



# RADIOWORLD

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## Gary Cavell Beats the Drum for Learning

Half of an engineering power couple, he is saluted by NAB for his contributions to radio

BY RANDY J. STINE

Garrison Cavell acknowledges that the National Association of Broadcasters created a unique situation by presenting this year's engineering achievement awards to him and his wife.

Cavell, president of Cavell, Mertz & Associates Inc., earned the Radio Engineering Achievement Award. Cindy Hutter Cavell, the company's senior broadcast consulting engineer, received the Television Engineering Achievement Award, the first woman to do so.

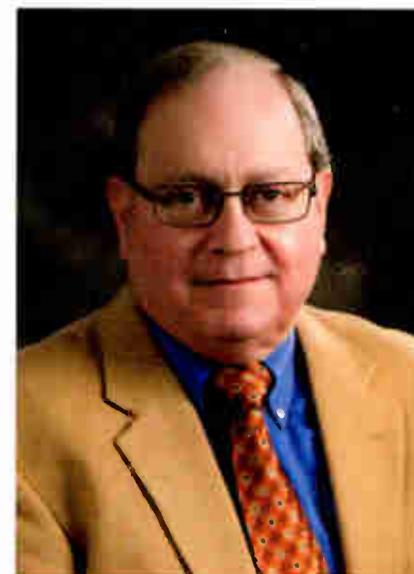
"It's obvious I'm riding my wife's coattails," said Cavell with a chuckle.

He really doesn't have to. Cavell's career in broadcast engineering has spanned more than 40 years, during which time he has designed, built and certified "countless" station antenna systems; he also been deeply involved

in testing benefits of the in-band, on-channel (IBOC) digital transmission system developed by iBiquity.

Prior to co-founding Cavell Mertz and its predecessor consulting firms in 1989, Cavell worked in radio and television engineering management, facility design and construction, program production and station systems development in his home town of New Orleans.

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Garrison Cavell

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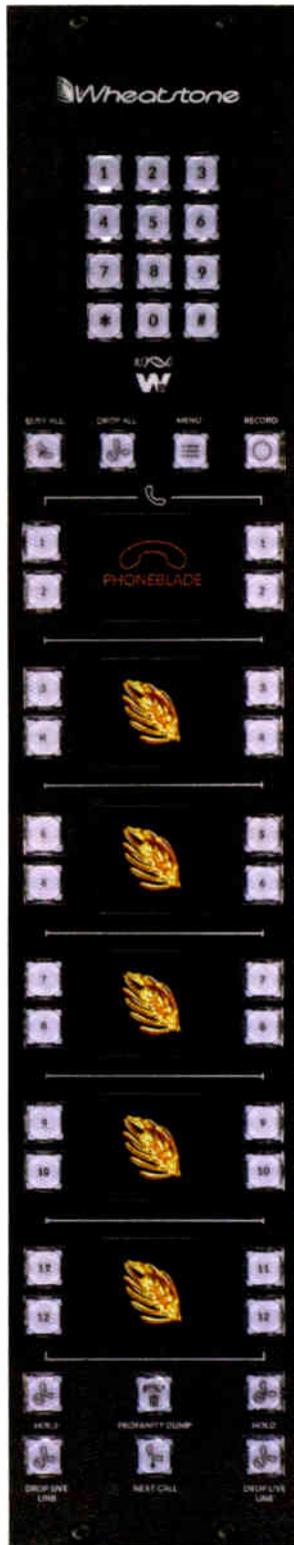
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# “I Believe We Are Only Scratching the Surface”

Frommert sees the power for radio in captioning and transcriptions

## VISUAL RADIO

A new Radio World ebook returns to the topic of visual radio and explores its trends in 2019. Among the interviews in the ebook is this one with Ken Frommert.

After five years as general manager of software manufacturer ENCO, Frommert was named its president in 2017. He has overseen expansion of its product line into TV automation, automated closed-captioning and visual radio.

*Radio World: Your company has been offering video-related tech for radio for a while: automated camera switching, music video playout, graphical overlays and so forth. In general, how far along is the radio industry at integrating video and “visual thinking” into its operations?*



**Ken Frommert:** Visual thinking is an interesting term, and certainly applicable to the way radio broadcasters are adopting the medium. Visual radio first took off internationally, but it continues to gain popularity in the U.S. market.

I believe we are only scratching the surface. Radio stations are still learning how to monetize and provide another medium. ENCO has been providing visual radio solutions and will continue to evolve those solutions as they are adopted.

*RW: “Captioning in radio” sounds like an oxymoron, but I understand that ENCO cap-*



*tioning now is finding interest in the radio side. How does this fit into what radio wants to do with video?*

**Frommert:** Many live radio programs are web-streamed (even audio only), and captioning can provide accessibility for listeners and avoid potential litigation for not providing captions. Many listeners or viewers also prefer to read captions over listening: A recent study notes that 85% of Facebook videos are viewed with

the audio on mute.

Other benefits include instant transcripts to be used online to accompany the pre-recorded video or audio and used for search and discovery, as well as SEO reasons. We do this and more with our enCaption live automated captioning appliances.

*RW: Are there important new technologies for video creators that readers need to know about?*

**Frommert:** We think that NDI is going to play an important role in managing video and audio workflows in visual radio applications. [Network Device Interface is an open protocol developed by NewTek to enable video compatible products to share video across a local area network. —Ed.] NDI allows you to handle multiple camera feeds and video/audio signals over a single connection, which is important in minimizing clutter and connections in crowded radio studios. It also establishes a stronger foundation for IP-based production workflows.

ENCO has already broken ground in this area with our recent announcement of NDI compatibility within our products, including enCaption.

*RW: What are some of the intriguing options you see for captioning in streaming radio?*

**Frommert:** We see tremendous opportunity to generate automatic transcriptions of pre-recorded files in a broadcaster’s archives, including on-demand content such as audio and video podcasts. Think of how this can help newsrooms, for example, to quickly unleash clips and stories with accurate captions — and do it much faster than previously possible. It is a perfect complement for a visual radio broadcast online.

*For more about this topic, read the free ebook “Trends in Visual Radio 2019” at [radioworld.com/ebooks](http://radioworld.com/ebooks). Also watch for the May 8 issue of Radio World, which will feature a Buyer’s Guide section on products that support visual radio.*



enCaption is an automated closed captioning and transcription system.

# Broadcast Finds Itself in a “Natural State”

Arkansas Broadcasters Association turns 70; we checked in with its leadership

## NEWSMAKER

BY PAUL McLANE

The Arkansas Broadcasters Association is noting its 70th anniversary this year.

“ABA began in 1949 as the trade association for broadcasters in Arkansas focused on providing broadcasters with a lobbying voice, while also providing them with technical and regulatory support and continuous professional enrichment opportunities,” it announced. “Over the years, ABA has been successful at helping Natural State broadcasters stay ahead of the ever evolving and changing landscape of broadcast media.”

The association will note the anniversary at its ARKCON event in July.

What are broadcasters talking about in Arkansas these days? We asked Executive Director Luke Story and ABA Board President Ali King-Sugg, owner/GM of Red River Radio Inc. of Heber

Springs, where she is also a morning air personality.

*Radio World: As the ABA celebrates its anniversary, what is the business climate like for broadcasters, and radio in particular, in Arkansas these days?*

**Ali King-Sugg:** Because Arkansas is mostly rural, I think that many Arkansans look to local radio as their first resource for what is going on in their communities. Because of that radio is thriving!

With my family being in the radio business for over 40 years, I’ve gotten to learn from some of the best broadcasters in Arkansas on how to keep radio local and the importance of it. If you do that, your community will support you back.

**Luke Story:** When I started

*Celebrating*



this job a little over a year ago, I launched a statewide member tour with the goal of visiting as many members as I could and glean from them how their needs have changed and what the association could do better to serve them. What the tour has taught me is more than ever, our industry is vibrant, vital and strong, but we must work collectively to address old, new and emerging challenges.

You ask specifically about radio but I think it’s important to recognize that more so than ever before, radio and TV are siblings in media. Radio does face the steep challenge of adapting to new digital technology, but together we will get there.

I often compare today’s challenges facing radio to the challenges it faced in the late ‘40s-early ‘50s, with the advent of television and TV becoming the household influential medium. A lot of people wrote radio off then, but 60-plus years later it still remains a powerful marketing tool for advertisers, a “go to” place for new and popular music and an economic growth engine for our communities and state. Over 18,000 Arkansas jobs created by local radio and TV.



Ali King-Sugg



Luke Story

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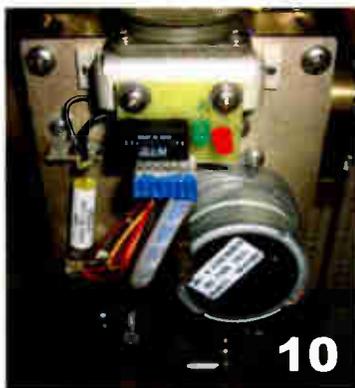


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Members of the National Alliance of State Broadcasters Associations are shown with FCC Chairman Ajit Pai.

**RW:** What important issues are front of mind right now for your radio members?

**King-Sugg:** With all the new technology of smart speakers, podcasts and dashboards, a big issue will be figuring out how to integrate digital and turn it into a revenue generator. And as broadcasters we are always worried about a performance tax.

**Story:** Issues that are front of mind for all members, radio and TV, are similar to other industries in the state. We are working hard to find quality sales people. Our industry is addressing a shortage of engineers, both RF and IT/

digital. And we continue to navigate the evolving digital landscape.

**RW:** There's discussion at the FCC about removing ownership subcaps for radio. What is ABA's stance on this?

**Story:** We haven't formally discussed this within the association.

**RW:** What other major lobbying concerns are you dealing with at the national or state level right now?

**King-Sugg:** On the national level, our main concern is a performance tax that would hurt local radio and potentially threaten local jobs. On the state level, we are very active and involved

especially with any new law that would weaken the Freedom of Information Act. Others that have come up in this year's session are advertising for medical marijuana.

