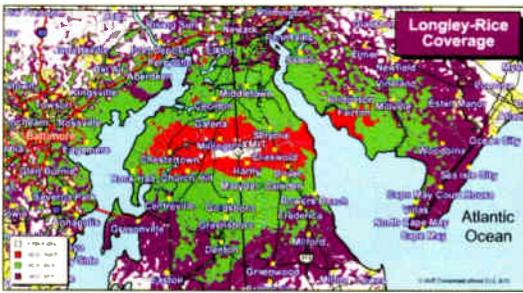
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### MISCELLANEOUS, CONT.

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Looking for KFRC signoff radio broadcast from 1930 Andy Potter, running time is 0:22 & also the KLX kitchen the program guest is Susanne Caygill, a discussion of women's affairs with a long promotion for Caygill's appearance at a local store. Anne Truax, Susanne Caygill, running time is 13:44. Ron, 925-284-5428 or [ronwtamm@yahoo.com](mailto:ronwtamm@yahoo.com).

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4	KW	2007	BE FM4C, solid state
5	KW	1995	Continental 815C, solid state
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READER'S FORUM

TRANSMITTER POWER SUPPLIES

I commend you on your recent article "How Transmitter Power Supplies Evolved" in the Feb. 1 issue.

I enjoy reading articles of a historical nature, especially those that contain pictures from the period. It's obvious James O'Neal spent many hours of careful research and is well versed on the subject.

**It adds perspective to see ... how early industry pioneers attacked the challenges of their day.**

- Dave Russell

In an age when trade journals tend to focus exclusively on new products and trends, it adds perspective to see where the technology evolved from and how early industry pioneers attacked the challenges of their day. I was so impressed with this article that I forwarded it to my 83-year-old father, a ham and director of the local civil defense communications relay team. I'm sure he will enjoy it also.

Dave Russell  
Product Line Manager  
MMW Radios  
HXI Millimeter Wave Products  
Harvard, Mass.

TRY, TRY AGAIN

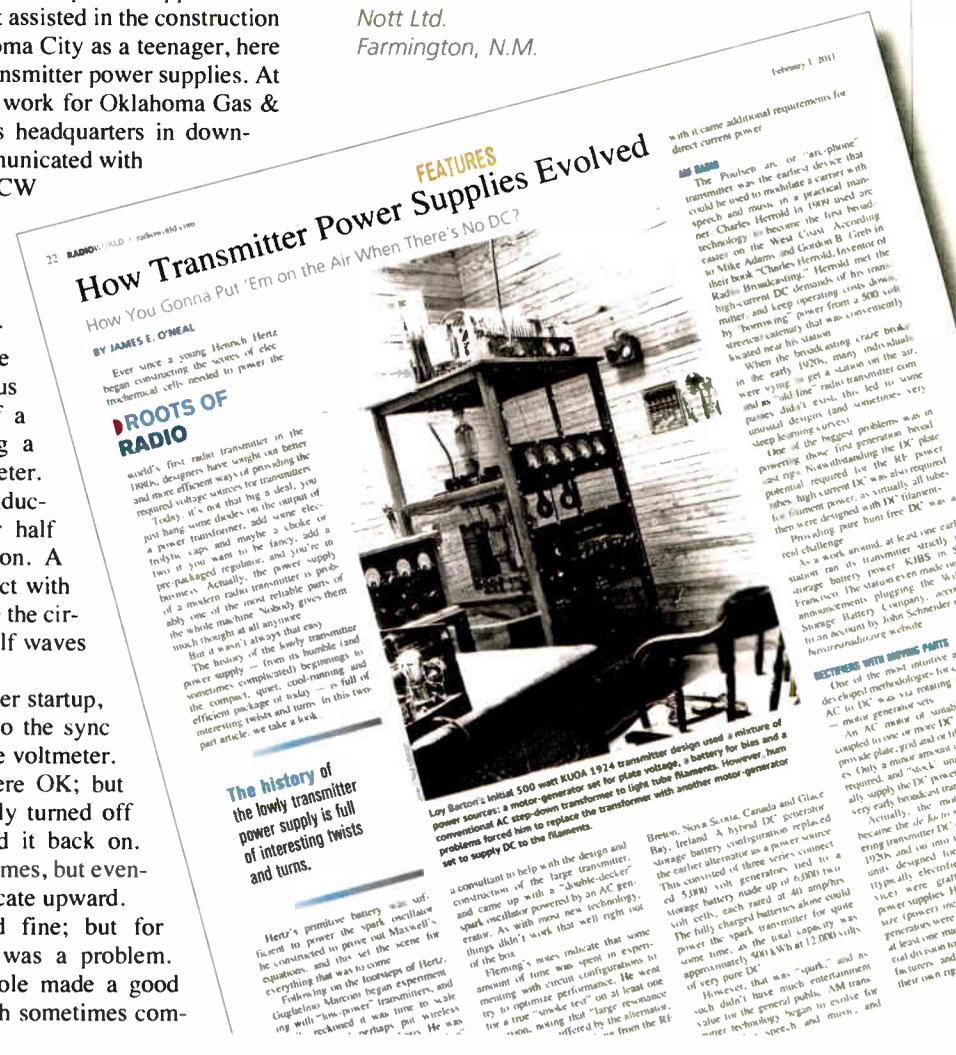
Excellent article on transmitter power supplies. While my father Art Nott assisted in the construction of the first WKY in Oklahoma City as a teenager, here is another application of transmitter power supplies. At age 18 in 1925, he went to work for Oklahoma Gas & Electric Co., which had its headquarters in downtown Okie City. They communicated with several power plants via CW (Morse code), and he was an operator.

