



RADIOWORLD

JANUARY 8, 2020 | The News Source for Radio Managers and Engineers | \$5.00 | RADIOWORLD.COM

Hotels Leave the Light on for Audio

A hotel lobby can be a nice studio home, recalling radio's roots in hospitality segment

BY JAMES CARELESS

Hotels played a big role in the early days of radio broadcasting, providing shelter and credibility to new radio stations.

New Orleans' WDSU launched as a respectable business inside the city's

DeSoto Hotel in 1928, after spending five years operating out of owner Joseph Uhalt's backyard chicken coop as WCBE. Other hoteliers played home to radio stations such as Chicago's Drake Hotel, which housed WGN (then WDAP) in 1923.

(continued on page 6)

Audio Explosion Reverberates in Radio

Symposium panelists paint their industry as challenged by competition and regulations

BY RANDY J. STINE

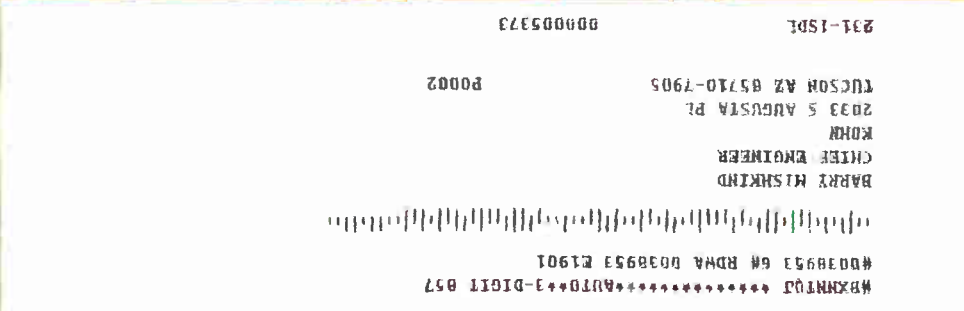
"The blood of the local radio industry will be on everybody's hands if we do not get relief from these archaic and rusty shackles."

That comment about regulation was made by Jeff Warshaw, the CEO of Connoisseur Media; and while the sentiment may be familiar to many in commercial radio, it was delivered

in an unusual setting: the chamber of the Federal Communications Commission in Washington.

The FCC hosted a symposium in late 2019 to ask industry representatives about trends and challenges facing the radio industry. Anyone who wanted to compile a list of business challenges heard plenty to be worried about.

(continued on page 4)



Radio companies want to be cool and hip, but they're competing in a dramatically changed audio-competitive environment.

Getty Images/Avesun

DAD, MusicMaster, and all new hardware for a low monthly cost.

Upgrade your station to the very best in radio automation and music scheduling, complete with broadcast-grade hardware, all for a low monthly rate. Stay on the cutting edge with software updates and a complete hardware refresh every 5 years, at no additional cost.

Visit ENCO.com/Subscription for more information and a personalized quote.





THE FUTURE CAN BRING ANYTHING LXE IS READY FOR EVERYTHING



Virtually every button, knob, and display is configurable to your workflow at any time. Built to last in every way. Whether it's 2020, 2040, or 2080, your LXE will adapt to your needs.



LXE: YOUR FOREVER CONSOLE

wheatstone.com/lxe-forever-rw



1.252.638-7000 | wheatstone.com | sales@wheatstone.com

www.radioworld.com

FOLLOW US

www.twitter.com/radioworld_news
www.facebook.com/RadioWorldMagazine

CONTENT

Managing Director, Content Paul J. McClane,
 paul.mclane@futurenet.com, 845-414-6105
Senior Content Producer — Technology Brett Moss, brett.moss@futurenet.com
Content Manager Emily M. Reigart, emily.reigart@futurenet.com
Technical Advisors Thomas R. McGinley, Doug Irwin
Technical Editor, RWEE W.C. "Cris" Alexander
Content Director — International Marguerite Clark
Contributors: Susan Ashworth, John Bisset, James Careless, Ken Deusch,
 Mark Durenberger, Charles Fitch, Travis Gilmour, Donna Halper, Craig Johnston,
 Alan Jurison, Paul Kaminski, John Kean, Peter King, Larry Langford, Mark Lapidus,
 Jim Peck, Mark Persons, Stephen M. Poole, James O'Neal, Rich Rarey, Jeremy Ruck,
 John Schneider, Randy Stine, Tom Vernon, Jennifer Waits, Chris Wygal
Production Manager Nicole Schilling
Managing Design Director Nicole Cobban
Senior Design Director Karen Lee

ADVERTISING SALES

Senior Business Director & Publisher, Radio World
 John Casey, john.casey@futurenet.com, 845-678-3839
Publisher, Radio World International
 Raffaella Calabrese, raffaella.calabrese@futurenet.com, +39-320-891-1938

SUBSCRIBER CUSTOMER SERVICE

To subscribe, change your address, or check on your current account status, go to www.radioworld.com and click on **Subscribe**, email futurepic@computerfulfillment.com, call 888-266-5828, or write P.O. Box 282, Lowell, MA 01853.

LICENSING/REPRINTS/PERMISSIONS

Radio World is available for licensing. Contact the Licensing team to discuss partnership opportunities.
Head of Print Licensing Rachel Shaw licensing@futurenet.com

MANAGEMENT

Senior Vice President, Content Chris Convey
Vice President/Group Publisher Carmel King
Vice President, Sales John Bubello
Head of Production US & UK Mark Constance
Head of Design Rodney Dive

FUTURE US, INC.

11 West 42nd Street, 15th Floor, New York, NY 10036



All contents ©Future US, Inc. or published under licence. All rights reserved. No part of this magazine may be used, stored, transmitted or reproduced in any way without the prior written permission of the publisher. Future Publishing Limited (company number 02008885) is registered in England and Wales. Registered office: Quay House, The Ambury, Bath BA1 1UA. All information contained in this publication is for information only and is, as far as we are aware, correct at the time of going to press. Future cannot accept any responsibility for errors or inaccuracies in such information. You are advised to contact manufacturers and retailers directly with regard to the price of products/services referred to in this publication. Apps and websites mentioned in this publication are not under our control. We are not responsible for their contents or any other changes or updates to them. This magazine is fully independent and not affiliated in any way with the companies mentioned herein.

If you submit material to us, you warrant that you own the material and/or have the necessary rights/permissions to supply the material and you automatically grant Future and its licensees a licence to publish your submission in whole or in part in any/all issues and/or editions of publications, in any format published worldwide and on associated websites, social media channels and associated products. Any material you submit is sent at your own risk and, although every care is taken, neither Future nor its employees, agents, subcontractors or licensees shall be liable for loss or damage. We assume all unsolicited material is for publication unless otherwise stated, and reserve the right to edit, amend, adapt all submissions.



Future plc is a public company quoted on the London Stock Exchange (symbol: FUTR)
www.futureplc.com
 Chief executive Zillah Byng-Thorne
 Non-executive chairman Richard Huntingford
 Chief financial officer Penny Ladkin-Brand
 Tel: +44 (0)1225 442 244



Please Recycle. We are committed to only using magazine paper which is derived from responsibly managed, certified forestry and chlorine-free manufacture. The paper in this magazine was sourced and produced from sustainable managed forests, conforming to strict environmental and socioeconomic standards. The manufacturing paper mill and printer hold full FSC and PEFC certification and accreditation.

Factors to Weigh in Your Tube Talk

We asked Jeff Welton about ROI and the role of tubes today

A recent RW ebook asked, "Have You Bought Your Last Tube?" It included a Q&A with Nautel's Jeff Welton, a recipient of the Association of Public Radio Engineers Engineering Achievement Award and the Society of Broadcast Engineers James C. Wulliman Educator of the Year Award.

These are excerpts; read the free ebook at <https://www.radioworld.com/ebooks>.



RW: Do you find that many users are attached to their tube systems, both because of familiarity as well as cost factors?

Welton: Very, very few — and it's a rapidly decreasing number.

There are some who are quite apprehensive about the cost of acquiring a new box, as it's a big number. However, in a lot of cases,

especially if you amortize it over the period of a lease or bank loan, the overall savings can actually outweigh the acquisition cost.

I've had situations where a station leased a solid-state transmitter to replace a tube rig, and the savings in operating costs actually made the lease payments. Obviously that's not always the case, but it's something to consider, especially if the current rig is eating you out of house and home, electrically speaking!

RW: What considerations then should an engineer or manager use to assess the ROI on a new purchase?

Welton: It's not enough to just look at purchase price. Look at the power bill now — and get the manufacturer to use that to provide you with a ballpark of what it would be with the new rig. Remember that this will just be an estimate — demand costs and overage charges can be hard to calculate without an intimate knowledge of the specific utility.

Also factor in the amount of time your engineer spends doing repairs — or if you have a contract engineer, what it's costing in emergency calls. Don't expect engineering costs to go away; if you're not doing maintenance, it's the same as owning a car and never changing the oil ... it's not if you'll have a failure, but when. However, you can factor in the cost of emergency repairs and tube costs; those alone can make up several thousand dollars a year.

Also look at air handling; if you're air conditioning, you'll need less of it as a rule. Forced air is less a concern. Obviously you should look at extra costs that may come with a new rig, also; liquid-cooled systems, for example, tend to have much higher installation costs associated with the plumbing. That's a one-time thing, but it does need to be considered.

If you are using air cooling, you may decide to switch from forced air to air conditioned; that's also an impact on ROI.

Remember that manufacturers will typically be leaning toward the solutions they provide, so get a couple of different opinions, even if you already think you know what you are leaning toward.

RW: What's the expected life of a tube these days?



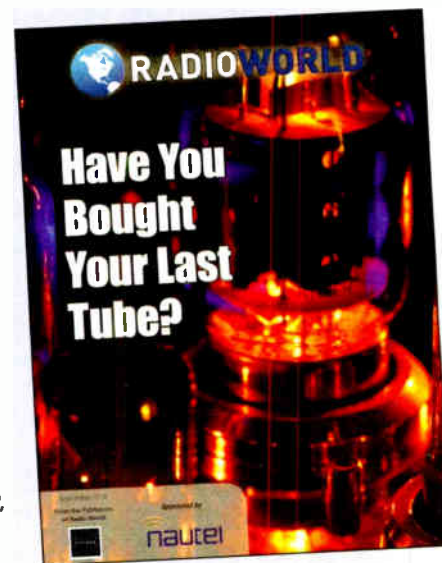
Welton: It varies, a lot. Some of the more popular systems out there are lucky to get 11 months out of a tube anymore, even with careful filament voltage management. Others are still good for a couple of years. I think the days of seeing 50,000 or more hours on a tube are pretty much gone. Part of that is systemic — the folks who know how to manage tuning for maximum tube life are slowly leaving us — and part of it seems to be related to material factors, but that's not an area I'm proficient in, for obvious reasons.

RW: How much more efficient are solid-state designs?

Welton: For the most part, overall efficiency of a solid-state FM transmitter is around 72% these days — that's AC to RF. For tube transmitters, efficiency can vary from less than 50% for a grounded grid design, to 65% or higher for some of the other designs, so the efficiency of a solid-state design will be somewhere between 10 and 50% higher than that of the tube system, as a rule.

This article is from Radio World's ebook

"Have You Bought Your Last Tube?" We've now published more than 50 ebooks on a wide range of topics that are of interest to the broadcast technologist or manager including AoIP, next-gen codecs, cloud technology, digital radio, RDS, DRM, translators and more. All are free to read. Find recent issues by clicking the ebooks section under the Resources tab at radioworld.com.



TRENDS

(continued from page 1)

The discussion, led by Fred Jacobs, president of Jacobs Media, covered topics like music licensing fees, the future of AM radio, new revenue sources and minority ownership. And you knew regulatory relief was going to come up too.

UNLIMITED CONTENT

The speakers certainly were in agreement that the ways in which Americans watch, listen and read to content are evolving fast.

"People are consuming media in different ways and in different places. There is an unlimited amount of content available now, but is it quality enough to attract listeners and in the places they need it?" said Hartley Adkins, president of Integrated Revenue Strategy for iHeartMedia.

"If you have good content but someone can't access it, or if you have poor content to begin with, it doesn't work. ... Even when you look at smart speakers, radio needs to be in position to deliver quality content in 2020 and beyond."

When you consider inflation, radio revenue is really down 30 to 40% from just over a decade ago.

— Mark Fratrick

Caroline Beasley, CEO of Beasley Media Group and former joint board chair of the NAB, told the symposium that radio must commit further to its local communities while exploring new platforms, as her company is doing with gaming and other initiatives.

"We're providing great local content via our local signals, but we need to be everywhere our listeners are. That is a business model significantly different than the over-the-air model. So we are making decisions on where to spend our resources. We are facing and making some very challenging decisions, especially now during budget season, thinking about next year."

Beasley said radio revenue in its radio markets has declined 30% over the past 10 years. "Our piece of the advertising pie is shrinking. It is going to digital, so if we want to stay in business we have to diversify our revenue streams. At the same time our costs are going up because we are being forced to distribute our programming over multiple platforms."

The panel visited the question of whether such companies are in "radio" or simply "media."

Jeff Warshaw, CEO of Connoisseur Media, said he considers himself in the radio business but that its definition has broadened.

"The [traditional] radio business, the business of broadcasting over the air and monetizing that service to advertisers, is shrinking, and will continue to shrink until it becomes an unviable business," he said. "Just because we can now take our content and try to monetize it against a myriad of competitors on multiple platforms, doesn't mean that the radio



At the FCC event (shown in a captioned webcast), Caroline Beasley emphasized the need for radio broadcasters to diversify their revenue streams. At left is Karen Slade, vice president/general manager of KJLH(FM) in Los Angeles.

business isn't shrinking and getting more difficult each year. It is," he said.

"We are now competing with companies that are hundreds of times larger than the biggest radio broadcaster. They are selling subscriptions, they sell data and they sell devices. They are unregulated, and we are stuck with regulations that could have never foreseen the types of competitive pressures we are facing."

NEW VENTURES, NEW COSTS

Karen Slade, VP and GM of KJLH Radio in Los Angeles, said her view was not from "30,000 feet up like the other members of the panel, but more like 10 flights up," which gives her a different perspective.

"We have about 500,000 listeners; but I'm also trying to reach more through local programs across platforms.

It becomes almost cost-prohibitive for me, because every new venture and every new platform comes with a cost," Slade said. "When can I get a return? There is additional licensing involved. Sometimes the better you do, the more expensive it gets."

Mark Fratrick, senior VP for BIA Advisory Services, said radio must press ahead to roll out additional digital services. "It's really the only potential for growth they have."

Fratrick, in charge of BIA's advertising forecast, predicts radio will never return to the OTA ad revenue levels it saw before the recession ending in 2009. "It just won't ever get back to that; and when you consider inflation, radio revenue is really down 30 to 40% from just over a decade ago," Fratrick said.

iHeart's new AdBuilder platform aims to help advertisers, especially smaller businesses, use online tools to order audio commercials and then target deployment, without talking to a sales rep.

Delivering quantifiable results is crucial, according to the panelists. "Digital makes that a lot easier. 'Last-click attribution,' if you will," Adkins said. "Radio was a little slower to that new reality, but now that we are doing it, advertisers are more comfortable giving us their money because we can prove our performance."

Adkins said iHeartMedia continues with efforts to make the buying of advertising "friction-free" for advertisers.

"We have something in beta right now called AdBuilder that includes a user experience similar to Facebook and Google and allows advertisers to share information about the business and spits out a commercial for them. Then they can purchase time on

(continued on page 5)

THIS ISSUE

JANUARY 8, 2020

NEWS

Hotels Leave the Light on
for Audio 1

Audio Explosion Reverberates
in Radio 1

Factors to Weigh in Your Tube Talk ... 3

Radio Presses FCC to Allow
Asymmetric Sidebands 8

Hungary Studies DRM Shortwave ... 12



FEATURES

Frank Hertel's 11 Tips for Dealing
With Mice 14

Best of Show Up Close:
Davicom 320 16

Best Practices for AM Directional
Systems 18

There's Still Time to Get Your 2020
Calendar 21

People News 21



GM JOURNAL

Reflections on Racism and Radio 22

STUDIO SESSIONS

Let's Finish Our Solid-State Mic
Preamp Project 23

OPINION

Hybrid Radio Breaks Out 29

Reader's Forum 30

Radio World (ISSN: 0274-8541) is published bi-weekly with additional issues in February, April, June, August, October and December by Future US, Inc., 11 West 42nd Street, 15th Floor, New York, NY 10036-8002. Phone: (703) 852-4600, Fax: (703) 852-4583. Periodicals postage rates are paid at New York, NY and additional mailing offices. POSTMASTER: Send address changes to Radio World, P.O. Box 282, Lowell, MA 01853.

(continued from page 4)

the formats targeting the audience they want without spending any time with a sales rep. That's the sort of modernization we are doing," Adkins said.

Alfred Liggins, CEO of Urban One, said FCC regulations often leave radio broadcasters at a disadvantage in the current marketplace.

"Basically, technology [companies] right now are eating traditional media. And they are eating traditional media from a standpoint of making media become a loss leader," he said. "You [have] Amazon and Apple entering the business, and their core business is not to provide audio to provide local news and information, they want to sell more product and devices."

entities taking a slice of the pie it makes it unprofitable. Yet consumer consumption patterns demand that we are serving that space. We have to modernize."

Liggins realizes terrestrial radio listenership continues to drop. "Persons using measured media is dropping significantly each year. There are so many more options. The time spent listening has significantly dropped," he said.

"A NEW MARKETPLACE OUT THERE"

The panel discussed AM radio and its future amid the possibility of future deregulation.

"If ownership restrictions are loosened on FM, then what we expect to see is some of that content that you can only get on AM moving to FM," Adkins

matter of time. The fact of the matter is that AM content is already moving to the FM band, either on full-power FM stations or FM translators. Kids don't know what the AM band is. It's just an inferior listening experience."

When Fred Jacobs asked Caroline Beasley if her broadcast company is shopping for AM properties, she replied with a simple "no" and chuckled.

There was ample sentiment on the panel for further deregulation.

"The blood of the local radio industry will be on everybody's hands if we do not get relief from these archaic and rusty shackles," said Warshaw. "It's not fun and games. Radio is the one who provides local services. Spotify is unregulated. They are not going to promote anything locally. Pandora is not doing local news. Sirius FM is not raising money for local shelters. We couldn't even get Apple to turn on the FM chip in the iPhone."