**Story:** Right now, medical marijuana advertising regulations is a hot topic and a very complex one at that. We continue to focus on any and all FOIA exemption-related legislation. At the national level, I work closely with my counterparts across the country and at the National Association of Broadcasters to address radio topics, such as the Local Radio Freedom Act, unlocking the FM chip in

*(continued on page 6)*

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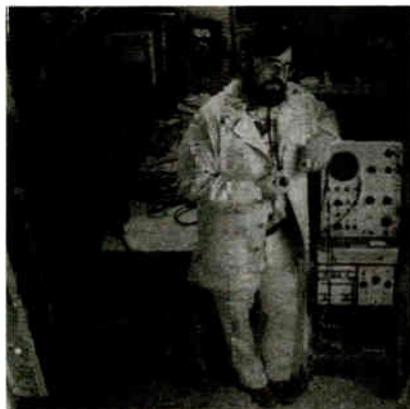
# CAVELL

(continued from page 1)

Cavell, 68, is a licensed pilot and former professional drummer. He has been around long enough to credit part of his success to mentors like Jules Cohen and Robert and Tom Silliman (all of whom are past NAB honorees) but humble enough to admit he still learns something new about his profession every day.

Lynn Claudy, senior vice president of technology at NAB, said, "In addition to all the excellent engineering consulting he's done for station clients over the years, Gary has generously volunteered his time to NAB as a faculty member at NABEF's Broadcast Leadership Training Program for almost two decades, and more recently the Technology Apprenticeship Program."

He also served as editor in chief



**1970s Gary Cavell, leisure suit and all**

announcer and engineering assistant.

"I was a kid playing country music and even some Cajun music. But it just so happened that the owner of the radio stations got involved with TV and invited me to help him build a television station in Houma. That was really the start of my technical career," he said.

There are topics Cavell declined to discuss in depth for this interview, including AM revitalization because of ongoing work for the NAB and FCC. In regard to the commission taking steps to overhaul ownership rules, he said there seems to be a mixed bag of arguments for and against.

"Of course, you have clients on both sides of many issues, whether it is changing the AM rules and updating the protections for the Class As or the move to launch C4 FM service. We really can't take a position because someone will be cheesed off," Cavell said.

But Cavell said the commission's efforts to lighten its regulatory touch on broadcast has resulted on plenty of work for firms like his.

"The FCC's moves to modernize media regulations and modify rules that are outdated and burdensome for broad-

## CINDY HUTTER CAVELL

The recipient of the 2019 NAB Television Engineering Achievement Award, Cindy Hutter Cavell serves as senior broadcast consulting engineer at Cavell, Mertz & Associates Inc. with a specialty in television station and microwave system design and implementation. According to NAB, her career includes stints as director of operations at ABC News' Washington Bureau, engineering director for several local TV stations, vice president of Fox Sports' Houston Technical Operations Center and broadcast engineering director for Sprint Communications.



As part of the ABC Broadcast Operations and Engineering team, Cavell won three Emmy Awards for Technical Innovation. She is the recipient of the AWRT/SBE 2007 Outstanding Female Broadcast Engineer award and holds the 2015 TVNewsCheck Women in Technology Award.

She is the first woman to receive the NAB Engineering Achievement Award. "I am proud to be part of a community that used to be called a brotherhood," she told TV Technology. "We've come a long way from the early 1970s when I got into the business when women were few and far between." Read TVT's interview with the couple at <http://tinyurl.com/rw-huttercavell>.

casters generally means more work for people who are in the business of offering help," he said. "Jules Cohen once told me, 'Don't worry, the FCC will always provide.'"

Cavell remains passionate about drawing more youth into broadcast engineering careers. He is supportive of the NAB Educational Foundation, the Society of Broadcast Engineers and their training programming for technical apprentices and interns.

"Mentoring is so crucial to help open doors. But there are two parts to the issue. First, traditional radio and television isn't as exciting as it was once. It's not top of mind, and there is lots of competition from other technical fields.

"Secondly, I know the compensation level for entry level folks is not as high as it should be," Cavell said. "So we have to get the attention of new young

blood and then pay them fairly."

The radio and TV industry needs to bring in young talent specifically to focus on computer networking, he said, where the "major growth will be the next decade."

### IT'S ALL ABOUT THE ...

Cavell reflected further on vast changes in the radio business throughout his career, from new technology to industry consolidation.

"It's really interesting. Computers have impacted us the most. We don't have to lay maps out all over the floor and draw lines on them. That was how we did it. Now you push a button and you get the same data. It's so efficient. I can do a Moment of Method Proof for an AM station in a fraction of the time. It's amazing. I think we charge about

(continued on page 8)



**In familiar environs: Gary Cavell at WMAL(AM) in 2007.**

for the 11th Edition of the NAB Engineering Handbook published in 2017, a huge tome that was completed on time. Claudy said, principally because of Cavell's commitment to the project as a labor of love.

### THE FCC "WILL PROVIDE"

Cavell, an IEEE and SMPTE Life Member, grew up in the Big Easy with an interest in radio, antennas and ham radio. He began his career at in Houma, La., at KCIL(FM) and KJIN(AM) as an

## ARKANSAS

(continued from page 5)

wireless phones, performance royalties and consent decrees and ownership regulations. We also address TV topics, such as the next generation of broadcast television, the expiration of STELA and open negotiations with retransmission consent.

**RW:** How many members does the association have; how does that compare to years past?

**Story:** We represent 230 members, both radio and TV, across the Natural State. We have worked hard to improve and grow our membership base and have succeeded in membership growth over the last year plus.

**RW:** Anything else we should know?

**Story:** In Arkansas, we are fortunate to have great broadcasters that show others what we like to call "Broadcasting Naturally." Arkansas broadcasters continue to serve their local communities and provide relevant news, weather, sports and emergency information in time of need in all 75 counties of the state.

Something else we are proud of is the equally important community service role broadcasters play. We raise money and support for dozens of community organizations helping them amplify their needs and good work. That's part of the mission of broadcasting: to strengthen the communities we serve. Last year, broadcasters raised more than \$30 million in charitable contributions to help Arkansans in need.

ARKCON is scheduled for July 18 and 19. For information visit [www.arkbroadcasters.org](http://www.arkbroadcasters.org).

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World Radio History

## CAVELL

(continued from page 6)

the same today for a project today as we did in 1989 because the time involved is so much less.”

He continued, “On the business side, radio consolidation has really impacted how we do business. It used to be we did business with dozens and dozens of broadcast groups. Now there are just a few, and that really has changed the dynamic of our business.”

Cavell said he believes over-the-air radio will remain relevant as long as broadcasters focus on content.

“Here is an engineer telling you it’s all about content, but it really is. If you put something on the air that people want to hear, they will tune in. It’s about content and always has been about content. Even as new technology develops, content will be crucial in order to get people to consume the product.”

However, he expressed surprise that some broadcasters have been slow to adopt HD Radio, considering its benefits, including extra channels.

“I thought as an industry it would be quicker.... Some broadcasters have been very forward thinking in launching HD Radio and finding ways for it to make sense for them. Others have shied away and more concerned about the cost factor.”

Cavell Mertz regularly conducts experiments in HD Radio on AM and FM for NAB’s Pilot program. Its test bed supports analog, hybrid AM and FM-band radio signals, he said.

“We test in various modes. We look at interference issues, performance issues and RDS issues. Folks from Xperi and Nautel are in here quite often,” he said.

The firm is involved in testing all-digital HD Radio on the medium-wave

band at Hubbard’s WWFD(AM) in Frederick, Md., as Radio World has reported. Xperi and Kintronic Laboratories are also involved in the project, which is operating under special experimental authority.

“I’m very excited about the all-digital AM project for Hubbard. I’m completely jazzed about it. It offers in my mind a viable way for AM to go,” he said. “It’s quieter and has FM fidelity. Hubbard is very happy with how things are going.”

The firm also conducted co-channel interference field studies on all-digital AM for NAB.

### SORROWS AND JOYS

Cavell Mertz suffered a setback when it lost one of its principals, Richard Mertz, to pancreatic cancer in 2013. Mertz joined the company in 1994 and



From the family photo album, after their wedding ceremony.

was critical to its growth, according to Cavell.

“It took the heart out of us for a while. In many aspects, Richard was fearless. His background was in physics so he gave us a lot of depth in that area when faced with difficult calculations.



Gary Cavell and Cindy Hutter Cavell have led RF Bootcamps at multiple NAB Shows.

He was the perfect foil. That is what made the firm so great is that we had different personalities,” Cavell said.

Cavell Mertz has nine full-time employees and regularly calls upon a half-dozen contractors to help with the firm’s TV repack consulting work for the FCC, he said. It frequently works with the accounting firm Ernst & Young, a TV repack fund administrator hired by the FCC.

“We work as their subject matter expert. It’s another of those topics I can’t discuss thoroughly. We are not doing any TV repack work for broadcasters.”

Cavell has no plans for retirement, even though he hopes to someday fly his Cessna 18 Skylane more often.

“This is still fun. I love helping people and teaching folks. I’ve been doing this for so long but I’m still happy. So I have no plans to pass the firm along or shut it down,” he said. “I give my thanks to NAB for this recognition. I’m not very interesting, but the things I work on

sure are.”

How did he and Cindy become an engineering power couple? Cavell related the story to RW sister publication TV Technology: “I met her at NBC here in Washington while I was working on a TV project, and we just became buddies because I liked how she handled people. I thought it was kind of funny because she worked with these big, burly guys, and she just handled it.”

She eventually became a client of the firm. “You get to know somebody in a different light than the usual dating or courtship relationship. We were professional and then personal friends for years. But eventually she persuaded me to marry her, and I persuaded her to come to this company.”

They wed in 2005, and she joined the firm in 2010.