I don't know how much power they used, nor the frequency; but for the transmitter high-voltage DC, they used a synchronous rectifier. This consisted of a synchronous motor driving a disk about 6 inches in diameter. Half of the disk was conductive copper and the other half hard black plastic insulation. A pair of brushes made contact with the disk as it rotated to close the circuit on only the positive half waves of AC from a transformer.

He said that on transmitter startup, you turned on the switch to the sync motor and watched the plate voltmeter. If it went upward, you were OK; but if it went down you quickly turned off the switch and then turned it back on. Sometimes it took several times, but eventually the meter would indicate upward. The transmitter worked fine; but for reception, streetcar QRM was a problem. The roller in the trolley pole made a good spark gap transmitter, which sometimes com-

pletely blanked the receiver. They had to operate fast between streetcars.

Ron Nott  
Nott Ltd.  
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How Transmitter Power Supplies Evolved

BY JAMES E. O'NEAL  
Ever since a young Heinrich Hertz began constructing the bases of electromagnetic cells, needed in power the world's first radio transmitter in the 1880s, designers have sought out better and more efficient ways of providing the required voltage sources for transmitters. Today, it's not that big a deal, you just hang some diodes on the output of a power transformer, add some electrolytic caps and maybe a choke or a triode regulator, and you're in two if you want to be fancy, and you're in pre-packaged transmitter is pretty business. Actually, the power supply of a modern radio transmitter is probably one of the most reliable parts of the whole machine. Nobody gives them much thought at all anymore.

But a young Hertz, who was only 17 when he conceived of the spark-gap transmitter, was not so lucky. His transmitter was a simple affair, consisting of a coil of wire connected to a spark gap. The spark gap was a simple affair, consisting of two metal rods connected by a thin wire. The spark gap was a simple affair, consisting of two metal rods connected by a thin wire. The spark gap was a simple affair, consisting of two metal rods connected by a thin wire.

The history of the lowly transmitter power supply is full of interesting twists and turns. Hertz's primitive battery was sufficient to power the spark oscillator he constructed to prove out Maxwell's equations, and this set the scene for everything that was to come. Following in the footsteps of Hertz, Guglielmo Marconi began experimenting with "low-power" transmitters, and he recommended it was just wireless communications. He was a consultant to help with the design and construction of the large transmitter, and came up with a "double-decker" spark oscillator powered by an AC generator. As with most new technology, things didn't work that well right out of the box.

The Position of an "art-phono" transmitter as the earliest device that could be used to modulate a carrier wave speech and music in a practical way are Charles Herold in 1909 used arc technology to become the first broadcast station on the West Coast. According to Mike Adams and Gordon B. French in their book "Charles Herold, Inventor of Radio Broadcasting," Herold met the high-current DC demands of his transmitter and kept operating with about 500 volt "booming" power from a conveniently located near-by station. When the broadcast craze broke in the early 1920s, many individuals were vying to get a station on the air, and "old-line" radio transmitter companies didn't exist, and sometimes very unusual designs (and sometimes very steep learning curves) were required. One of the biggest problems was in power supply. Notwithstanding the DC plate power required for the RF power tubes, high current DC was also required for filament power, as virtually all tube filament power was "DC" filament. The power supply for the "DC" filament was a real challenge. As a work-around, at least one early station ran its transmitter directly off the storage battery power. KJBS in San Francisco. The station even made an announcement plugging the "Wills Storage Battery Company," according to an account by John Schneider on his hamradio.org website.

One of the most innovative and developed methods for converting AC to DC was via rotating machine generator sets. An AC motor of suitable speed to one or more DC generators (only a minor amount of power was required, and "spark" units were very early broadcast transmitters. Actually, the AC motor was because the AC motor in a rotating transmitter DC unit developed for units were grater power supplies. The AC motor were generators were at least one main unit division to factories and their own rigs.

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# It's Time for a Lighthouse Protocol

Inventor Thinks Community Stations Would Benefit From a More Far-Reaching Concept

## COMMENTARY

BY NICKOLAUS E. LEGGETT

The demand for community and neighborhood broadcasting will not be fully accommodated in the existing AM and FM broadcasting bands. These frequency bands are too crowded in the urban areas of the United States.

Thus it will be necessary to look for new frequencies for local broadcasting. The most promising frequency range is the millimeter-wave frequencies (30 to 300 GHz).

This lightly-used band of frequencies has a huge capacity to accommodate communications including numerous local radio broadcasting stations.