The ability to "consolidate and have economies of scale has absolutely helped us increase news programming and increase public affairs programming," he added.

Fratrirk of BIA Advisory Services summed up the tenor of the discussion: "For radio to grow and remain viable, it does need some level of relief from regulation that was fostered during an earlier period. We are in a different audio and entertainment environment, and certainly in a different advertising [one], and there has to be some recognition of that by the FCC and the DOJ that there is a new marketplace out there."

You can watch the video archive of the symposium at <https://tinyurl.com/rw-fee-symposium>

It becomes almost cost-prohibitive ... because every new venture and every new platform comes with a cost.

— Karen Slade

Liggins said he is not under the illusion that radio can compete with Google and Facebook and Yelp. "They are technology platforms, and we cannot offer all of the services, even with our digital products, that they can. However, scale will be necessary in order to survive the onslaught of new competition," he said.

The problem with digital for radio, Liggins said, is it "turns analog dollars into digital dimes, since there are so many

of iHeartMedia said. "That could be the death knell for AM radio. AM is too important to us though. We feel there are plenty of opportunities on AM, the diversity is incredible whether it is sports play-by-play, Rush and Hannity and other content."

Liggins of Urban One, though, was emphatic in answer to a question about AM's survivability in the current marketplace: "I think it's done. It's just a

NEW! SPORTSCASTER SIMPLIFIES REMOTES!
It's the "missing link" that ties everything together.

For radio or video, SportsCaster integrates mic mixing, talent headphone control, and intercom in an easy-to-use system. Comprehensive and compact, it eliminates a whole carload of extra gear!

Visit www.henryeng.com or call any Henry Engineering dealer. Tel: 562-493-3589

HOTEL

(continued from page 1)

But the trend was short-lived: As radio began to boom in the 1930s, stations checked out of hotels to move into their own dedicated facilities.

Today, in Washington, D.C., there are two facilities whose presence harkens back to radio's historic relationship with hotels; and the hospitality segment has drawn new interest recently from iHeartRadio as it seeks to bring its own channels and content to hotel-based consumers nationally.

RETURN OF THE LOBBY STATION

If you're a guest at The Line hotel in Washington, you're free to look through the windows at live broadcasts being streamed from Full Service Radio, a lobby-based internet radio station in a chic, elegant setting.

"We offer 34 weekly programs/podcasts created by local producers, which can be heard live or on demand at www.thelinehotel.com/full-service-radio."



Artist's rendering of the studios of Big Whig Media in the courtyard of the historic Willard Hotel.

"We're free to do anything we want as we see fit."

— Jack Inslee

said Jack Inslee, founder and executive producer of Full Service Radio. Inslee previously helped launch Heritage Radio Network and is a record producer, audio engineer and DJ.

"The shows cover a very wide variety of topics from music and food to self-help and pop culture. Our full-time employee and part-timers work to identify possible hosts, who provide the content to us for free in exchange for using our studio to create this content and distribute it worldwide."

Full Service Radio's live schedule at The Line hotel runs Sunday to Friday. Its program/podcast titles include "SongByrd Radio," "Beer Me," "Beats&Beautiful Music," "The Wedding Dish" and "Edible Activist."

Although he says Full Service Radio does work with The Line hotel on con-

tent occasionally, the streaming station manages its own programming without external direction.

"We're free to do anything we want as we see fit," said Inslee. "Meanwhile, if our hosts manage to attract sponsors, they get to keep the majority of the revenues, which provides them with an incentive to grow their programs and their audiences."

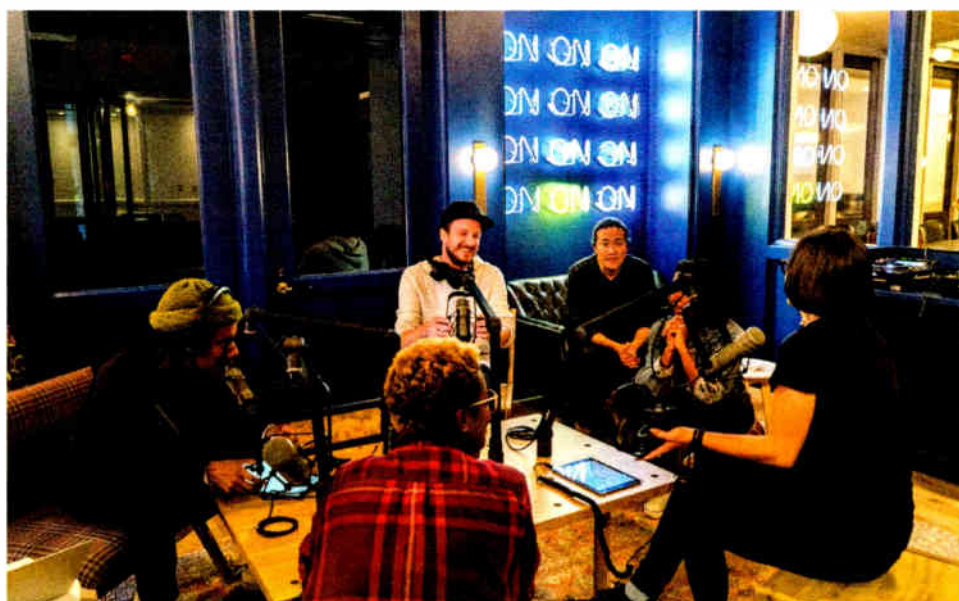
BIG WHIG

Newly completed in the courtyard of the Willard InterContinental Hotel is Big Whig Media, a full-fledged multimedia production facility. It is a partnership of Nahigian Strategies, a communications and public relations firm, and property developer Carr Companies.

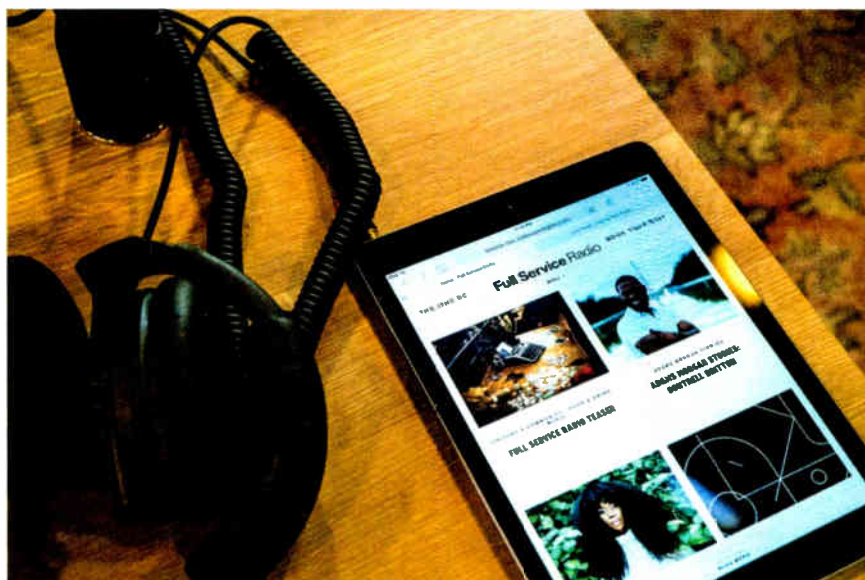
Big Whig Media ("Whig" being a nod to the defunct political party) is home to an audio production studio for live radio and audio streams and podcasts, a multi-camera video studio and TV editing suite, and satellite uplinks/landline links to get the content out to the world.

"There's a real demand for third-party production studios in downtown Washington," said Cassie Scher, an account manager with Nahigian Strategies. "With industry experts and

(continued on page 7)



Jack Inslee, center facing camera, talks with guests at Full Service Radio.



Full Service Radio as seen on an iPad. At upper right: "Book Your Stay."

NVLT Series nautel
3.5 kW – 40 kW
Outstanding Efficiency
at Exceptional Value
Now upgradable
to HD Radio
nautel.com/NVlt

NEWS

thousands of iHeartRadio's music playlists, podcasts and can even stream live radio stations," the companies announced. "Guests can access this new feature directly from their TVs in Hilton's 'Connected Room' guest entertainment platform."

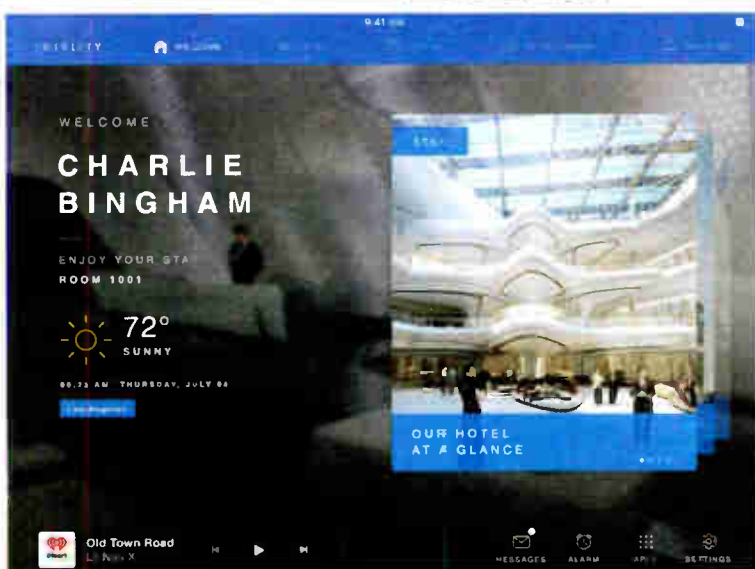
CAPTIVE AUDIENCE

Perhaps it's too much to call any of this a rebirth of hotel-based radio or even a trend in hotel-based internet radio. But the special nature of hotels seems to have enduring media appeal.

Intelity CEO Robert Stevenson describes hotel listeners as a highly engaged, captive

audience. Similar captive audiences could be captured by setting up internet radio stations in other specialized locations, he added. "For example, if there is a streaming audio station set up in a mall, they have the opportunity to sell advertising placements to the stores within the mall and can guarantee that those advertisements will reach a relevant audience," Stevenson said. "The secret is to have a targetable audience and a platform to deliver a broadcast on, ideally digital and mobile."

It remains to be seen if hotels in other U.S. cities follow this trend; but Full Service Radio is now producing programs in The Line hotels in Austin, Texas, and Los Angeles.



The welcome screen of a guest's Intelity media center shows iHeartRadio content at lower left.

(continued from page 6)

foreign dignitaries staying at the Willard, and so many government agencies and associations nearby, this location is the perfect spot for people to be able to do their interviews without having to go too far out of their way."

Appealing to audio professionals is definitely part of its goals. Its website states: "Bring your podcast or live radio show to the cutting edge! Big Whig Media offers the only ground-level, windowed studio focused primarily on creating premium audio content. We also offer the opportunity to transform your program from an audio-only experience into a dynamic, visual show, streamed with the ability for fans to see you record *live*. For those content creators or radio hosts visiting Washington D.C., we offer the opportunity and equipment you need to broadcast from the iconic Willard InterContinental Hotel."

HOTEL LISTENING

Industry biggie HeartMedia may not be based in a hotel lobby, but it too sees the potential in the hospitality segment. Since 2017 it has been using a cloud-based distribution platform from hospitality tech company Intelity to deliver its streamed stations to hotel guests using tablet computers in their rooms.

"Integrating iHeartRadio into hotel rooms through partners like Intelity is a great way to give travelers a chance to stay connected to their communities while on the road, while also giving them the opportunity to quickly discover what's happening in the places they are visiting," said Jessica Jerrick, iHeartRadio's EVP of business development and partnerships.

"In addition to access to thousands of live radio stations across the country, travelers can access music and podcasts perfect for any mood or activity, all for free."

This September, for instance, iHeart announced an agreement with Hilton Hotels. "Hilton guests can now enjoy

ACCESS NX

A sleek, portable IP audio codec
designed with the user in mind

Visit www.comrex.com/access-nx/video
to learn more.



Unparalleled reliability for remote broadcasting!



ACCESS NX RACK

THE AES67 COMPATIBLE CODEC

NOW SHIPPING



ACCESS MultiRack

5 CODEC INSTANCES IN ONE BOX



Contact Us Today To Learn More
1-800-237-1776 | www.comrex.com

COMREX

Radio Presses FCC to Allow Asymmetric Sidebands

NAB, NPR and Xperi say thousands of stations theoretically could benefit

Calling it unfinished business from seven years ago, the NAB, NPR and Xperi, parent of HD Radio, are asking the FCC to allow FM stations to operate with asymmetric sideband power levels without going through the hoops of seeking separate or experimental authority.

"Authorizing asymmetric sidebands on a blanket basis would significantly increase the number of stations eligible to boost power and improve their coverage without causing new host analog or adjacent channel interference," they wrote in December.

The following are excerpts from the petition:

In November 1999, the FCC initiated a proceeding in furtherance of its desire to provide all broadcasters with "the opportunity to provide DAB service." Although the commission recognized the long-term benefits of establishing an all-digital terrestrial radio service, the agency committed to "foster[ing] a rapid and non-disruptive transition to DAB for broadcasters and listeners," and reiterated its view that in-band/on-channel digital radio technology "may be able to facilitate a seamless transition to an all-digital radio broadcast environment by affording all broadcasters a concurrent digital and analog broadcast opportunity."

Accordingly, in October 2002, the commission authorized AM and FM digital broadcasts using the IBOC technology developed by iBiquity, and in June 2007, the FCC established service, operational and technical rules to "foster the development of a vibrant terrestrial digital radio service for the public and to ensure that radio stations successfully implement" digital radio technology.

As Fig. 1 shows, 20 years after the FCC's first step toward bringing digital radio services to the public, consumer interest in, and adoption of, HD Radio broadcasting is strong.

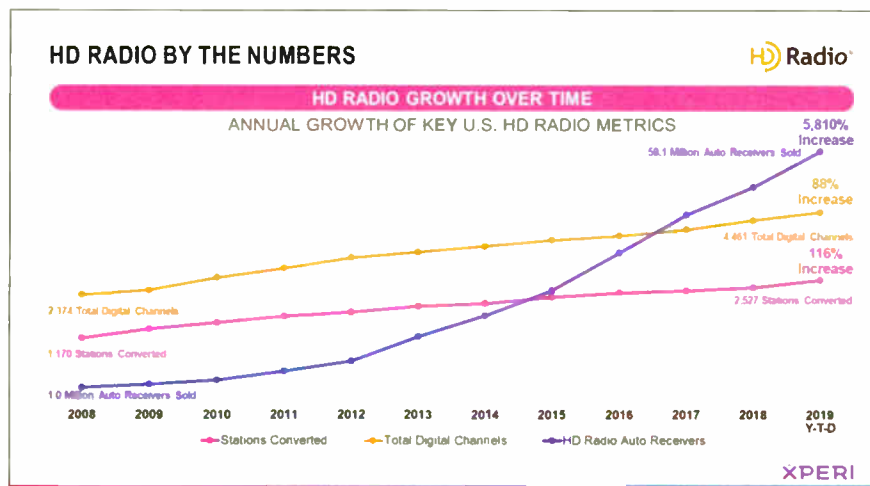


Fig. 1

The vast majority of digital receiver sales are tied to the purchase of new passenger vehicles. Forty-one automobile manufacturers offer a combined 298 vehicle models with factory installed HD Radio receivers. Indeed, more than half of all new vehicles delivered nationally in 2018 contained a factory-installed HD Radio receiver, and in 2019, the number of HD Radio-equipped cars ("HDEC") in some radio markets is approaching (or exceeding) 33 percent.

Moreover, in the first nine months of 2019, 51.3 percent of new vehicles were delivered with HD Radio in the dash. To date, almost 59.1 million vehicles have been manufactured with digital receivers.

Broadcasters, meanwhile, are continuing to innovate and look for opportunities to incorporate the digital broadcast system into their future business plans. To date, over 2,500 radio stations have been converted to digital broadcasts and offer in excess of 2,190 additional multicast channels using digital technology.

In July 2018, the FCC granted an experimental license for AM radio station WWFD to transmit an all-digital signal, and the commission recently adopted a Notice of Proposed Rulemaking to authorize a voluntary transition to the MA3 all-digital mode of HD Radio operation for AM stations based on a Petition for Rulemaking filed by Bryan Broadcasting Corp.

While broadcast adoption of digital radio technology continues to grow, authorizing asymmetric sideband operation on a routine basis would enable individual

stations to maximize HD Radio service coverage areas to replicate their analog coverage as much as possible within existing digital power limits. In the FCC's First Report and Order in the DAB proceeding, the commission authorized FM stations to operate with digital effective radiated power equal to 1 percent of analog power or -20 dBc. In 2010, the Media Bureau adopted an order ... to allow all FM IBOC stations to operate at -14 dBc and for stations that meet certain guidelines to increase further to -10 dBc.

To operate above -14 dBc, stations must submit an informal request to the Media Bureau. The informal request must include an analysis of the station's potential to cause harmful interference to adjacent channel analog signals using the following formula that is defined for dual sideband power:

$$\text{Allowable IBOC power} = [2.27 * (60 - \text{IBOC station } F(50,10) \text{ dB}\mu) - 33.6]$$

A modification of this formula allows for determination of asymmetric sideband power levels where the formula is applied to each sideband independently:

$$\text{Allowable IBOC power} = [2.27 * (60 - \text{IBOC station } F(50,10) \text{ dB}\mu) - 36.6]$$

Consistent with the Advanced IBOC Coverage and Compatibility Study Project Report, the FCC mandates that all stations calculate the formula using the station's analog F(50,10) field strength at all points on the 60 dBμ F(50,50) contour of the desired station without regard to the actual class of station or protected contour for the station. Once the most restrictive (that is, strongest) analog F(50,10) field strength of the proponent station has been determined, the licensee uses the following table to determine the proponent station's maximum permissible FM digital power:

Proponent Analog F(50,10) Field Strength at Protected Analog 60 dBμ F(50,50) Contour	Maximum Permissible FM Digital ERP
51.2 dBμ and above	-14 dBc
50.7 dBμ -51.1 dBμ	-13 dBc
50.3 dBμ -50.6 dBμ	-12 dBc
49.6 dBμ -50.2 dBμ	-11 dBc
49.5 dBμ or less	-10 dBc

This approach assumes symmetric rather than asymmetric digital sidebands.

The use of symmetric sidebands for all calculations eliminates a viable path for many stations to increase power on at least one sideband, which would improve digital coverage.

In 2011, the commission sought comment on a request by iBiquity and NPR to permanently authorize voluntary asymmetric digital sideband power for FM stations so that broadcasters would not have to seek temporary, experimental authority to operate with asymmetric sidebands.