“Cindy is outbidding me now. That’s no secret,” he told RW. “We work great together. She has her portion of the practice, and I have mine. She works mostly on TV. We do have an agreement never to discuss business at home unless it’s very urgent.”

The couple resides in Haymarket, Va., just west of Washington, D.C., near the Bull Run Mountains.

## HONOR ROLL

Recipients of the NAB Engineering Achievement Award are listed here. Beginning in 1991, radio and TV winners were named; only radio winners are shown below for the latter years.

1959 John T. Wilner  
1960 T.A.M. Craven  
1961 Raymond F. Guy  
1962 Ralph N. Harmon  
1963 Dr. George R. Town  
1964 John H. DeWitt Jr.  
1965 Edward W. Allen Jr.  
1966 Carl J. Meyers  
1967 Robert M. Morris

1968 Howard A. Chinn  
1969 Jarrett L. Hathaway  
1970 Philip Whitney  
1971 Benjamin Wolfe  
1972 John M. Sherman  
1973 A. James Ebel  
1974 Joseph B. Epperson  
1975 John D. Silva  
1976 Dr. Frank G. Kear

1977 Daniel H. Smith  
1978 John A. Moseley  
1979 Robert W. Flanders  
1980 James D. Parker  
1981 Wallace E. Johnson  
1982 Julius Barnathan  
1983 Joseph Flaherty  
1984 Otis S. Freeman  
1985 Carl E. Smith  
1986 Dr. George Brown  
1987 Renville H. McMann  
1988 Jules Cohen  
1989 William Connolly  
1990 Hilmer Swanson  
1991 George Marti

1992 Edward Edison & Robert L. Hammett  
1993 Robert M. Silliman  
1994 Charles T. Morgan  
1995 Robert Orban  
1996 Ogden Prestholdt  
1997 George Jacobs  
1998 John Battison  
1999 Geoffrey Mendenhall  
2000 Michael Dorrrough  
2001 Arno Meyer  
2002 Paul Schafer  
2003 John W. Reiser  
2004 E. Glynn Walden  
2005 Milford Smith

2006 Benjamin Dawson & Ronald Rackley  
2007 Louis A. King  
2008 Thomas B. Silliman  
2009 Jack Sellmeyer  
2010 Steve Church  
2011 L. Robert du Treil  
2012 Paul Brenner  
2013 Frank Foti  
2014 Jeff Littlejohn  
2015 Thomas F. King  
2016 Andy Laird  
2017 John Kean  
2018 Tom Jones  
2019 Garrison Cavell

# Cover all Bases with ViA



Bill Eisenhamer, Chief Engineer (Left) with JR Rogers, Technical Director

**The Tieline ViA has been the backbone of the San Diego Padres road play-by-play live broadcasts.**

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# Add a Diagnostic Aid to an RF Transfer Switch

A few simple changes can make troubleshooting faster and easier

## WORKBENCH

by John Bisset

Email Workbench tips to [johnpbisset@gmail.com](mailto:johnpbisset@gmail.com)

Harry Bingaman is former director of engineering for Sudbury Broadcasting in Pennsylvania. Harry retired last fall from the group but stays active doing contract jobs, working the ham bands and enjoying his grandchildren.

When Harry had an issue with an MCI-6100 Series Coaxial Transfer Switch, he came up with a diagnostic aid to share with Workbench readers.

His problem was that the MCI coaxial transfer switch would not do a switch from position A to position B. Harry removed the cover from the switch and located the latching relay that controls

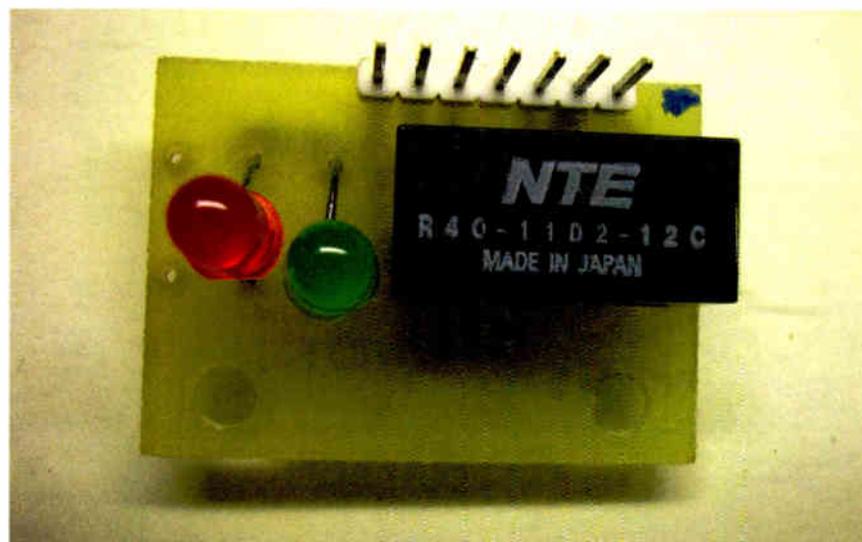


Fig. 1: The modified control board, with the two ultra-bright LEDs.

— when working on this latching relay control board, make sure you disable the 110-volt control to the position motor. You don't want the motor changing the RF path by accident. You'll also want to make sure the control relay is latched to the same position as the Position motor on the coax switch before reassembly and power-up.

Harry offers this warning if you did not connect all of the appropriate transmitter interlock connections to the coaxial transfer switch. Remember, *no hot switching is allowed!*

If you haven't connected the interlocks for *both* the main and auxiliary transmitters, please take the time to do this. Over the years, Harry has seen the result of hot switching at more than a few stations, where all that was connected was the connection for a switch from main to aux.

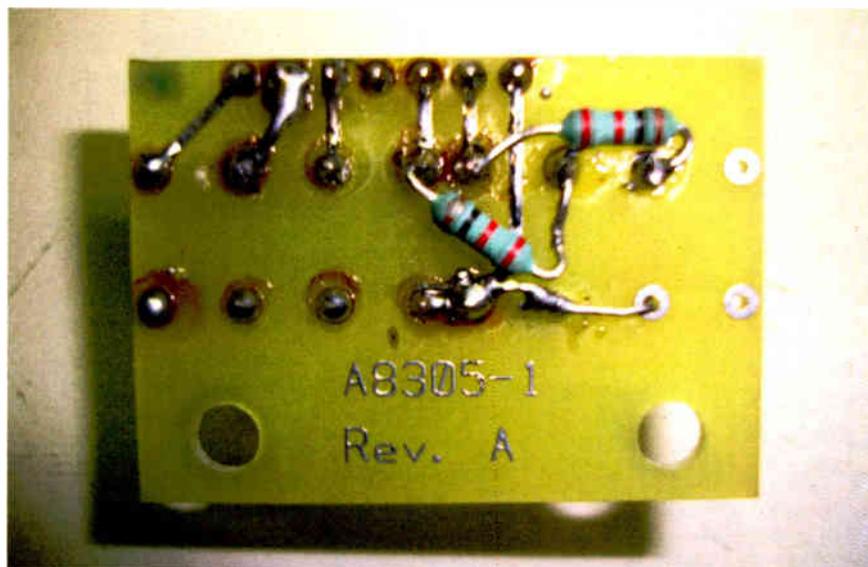


Fig. 2: The solder-side of the control board, showing the LED dropping resistors.

the changeover. The latching relay voltage on this unit was 12 VDC and only requires a momentary pulse to latch the relay one way or the other.

The latching relay is mounted on a small circuit board with a Molex-brand connector with several wires that provide switching voltage to the position motor and 12 VDC control pulses from

the remote control. The board and relay are rather small, and it's tough to connect a voltmeter to ensure you have a voltage pulse to the latching relay.

To further complicate troubleshooting, most coax switches are located in a place that requires a ladder, a third arm and a distant reach from the remote control. If you look carefully at this board, the relay is a solder-in type, and the circuit board has six unused holes to its side.

This gave Harry the idea of mounting two LEDs in those spare holes (Red=A; Green=B) with the appropriate dropping resistors to give him a visual indication that he is getting voltage to the relay latching coils at least. There is plenty of room inside the switch housing to accomplish this task.

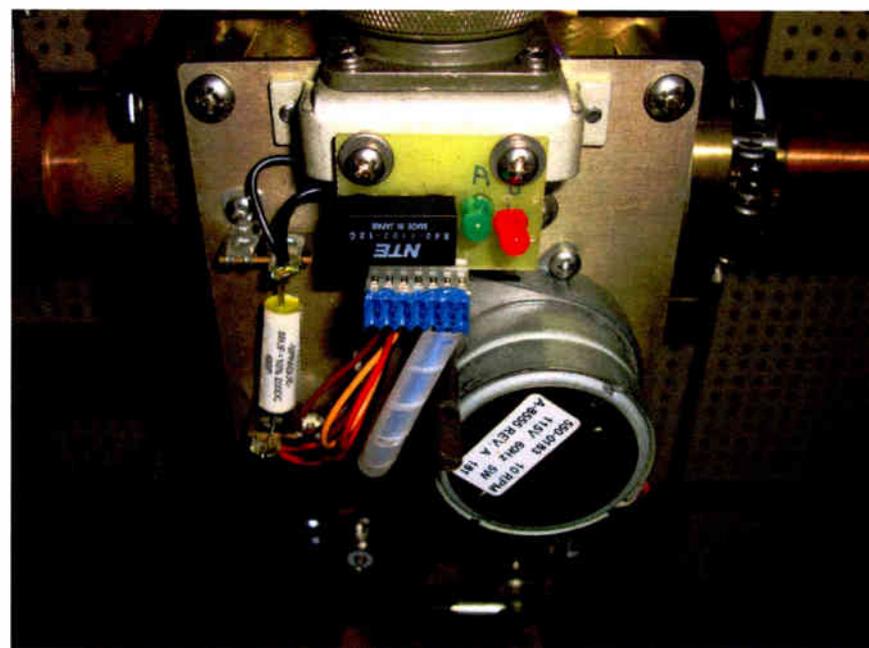


Fig. 3: The latching relay board remounted with the diagnosing LEDs in place.