### Lighthouse protocol broadcasting needs additional development before it is ready for commercial use.

Millimeter-wave transmitters now in use tend to be low in power, fed to very high-gain antennas. This communication often is referred to as "pencil beam" communication but it is not a natural match for the omnidirectional transmissions used by broadcasters.

However, a pencil beam can be converted into an omnidirectional broadcasting system by using a rotating beam. The high-gain transmitting antenna is mounted so that it can be continuously rotated in a similar manner to a plan position indicator (PPI) radar antenna.

The transmitting millimeter wave beam would "paint" the surrounding geographic area like an electronic lighthouse.

#### LIGHTHOUSE PROTOCOL

The neighborhood broadcasting station would transmit packets of digital program material to the broadcast receivers. Each receiver would store the packets and play the program material to the listener.

The station would use a protocol where the same set of packets would be repeated for each beam-width around

the points of the compass.

For example, if the transmitting antenna has a 10-degree beam-width, it would transmit 36 repetitions of the packet set. Each repetition would be at a different compass direction to cover a full 360 degrees.

The radio receivers would put the packets together and play them out to the listeners. This would result in the program material being delayed somewhat from real time; but this would not be a major problem for most neighborhood broadcasting applications.

#### NEIGHBORHOOD BROADCASTING

A frequency range in the vicinity of 60 GHz is desirable because the atmosphere strongly absorbs these transmitted signals. This will limit each broadcaster to a single neighborhood or modest-sized community. The same channels can then be reused in a nearby community with no problem of interference. This absorption of the signals is strong enough that you could have several reuses of a 1,000-channel set within a single metropolitan area such as the New York City area.

Here at last you have a neighborhood broadcasting system that can be used in dense urban areas. This is a contrast to the existing low-power FM (LPFM) broadcasting service, which has been limited largely to rural areas by spectrum crowding concerns.

#### PROPAGATION ISSUES

Of course this new technology will have some technical and developmental challenges, such as propagation.

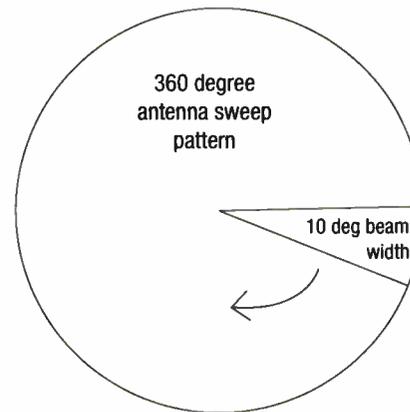
Millimeter-wave transmissions are very much a line-of-sight process, like light-wave transmission. Leaves of trees can absorb the signals. As a result, outdoor receiving antennas above the roof line would be desirable for this radio service. This could conflict with the widespread prohibitions of external antennas by homeowner associations and condominiums.

Any FCC docket on millimeter-wave broadcasting would have to address these private regulations and their negative impact on this new broadcasting opportunity.

#### ADDITIONAL SPECTRUM

If the millimeter waves do not provide enough spectrum, even higher frequencies can be used, such as infrared light.

As we go higher in frequency, the available capacity increases; we can cre-



If the transmitting antenna has a 10-degree beam-width, it would transmit 36 repetitions of the packet set.

ate a situation where there is no shortage of frequencies available for this type of broadcasting.

This is a stark contrast to the situation on the traditional AM, FM and shortwave broadcast bands. In a light-wave version of lighthouse broadcasting, a low-power laser would serve as the transmitter and a focusing mirror with a light detector would serve as the receiver. Standards would be established regulating the power of the laser to reliably safe levels somewhere under five milliwatts of output power.

#### DEVELOPING THE IDEA

At this point in time, lighthouse protocol broadcasting needs additional development before it is ready for commercial use. In this difficult economy, there are not a lot of development funds available. This can be overcome by using volunteer labor. Amateur radio operators have built and operated radio communications equipment up to 400 GHz. The amateur radio community can be recruited to develop and test lighthouse communications, as I wrote in the 2004 article "A 'Lighthouse' Protocol for Random Microwave Contacts," published in the ARRL's "QEX: A Forum for Communications Experimenters."

In addition, university engineering departments and graduate students can be involved in the development of lighthouse protocol broadcasting. Rapid progress can be made because the protocol allows existing low-power millimeter wave transmitters to be used for the initial experimental tests. Some graduate degree theses can be devoted to different aspects of the development.

*Nickolaus Leggett is an electronics technician, analyst, technical writer and inventor. He holds three U.S. patents. He was one of the original petitioners for the low-power FM radio broadcasting service.*

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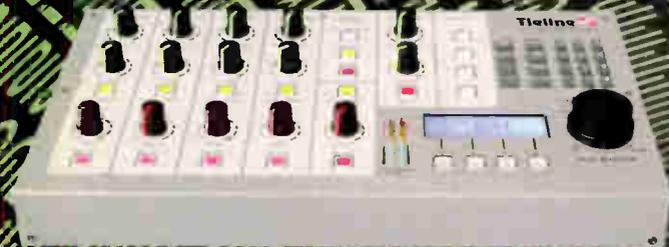
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