Such authorization of asymmetric sideband operation would encourage greater station adoption of digital radio technology and enable broadcasters to keep up with both the growth in receiver sales and the public's interest in high quality radio service. Yet, after the comment cycle closed in January 2012, and with virtually no opposition to the permanent authorization of asymmetric digital sideband operation, the FCC has taken no further action on the matter.

As the commission considers the next steps toward its goal of creating an all-digital radio broadcast environment, it can strengthen the existing digital radio ecosystem and facilitate the continued growth of digital radio by addressing an important matter left unresolved in the prior rulemaking.

Authorization of asymmetric sidebands will help stations improve reception of HD Radio services at minimal cost to them or to the commission. It will also encourage transmission equipment and receiver manufacturers to continue to invest in research and development of HD Radio equipment, thereby reducing equipment costs and facilitating further adoption of HD Radio broadcasting. Adoption of this petition will benefit all sectors of the digital radio ecosystem, particularly the public.

ROUTINE MATTER

The commission should authorize asymmetric sideband operation as a routine matter.

(continued on page 10)

ViA The Remote Codec of Choice...

The ViA now supports 7 IP interfaces:

- Internal module supports 2 SIM cards for Telco diversity
- Supports built-in Wi-Fi (no USB modem required)
- Connect 2 air cards and 2 Ethernet connections
- Rock solid IP connections with primary and redundant streams using SmartStream PLUS
- Control remotely from anywhere with the new Cloud Codec Controller (sold separately). Watch the video



<https://youtu.be/S1WZ6TacYDI>

(((ViA)))



Wi-Fi
Built-in

Tieline ✓
The Codec Company

317-845-8000 | sales@tieline.com | tieline.com

SIDEBANDS

(continued from page 8)

The petitioners propose a modification of the requirements contained in the 2010 Order by authorizing FM stations to use asymmetric sidebands on a permanent basis, thus making it possible for stations to calculate maximum allowable power per sideband.

This rule change would provide stations with greater flexibility to achieve the best balance between maximizing digital signal coverage and building penetration while protecting adjacent channel analog signals. Moreover, adoption of this proposal would advance the goals the Media Bureau articulated in the 2010 Order: “to improve FM digital coverage and to eliminate regulatory impediments to FM digital radio’s ability to meet its full potential and deliver its promised benefits.”

The most effective way for stations to increase digital coverage is to increase digital power. However, the commission has always balanced the desire to increase power (and thus coverage) with the need to protect adjacent channel analog signals from harmful interference. Asymmetric sidebands provide an effective tool for broadcasters to optimize this balance.

“The use of symmetric sidebands for all calculations eliminates a viable path for many stations to increase power on at least one sideband, which would improve digital coverage.”

Permanent authorization of asymmetric sidebands would allow additional stations to increase power and avoid harmful interference using the formula in the 2010 Order.

Currently, if the interference potential from each digital sideband differs due to variations in geographic spacing or power levels of the upper and lower first adjacent stations, the digital station must set its digital power based on the most restrictive interference scenario. This constrains overall digital power for many stations that have potential interference issues on only one sideband.

If stations were able to calculate the potential interference on a per-sideband basis, a station could, for example, maintain one sideband at -14 dBc and increase the other sideband to -10 dBc. Or the station could increase one sideband to -10 dBc and the other sideband to a level above -14 dBc but below -10 dBc. This would result in an overall increase in digital power, even if it is below the full -10 dBc level.

To help quantify the benefit of asymmetric sidebands, NAB and Xperi conducted an analysis in 2017 that looked at every full-power FM station in the United States and, for each of those stations, the three worst first adjacent interferers.

Using that data, the study concluded that only 60% of FM stations can qualify to raise power to the -10 dBc level (-13 dBc per sideband) under the existing

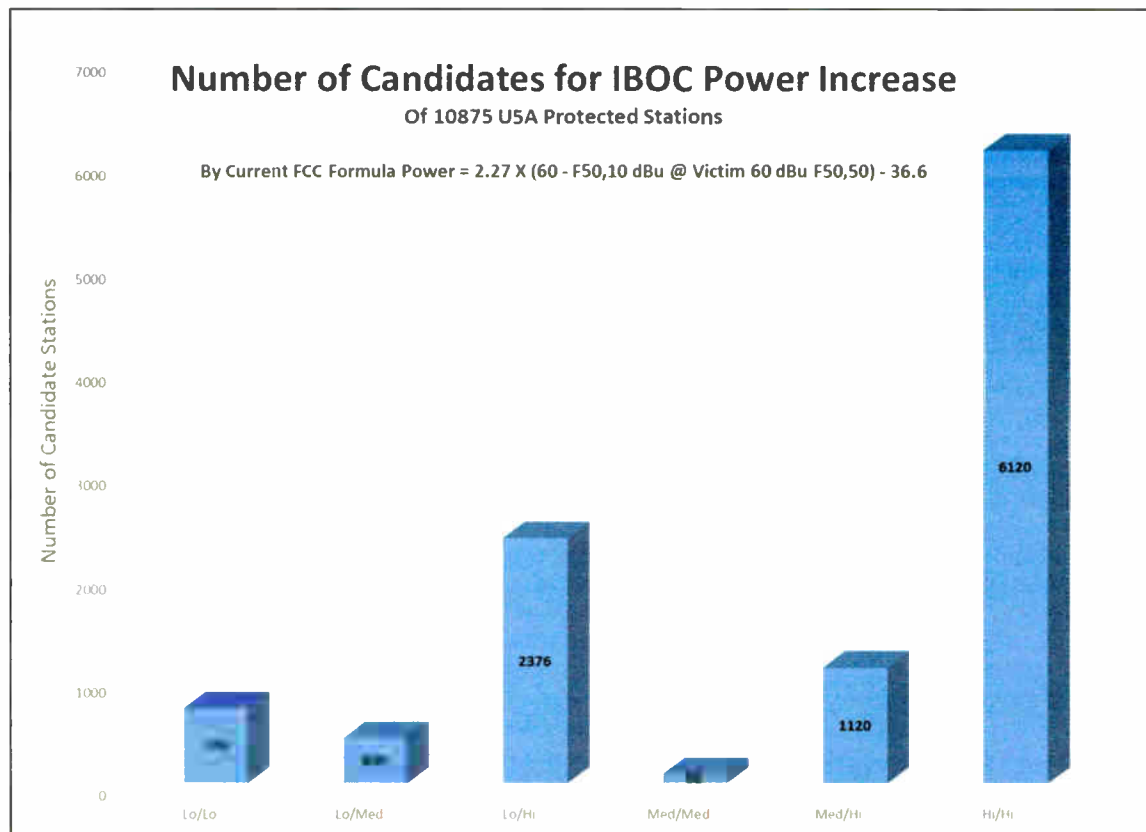


Fig. 4: Number of candidate stations for IBOC power increase, where:

Lo/Lo	Stations may not increase either sideband above -17 dBc per sideband (-14 dBc total power)
Lo/Med	Station may increase one sideband to an incremental value between -17 and -13 dBc per sideband (-14 and -10 dBc total power)
Med/Med	Station may increase both sidebands to an incremental value between -17 and -13 dBc per sideband (-14 and -10 dBc total power)
Lo/Hi	Station may increase only one sideband to the -13 dBc limit (-10 dBc total power), other must remain at -17 dBc (-14 dBc total power)
Med/Hi	Station may increase one sideband to -13 dBc (-10 dBc total power), the other can increase to an incremental value between -17 and -13 dBc
Hi/Hi	Station may increase both sidebands to -13 dBc (-10 dBc total power)

formula using symmetric sidebands. In many cases, the stations that cannot increase power are located in urban and suburban areas with greater population density and more tall buildings.

A power increase for those stations would enhance building penetration and significantly improve their listeners’ ability to receive a strong digital signal. As can be seen in Fig. 4, of the 10,875 FM stations in the study, only 6,120 are eligible to increase power to -10 dBc (-13 dBc per sideband — classified as “Hi/Hi” in Fig. 4).

However, if stations were authorized to operate using asymmetric sidebands, an additional 3,496 stations would be able to increase one digital sideband to -10 dBc (-13 dBc per sideband, classified as “Low/Hi” and “Med/Hi” in Fig. 4), and an additional 532 stations would be able to increase at least one sideband above -14 dBc (-17 dBc per sideband) but not to the full -10 dBc level (-13 dBc per sideband) (classified as “Lo/Med” and “Med/Med” in Fig. 4).

As Fig. 4 demonstrates, authorizing asymmetric sidebands on a blanket basis would significantly increase the number of stations eligible to boost power and improve their coverage without causing new host analog or adjacent channel interference.

Although stations currently can request an experimental authorization to operate with asymmetric sidebands, FM stations have demonstrated they will not make the capital investment in equipment needed to increase power if the station’s operations are tied to experimental (i.e., temporary or revocable) authorizations.

Fully authorizing the use of asymmetric sidebands on a standard basis would provide greater regulatory certainty for stations to promote use of this mechanism for raising power while minimizing potential harmful interference to adjacent channel stations. This also would reduce the administrative burden of processing and tracking experimental authorizations.

(continued on page 13)

THE TELOS ALLIANCE®

Control Your AoIP Universe



QUASAR

by AXIA

Application-specific controls. Customizable Source profiles. Metering where you need it. User-assignable buttons. All cosmically connecting with networked sources near and far.

Finally, you have the power to create the most brilliant content in the AoIP universe. Harness It.

To experience
limitless production
possibilities,
contact us today.

SHAPING THE FUTURE OF AUDIO

THE TELOS ALLIANCE

TelosAlliance.com | inquiry@telosalliance.com | +1.216.241.7225

World Radio History

Hungary Studies DRM Shortwave

The 26 MHz tests aim to demonstrate DRM's capabilities

The antenna used in the trial is located at the Budapest University of Technology.



BY HANS JOHNSON

BUDAPEST, HUNGARY — Digital Radio Mondiale transmissions began from Budapest, Hungary, last June. Although two Hungarian broadcasters previously tested DRM on medium wave, the transmissions are the country's first DRM trials on shortwave.

The Department of Broadcast Info-Communications and Electronic Theory at the Budapest University of Technology is conducting these latest trials. Csaba Szombathy, head of the broadcasting laboratory, is also head of the project, which will last for at least 12 months.

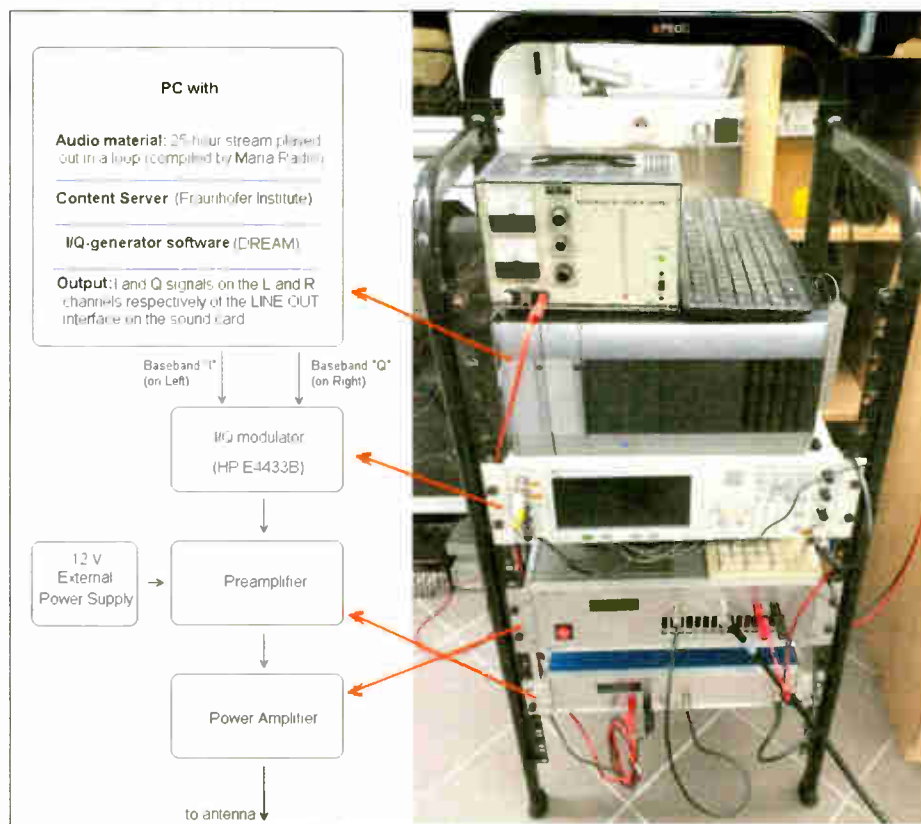
While the 11-meter 26,060 kHz frequency is well known for use in local broadcasting, it's rarely implemented for international broadcasting. Both World Radio Network (now owned by Encompass Digital Media) and Vatican Radio conducted DRM trials on shortwave in the 26 MHz range in London and Rome in 2005 and 2008 respectively. Researchers have also performed tests in this frequency to measure coverage and determine optimal mode and bandwidth on various occasions in Mexico and Brazil. The new Hungarian trials will add to this research.

FURTHER DATA

Szombathy initially operated the transmitter with just 10 W of power into a 5/8-inch vertical monopole. Radio Maria, a Catholic station, is providing a 25-hour program loop, while a Dream DRM software-based encoder broadcasts the signal using AAC encoding. In spite of the low power, the program was reportedly received in the Netherlands.

In early September, Szombathy moved the antenna and transmitter to a

(continued on page 13)



This diagram shows the compact DRM shortwave setup.

In early September, Csaba Szombathy moved the antenna and transmitter to a slightly different location to improve coverage. He increased the power to 100 W.

SIDEBANDS

(continued from page 10)

Asymmetrical operation should be permitted as needed for all stations of all classes, including grandfathered superpowered stations. Implementing the permanent authorization of asymmetric sidebands operation would only necessitate modest revision to the Form 335-FM used to notify the commission that a station has commenced digital operations.

Instead of specifying single values for the analog and digital Effective Radiated Powers, the Form could

be modified to accommodate separate ERP values for each sideband as follows:

Digital LSB _____ kilowatts
 Digital USB _____ kilowatts

For Transmitter Output Power, a combined power would be supplied as follows:

Digital LSB (...) _____ kilowatts
 Digital USB (...) _____ kilowatts
 Digital Total (...) _____ kilowatts

Stations wishing to operate asymmetric digital sidebands would simply submit the form so the commission can update its records accordingly.

Providing permanent authorization for asymmetric sidebands is consistent with the commission's broader effort to remove unnecessary regulatory barriers in the broadcast industry and promote broader adoption of DAB systems. Furthermore, because the transition to digital radio will remain voluntary, there is little downside to providing broadcasters with the flexibility and certainty that they need to best serve their communities.

(continued from page 12)

slightly different location to improve coverage. He increased the power to 100 W.

MULTIMEDIA CAPABILITIES

The second stage of the project is demonstrating DRM's multimedia capabilities. Germany's Fraunhofer IIS loaned the laboratory a content server, which provided a substantial upgrade to their setup. Szombathy's station is transmitting with a xHE-AAC codec. The project also features Journaline data service, which Fraunhofer describes as "hierarchically structured textual information."

Although a number of Indian medium-wave stations broadcast in xHE-AAC, the Hungarian station is the only shortwave station with regular xHE-AAC transmissions. Fraunhofer previously supported a German university station broadcasting in xHE-AAC. That station, Funklust, is no longer on shortwave.

Szombathy says he welcomes any DRM receiver manufacturer or developer to Budapest to conduct field tests using any receiver they are working on.

The station may go on beyond its one-year project. "It depends on what we archive or where we get during this year," explained Szombathy. "If I can generate sufficient interest, there's a chance it'll transition into a permanent, live broadcast."

Hans Johnson has worked in the broadcast industry for more than 20 years in sales, consulting and frequency management.

Do you have a DRM story to tell? Write to rwi@futurenet.com.

Replace your 'Old' Automation with 'New' for only \$125 per month

For the cost of most support contracts you can have a complete APEX Radio automation system. For the one low monthly price you get 'APEX' on air software (Live, hard disk automation, satellite automation, Ball games and more), 'Tools' software (Library management, Production, Scheduling, Voice tracking from anywhere, Reporting, and more), and 'Bridge' hardware (sound cards, sat switcher, sat logic), plus customer support, and all software updates and upgrades. Just add a Windows 10 PC and you are on air. Need another 'Tools' studio just add software for \$250 and another Windows 10 PC. No contract to buy, APEX is month to month. Like it then keep it. Join the thousands who have chosen Arrakis automation since 1991.



It's not magic!

www.arrakis-systems.com 870-461-0730

Frank Hertel's 11 Tips for Dealing With Mice

Great tips for keeping rodents out; also, do these hands look familiar?

WORKBENCH

by John Bisset

Email Workbench tips to johnpbisset@gmail.com

Frequent Workbench contributor and consultant Frank Hertel of Newman-Kees is not one to brag, but he has quite a bit of experience in dealing with mice. After 50+ years of servicing some really bad transmitter sites, he has a number of tips to share with readers.

1. Inspect the seals of all doors and windows and cable entries to the outside world, to ensure they fit tight.
2. Screen all fan openings and air exits with 1/4-inch galvanized hardware mesh, to keep critters out.
3. Make sure to plug the main electrical service entry conduits with stainless steel wool or copper wool and caulk. (Mice will eat through caulk alone.)

4. Resist the temptation to "dress up" your site by adding dropped ceilings; they provide an ideal location for nesting of mice.

5. *Never* take food or soft drinks into the building. Even a few crumbs or an empty soda can will invite mice.

6. The same is true for any food-scented wrappers or containers. Keep them out of the transmitter building. Also use a trash can with a tight seal to dispose of everything. Better yet, always take your trash with you as you leave a transmitter building.

7. Realize that food scents in the building can entice mice. They will gnaw through some types of exterior wall surfaces if they get even the slightest scent of food.

8. Don't use rodent bait; it actually attracts mice! And although it works, many times the mice often crawl off into some secluded space to die and make the building smell.

Furthermore, most rodent bait will decompose over time and turn to dust — which you end up breathing. If you ever go to a transmitter site and find they have used mouse bait, don't ever sweep or vacuum the floor without a respirator.

9. Instead of rodent bait, use something safe like "Peppermint Oil" to repel mice. It works! Here's a video example showing its effectiveness: https://youtu.be/wNaNGH_lmEE

10. On visits to infested sites, be sure to take a change of clothes

and a bag to put your dirty clothes in! Otherwise you are infesting your vehicle with all the nasty stuff from the transmitter building.