Harry used super-bright LEDs so he can see them from the other end of the transmitter room, where the remote control is located. This makes observing the position easier when toggling the remote control from position A to position B.

If you need to replace the latching relay, Harry suggests including an IC socket rather than the standard solder-to-the-circuit-board arrangement. This would make relay replacement a little quicker if ever needed. This latching relay is rated at 2 Amps, and normally hangs in there for a long time.

As Harry diagnosed his problem, he found the latching relay had a coil "A" open.

Harry offers one word of warning

The thinking was that whoever would make the switch would be intelligent enough to power down all systems first. This is a bad assumption and also an expensive one!

Take the time to make the interlock connections. The extra time will save you a lot of headaches down the road.

*Workbench thrives on your tips and other great ideas. Help fellow engineers and qualify for SBE recertification credit. Send tips and high-resolution photos to [johnpbisset@gmail.com](mailto:johnpbisset@gmail.com).*

*Author John Bisset has spent 49 years in broadcast and is still learning. He handles western U.S. radio sales for the Telos Alliance. He is a past recipient of the SBE's Educator of the Year Award.*

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# Giant Tesla Coil Utilizes 21st Century Technology

Radio transmitter forerunner moves into the solid-state era

## ROOTS OF RADIO

BY JAMES E. O'NEAL

If you've ever constructed a Tesla coil or watched a demo, there's something fascinating about the steady stream of purple sparks that spray out from its discharge terminal, the noise of the spark, the smell of the ozone.

You'll also likely realize you're witnessing the step-up of a hundred volts or so into tens of thousands, and that the output of most coils (tabletop variety) is rather harmless, due to the limited current and high output frequency that channels most of the energy over the outer surfaces of living organisms — the so-called skin effect.

The Tesla coil is also a radio transmitter, embodying elements found in any such device — a source of oscillations and resonant circuitry — and a good case can be made for Tesla's having "gotten there" before Marconi. However, according to Nikola Tesla, his invention was not intended as a device for wireless communication, but rather as a means of generating very high frequency alternating current that might be used for wirelessly powering homes and industry.

When the circuits of early radio transmitters (spark oscillators) and the Tesla coil are compared, there's little difference, except for a coupling network for delivering the RF output to an antenna and an easy means for rapidly turning the RF generation on and off (keying).



Ed Wingate's newly-constructed solid-state "radio transmitter" is designed to radiate most of its output in the form of corona discharges.

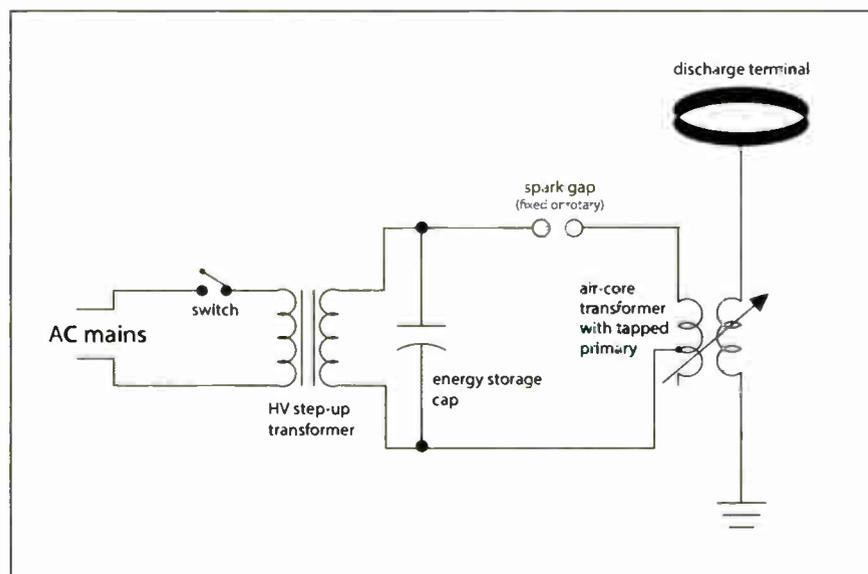


Fig. 1: The classic spark-excited Tesla coil has been around for more than 100 years, and with the exception of the output terminal, it is essentially the same circuit as used in early radio transmitters.

At its heart, Tesla's coil is a radio transmitter — but one that operates without communications as its goal and in an environment where corona discharge is welcomed rather than strongly discouraged!

In the 1920s, the advent of high-power vacuum tubes relegated the spark transmitter to the scrap heap. A 1927 international agreement officially banned the licensing of new spark transmitters after 1929; however, by this time, due to inefficiency of spark technology and the interference produced, few spark stations were still in operation.

### MOVING FROM THE SPARK

The Tesla coil also made the jump to the vacuum tube as a source of radio frequency energy, with a number of designs adopted by experimenters (and commercial enterprises). One of these is shown in Fig. 1.

While broadcast and other transmitter designs began to move away from vacuum tubes during the final decades of the 20th century, the Tesla coil lagged somewhat behind, as making such a jump involved much more than fitting a big transistor in place of the triode tube shown in Fig. 2. And due to the relative fragility of transistors, especially

(continued on page 14)

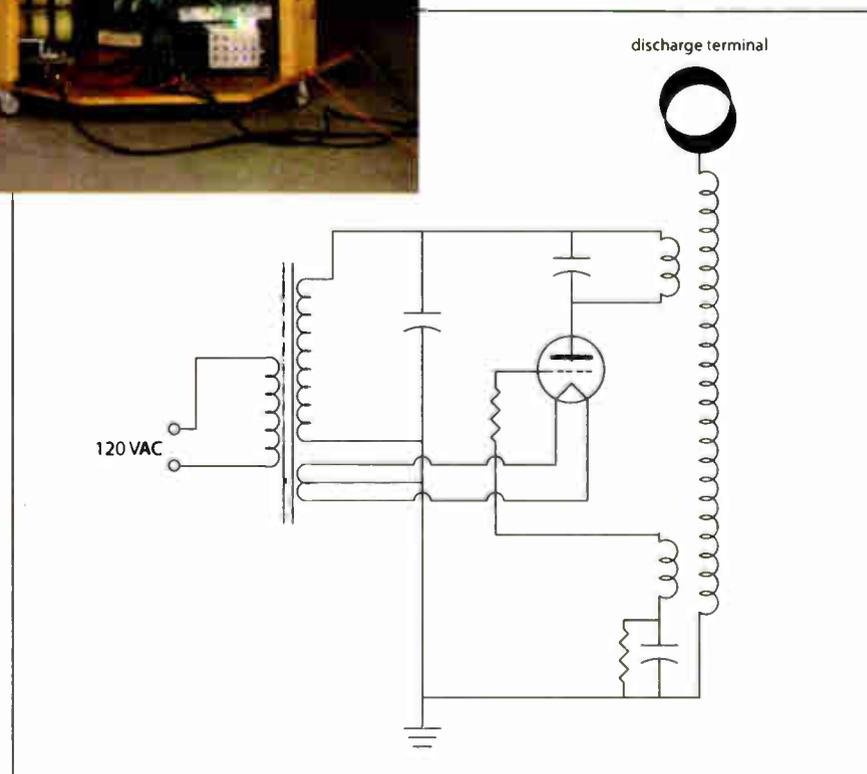


Fig. 2: A vacuum-driven coil is little more than the "power oscillator" architecture used in some of the first tube-type radio transmitters. The circuit uses a triode capable of delivering several Watts of power. Oscillation is achieved by a feedback winding on the RF transformer (Tesla coil). Note there is no rectifier in the "power supply." The tube conducts and produces output only during the positive-going portion of the stepped-up AC. Obviously this wouldn't work in a conventional radio transmitter, but hum in the signal isn't a factor in Tesla coils.

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World Radio History

# TESLA COIL

(continued from page 12)

with regard to voltage spikes and other momentary disruptions that would be of little consequence to tubes, most Tesla coilers were content to stick with spark- or vacuum tube-excited machines.

Due to the dedication and engineering efforts of some coilers, solid-state excitation is now feasible, even in very large coils, and serious experimenters are beginning to feel the same way as broadcasters with regard to operating with anything other than a solid-state rig.

## MAKING THE SHIFT

Readers may recall my story in these pages in 2015 about “super-coiler” Ed Wingate and his giant Tesla coil ([radio-world.com](http://radio-world.com), keyword Wingate).

Wingate, a career tool and die maker with no formal training in electricity or electronics, has been interested in

Tesla coils for most of his life and has constructed a number of them, reaching a pinnacle of sorts with a monster coil capable of delivering awe-inspiring discharges 10-feet in length or more.

In the article, Wingate, then 67, mentioned that he was intrigued by the possibilities of moving into solid-state technology, especially after locating some insulated-gate bipolar transistors (IGBTs) that could handle upwards of 1,200 Volts and were comfortable with currents of several hundred Amperes.

He has now made the jump to solid-state technology, finding that while it wasn't especially easy or cheap, such a move is rewarding, as his new coil can do things the old one couldn't (such as be modulated with tones or music).

## NOT NECESSARILY AN EASY PATH

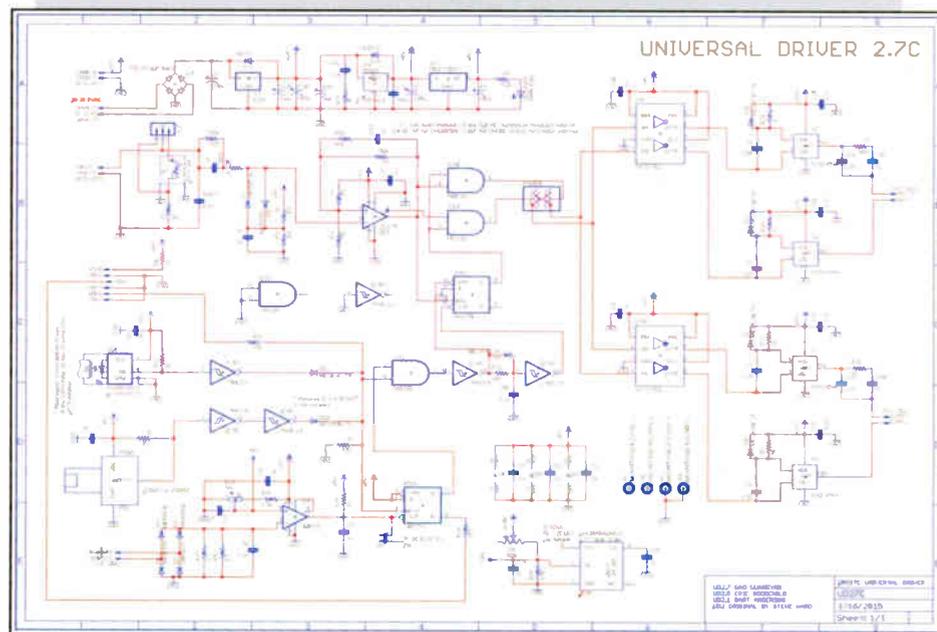
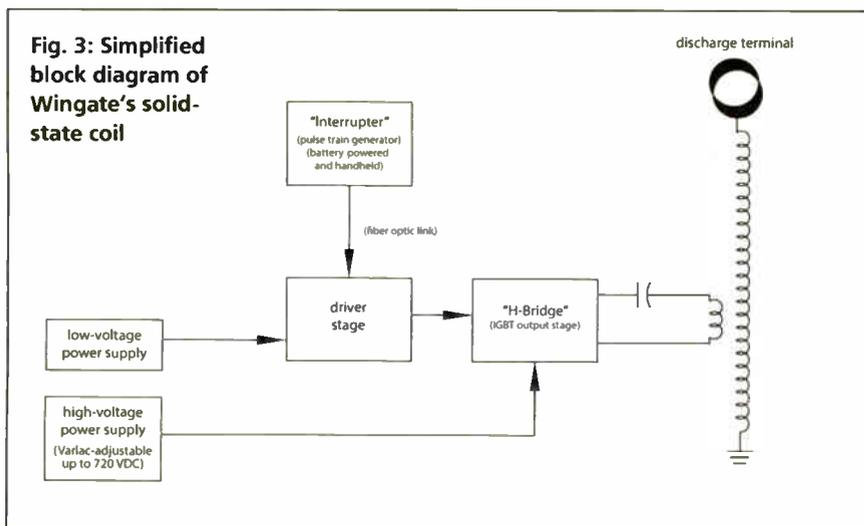
Wingate related that he decided to start out by purchasing a commercial kit for constructing a solid-state coil.

## THE BIG COIL'S SOLID-STATE CIRCUITRY

As mentioned, there's a lot more to creating a reliable solid-state Tesla coil than replacing the power triode in the vacuum tube circuit (Fig. 2) with a transistor. As evidenced by the schematic of a large portion of the coil (Fig. 4), there's a great deal more involved!

In very basic terms, the solid-state coil's inner workings may be described as follows:

A square wave pulse train with an adjustable duty cycle is generated by the “interrupter.” (Circuitry is based around the “old reliable” NE555 timer i.c., and is contained in a hand-held metal enclosure that's physically and electrically isolated from the high-power portion of the coil by fiber optic connectivity. It's powered by an internal 9-Volt battery.)



**Fig. 4:** This schematic illustrates the overall complexity of the driver portion of a typical IGBT-driven Tesla coil. Visit [bit.ly/teslacoilschematic](http://bit.ly/teslacoilschematic) to see a larger version.

The pulse train arriving from the “interrupter” feeds a “driver” stage that generates gating pulses for switching the high-power insulated-gate bipolar transistors (IGBTs) on and off. (Both coil designer Ward and fabricator Wingate point out that switch timing is critical to successful operation — and longevity of the IGBTs — as the silicon devices don't like to see large voltage spikes or overshoots from pulses arriving at the wrong time. “You really have to have an oscilloscope to ‘tune’ the coil,” Wingate observed.)

The timed pulses from the driver control the switching of the IGBTs in the “bridge” or “output” stage of the coil (Fig. 5). Ward notes that two different IGBT configurations are commonly used in solid-state coils — a balanced “H-bridge” with four transistors, or a “half-bridge” constructed with two IGBTs. (Wingate's coil uses H-bridge architecture. (See Fig. 5.)

The gates of the IGBTs are driven by output windings of the two transformers configured in such a way that the left and right pairs of IGBTs operate in a “push-pull” manner. The devices feed the “load,” which is the primary winding of the Tesla coil in series with a capacitor that's selected to form a series-resonant circuit at the desired operating frequency (in the case of Wingate's coil, around 27 kHz).

As seen in the drawing, Ward's output stage design includes a number of Zener diodes, including four large 440-Volt devices, to protect the IGBTs from overvoltage conditions and high-frequency voltage spikes.

He also notes that in the design and construction successful large solid-state coils, keeping parasitic oscillations — and the RF voltages that could arise from them — at “ultra-low levels” is absolutely essential, and was a concept not initially well-understood or appreciated by the Tesla coil community, when some coilers began experimenting with solid-state designs a number of years ago.

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"It was a small DRSSTC [dual-resonance solid-state Tesla coil], and I was very disappointed with the performance," said Wingate. "It would only do seven- or eight-inch sparks, and as the driver had no current limiting, it blew IGBTs quite frequently. I wound up with a whole can full of blown transistors, and it was a real pain in the butt to change them out."

After giving up on the kit, Wingate sat on the sidelines for a while before testing solid-state waters again.

"I had become a skeptic about solid-state and was not really aware of what really could be done in that area," he said. "However, I got an offer from a museum to build a coil for them and finally decided it was time to try again."

**"There are no kits or even p.c. boards for something like this."**

— Ed Wingate

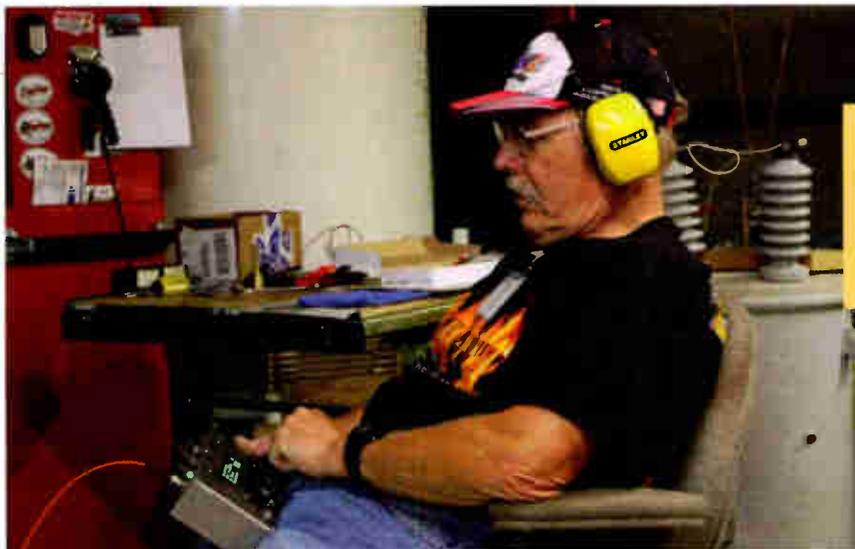
Wingate points out there was no "kit" approach for a really big coil and his new solid-state device required several hundred hours to construct, spread out over some four to five years.

"I got the driver section and the bridge [output] all figured out and assembled, as well as the tank capacitance circuit, but then I sat on it for a couple of years. Finally, a friend nudged me to complete it, and I did so in about six months."

Wingate observed that pulling everything together and getting the new coil "on the air" was made considerably easier, as there is now an established community of coilers who have moved to solid-state technology, and he was following in the footsteps of others who had learned where pitfalls existed. However, he stressed that getting there wasn't exactly a "cakewalk."

"There are no kits or even p.c. boards for something like this," said Wingate, noting that the only area of the coil that is not hand-wired is in the output stage with the big IGBTs. This construction was facilitated by a design from another coiler.

"There are two copper plates used for mounting the IGBTs in the driver bridge that were designed by a young man named Philip Slawinski, and this is a very good design. The IGBTs are screwed down to heat sinks on these plates, and these plates are something



Wingate operates the new solid-state coil from a fiber optic-connected control box. (Although the big noise-making rotary spark gap component in previous coils is absent, the noise from powerful discharges still mandates hearing protection.)

you can't just go out and buy." (Wingate had his laser-cut from one-eighth inch copper plate by a local machine shop.)

What about the big insulated-gate transistors themselves? Wingate admits that they sound pricey, but thanks to some Internet shopping, these and other

(continued on page 18)

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# TESLA COIL

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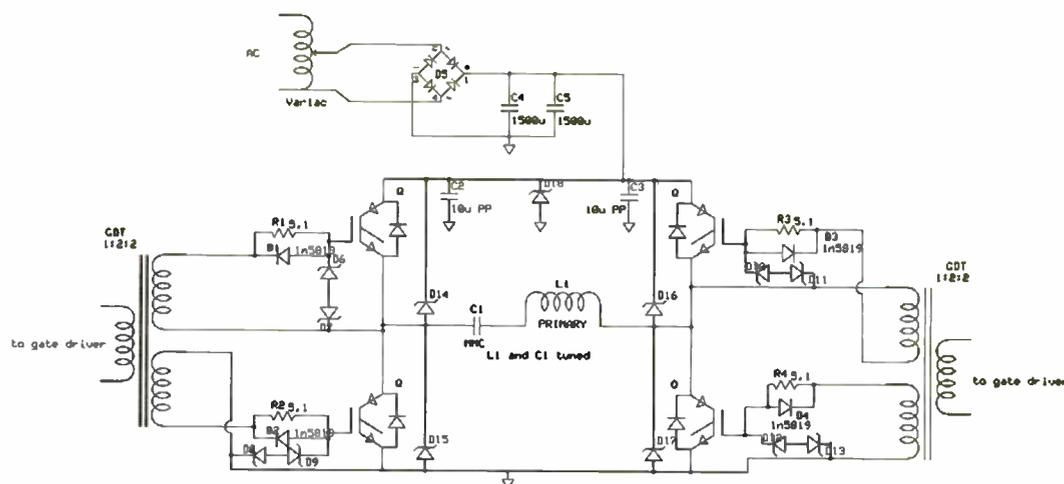
specialized components weren't all that expensive.