11. Carry a jug of water, a bar of soap, a roll of paper towels and a bottle of alcohol, and clean yourself when leaving and before getting into your vehicle. This is especially helpful if you take a break to eat.

Frank adds that he has a personal reason for helping you to manage your exposure to rodents.

For a long time, he suffered from an unusual medical condition. Whenever he ate something sweet or drank a sugary drink, he would get an extreme pain where his esophagus entered his stomach. He tolerated this for 25 years, and had a number of tests during those 25 years: nothing was diagnosed.

One Thanksgiving, after eating a couple of those miniature Hershey bars, Frank was in deep distress and was taken to the hospital. Initially, the doctors thought it was a heart attack. Among the tests they performed was a "bore scope" down Frank's throat. When Frank awoke from the anesthesia, the doctor had identified the problem: five small bacterial-based ulcers. Frank asked whether exposure to mouse bacteria, from contact with urine and droppings dust, could have caused the problem. The doctor's reply was an emphatic "YES!"

A 20-day treatment with Amoxicillin worked. But Frank no longer views



mouse-infested transmitter sites the same way. His business does not provide routine service/maintenance; he is usually called in just for an emergency, and too many facilities

have not had routine cleaning. He now carries a face mask and respirator in his vehicle. Mice are not to be taken lightly. More than just your equipment is at risk.

Wiring maven Steve Lampen attended a recent tips webinar sponsored by Telos. From our discussion of AoIP installations and the tons of analog wiring that is usually removed, Steve suggested that engineers Google "copper scrap reclamation" for information on turning your old wire into money. A recent Bloomberg headline stated, "Copper Tapped as the Next Big Metals Trade of 2020."

I was commiserating with an engineer about remote broadcasts of the 1960s and '70s and how they've changed. Many stations load their jocks up with a tablet or a smartphone and it's show time! Even the gear required for news interviews has been simplified thanks to several codec manufacturers.

Using a smartphone for an interview is fine, but there are times where you'd like to mix two signals. That's where CEntrance comes in.

(continued on page 16)



SI
Studio Items Inc.

Mic Booms
On-Air Lights
Speaker Mounts
www.studioitems.com

TORPEY TIME
(The Good Time People)

Clocks
Up/Down Timers
www.ram68.com

Dixon Systems

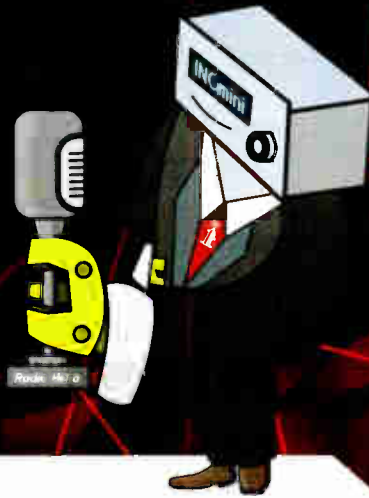
News Mixers
Line Matchers
USB Audio Codecs
www.ram68.com

RAM
RAM Systems

Broadcast Furniture
Systems Integration
Sound Absorption Panels
www.ram68.com

INO *mini*

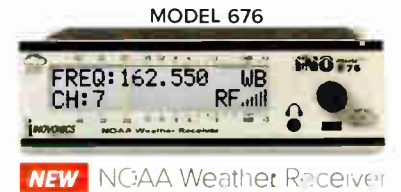
CELEBRATES ITS
10TH
ANNIVERSARY



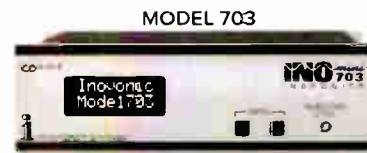
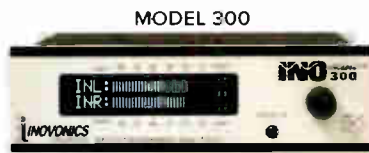
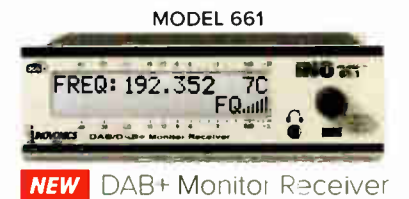
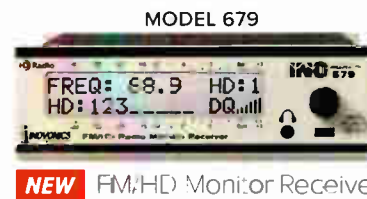
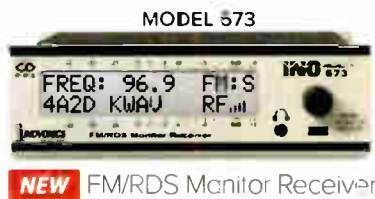
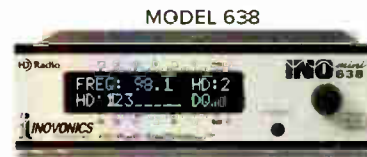
Small in size, but packed with
**MONITORING
MUSCLE**

**SAVE MORE
CALL TODAY**

Contact your preferred Inovonics dealer today for a special offer on a customized RackPack solution. Choose from a growing family of INOminis and other small form factor products to create your own RackPack monitoring solution.



Remote Off-Air Monitoring with Web-Enabled **SiteStreamers™**



Powerful Remote Monitoring / Web-Enabled

NEW THE ELITE
SOFIA 568 FM/HD **SiteStreamer™**

Displays HD Radio Artist Experience, Streaming to 10 listeners, Adjustable Outputs, Dante AoIP



www.inovonicsbroadcast.com
sales@inovonicsbroadcast.com | 831-458-0552

WHY INOVONICS? Quality Solutions. Competitive Prices. | Quick to install. Easy to Program. | Quality after sales service. | Three-year Factory Warranty.

Best of Show Up Close: Davicom 320

"Best of Show Up Close" is a series about participants in Radio World's annual Best of Show at NAB Awards program. In 2019, Davicom nominated the Cortex 320 remote control. The Cortex is the second member of the Cortex line, smaller than the established Cortex 360 and aimed at facilities with simpler needs and lower budgets. We asked Davicom President John Ahern for more information.



Radio World: What is the product and what are its targeted uses?

John Ahern: The Cortex 320 is Davicom's new baby in the Cortex intelligent remote-control family. Although it is built on the same platform as the Cortex 360, the 320 has been optimized for small-budget requirements. So small market and noncommercial stations can take advantage of the core benefits provided by larger, and more costly, remote controls.

RW: The system is described as versatile and intelligent. What sets it apart from similar offerings in this product class?

Ahern: One example would be the unit's 12 versatile inputs that can be used as either metering or status inputs. Coupled with the 320's four dedicated status inputs, it can be configured for just the right mix of GPIO.

Another example is the unit's 128 virtual logic gates that can be used to program smart actions, depending on input conditions. Davicom units have always included advanced broadcast-related functions such as an automatic sunrise-sunset flag, direct VSWR indications, hysteresis to reduce false alarms, and advanced math for logarithm and decibel calculations.

One design aspect that sets us apart is our use of standard protocols and interfaces such as MODBUS and SNMP. Users can buy their own, low-cost/less intelligent devices and use the 320 to make everything work together smartly. They can also interface directly with gensets and transmitters without needing to buy extra hardware.

Another is its design for electromagnetic compatibility. I think that we may be the only manufacturer that operates

its own EMC lab with a full-sized TEM cell and 3 m emissions test range. All our products meet and even surpass the requirements of FCC and CE emissions and immunity standards.

And even though the 320 is totally at home in an IP and networking environment, it can still operate on dial-up lines and even over narrow-band serial communications links down to 2400 baud. This ensures the Cortex can be used and accessed at those many sites where IP is not available or reliable.

MSRP for the basic 12 VDC unit with IP connectivity is \$2,436. Consult your



favorite dealer to enquire about alternative pricing.

RW: What do you see as the most important changes in how broadcasters design and build remote control and monitoring infrastructure?

Ahern: We've been seeing this trend since 2007, when we first introduced an integrated SNMP manager into our

Davicom units, but site management by IP is finally here. Even if a remote site doesn't have outside network access, an on-site LAN can greatly facilitate system setup and operation. Monitoring and control wiring are reduced by orders of magnitude and reconfigurability is greatly increased.

This new paradigm does come with its lot of new challenges however. System monitoring and troubleshooting have changed and now require different tools and methods. Broadcasters aren't only measuring voltages, RF powers and contacts anymore, they now need to do things like ping transmitters, read IP addresses, automatically restart flaky routers and monitor digital audio data streams.

WORKBENCH

(continued from page 14)

The MixerFace R4, pictured in Fig. 1, is a high-quality mixer, recorder and USB interface. The rugged metal enclosure is about the size of a smartphone, and can record to an SD card or the phone.

In addition to gain and monitor controls, each channel has a switchable high-pass filter (to reduce on-location wind noise) as well as a Hi-Z/Low-Z selector switch for each channel. Longer recording sessions are assured with an 8 hour battery.

The MixerFace R4 is available through broadcast distributor Broadcasters General Store (www.bgs.cc), which is sponsoring a fun contest. Look at Fig. 2. The first person identifying the hands holding the MixerFace R4 will win a \$25 coffee card. Send your entry to my email, johnpbisset@gmail.com, and maybe include a tip or a picture of something to share from your gallery (not required). Only one winner, and the time/date stamp on your email will be the determining factor.

Earn recertification credit when you share a tip published in Workbench. Thank you for sharing your tips and high-resolution photos by sending them to johnpbisset@gmail.com.

John Bisset has spent 50 years in the broadcasting industry and is still learning. He handles western U.S. radio sales for the Telos Alliance. He holds CPBE certification with the Society of Broadcast Engineers and is a past recipient of the SBE's Educator of the Year Award.



Fig. 1: A compact recorder and mixer from CEntrance.



Fig. 2: This is not some kind of science fiction monster; it's two people holding a MixerFace. Identify the hands and maybe you'll win a prize.

REAL TIME BUILT-IN INSTRUMENTATION

Comprehensive Monitoring & Control

100% Remote Access

nautel.com/AUI



ADVANCED PROCESSING: BEHIND THE SCREENS

X5 is the most advanced, finest sounding broadcast audio processor ever designed. It's loaded with inventive technology that dramatically improves your sound AND delivery all while letting you be counted by every PPM out there.

PPMport INSERT LOOP FOR PEOPLE METERS

An insert loop to interface your ratings encoder AFTER the processing delivers a signal with greatly reduced audible artifacts, which ensures you'll be moving all those meters out there.

FM/HD LIVELOCK FM/HD SIGNAL SYNC

Integrated HD and FM analog signal alignment keeps listeners tuned in to your station even during extreme blending conditions. No more "dip and skip" in reception that can cause tune out, affecting TSL.

UP UNIFIED PROCESSING®

Each X5 function in the chain interacts closely with other functions to deliver just the right amount and type of processing needed, creating a sound that's as close to the original as possible.

LIVE LOGGER LIKE THE NSA FOR YOUR X5

Live Logger keeps track of everything happening on your X5. Pre-set takes? Remote login? Audio failover? Every event is date and time stamped so you can review it.

LIMITLESS CLIPPER INTELLIGENCE KNOWS ITS PLACE

Proprietary high-frequency distortion canceling technology passes the highs, but not the overshoot. No more "spitty" highs or pops from clipping, no IMD distortion whatsoever. Takes all the highs you can give it and never gives you back IMD.

MPX SYNCLINK STUDIO-TRANSMITTER LINK

Extends HD/FM alignment from your studio to your transmitter site. Keeps the HD and FM packets in sync so time alignment done at the studio goes straight to the receiver.

BETTER SOUND
MORE LISTENERS **X5**

wheatstone.com/X5-rw

Wheatstone
BROADCAST AUDIO PERFECTIONISTS®

1.252.638-7000 | wheatstone.com | sales@wheatstone.com

World Radio History

Best Practices for AM Directional Systems

DAs are marvels of engineering but can seem daunting. Here are useful tips!

TECHTIPS

BY MARK PERSONS

Our previous article "Find Your Modulation Sweet Spot," published in the Oct. 9, 2019, issue of Radio World, is still available online, just Google that headline. It sets the stage for a two-part discussion of AM directionals, beginning here.

As you surely know, fewer engineers are qualified to work on AM directional antenna systems today. Younger ones who maintain these marvels of engineering may not be as well versed as their predecessors.

If you are a member of the new breed, my advice is to be careful not to do the wrong thing when tackling a problem. Don't make adjustments without analyzing a situation first.

PROBLEMS

If you find antenna monitor phase and ratio readings are off more than a few degrees or a tower ratio is off more than 5%, don't start adjusting the phasor to compensate. Keep your cool. Write down all the phasor dial readings for future reference. Do a complete physical inspection, including eyeballing the inside of the phasor cabinet and antenna coupling networks. Look for broken connections everywhere and on lines running to the towers. Go out and measure the monitor points. You may find they are in spec and that your real problem is in the antenna monitor or other part of the sample system.

Jumping to the wrong conclusion could result in chasing your tail to fix an antenna problem that you don't have.

TOO MANY KNOBS

An engineer maintaining a two-tower AM directional antenna station called me for advice recently. He is one of the engineers I am mentoring.

A station's commonpoint impedance (RF input to the phasor) was difficult to adjust because the variable common-

point resistance coil was at one end of its travel. All had been well a few months before. Today's solid-state transmitters want to see exactly 50 ohms with near zero reactance, as you know, so setting the commonpoint impedance correctly is very important.

As it turns out, the phasor has phase and ratio controls for both towers. In this case, it was too many knobs.

The ratio controls could be tweaked on either tower to keep the station in specs. This led to the commonpoint problem when he used both to get the correct antenna monitor phase and ratio numbers. The phasor's input matching network was looking at a phasor "buss" impedance that was not according to the original plan.

PHASOR DESIGNS

It's important to understand how phasing systems are designed and built. A transmitter feeds RF power into a phasor cabinet, where there is a three-coil impedance matching network. It feeds RF energy to a point called the "buss." This is where power is rationed out to phase and ratio controls for each tower. The buss is rarely 50 ohms, and it is normal to have the impedance change a bit as an engineer tweaks phase and ratio controls to maintain FCC licensed specifications. The input matching network normally has enough operating range to compensate for these adjustments.

Not all phasors have a front panel adjusted ratio control for the reference tower. That is for good reason. The reference tower normally gets more power than the other tower or towers. There is normally no need to adjust power to the reference tower after the station is initially tuned and licensed. It is the standard/reference that the other towers or towers are compared/referenced to.

I told the engineer to carefully adjust the reference tower ratio control to full, or close to full on, while keeping the other tower ratio and phase correct. Then, don't touch the reference tower radio control again. Mark it as "don't adjust." That solved his commonpoint problem. He then had good resistance and reactance control because the buss impedance was as expected in the design. Also, running both ratio controls down to their lower ends could cause some phasor components to run hot.

DESIGN EVOLUTION

Phasor systems did not typically have front-panel adjustable input matching networks years ago when tube transmit-

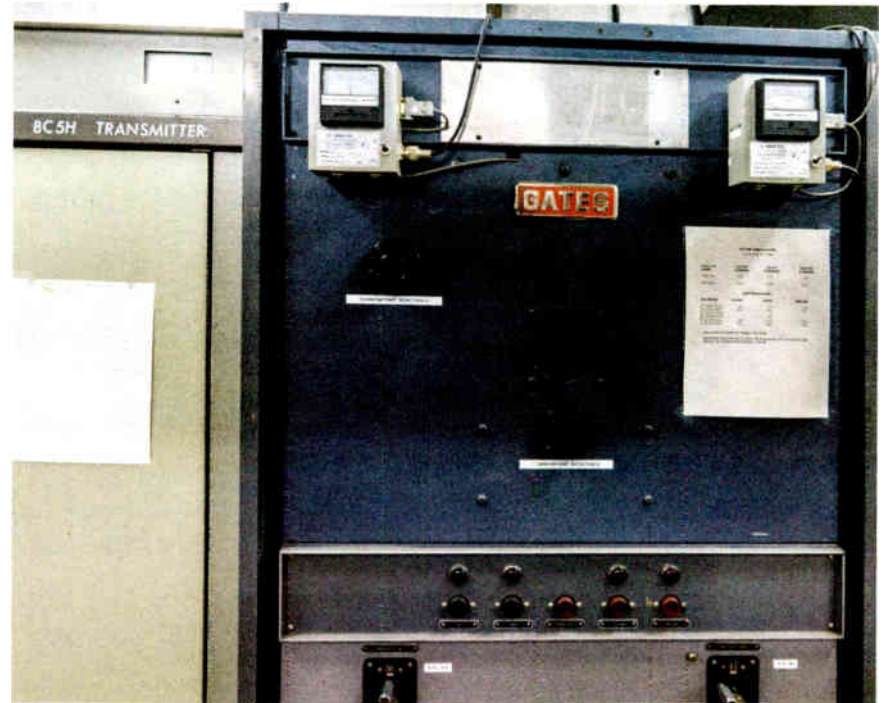


Fig. 1: A 1960s phasor with commonpoint controls added.



Fig. 2: Commonpoint controls were added to this phasor.

ters were the norm. That changed when solid-state transmitters came along. Now input resistance and reactance controls are required to keep reflected power low and transmitters happy.

Fig. 1 shows a 1967 vintage Gates three-tower phasor. It did not originally have an input matching network that is adjustable from the front panel. I added those knobs to help control the input impedance and transmitter power when switching from 5 kW non-directional day to 5.4 kW directional night. One control is for resistance, which is tweaked to keep the input at the licensed

50 ohms. The other is commonpoint reactance. Fig. 2 is the dial I normally adjusted to get the transmitter to make just the right amount of power at night.