"I used four CM600HA IGBTs, which are rated at 600 Amps at 1,200 Volts," he said. "When they first came out, they ran about \$500 apiece. Now, you can buy them on eBay for about \$20."

Wingate also shopped around for the specialized energy-storing capacitors that are part of his design.

"There are 75 of these in the tank circuit," he said, noting that the Eurofarad pulse capacitors he purchased from a surplus dealer had likely come from a nuclear magnetic resonance imaging machine [MRI], and if new, would sell for some \$200 each.

To get the necessary capacitance value (1.25 mfd.) and voltage rating (18 kV), Wingate arranged the caps in a series/



**Fig. 5: The output or "H-bridge" section of Wingate's new coil. It's constructed around four IGBTs, each capable of handling 600 Amps at up to 1,200 Volts.**

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D14-D18 are 400V TVS



Most of the components of Wingate's new coil are housed in the base of the resonant transformer unit. The IGBT output or "H-bridge" section is visible at the lower left under the group of large white that form energy storage section of the power supply. The tank circuit capacitors are those in the center of the photograph. They're connected with copper strap in series/parallel to provide about 1.25 mfd at 18 kV. The two smaller oil-fill caps in the foreground are used for shunting spikes that could damage the IGBTs. (There are two others not visible in the photo.)

parallel configuration comprising five strings with 15 capacitors in each string.

"The whole capacitor bank weighs about 125 pounds," he remarked.

Equally impressive are some of the

electrical parameters of the IGBT coil. Wingate supplies the driver section with up to 720 Volts of DC from a voltage multiplier-type power supply fed directly from 240 Volt AC mains.

"There's a total of about 23,000 microfarads of energy storage in the power supply. I run the power supply with a Variac to bring the voltage up slowly, as there's something about plugging 23,000 microfarads of capacitance into the AC line that scares me a little."

He notes that "current limiting on the driver board is set at 2,500 Amps, which may seem extreme for 600 Amp-rated

(continued on page 20)

## COMMENTS FROM A DESIGNER OF LARGE SOLID-STATE TESLA COILS

Steve Ward, an Austin, Texas-based electrical engineer who specializes in embedded power electronics, and is well-known to the Tesla coil community for his solid-state design contributions, provided additional information on the performance of Wingate's new coil.

As measured with the "top hat" capacitive toroid in place, the resonant frequency of the primary of Wingate's coil (Tesla "transformer") is about 27 kHz, and the peak power (we're dealing with pulse, not average power here) runs in the neighborhood of one megawatt (600 Volts x 1,750 Amps). As the pulse duration is in the tens to one-hundreds of a microsecond range, he calculates an average input power on the order of 20 kW.

Ward points out that in the design of large Tesla coils, a couple of factors influencing the winding conductors limit overall efficiency. The first is the "skin effect" encountered with high-frequency currents which causes most of the current to flow on or near the outer surface of the conductor. He estimates that power losses due to "skin effect" limit efficiency to between 70 and 80%.

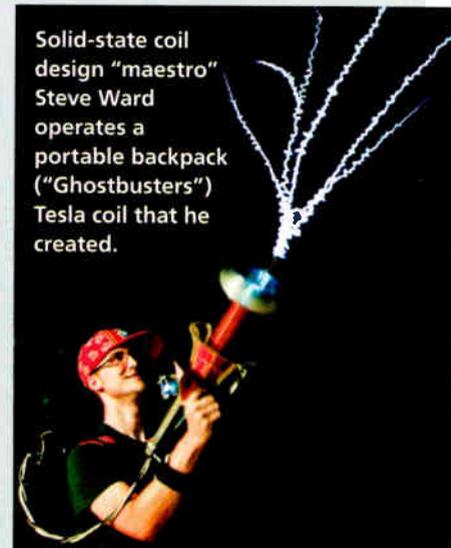
A second factor is the "proximity effect," which stems from the influence of the magnetic coupling between coil windings. The effect is to reduce current flow in adjacent windings to flow within a smaller subsection of the conductor, further reducing their useful current-carrying area.

Ward also points out Tesla coils aren't very efficient radio transmitters, as they aren't able to radiate much of the RF energy produced due to the classic situation of poor free-space radiational efficiency that results with an electrically short antenna.

"Very little of the peak power making it to the output of the Tesla coil can be radiated as RF energy," said Ward. "The operating wavelength of the coil is very long, yet the coil is relatively short at just several feet high — perhaps two meters. At 40 kHz, a quarter wavelength is about 1,875 meters. The VSWR is very high.

"If it were not for the sparks eating up nearly all of this energy, most of it would be returned to the DC power source feeding the H-bridge via rectification. In radio engineering terms, the impedance match is very poor!"

Solid-state coil design "maestro" Steve Ward operates a portable backpack ("Ghostbusters") Tesla coil that he created.



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## TESLA COIL

(continued from page 18)

transistors, but it's pulsed." RF potential on the primary of the coil (constructed from large diameter copper tubing) is estimated to be around 10,000 Volts.

Even by taking a "bargain basement" approach to components (the five-foot-high, 10-inch diameter PVC coil form was originally intended for plumbing purposes) and using items already on hand, construction of the IGBT coil was not a trivial expenditure.

"The whole thing came in somewhere between two and three thousand dollars," said Wingate, adding that this was probably close to what he'd spent on his earlier big spark gap-excited coil.

### A NEW FRONTIER

As Wingate had been content with his spark-driven coil for several decades, what was the incentive to go solid-state?

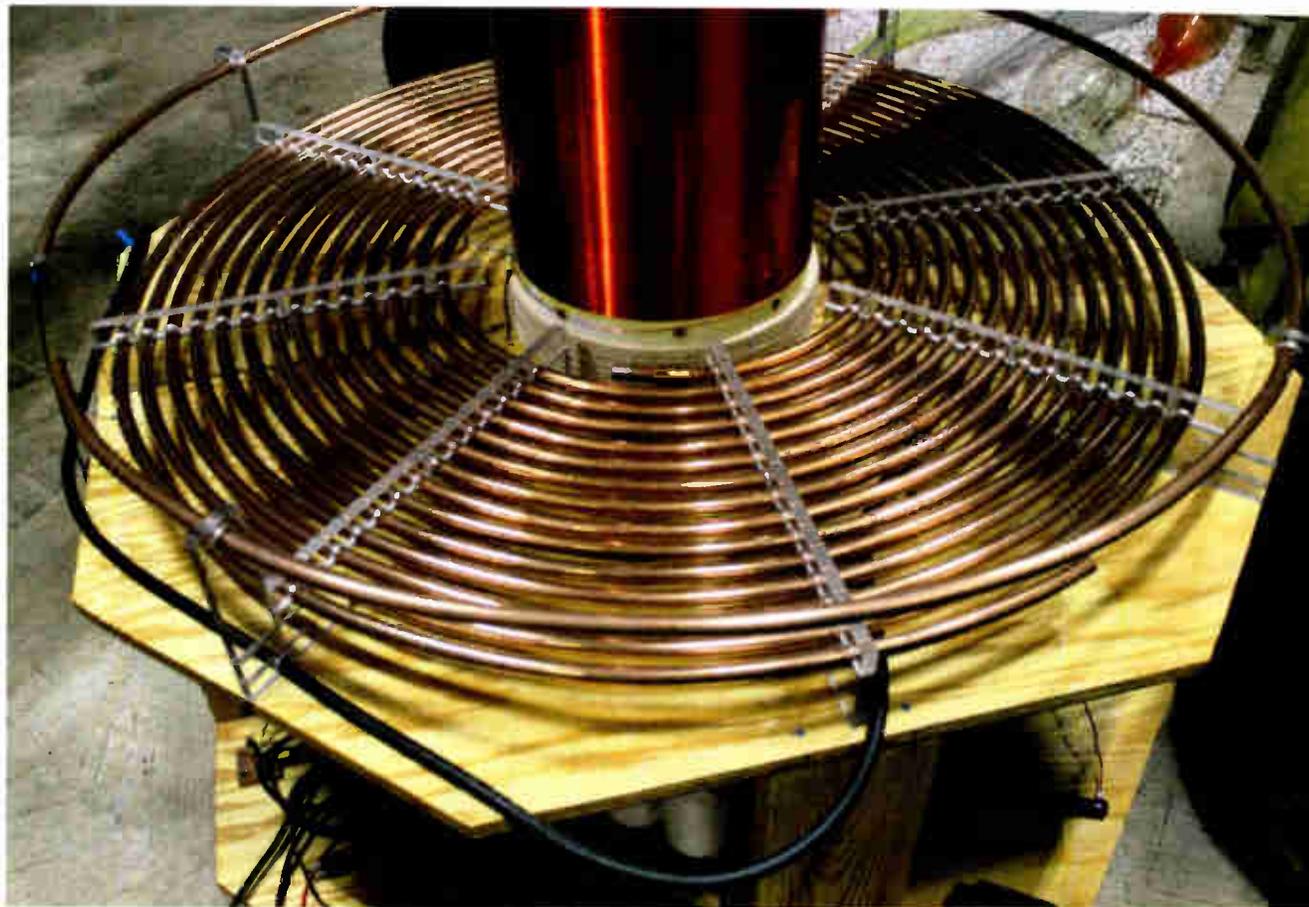
"I wanted to try something new as far as coils went, and solid-state was the 'final frontier,' something I'd not gotten into yet," he said. "There is also the efficiency and control you have with a solid-state coil."