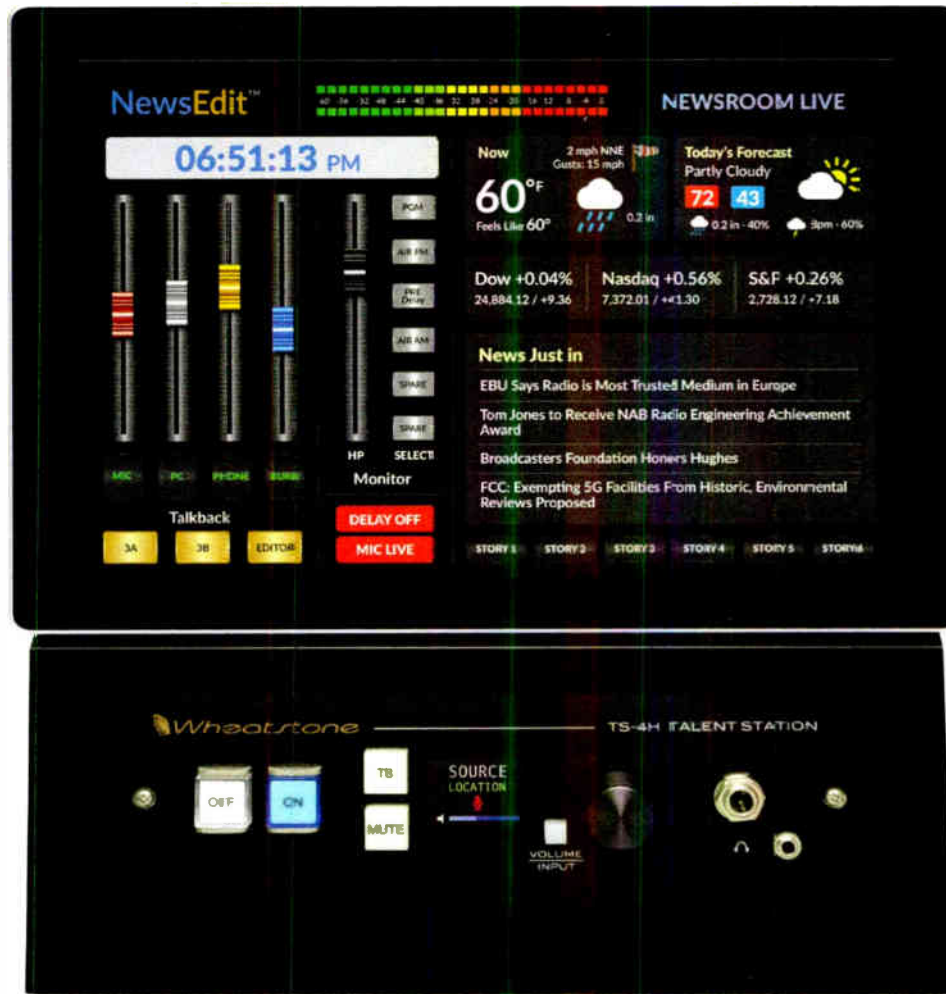
In this case, the day non-directional antenna coupling unit has clips on fixed coils for adjustments. Once set, it was good to go. The maintenance procedure is to get the transmitter running at the correct power level in the day mode, then switch to night and adjust the night commonpoint reactance control to get the correct directional antenna power. It is that simple.

(continued on page 20)





NEWS DESK IN UNDER 1 SQ FT



With ScreenBuilder™ 2.0, YOU decide what to put behind your glass. Smart virtual tools. Buttons. Faders. Knobs. Meters. Clocks and timers. Salvos. Hardware control and interaction. Complete signal chains. YOU determine exactly how they function and interact via the Intelligent Network with a simple scripting wizard. Adapt as your needs change. Get the idea?

BUILT WITH
SCREENBUILDER

wheatstone.com/glass-screenbuilder2-news-rw

Wheatstone
BROADCAST AUDIO PERFECTICNISTS®

1.252.638-7000 | wheatstone.com | sales@wheatstone.com

DIRECTIONAL

(continued from page 18)

You'll also note there are FCC-required operating parameters listed on the front of the phasor and transmitter. They are right where needed most.

Yes, that is a Gates BC-5H Transmitter next to the phasor. It has been in full service, running 5,000 watts day and 5,400 watts night since 1973. That's 46 years! This transmitter is on its third high-voltage transformer, third set of AC contactors, fifth set of high-voltage rectifiers and the solid-state audio driver section has been rebuilt four times on site without sending it to a factory for repair. The transmitter lives on, but will likely be replaced by my engineering successor when the next serious failure occurs. Fortunately there is a Collins 5 kW AM to back it up. Both are excellent tube designs.

ANTENNA EFFICIENCY

Can you assume that all is well when the monitor points are below FCC limits? Not necessarily. You might have serious impedance mismatches and power divider mismatches, as described above. RF power could be turning to heat.

You can get a readout on antenna

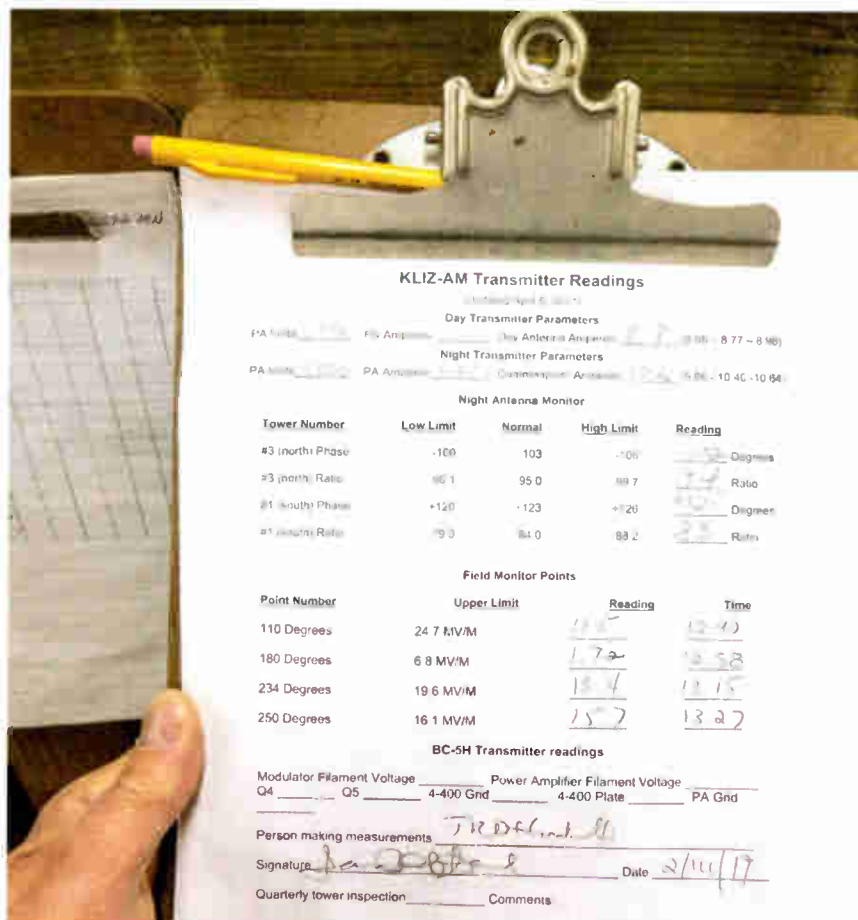


Fig. 3: Keep good records.

Today's solid-state transmitters want to see exactly 50 ohms with near zero reactance, so setting the commonpoint impedance correctly is very important.

efficiency by going to the original proof of performance documentation and making six or more measurements in the major lobe or lobes. The readings should agree, although there are seasonal variations. RF travels better over frozen ground so winter signals are inherently a bit higher. It is not a big deal in the first couple miles from the transmitter. Ground loss changes become more apparent the further out you go, especially at 20 miles and beyond.

OOS, OOM

Just because the phasor doesn't have active components, that doesn't mean it should be ignored. Rodents get in sometimes and need to be dealt with. Loose hardware is common on RF contactors because they are usually operated twice a day with plenty of vibration in the process. RF contacts wear and should be replaced before they fail completely.

HEAT

Get one of those infrared temperature meters and go through the phasor, then antenna coupling networks looking for hot spots. Use it around electrical load centers too. You might be amazed to find hot electrical contacts and wires that are about to fail. Best to take care of the problem before it causes an off-air emergency at a bad time.

PAPERWORK

Keep good visit-to-visit documentation on an AM directional (Fig. 3). It is a history of how the system has been behaving. You don't just log that everything is OK. AM directionals have many parameters to keep track of. That includes phase and ratio readings on each non-reference tower, dial settings on the phasor, transmitter PA readings, commonpoint current and monitor point readings, along with date and time. You'll likely see seasonal changes on

number of active turns on each coil in the system. As you know, silver-plated straps with clips are used to short out unused turns on fixed coils. They are set once and then normally not touched again. It won't take but an hour to do the documentation and will save a lot of headaches in the future. Lightning can blow up a coil or capacitor beyond recognition. Having parts values and settings on a schematic diagram can be a life saver.

A nearby station was visited by vandals one night. Somehow they got into the antenna coupling networks and pulled clips off the fixed coils. No other damage, just mischief. It took the engineer only an hour to put the coil clips back in the right spots, plus do a little tweaking, to get the antenna system working properly again. Imagine trying to start from scratch to get the system operational without that knowledge. Ouch!

By the way, spare parts and equipment manuals belong where the equipment is, not back at the studio. That includes books and programming information for remote control systems.

The best is yet to come. Stay tuned for an upcoming issue, where you'll find a real-life story about a 197-foot tower



Fig. 4: Mark your normal dial settings for easy reference.

monitor point measurements.

Fig. 4 shows a phasor adjustment crank. Note that normal counter dial reading is labeled nearby for easy reference. This is one more way to prevent an "oops" from becoming a major problem.

You should keep accurate phasor schematic documentation on hand at the transmitter site. Designs and "as built" are often a bit different. I recommend you pencil any changes on the original schematic. Also, mark down the

that came down in the parking lot at a directional AM station.

Comment on this or any article. Write to radioworld@futurenet.com.

Mark Persons, W0MH, built four new AM directional systems, from the ground up, using only schematic diagrams and parts. He is an SBE Certified Professional Broadcast Engineer and was named SBE Engineer of the Year in 2018. Mark is now retired after more than 40 years in business. His website is www.mwpersons.com.

There's Still Time to Get Your 2020 Calendar

Here's the 411 on two popular radio-themed choices

CALENDARS

John Schneider's epic Radio Historian's calendars are always a treat for radio aficionados.

His latest, the Radio Historian's 2020 Calendar, is no exception. Perhaps the best ever, it is packed with colorized



black and white photos of radio facilities, mostly studios and mostly pictures taken in the 1920s, '30s and '40s. Highlights include coverage of the Lindbergh baby kidnapping, Orson Welles and Burns & Allen.

Also outstanding are facility pictures of Powel Crosley's WLW and Edwin Armstrong's New Jersey FM test site.

Buy it online at www.theradiohistorian.org.

PEOPLE NEWS



Monisha Ghosh

appointed Chief Technology Officer of Federal Communications Commission. Succeeds Eric Burger



Joseph McDonnell

becomes president/CEO of Howell Laboratories, parent of Shively Labs succeeding David Allen, who retired

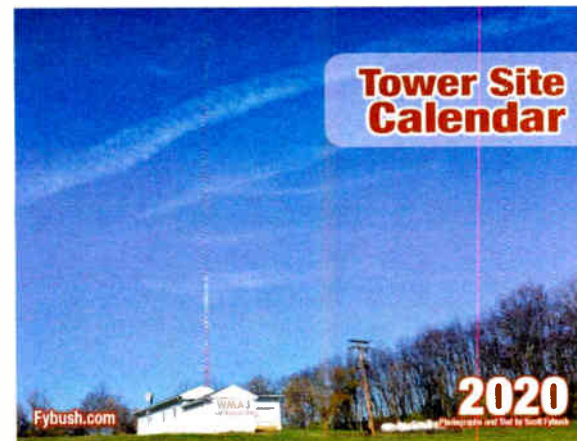
Send People News to radioworld@futurenet.com.

PICS OF STICKS

Start off the new year off right with Scott Fybush's famed Tower Site Calendar for the year 2020. As always, each month features a radio broadcast tower in a gorgeous setting.

This 19th edition takes a trip across the pond, adding a tower in the United Kingdom.

Calendars are \$20 plus shipping, and tax if you live in New York state. For info contact Lisa Fybush or call 1-585-442-5411. Buy it at www.fybush.com/shop.



Moseley

SIMPLY POWERFUL



Whatever your STL strategy:

- Group owner of multiple stations in a market with co-located studio and transmitter sites
- AM station adding one or more FM Translators to a common site
- Backup for multiple station cluster

The best tactic is the 8 channel Starlink.

The Starlink SL9003QHP-8SLAN overcomes overcrowded 950 MHz STL channels in your market by concentrating multiple stations on one licensed STL frequency. Perfect for main or backup service, it is extremely cost effective when compared to individual single station STL links.



- 2 to 8 Audio Channels make it perfect for multi-stations • Linear Uncompressed Audio or AAC & MPEG for maximum payload capacity • Data Channels carry RDS • Ethernet Channel (one-way) for HD Radio™
- 5 Watts Digital Power conquers challenging STL environments • Web Browser User Interface makes setup easy
- User re-configurable with no additional purchases makes it future-proof

It's your move now:

Contact Sales at (805) 968-9621 x785 • sales@moseleysb.com

www.moseleysb.com

Moseley uses proprietary technologies and owns more than 50 patents and has delivered more than a million radios deployed in over 120 countries.

Reflections on Racism and Radio

Your station can play a positive role by considering steps such as these

Many years ago as a DJ at a rock station, I became friends with a bartender who was a regular listener of my show. He seemed like a solid guy, and I admired that while he poured drinks for a living, he did not drink.

One morning perusing the newspaper, I saw a headline about a KKK rally that had occurred that weekend, with a photo of a bunch of guys in white robes carrying crosses through the center of town. The leader had taken off his hood.

Much to my shock, I recognized my "pal," the bartender. An ugly snarl on his face, he was screaming something at the crowd.

I felt sick as the realization hit me for the first time that it's impossible to know what hatred lies in a person's heart.

WORK TO DO

For a long time, I thought racism in America was decreasing; but social media, videos on YouTube and continuous targeted racist violence clearly indicate that our country has a long way to go.

Historically, the radio industry has contributed both to perpetuating racism and educating listeners to fight against it. While the scales have certainly tipped toward education, tolerance and awareness, we have much work to do. Perhaps the few examples that follow can kick-start a New Year's plan at your station.

- Let's begin by recognizing public radio for the range and timeliness of stories that NPR and affiliates are running on the air and featuring prominently on station websites. Search the term "racism" plus a set of public radio call letters, and you will often encounter a page focused purely on stories pertinent to the issue.

CBS local websites also cover the topic, as do many other commercial broadcasters.

It's best when the stories are aggregated under one tag for archive viewing and for search purposes. I'm hopeful that most of these stories make it on the

air as well as the websites. When time doesn't permit, it does make sense to do shorter on-air stories with a reference to details on the website.

- Promotionally, there's much all radio formats can do to help organizations that fight racism and other forms of hatred. As you're looking at your 2020 event calendar, could you schedule

- When is the last time you had a staff discussion concerning racism and cultural intolerance? If the answer is a long time ago, or never, this is the time of year to get it done. Many experts are available to help you tackle this tough topic on two levels: how you approach issues on-air and at remotes and, perhaps even more sensitive, in your station's own environment.

PROMO POWER



Mark Lapidus

Whatever one's background, each of us benefits from enriching our self-awareness as regards social diversity and learning more about how others can do so as well. As we enter a new decade, let's take the opportunity to help keep life peaceful for everyone.

The screenshot shows the iHeartRadio website interface. At the top, there's a navigation bar with 'iHeartRADIO Upgrade', 'For You', 'Your Library', 'Live Radio', 'More', and a search icon. Below the navigation, the main content area features a large blue and green graphic for the podcast 'Yo, Is This Racist?' with the text 'Yo, Is This Racist?' and 'With Andrew Ti'. There are 'Follow' and 'Share' buttons. Below the graphic, a text block reads: 'Yo, Is This Racist?, hosted by Andrew Ti, creator of the popular blog of the same name, is now a weekly podcast! Every Wednesday, Ti and his guests answer questions from fan-submitted voicemails and emails about whether or not something is, in fact, racist.'

"Yo, Is This Racist?" is a podcast co-hosted by Andrew Ti, creator of the popular blog of the same name.

a month during which you work with a local non-profit to raise awareness, volunteerism and money? Make sure to utilize on-air psas running with good frequency. This is also a rare opportunity for you to involve local religious institutions in all aspects of your plan. Churches, synagogues and mosques have people whom they can activate through social media, mailing lists and pulpits.

- For talk/news formats, there's no question that it takes an ever-vigilant program director to work with hosts on understanding what constitutes racism and how to deal with live callers who are on a mission to spread hatred. Racism and hate speech, from the right or the left, is wrong and has no place on American radio. Industry veterans know that it's a small but vocal part of the audience, often trolls, who call in a lot. If you have hosts who can handle the rants, that's terrific, and the calls can be transformed into a learning moment; but when it becomes repetitive and tedious to deal with the same callers, a number block may be in order.

- There are already many podcasts focused on racism and cultural intolerance. Does your parent company have one you can help promote, or is the topic of enough interest in your market to support your own effort? Either way, be sure to promote on-air and through all of your platforms.

The screenshot shows the website for W.O.U.B. PUBLIC MEDIA. The top navigation bar includes 'Hardwood Heroes', 'Community Calendar', 'Media Lab', 'Listen', 'The Learning Lab', 'About W.O.U.B.', 'SHOP', and a search icon. Below the navigation, there's a 'NEWS' section with a sub-header 'ARCHIVE' and 'You are viewing the "Racism" Archives'. The main content area displays a grid of news articles with thumbnails and titles. The articles include: 'W.Va. Officials Announce Discipline Over Photograph of Corrections Trainees Giving Nazi Salute', 'FBI Reports Dip in Hate Crimes, But Rise in Violence', 'Athens Man Sues White Supremacists Over 2017 Virginia Rally', and 'Ohio Officials Discuss Hate Crimes Before Klan-Related Rally'. Each article includes a byline, date, and a 'Read More' link.

The website of W.O.U.B. in Athens, Ohio, provides searchable tags for racism and hate crimes.

The Nautel logo features the text 'We've NEVER DISCONTINUED SUPPORT on any of our products' in white and blue, with a headset icon and the Nautel logo below it. The website 'nautel.com' is also visible.

Let's Finish Our Solid-State Mic Preamp Project

We complete our latest DIY project, built around ICs from THAT Corp.

DIY PROJECTS

BY CURT YENGST, CSRE

Ever get a song stuck in your head that you don't necessarily mind being there? My latest benign earworm happens to be "Frankenstein" by the Edgar Winter Group; probably due to what's been going on at my workbench lately.