Discharges delivered by the new coil are as impressive as those from his earlier model, and there's also another "enhancement" that's not possible with a spark gap type machine. This is the ability to modulate audio on the RF pulse train powering the big coil.

Recognizable sound is produced by the rapid heating and cooling of the air around the discharge, just as with lighting and accompanying thunder. While not exactly "hi-fi," varying audio tones, music and even speech can be output with this sort of drive system. Wingate says that he's never tried speech, but does play recorded synthesizer music as part of his demonstrations of the new coil.

Now that he's arrived in the solid-state world, has Wingate abandoned his spark-powered coil? "No, it's still ready to run at a moment's notice," he said.

And just like the earlier device, the IGBT-driven coil is by its nature a very powerful generator of radio frequency energy. Wingate is mindful of this, with the bonding and grounding of all sections of his metal Tesla laboratory building, and the installation of powerline RF filters. As he observed previously, "My entire lab is a Faraday cage."



This "pancake" inductor wound with copper tubing forms the primary of the Tesla coil. The heavy black wire connects to an adjustable "tap" that allows tuning of the primary circuit. The elevated copper ring is used to protect components (including the IGBTs) mounted under the base.

## WHO'S BUYING WHAT

**Hubbard Radio's WTOP** is using Electro-Voice microphones at its new 30,000-square-foot facility in Friendship Heights, Md., which was designed by integrator Radio DNA. The workstations are equipped with RE320s and EV 309A suspension mounts, 78 mics in total, according to EV.

**iHeartMedia Colorado's KOA(AM/FM)** tapped **Skyview Networks** to implement its AdView live read capture software. All Colorado Rockies Radio Network live advertiser mentions will be cataloged by time, date and advertiser in a personalized database and scheduled across the entire season.

**PodcastOne's "The Adam Carolla Show"** says it's upgraded its podcast studio with an **Allen & Heath SQ-6** digital mixer.

Philadelphia's **WXPN** is using **Reflector** service from **StreamGuys** and **Barix** to power its new syndication system for **XPoNential Radio**.

**BBC World Service** has chosen **WorldCast Systems** to supply **Ecreso FM** transmitters and associated services. According to the announcement, the agreement covers racks equipped with **Ecreso FM** transmitters in a 1+1 redundant configuration and an **Ecreso Control Unit**, and the associated services include system integration, transmitter configuration, testing, delivery and transmitter



Reflector in action at **WXPN**

operations training.

**Midwest Communications** says it has expanded its relationship with **Triton Digital**. Midwest will utilize Triton's integration with the **Omny Studio** platform to capture, edit and distribute podcast content and Triton's **Podcast Metrics** service. The broadcaster will also use the **Tap Ad Server** to dynamically insert targeted ads, as well as the **a2x** programmatic audio marketplace and audio **SSP (Yield-Op)** to make their podcast inventory available.

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# WKDT “Voice of the Long Gray Line” Now Online

West Point cadets operate their own version of the classic college radio station

## STUDENTRADIO

BY PAUL KAMINSKI

The Long Gray Line of cadets at the United States Military Academy, West Point, N.Y., has had a radio voice for years. On carrier current back in the day, low-powered FM and now online, WKDT Radio has long been the West Point cadet soundtrack.

WKDT started in 1954 as a carrier current station (KKDT) so cadets in the cadet barracks at West Point could listen on AM.

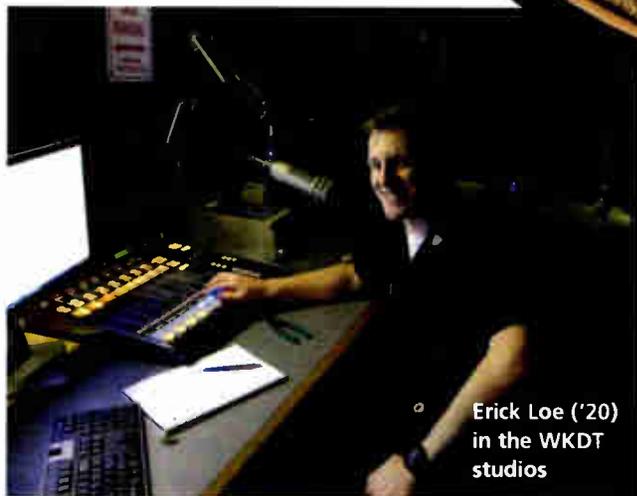
In 1972, WKDT began broadcasting on FM, thanks to a Memorandum of Understanding between the FCC and the Department of the Army, allowing the Army to operate a transmitter on 89.3 FM with the proviso that no interference to licensed stations on that frequency be

transmitted. That memo adorns the walls of WKDT’s offices on the second floor of a student activity building in the shadows of Eisenhower Hall.

With most of the Military Academy at West Point surrounded by impenetrable granite, preventing interference has been easy to do, says Officer In Charge Joseph Cyr. For many years, the station has been an internal communications vehicle for staff, faculty and cadets. With an increased online presence, ([893wkd.com](#), Google Play and Apple App Store), Cyr says WKDT



The club patch that WKDT members wear on their windbreakers.



Erick Loe ('20) in the WKDT studios



Nick Levay ('19) gets familiar with the recently installed SAS iSL 1.2 console at WKDT.

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will become even more of a public face of the academy.

**CADET CLUB**

WKDT is a club that cadets can join as an extracurricular activity. Cyr says his goal is to make sure the cadets who volunteer have fun within the guidelines of the academy. "When you join [WKDT], you are committing yourself to entertain others."

The WKDT schedule is a mix of music and sports and talk, live and automated. Cadets are in bed by 11:30 at night, so the cadet volunteers at WKDT produce programs to cover 24 hours. They do this while juggling a heavy course load, athletics and military instruction.

Dr. Lissa Young ('86) is the officer representative from the faculty. Young believes the live element in programming is important and also poses its own set of challenges. "What we have to be careful [about] is interfering with their study time. If we can get upperclassmen to come down and volunteer to run a live show, that keeps that connection."

WKDT club members also provide public address and DJ support for cadet events.

Nicholas Levay ('19) served as the cadet general manager of WKDT. Before he came to West Point, Levay worked as a live event DJ. He says joining the station helped him deal with the challenges of cadet life.

"A lot of cadets find stress relief in the clubs and organizations they join. It is a lot of work, but it's things I like to do," Levay says. "I think the radio station and Joe and the friends I've made here are really what's kept me at the academy. Without this outlet to express myself creatively outside of a military environment, I don't think I would have lasted long at the academy."

Even after graduation, graduates look back fondly on the station. Lt. Col (Ret.) Kathryn Donnelly ('90), an attorney with the Tully Rinckey law firm, remembers WKDT. At that time, "plebes" (freshmen) could not have radios, etc. until the second semester of the freshman year.

"WKDT was like Pandora, Netflix, CNN and Facebook rolled into one," she says. "After five months of listening to the same tape they blasted over the loudspeakers at 0-dark-thirty, hearing Run DMC, Bon Jovi, Cyndi Lauper along with the dark cadet humor and eventually, Milli Vanilli, was a great relief. It made the un-college more college-like. Everyone listened."

**WKDT, ADD ONE**

One of the reasons the cadets and alumni like to listen to WKDT is their sports coverage. The station and staff make no apologies for being "homers" when broadcasting West Point sports



The WKDT station vehicle seen at remotes, cadet and post functions on West Point.

events.

Erick Loe ('20) was the radio manager during Army football's successful 2018 season. Loe says WKDT provides a perspective that the commercial rights holder broadcast wouldn't. "I've called West Point football games for the past three seasons. On our broadcasts, we come up with things, personal stories about the players and cadet life."

For example, Loe and Army quarterback Calvin Hopkins were roommates during cadet basic training.

Loe says, "So when we get on the radio, families and listeners to us are going to be listening for that cadet appeal. That's what our listeners want to hear."

When we visited, the studios were being refitted with SAS iSL 12.2 consoles connected to a Rio Bravo audio engine with 64 channels of Dante AoIP audio. Announce and guest microphones are ElectroVoice RE-20s, processed by dbx 286 processors. According to Nick Straka of NS Radio Engineering, which

provides technical support at the station, the transmitter is a Crown FM-100 running about 100 watts into a two-bay OMB ring-stub antenna.

Cyr has guided WKDT for 34 years. In that time, one thing has stayed constant, he says. "I have the best kids in the corps."

Paul Kaminski has been a Radio World contributor since 1997. He is retired from the United States Army and can be reached on Twitter (@msrpk\_com) and Facebook (Pkaminski2468).

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# Reexamining an Analog Console in the Digital Age

Curt Yengst takes the Tascam Model 24 mixing console for a spin and likes a lot of what he sees

## PRODUCT EVALUATION

BY CURT YENGST

My history with Tascam goes back to the early 1990's when I built my first studio in my parents' garage. My console was Tascam's M2516, a 16-channel 8-bus mixer, paired with their TSR-8 analog 8-track reel-to-reel recorder. It was a fun setup to work with.

In 2003, having long since moved out, I replaced both with a Tascam DM-24 digital console mated to a DAW. That setup served me well for many years, until recent changes in workflow led me to go boardless. I still enjoy mixing on an analog console whenever I can; so when I was asked to try out Tascam's latest offering, the Model 24, I jumped at the chance.

Unboxing the mixer, my first impression was that it was larger than I thought it would be. Its footprint is pretty close to that of my old DM-24. Not exactly monstrous, but it'll need more space than the average desktop interface and laptop. That's fine, because if I'm going to mix on an analog console, I want something I can get my hands on!

### THE SPECS

Unlike a lot of small mixers today, it features full 100 mm faders. Call me picky, but 60 mm (or smaller) faders just feel "toy"-ish to me. The input preamps offer 50 dB of gain for mic level signals (30 dB for line level), plus a 100 Hz rolloff switch. The channel EQ is a simple three-band boost/cut style with a frequency-variable midrange. Just above the EQ controls are single-knob compressor stages for the first 12 channels. The first two channels also offer hardware insert points and instrument input switches. South of the EQ there are two monitor sends followed by an FX send.