In our first installment (see *radioworld.com*, keyword Yengst), we walked through the audio circuit of "THAT Thing," a mic preamp design built around THAT Corp. (*www.that-corp.com*) ICs.

POWER SUPPLY

In this "episode," we start with the power supply. It's a fairly common, straightforward design. The audio chips require bipolar DC power at a maximum of ± 20 Volts. A +48VDC rail is needed for phantom power.

We start with an AC transformer that takes 120VAC from the wall and steps it down to 48VAC with a center tap, 24VAC for each side of the bipolar supply.

Following rectification through BR1, we get two pulsing DC rails. From there, the pulsing DC goes through a set of electrolytic capacitors, C101-C104, to level out the bumps. Then, the actual regulation occurs with U101 and U102, positive and negative 18VDC regulators. Next, each rail gets another dose of filtering through C105-108 to take out any remaining ripples.

C109 and C110, a pair of polyester capacitors, remove any RFI sneaking in through the power rails. D101 and D102 are there to ensure that the positive and negative rails stay that way. Any negative voltage appearing on the positive rail shunts to ground and vice versa. D103 and D104 protect the regulator ICs by ensuring that the output voltage never exceeds the input.

Finally, LEDs 101 and 102 in combination with their respective current limiting resistors, R104 and R105, indicate the presence of actual voltage on each rail to show that the supply is functioning correctly, a good aid in troubleshooting.

For the phantom power section, the entire 48VAC secondary winding of the transformer is used. After filtering and rectification through C111, C112 and BR2, we're left with about 70VDC. Additional RF and ripple filtering

is accomplished by C113 and C114. Regulation is performed by U103, a TL783 adjustable regulator. R101 and

R102 determine the output voltage of the IC, and C116 filters out any output noise.

Additional stability is provided by C115 and R103. 48VDC phantom power must be ruler flat to prevent any noise being introduced at the mic inputs, where the audio circuit is the most sensitive.

BREADBOARDING

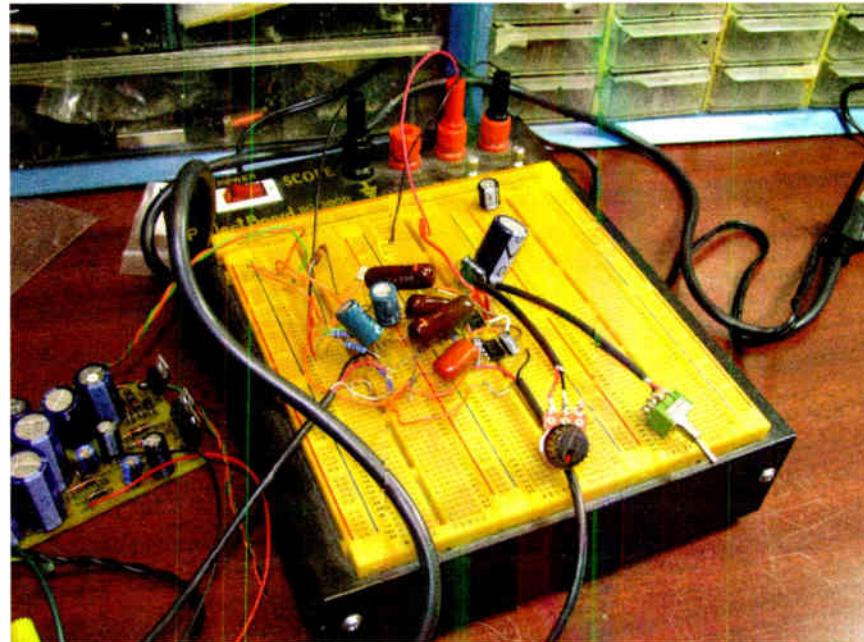
At this stage, I began breadboarding the circuit to test a few component choices and layout. Here's where I found out firsthand the importance of filter caps C7-C10.

Without those critical components in place, the circuit made a nice white noise generator, especially in the unprotected environment of the workbench!

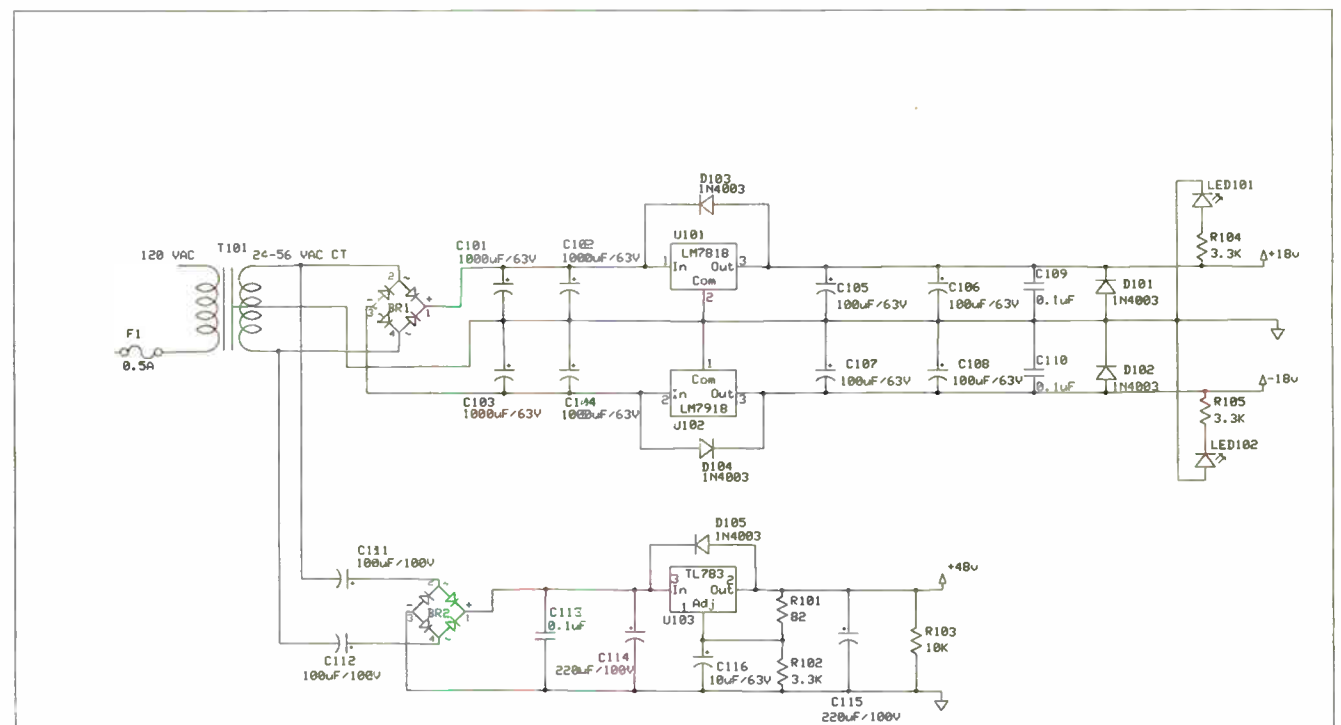
I also found that I had pretty wide latitude in my choice of C6, the high-pass filter capacitor. I settled on 1 μ F because it offered, to my ears, the best balance between getting rid of rumble and being able to go high enough for extreme roll-off, if necessary. Anything — even as high as 47 μ F — will work, as long as the gain is high enough.

Once I was through experimenting with circuit topology, I imported my schematic into ExpressPCB and

(continued on page 24)



Breadboarding the circuit.



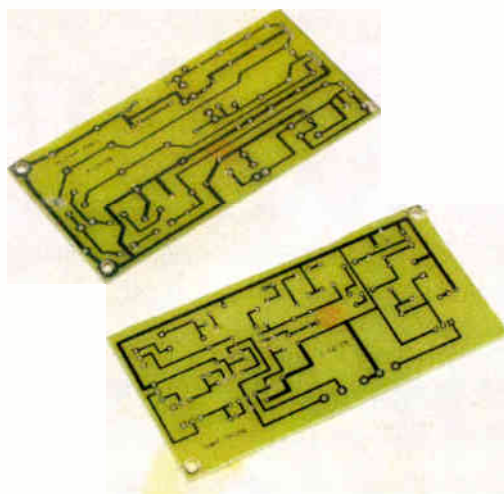
For a closer look at this schematic, plus some additional images, visit www.radioworld.com/miscellaneous/that-thing-supplemental-material.

18VDC Bipolar Supply	
with 48VDC Phantom Power	
Curt Yengst	Rev 1 7/15/2019

DIY*(continued from page 23)*

worked on the circuit boards. In order to maximize flexibility, and to be able to possibly repurpose the design, I opted to keep the power supply and each audio channel on separate boards.

Once I had all the correct parts together and etched the boards, I was able to bench test the finished power supply and one completed channel. Surprisingly, the only issue was that I had wired the phantom power LED on the audio board backwards! An easy

**Etched PCBs****Power supply board****Curt etches the PCBs.**

fix for a change! It was only mounted directly to the PCB temporarily, anyway. Its intended location is the front panel with the other controls.

Speaking of which, while thinking about how I was going to house this creation, I came across an abandoned IRU chassis that was just right. I stripped out the guts and replaced the front panel with a IRU blank that could be punched and drilled specifically for this project. I put the input XLR jacks on the front panel, taking a cue from a previously built kit in my studio. The output jacks are 1/4-inch TRS for easy interface with my 1/4-inch TRS patch bay.

**CONSIDERING IMPROVEMENTS**

Never one to leave anything alone if I think there's room for "improvement," I started thinking of potential modifications to this design. Looking at some of the design notes from THAT Corp., and discussing this project with other DIYers, I settled on two relatively simple things to try.

First up, an alternative to the gain pot is a rotary switch with several positions, each position providing a different fixed gain. The advantage here is better component matching between channels, which translates to more accurately repeatable settings between channels. High quality reverse log pots of this resistance value can be hard to find at reasonable prices. Besides, more precise adjustments can be made further down the signal chain, or in the mixing/editing stage.

The other modification I looked into was replacing the initial input stage with a transformer. While I suggested in the first installment that transformers are expensive compared to capacitive coupling stages, this is a case where the custom build aspect and its benefits perhaps outweigh the added cost.

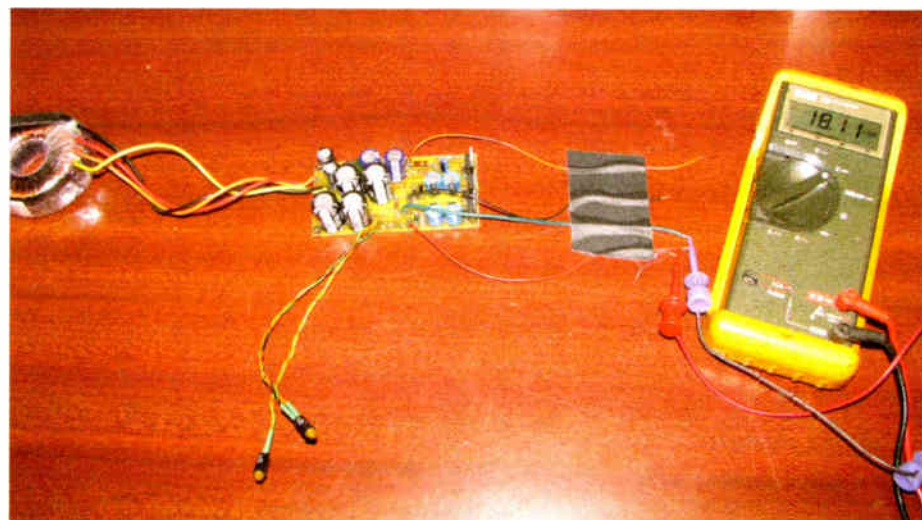
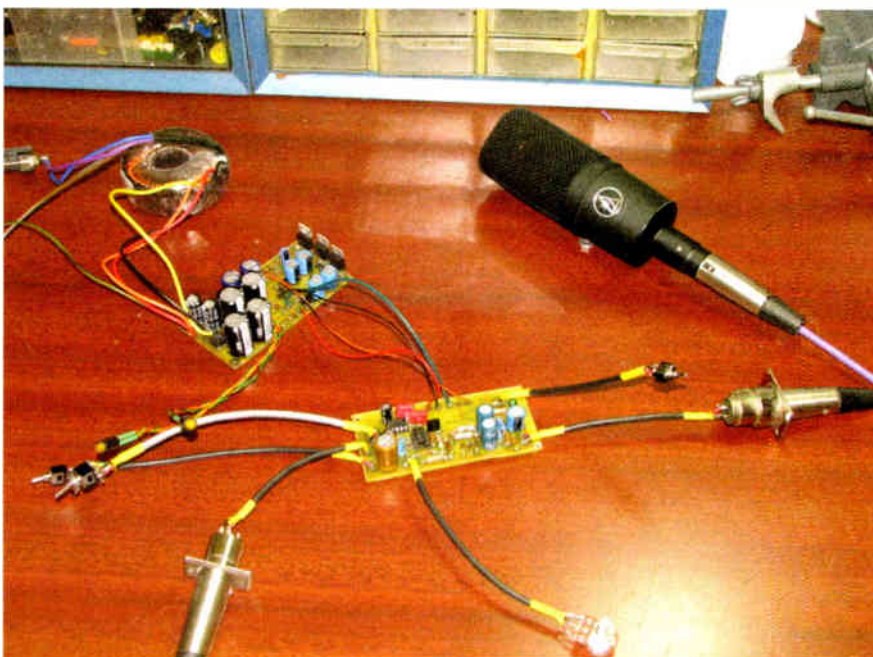
True, the concept behind chips like the THAT1512 is to obviate the need for a transformer, which is perfectly valid, if one is building numerous pre-amp stages or a 16-channel mixer. On the other hand, a transformer provides way better common mode rejection, kills RFI, eliminates hum loops and also mitigates against any phantom power faults possibly cooking the ICs. Placing a transformer on the input eliminates several other components: C3, C4, R3, R4, R5, R6, R7 and D1-D4 all go away.

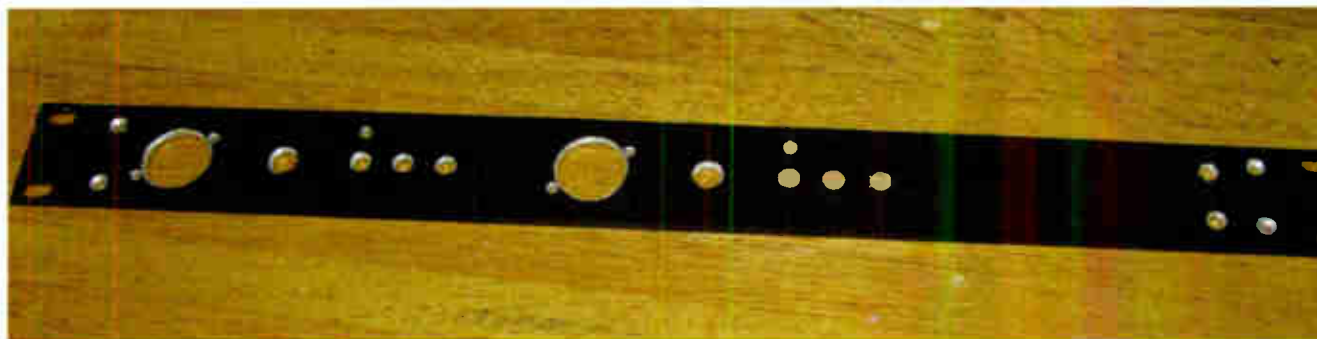
VERSION 2

In version 2 of THAT Thing, I went ahead with the input transformer and the rotary gain switch with six positions.

The transformer I used is OEP's A262-A3E, which I borrowed from a tube mic preamp in my rack. It's much less expensive than a Jensen or

a Lundahl and, hey, it's what I had! Good thing it was cheap because while desoldering it from the other preamp's PCB, I somehow managed to fry the

**Testing the power supply assembly.****Testing the preamp assembly with a microphone.**



The faceplate after drilling.

secondary winding. Oops! It had a good run. R.I.P.

Once the replacement arrived from www.Newark.com, I set about testing

it within the circuit. It's important to consider that the input transformer adds some gain of its own to the circuit, about 16 dB. It took some experimen-

tion to settle on the gain levels for the rotary switch, but I ended up with a range between 19 dB and 50 dB.

So, how did it sound? Super clean,

and the transformer definitely adds some character. Either version works very well with just about every mic I tested, from a Shure SM58 to an MXL ribbon mic, to an Audio Technica AT4040. Two to four channels of "THAT Thing" would nicely compliment a Mackie 1202 or 1402 mixer's line inputs, should you find yourself running short of mic inputs. Or connect it straight to a PC's sound card input.

TRY IT YOURSELF

For anyone willing to take a stab at this, I'm happy to provide the schematics, PCB layouts and other notes.

(continued on page 26)

PRODUCTS & SERVICES SHOWCASE



The most trusted Nautel dealer for 35 years

Contact your local RF Specialties office for more information
rfspecialties.com

SPACE IS AVAILABLE!

To advertise, call
1-845-678-3839

Get on the Calendar!

Find out what's coming up in our industry by visiting the Radio World events calendar at radioworld.com.

Does your organization hold a conference, convention or meeting? Submit the information for a **free listing** on our website and in the Radio World NewsBytes daily e-newsletter.

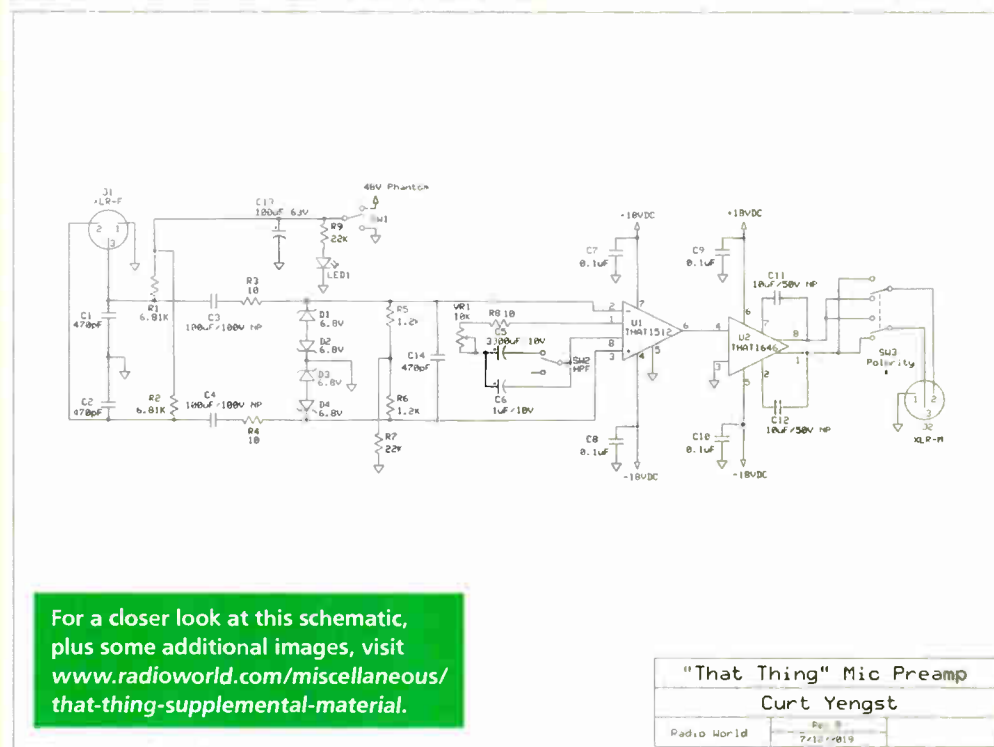
Visit radioworld.com/calendar

SHOWCASE

Parts List

THAT Thing Mic Preamp — Version 1

Part	Description	Quantity
Resistors		
R1,R2	6.81K	4
R3,R4, R8	100hm	6
R5,R6	1.2K	4
R7,R9	22K	4
R101	82 Ohm 2W	1
R102	3.3K 2W	1
R103	10K 1W	1
R104,R105	3.3K 1W	2
Potentiometers		
VR1	10K Rev. Log	2
Capacitors		
C1, C2, C14	470pF Ceramic	6
C3, C4	100µF/100V Non-Polar Electrolytic	4
C5	3300µF/10V Electrolytic	2
C6	1µF/10V Electrolytic	2
C7–C10, C109,		
C110, C113	0.1µF Polyester	1
C11, C12	10µF/50V Non-Polar Electrolytic	4
C101–C104	1000µF/63V Electrolytic	4
C13, C105–C108	100µF/63V Electrolytic	6
C111, C112	100µF/100V Electrolytic	2
C114, C115	220µF/100V Electrolytic	2
C116	10uF/63V Electrolytic	1
Diodes		
D1–D4	1N5235 6.8V Zener Diode	8
D101–D105	1N4003	5
BR1, BR2	1A Bridge Rectifier	2
LED1, LED101,		
LED102	Standard LED	4
ICs		
U1	THAT1512 Audio Preamp	2
U2	THAT1646 Balanced Line Drive	2
U101	LM7818 Positive 18V Regulator	1
U102	LM7918 Negative 18V Regulator	1
U103	TL783 Adjustable Regulator	1
Switches		
SW1, SW2	SPDT Toggle Switch	4
SW3	DPDT Toggle Switch	2



For a closer look at this schematic, plus some additional images, visit www.radioworld.com/miscellaneous/that-thing-supplemental-material.

"That Thing" Mic Preamp
Curt Yengst
Radio World
7-10-2019

Transformers		
T101	48VAC CT	1
Connectors		
J1	XLR-F Panel Jack	2
J2	XLR-M Panel Jack	2
Miscellaneous		
	DIP Socket	4
	Heat sink kit	3
F1	Fuse Holder	1
F1	0.5A Fuse	1
	Knob	2
	Chassis	1RU Rackmount chassis
	Power Cord	3-prong A/C Power Cord
	Strain Relief	Grommet
	PCB	6x4 Presens. Copper Clad Board

Assorted screws and nuts, wire, prototyping chemicals, etc.

NOTE: Parts lists are for two channels plus power supply.

DIY

(continued from page 25)

You'll need to download ExpressPCBPlus (free at www.expresspcb.com) to read and print them out. All parts except the input transformers are available from Mouser Electronics (www.mouser.com) or most other suppliers. The transformers, as mentioned earlier, can be ordered from Newark.com.

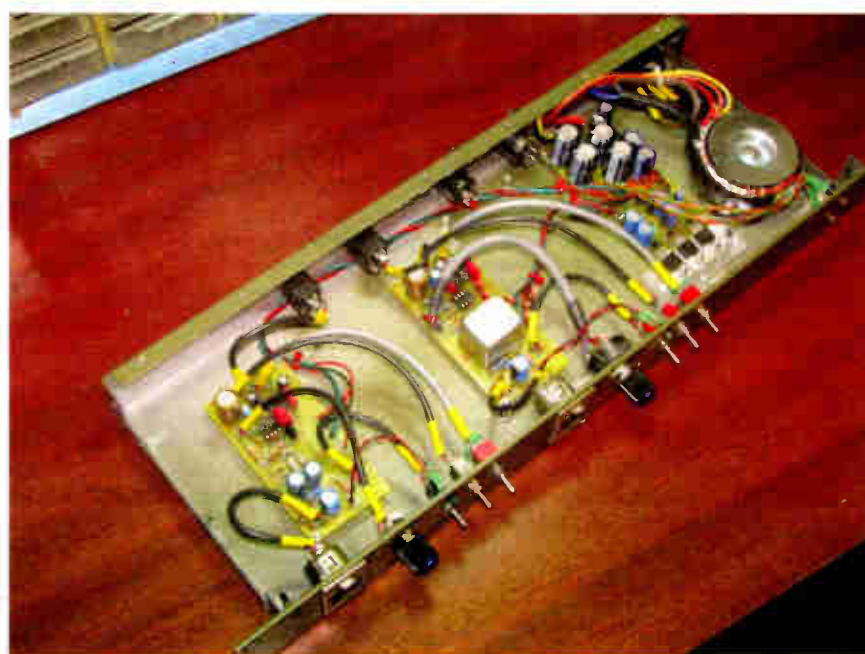
Happy soldering!

Curt Yengst, CSRE, is a contributor to Radio World and an assistant engineer with WAWZ(FM) in Zarephath, N.J.

Email us with your own DIY ideas at radioworld@futurenet.com.



Above: The Version 2 preamp assembly with transformer installed.

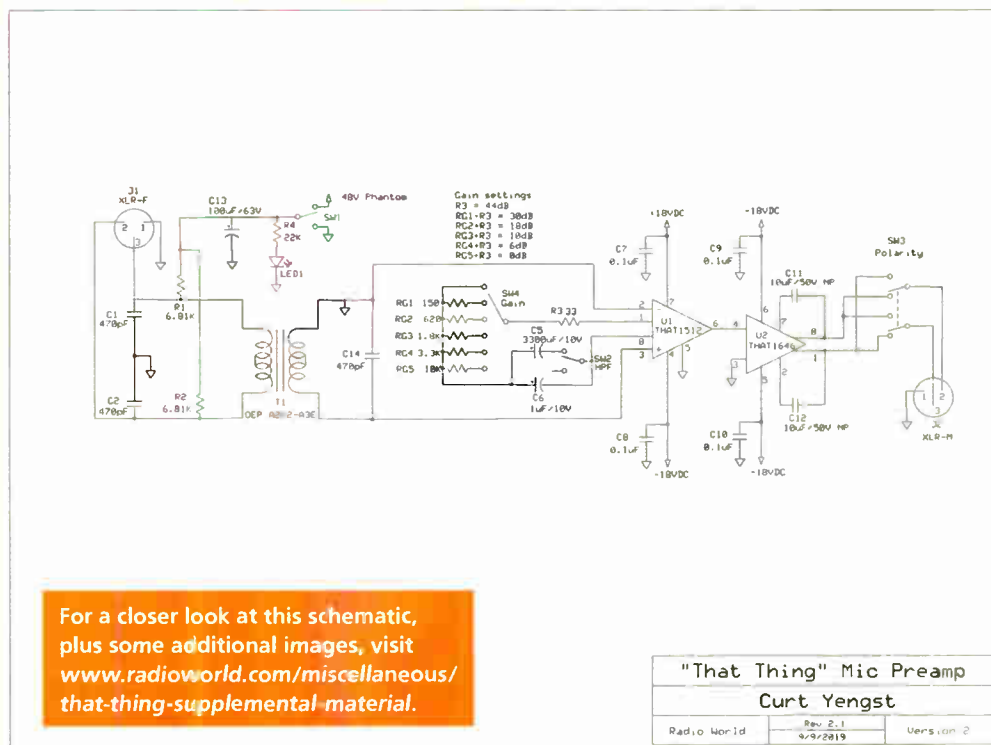


Right: Looking inside.

Parts List

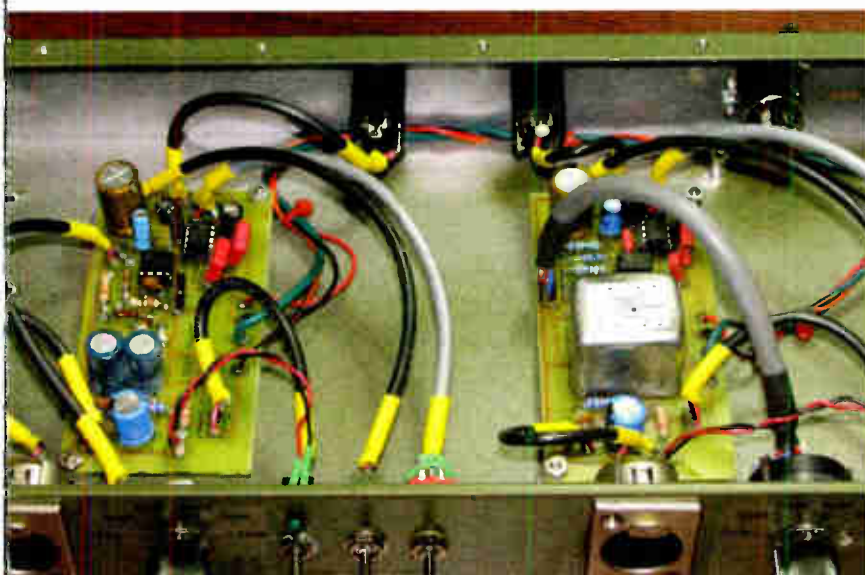
THAT Thing Mic Preamp — Version 2

Part	Description	Quantity
Resistors		
R1,R2	6.81K	4
R3	220 Ohm	2
R4	22k	2
RG1	820 Ohm	2
RG2	1.8K	2
RG3	3.6K	2
RG4	10K	2
RG5	150K	2
R101	82 Ohm 2W	1
R102	3.3K 2W	1
R103	10K 1W	1
R104,R105	3.3K 1W	2
Capacitors		
C1, C2, C14	470pF Ceramic	6
C5	3300µF/10V Electrolytic	2
C6	1µF/10V Electrolytic	2
C7-C10, C109,	0.1µF Polyester	11
C11, C12	10µF/50V Non-Polar Electrolytic	4
C101-C104	1000µF/63V Electrolytic	4
C13,C105-C108	100µF/63V Electrolytic	6
C111, C112	100µF/100V Electrolytic	2
C114, C115	220µF/100V Electrolytic	2
C116	10µF/63V Electrolytic	1
Diodes		
D101-D105	1N4003	5
BR1, BR2	1A Bridge Rectifier	2
LED1, LED101, LED102	Standard LED	4
ICs		
U1	THAT1512 Audio Preamp	2
U2	THAT1646 Balanced Line Drive	2
U101	LM7818 Positive 18V Regulator	1
U102	LM7918 Negative 18V Regulator	1
U103	TL783 Adjustable Regulator	1
Switches		
SW1, SW2	SPDT Toggle Switch	4
SW3	DPDT Toggle Switch	2
SW4	1 Pole 6 Position Rotary Swi	2



"That Thing" Mic Preamp
 Curt Yengst
 Radio World Rev. 2.1 4/9/2019 Version 2

Transformers		
T101	48VAC CT Toroidal AC	1
T1	OEP A262-A3E Audio	2
Connectors		
J1	XLR-F Panel Jack	2
J2	XLR-M Panel Jack	2
Miscellaneous		
DIP Socket	8-pin DIP Socket	4
Heat sink kit	TO-220 Heat Sink Kit	3
F1	Fuse Holder	1
F1	0.5A Fuse	1
Knob	6mm D-shaft black	2
Chassis	1RU Rack mount chassis	1
Power Cord	3-prong A/C Power Cord	1
Strain Relief	Grommet	1
PCB	6x4 Presens. Copper Clad Board	1



Left: Inside closeup.

Above: "THAT" Thing in the rack.



Rebuilt Power Tubes 1/2 the cost of New!

Se Habla Español

ECONCO

Se Habla Español

Tel: 800-532-6626 Web: www.econco.com
Intl +1-530-662-7553 Fax: +1-530-666-7760



ACOUSTICS



ANTENNAS/ TOWERS/CABLES

WANT TO SELL

CCA FM8000G Trans 107.9, great cond; 4-Bay Jampro antenna w/deicers; 3-bay Shively antenna FM. D Brockman, 606-965-3436.

AUDIO PROCESSING (INCLUDES ON-AIR)

WANT TO BUY

Teletonix LA-2A's, UREI LA-3A's & LA-4's, Fairchild 660's & 670's, any Pultec EQ's & any other old tube compressor/limiters, call after 3PM CST - 214 738-7873 or sixtiesradio@yahoo.com.

Wanted: real plate reverb. abgrun@gmail.com.

MICROPHONES/ HEADPHONES/ SPEAKERS/AMPS

WANT TO SELL

1934 RCA 77A double ribbon microphone, originally used by Anhur Godfrey at WFBR Baltimore. 100% perfect condition. Contact Bill Cook, 719-684-6010.

WANT TO BUY

RCA 77-DX's & 44-BX's, any

other RCA ribbon mics, on-air lights, call after 3PM CST, 214 738-7873 or sixtiesradio@yahoo.com.

MISCELLANEOUS

WANT TO SELL

UPGRADE consoles to international specs with world standard Weston 30B illuminated 4" vu meters. 4 in like-new condition. GramOphone@earthlink.net

I'm selling between 150 and 200 cassette tapes that consist of old-time radio shows, sports shows, some local New York radio talk shows, etc... Must take entire collection and the price is negotiable. Please call me for details and, my phone number is 925-284-5428.

Radio broadcasts of Major League Baseball, NFL, and some college football games that are on cassette tapes, approx 100 to 125 games, time period of entire collection os from the 1950's - 1970's, BO. Must purchase entire collection. Contact Ron, 925-284-5428 or ronwtamm@yahoo.com

WYBG 1050, Messina, NY, now off the air is selling: 250' tower w/building on 4 acres; 12' satellite dish on concrete base; prices drastically slashed or make offer. 315-287-1753 or 315-528-6040

WANT TO BUY

Wanted: ITC interconnect cables between ITC cart machine and record amp. Manual and idlers for Harris CB-1201 turntables. Don, k8drs1@gmail.com

Equipment Wanted: obsolete, or out of service broadcast and recording gear, amplifiers, processing, radio or mixing consoles, microphones, etc. Large lots preferred. Pickup or shipping can be discussed. 443-854-0725 or ajkivi@gmail.com.

I'm looking for KFRC radio special of Elvis Presley which aired on January 8, 1978. I'd be willing to pay for a digital copy. Ron, 925-284-5428.

I'm looking for KTIM, AM, FM radio shows from 1971-1988. The stations were located in San Rafael, Ca. Ron, 925-284-5428.

I'm looking for the Ed Brady radio show in which he did a tribute to Duke Ellington, the station was KNBR, I'd be willing to pay for a digital copy. Ron, 925-284-5428.

I'm looking for San Francisco radio recordings from the 1920's through the 1980's. For example news-cast, talk shows, music shows, live band remotes, etc. Stations like KGO, KFRC, KSFO, KTAB, KDIA, KWBR, KSF, KOBY, KCBS, KQW, KRE, KTIM, KYA, etc, I will pay for copies... Feel free to call me at 925-284-5428 or you can email me at ronwtamm@yahoo.com.

Looking for a broadcast excerpt of a San Francisco Giant's taped off of KSFO radio from 1959, interviews with Willie Mays, Dusty Rhodes & some play by play excerpts, also features a homerun by Willie Mays and Felipe Alou stealing second base, running time is 18:02, also looking for SF Giants games and/or

highlights from 1958-1978 also taped off KSFO Radio. Ron, 925-284-5428 or ronwtamm@yahoo.com.

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 email ronwtamm@yahoo.com.

Looking for KSFX radio shows, Disco 104 FM, 1975-1978. R Tamm, 925-284-5428.

RECEIVERS/ TRANSCIVERS

WANT TO SELL

Johnson Electronic SCA880 module, 67/92 Khz, 417-881-1846.

WANT TO BUY

AM Stereo radio. Call 417-881-1846.

RECORDING & PLAYBACK HARDWARE

WANT TO BUY

1960s-vintage MacKenzie Repeater machines, magazines, spare parts and manuals, complete or "parts" machines considered, James, 870-777-4653.

Schnader telecriptions 16 mm musical films produced in the early 50s. Bill Cook, 719-684-6010.

Large or small collections of 16" transcriptions or 12"

transcriptions, not commercial LPs. Bill Cook, 719-684-6010.

Standard Short-tune series. Bill Cook, 719-684-6010.

(2) LPFM radio stations for sale, located in the NW part of central Florida on the gulf coast, covers the county, get out of the cold weather, come to Florida, call or write for particulars, 352-613-2289 or email boceey@hotmail.com or Bob, PO Box 1121, Crystal River, FL 34423.

RF CONNECTORS

WANT TO SELL

RF CONNECTORS & GADGETS - Parts, Products & More! www.W5SWL.com

TAX DEDUCTIBLE EQUIPMENT

Donate your broadcast facility; IRS approved 501(c)(3) non-profit charitable organization. Fair market value. License (AM/

FM/FV), land, building, tower, equipment, etc. The Augustus Foundation, Inc., 2902 Main Street, La Marque, Texas 77568. (409) 359-3435. Contact Dr. M. Augustus

TRANSMITTERS/ EXCITERS/TRANSLATORS

WANT TO SELL

BE-25T 25KW FM transmitter 2007 frequency agile tube transmitter in good working condition on 90.7 (all its life) when pulled from service. Approx. 6 mos. on rebuilt tube and a newly rebuilt fan motor, also spare optical modules, manuals and maintenance logbook. \$17,500/OBO. As-is, where-is: Hayward, CA, Jeff Cotton, 530-279-6262 or info@kdup.org.

BE 35kW FM. Make an offer. Working when removed. Steve Tuzeneu 704-973-0438 (9 a.m. to 4 p.m. Eastern, Monday-Friday) or stuzeneu@bbnmedia.org

Out with the old...

...In with the new!

NEED TO MAKE ROOM FOR THE NEW EQUIPMENT YOU ORDERED?

Sell your used equipment here in the pages of Radio World Broadcast Equipment Exchange.

DON'T LET YOUR OLD EQUIPMENT COLLECT DUST...COLLECT \$ INSTEAD!

Call John at 1-845-678-3839 for more information.

EMPLOYMENT

POSITIONS WANTED

Are you a small market station needing a good nuts & bolts engineer in the Los Angeles area? I will make your station shine! CET, fully FCC Licensed. Available for Full/Part-time/Contract work. Available immediately. Mitchell Rakoff, 909-446-6820, mitchellrakoff@yahoo.com.

SITUATIONS WANTED

Manager-engineer with multiple decades of experience in many areas, seeks full-time executive level position (G.M.) or higher with CCM, modern Inspo, or G-rated family-friendly secular format(s). Prefer warm climates. Send complete details to: radiogm@hotmail.com

Hybrid Radio Breaks Out

How DTS Connected Radio is poised to help broadcast radio fulfill its true digital potential

COMMENTARY

BY BOB DILLON

The author is senior vice president, Connected Radio for Xperi.

Not long ago, Gene “Bean” Baxter said goodbye to KROQ(FM)’s “The Kevin & Bean Show” after 30 years on the station’s signature morning drive-time show. He left behind a legacy that stretched across generations of listeners and traveled far beyond the Los Angeles basin. It’s fair to claim, in fact, that the “World Famous KROQ” lived up to its tagline in part due to the magic of shows like this one.

It also raises two very good observations about the power of radio: that there’s something tangibly personal and rich about the broadcasting, and that as the world grows smaller — radio becomes more inclusive and empowering.

After all, one doesn’t have to be from Los Angeles to appreciate Kevin & Bean. The value and the significance of the content produced travels far beyond one spot on the map. In fact, it’s possible that the power of radio — personal and real entertainment — has never been greater. That’s good news for everyone who values access to rich content — and the ability to choose what they’d like to consume.

ENTERTAINMENT OPTIONS ARE ENDLESS

Creating choices for entertainment is perhaps greatest inside your vehicle. Inside the cabin of today’s newer cars is a plethora of options, all of them good. You can connect your personal device via Apple CarPlay or Android Auto; there are satellite networks that deliver programming in hundreds of different ways and categories. On-board apps abound, full of playlists that continuously pump the music at you 24/7.

Then there’s radio. And it’s a stronger option today than ever before, thanks to the widespread adoption of HD Radio and the emergence of hybrid radio.

Our version of hybrid radio is DTS Connected Radio, which combines over-the-air broadcasting (analog, HD Radio and DAB+) and corresponding metadata (via IP) on a global scale. This convergence creates three very important benefits:

Deeper and more fulfilling content for users: The combination of data with broadcast enhances the discovery of quality programming. In fact, one of the challenges around broadcast radio going digital is choice — especially in North America with HD Radio, where multi-casting has expanded the number of sources by over 2,000 stations. In addition, today’s modern digital platforms give users the ability to search via many different ways, including voice activation. Hybrid radio also provides that level of enhanced

discoverability. There’s a rich visual interface so you can search for content, and the availability of information for all radio stations in a market in under one second. It combines the search-and-sort value of online experiences with higher quality radio programming available in the user’s market.



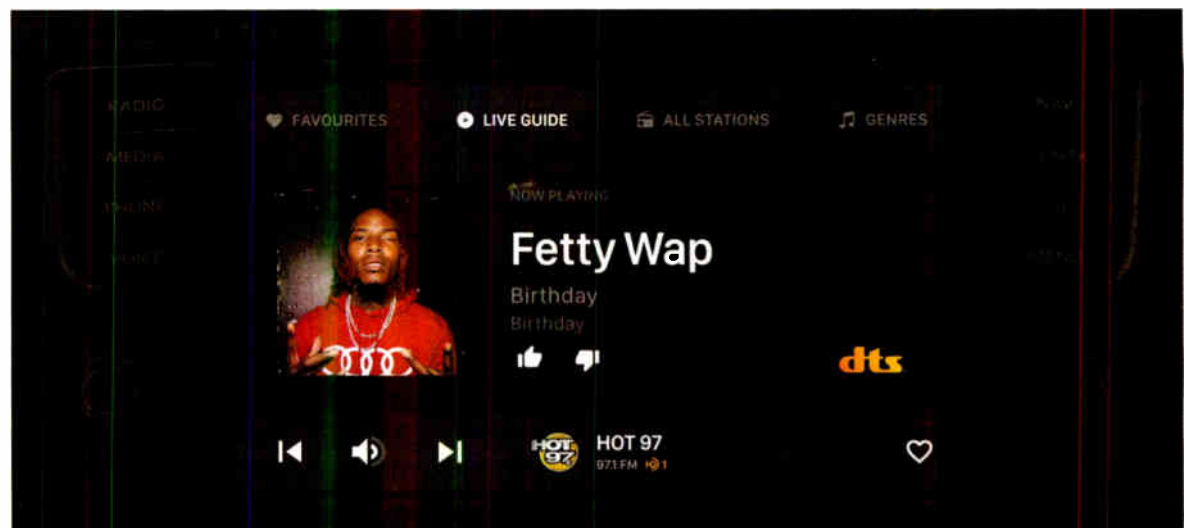
Affordable change at a global scale for automakers: There’s no mistake that the car dash is changing, getting more complex and more expensive. There’s increased connectivity and hardware, along with new regulations in Europe — and probably soon in North America — that require a module that’s basically a cellular modem in the car for emergency response. Hybrid radio leverages what automakers already are legally required to have as a part of their vehicle technology offerings. The only service that that can deliver that level

of affordable infotainment inside a vehicle is radio. Automakers have already made an investment in the

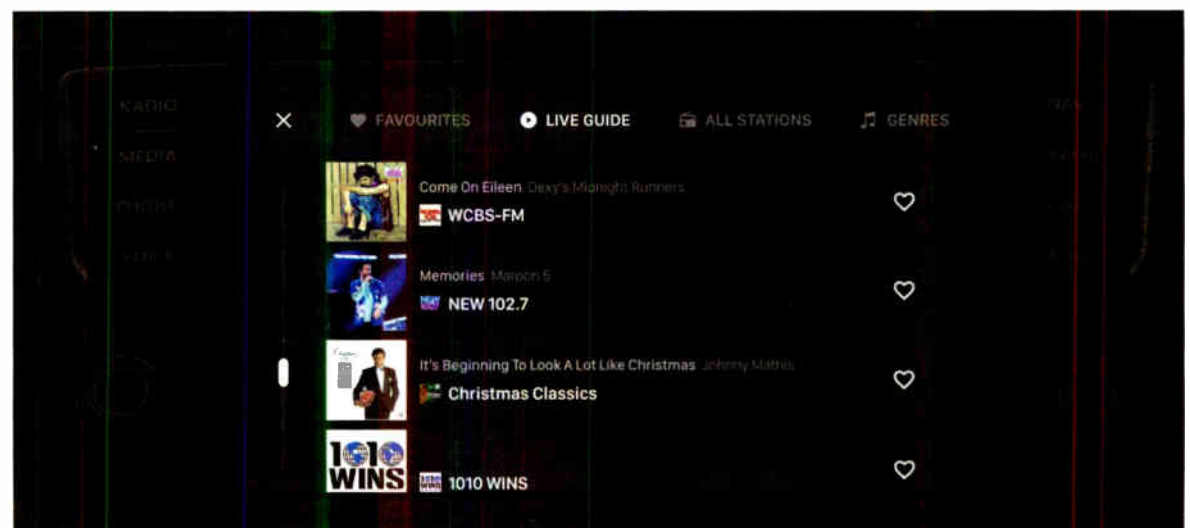
digital tuner; they’re now also required, in certain markets, to add a connectivity module for regulatory purposes, and emergency response. Hybrid radio brings these two components together, leverages the investment and creates enhanced radio — the only truly free medium. Automakers can now deploy an enhanced content platform through investments that they’ve already made — with broadcasters who are already on board. It’s affordable, rich content on a global scale, a single radio platform that delivers a consistent and enhanced user experience across analog, HD Radio, or DAB+ radio.

Sharper listener insights for broadcasters: The value of metadata doesn’t stop at the album name. Indeed, the real value is in user listening habits. For DTS Connected Radio, once the car is turned on the radio immediately connects to our service. Let’s say a session starts with a vehicle in Los Angeles. We know the radio station, and how long they listen before jumping to another station or service. All the while, we’re sending data to the user, creating a two-way feedback flow that we measure and send back to the station. The radio station can learn why they tuned in, and what made them

(continued on page 30)



A DTS Connected Radio Now Playing screen shows image and text for currently playing content along with station metadata.



The DTS Connected Radio Live Guide shows Now Playing information for each tunable station, enabling station choice based on what’s playing.

READER'S FORUM

MOSQUITO NETWORK

Allow me to express appreciation for three interesting articles on the international radio scene in Radio World's Sept. 1 issue.

"U.S.-Based Shortwave Broadcasters Eye Digital" [discussed] the need for an appropriately priced, mass-production digital shortwave radio. A second article drew attention to the production of a Voice of America program beamed to Asia on shortwave and medium-wave in the Rohingya language for the benefit of refugees who have fled Myanmar into Bangladesh.

Then there was the fascinating historic article on the AFRS (American Forces Radio Service) Mosquito Network during the devastating Pacific War.

Back during the middle of the last century, there were usually only two medium-wave stations in Australia on the air late at night. 2UW in Sydney and 3AK in Melbourne, and consequently the band was wide open for late-night

listening to the American AFRS stations throughout the Pacific. Over a period of time, we as listeners in both Australia and New Zealand heard all of these exotic little radio stations.

A photo with the story [right] shows the entrance noticeboard of an AFRS station in the Mosquito Network without location and without call sign. However, the operating frequency 670 kHz provides a valuable clue.

It is known that only one AFRS Mosquito Network station operated on 670 kHz, and that was for only a short period of time, before a frequency change to 690 kHz. That station was located on Bougainville in the Solomon Islands, and the photo was taken before the station adopted the unofficial and irregular call sign WSSO.

American AFRS stations in the Pacific were generally allocated four-letter call signs beginning with WV or WX. We would suggest that the photograph of the Bougainville station was taken in very late 1943 or very



Photo from The National Archives

An affiliate of the Mosquito Network

early 1944, before the informal call sign WSSO was adopted. This information would also agree with the other photograph in your article that promoted WSSO programming in February 1944.

By the way, we have drawn attention to these Radio World articles in our weekly half-hour program "Wavescan," broadcast on shortwave in the Americas and worldwide 35 times each week. The program is researched and written in Indianapolis, voiced by Jeff White

(Radio Miami International WRMI) and Ray Robinson (Voice of Hope KVOH, Los Angeles). In the United States, "Wavescan" is broadcast by shortwave WRMI and KVOH, as well as by WWCR in Nashville. In Africa, the program is on the air from the Voice of Hope in Zambia, and for Europe, Asia and the Pacific via KSDA on the island of Guam, and additional shortwave relay stations.

*Dr. Adrian M. Peterson
Adventist World Radio*

ADVERTISER INDEX

This listing is provided for the convenience of our readers. Radio World assumes no liability for inaccuracy.

PAGE	ADVERTISER	WEBSITE/URL
13	Arrakis Systems Inc.	www.arrakis-systems.com
7	Comrex Corporation	www.comrex.com
1	ENCO	www.enco.com
5	Henry Engineering	www.henryeng.com
15	Inovonics Inc	www.inovonicsbroadcast.com
21	Moseley Associates	www.moseleysb.com
6, 13, 16, 18, 22, 24, 25	Nautel Ltd.	www.nautel.com
14	Ram Broadcast Systems	www.ram68.com
32	RCS	www.rcsworks.com
25	RF Specialities	www.rfspecialities.com
11	Telos Alliance	www.telosalliance.com
9	Tieline Technology	www.tieline.com
2, 17, 19	Wheatstone Corporation	www.wheatstone.com

ADVERTISING CONTACTS

THE AMERICAS:
JOHN CASEY
845-678-3839
john.casey@futurenet.com

EUROPE, MIDDLE EAST & AFRICA:
RAFFAELLA CALABRESE
+39-320-891-1938
Fax: +39-02-700-436-999
raffaella.calabrese@futurenet.com

SEND MATERIALS TO:
NICOLE SCHILLING nicole.schilling@futurenet.com

@ Write to RW
Email radioworld@futurenet.com with "Letter to the Editor" in the subject field. Please include issue date and story headline.

HYBRID RADIO
(continued from page 29)

leave. Did they tune to another radio station? Shut off the car, or did they drive out of coverage? How long did they listen? Ultimately, that's all available audience flow data over time. Hybrid radio — at least DTS Connected Radio — is able to provide a measurement of their total audience and how that audience flows in and out of their station throughout the day.

Overall, DTS Connected Radio enables automakers to create a common experience across analog and digital broadcasting. It pairs broadcast programming with IP-delivered content, all from the vehicle's IP connection. The combination of analog programming and its corresponding metadata creates a richer, more valuable content experience — and one that's affordable at a global scale for automakers.

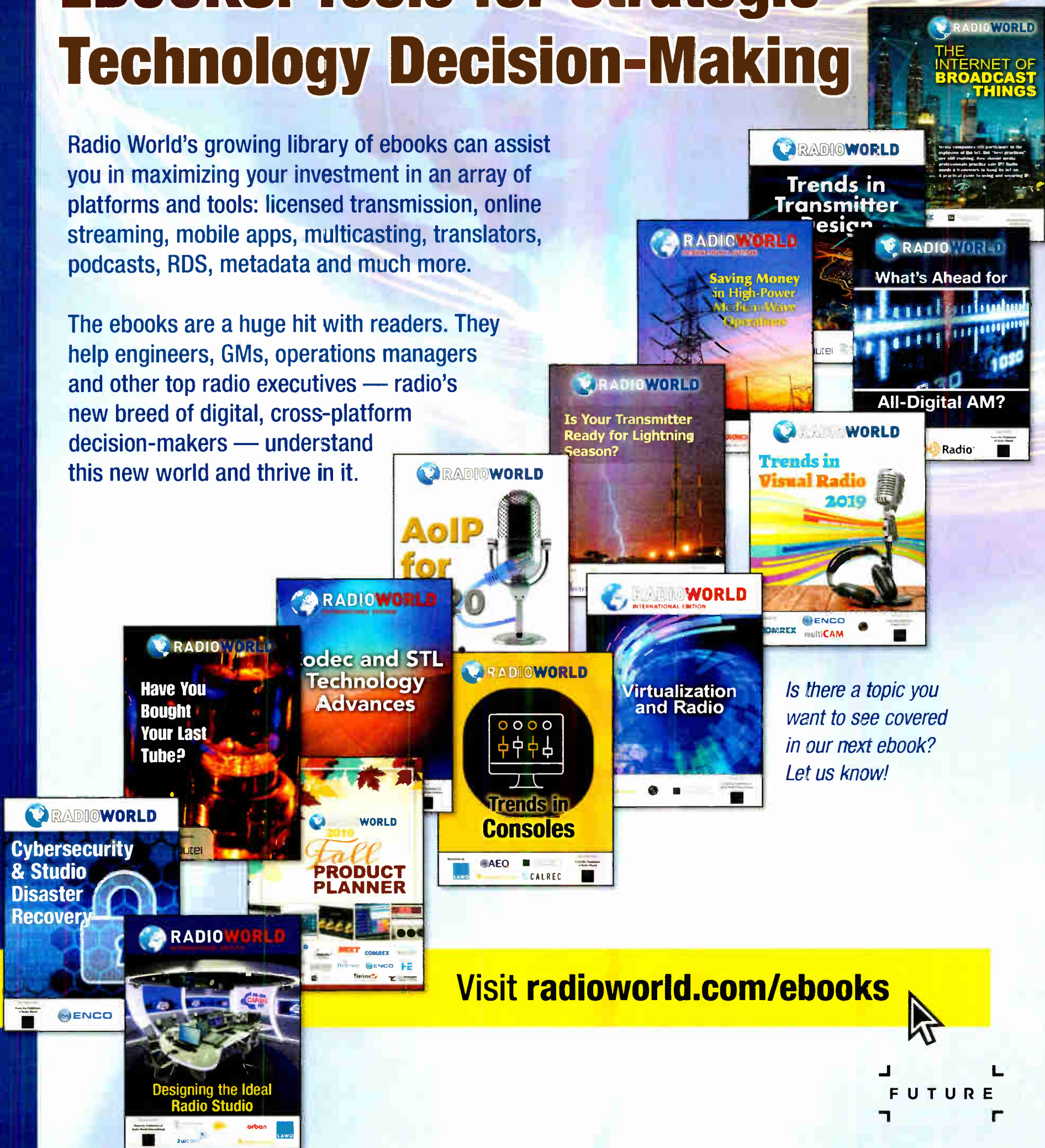
There's a very real quality to the content that radio brings to listeners. Globally and regionally, it's a vital part of how we enjoy life and expand our own personal horizons. Radio is unique in that way. As it moves forward toward a hybrid system of digital information and broadcast programming, it is evolving into a scalable format that brings the best of those real moments to an on-demand and two-way system of information sharing — done across a digital, affordable and global platform.

Comment on this or any article. Email radioworld@futurenet.com with "Letter to the Editor" in the subject field.

EBOOKS: Tools for Strategic Technology Decision-Making

Radio World's growing library of ebooks can assist you in maximizing your investment in an array of platforms and tools: licensed transmission, online streaming, mobile apps, multicasting, translators, podcasts, RDS, metadata and much more.

The ebooks are a huge hit with readers. They help engineers, GMs, operations managers and other top radio executives — radio's new breed of digital, cross-platform decision-makers — understand this new world and thrive in it.



Is there a topic you want to see covered in our next ebook? Let us know!

Visit radioworld.com/ebooks



FUTURE



RCS[®] Sound Software

We can help your station recover from a disaster faster than anyone else. Be back on air in seconds with our brand new state-of-the-art Zetta-based solution.

Radio's Worldwide Cloud-Based

DISASTER RECOVERY

RCSWORKS.COM

© Copyright 2019 RCS. All Rights Reserved. RCS Sound Software and its products and their marks and logos are registered trademarks of RCS.