Then we have the pan pots, faders, and buss assignment and mute switches.

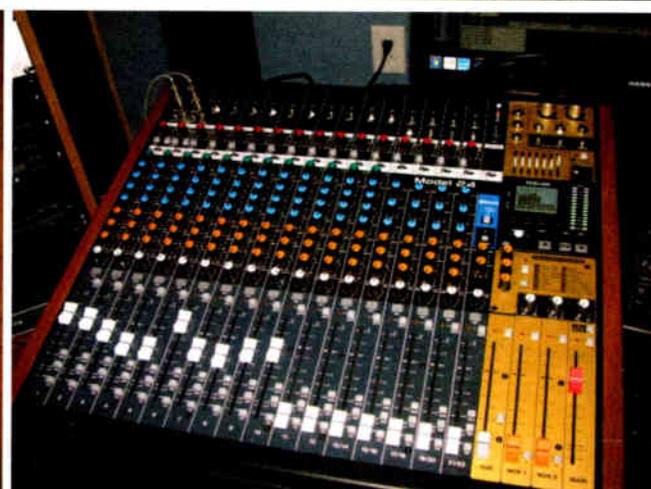
Channels 13 through 20 are arranged in fixed stereo pairs, with simple three-band EQs. Channels 21 and 22 are a stereo pair dedicated to smartphone audio or other unbalanced media devices. This channel is Bluetooth capable, so no need for phone adapters. The

act as a 22 input/24 output-channel ASIO I/O for PC or Mac. It can also make multitrack or stereo recordings internally using SDHC and SDXC cards. Although the design emphasis appears to be on live scenarios, it seems the design is attempting to be all things to all people, but how well does it pull that off?

The mixer itself is every bit as intuitive as most other analog mixers. The gas pedal, brake and steering wheel are where they're expected to be, if you know what I mean.

this mixer. They are very quiet, even at high gain settings. They held their own against my outboard Class A mic preamp with Jensen input transformers, using a Rode NT2 large diaphragm condenser and a good old fashioned Shure SM58. Certainly, the outboard preamp sounded clearer, but not several hundred dollars clearer!

I wish, however, that the phantom power wasn't global, affecting all channels at once. This makes it difficult to employ ribbon mics in a session with



Photos by Isabelle Yengst

output section features faders for stereo output and monitor busses, as well as a fader for a separate submix. There are separate controls for control room monitors, headphones, and solo. There is a built-in FX section featuring a few basic reverb and delay settings, along with master aux controls. The output section also includes a basic seven-band graphic equalizer that can be assigned to the main stereo bus or the monitors. A global phantom power switch is provided for the mic channels.

Rounding out the feature set are the SD recorder section and the USB interface. On the USB side, the Model 24 can

At first, the color scheme of the controls seemed garish; but then I imagined operating this in the back of a darkened club, and it made perfect sense.

My biggest complaint is the feel of the controls. The faders seem very stiff and gritty, and the pots feel fragile. I realize it's not a Wheatstone or a Harrison, and it's not trying to be; but even the controls on my old M2516 felt smoother. I didn't have months to take this on the road, so I could be wrong, but I don't see it surviving the rigors of the club circuit.

On the other hand, I was very impressed with the mic preamps on

condensers. I understand that most live setups aren't going to get that complicated, but even splitting the phantom supply between two sets of channels with two switches would have been nice.

The EQ does what it's supposed to do, where it's supposed to do it. The variable midrange is a welcome feature. The single knob compressor does well managing levels when used judiciously. That single knob adjusts the threshold of the fixed 6:1 ratio. Extreme settings will certainly introduce pumping and drop the overall level considerably. Setting it about halfway sounded ideal for spoken word. An LED adjacent to the control

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For information, contact Tascam in California at 1-323-726-0303 or visit [www.tascam.com](http://www.tascam.com).

indicates how much compression is happening.

The built-in SD card recorder would be a handy feature if all it did was record the main stereo output, but it does much more than that. It can also record and playback from any channel selected. This makes it very useful for field recording, or even just as a backup recording to supplement other methods. One cool aspect of this feature is that, regardless of how many input channels are assigned to the recording, the main stereo bus is always assigned and always recorded; so, as long as it's recording, something is always captured. The SD recordings can be backed up and restored via the Model 24's USB connection. Recording via SD cards is limited to 44.1 kHz and 48 kHz sample rates. A 16GB SD card will hold a little over 16 hours of recorded material.

**AUDIO INTERFACE**

The Model 24 also functions as a very capable audio interface for PC or Mac. The ASIO drivers and software must be downloaded from the TEAC/Tascam website ([https://tascam.com/us/product/model\\_24/download](https://tascam.com/us/product/model_24/download)), as no driver disc is included.

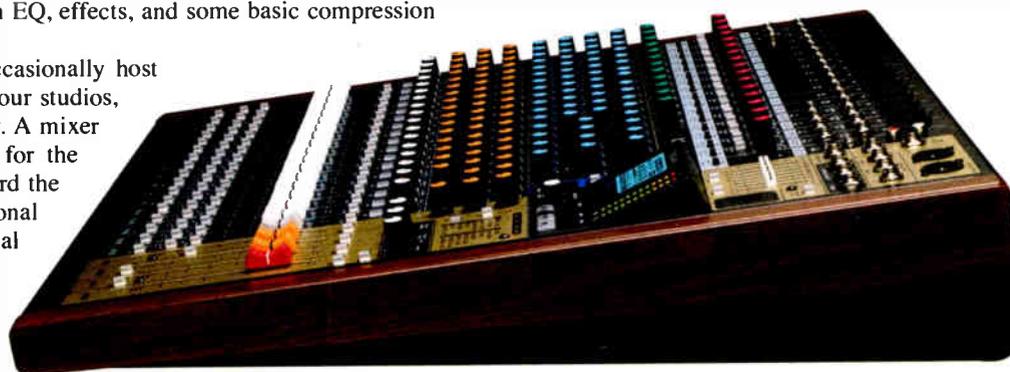
The install went very smoothly on my Windows 8.1 workstation. I was quickly able to bring multiple tracks from my DAW to individual channels on the mixer and mix in the analog realm (still a preference for some). Recording in this mode, as with the SD recorder, provides separate ASIO inputs for all channels. This makes it ideal for the home project studio that needs a little more than just an eight-input USB interface.

It's clear that Tascam built this mixer to a price point — in this case, a little under \$1,000. Where the feature set is concerned, they succeeded. This thing is an audio Swiss Army knife. Just considering its use as an interface for a

DAW, it's a good value, providing over twice as many inputs as the average rack-mount unit, and throwing in EQ, effects, and some basic compression to boot.

Here at Star 99.1, we occasionally host small live performances in our studios, featuring the artists we play. A mixer like this is almost perfect for the job, and it allows us to record the performance with no additional gear. As part of a personal production rig, it's certainly worth a look, and a listen.

*Curt Yengst, CSRE, is assistant engineer for WAWZ in Zarephath, N.J.*

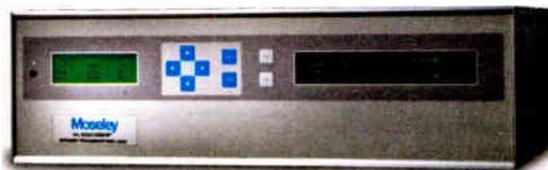
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# Has the Trump Bump Been Replaced by Trump Fatigue?

Talk radio programmers caution that talkers will need to adapt to attract and retain listeners

## 21<sup>ST</sup> CENTURY PD by Dave Beasing

Except for a reprieve in 2016, producers of the annual Talk Show Boot Camp have reported a decline in 25–54 year old listening to the news/talk format each year, a 27% cume drop since 2011. The good news is that the cume decline has slowed in recent years and — on an Average Quarter Hour basis — has somewhat stabilized.

tion, either. Public radio has an image of providing a more fair and balanced presentation. As one young lady said at our conference a year or two ago, listening to commercial talk radio was ‘like listening to my dad yell at me for an hour.’”

Hobbs says, “NPR continues to be an 800 pound gorilla. Look, in 2016, everybody had a great year because of the ‘Trump Bump,’ as we called it. And then, in 2017, everybody held on to that audience to a degree, but noncom-

**You can’t move** that rundown antique store in the alley behind Broadway to the mall and not change the motif a little bit. If you’re going to attract 25–54 sampling, you need to change your store window.

— Gabe Hobbs

Compiling Nielsen data from 158 news/talk stations, Gabe Hobbs congratulated some stations for showing significant audience increases during 2018. These include KRTH(AM) Houston, KPRO(AM) Providence, KIRO(FM) Seattle, KMBZ(FM) Kansas City, KXL(FM) Portland, WIBC(FM) Indianapolis and WTKS(FM) Orlando. Of the news/talk stations that were up in 2018, 10 were AM commercial stations, nine were FM commercial stations and 15 were non-commercial.

### HOBBS REPORT RESULTS

In his annual Hobbs Report to Talk Show Boot Camp, the consultant also pointed out a migration of audience from commercial to noncommercial talk radio. He cites the commercials themselves as one possible reason.

Another is “the tone and the openness of public radio. In other words, you’re not made to feel like you have to be a member of the ‘Angry White Guy Conservative Political Association’ or for that matter a liberal organiza-

tion, either. Public radio has an image of providing a more fair and balanced presentation. As one young lady said at our conference a year or two ago, listening to commercial talk radio was ‘like listening to my dad yell at me for an hour.’”

### FROM BUMP TO FATIGUE?

Has the Trump bump been replaced by Trump fatigue?

Hobbs says people eventually tire of any big news story, and some stations and hosts “keep pounding the same points over and over. Certainly, you have to give President Trump credit that keeps feeding news cycles with fresh talking points, but you have to have relief topics as well.”

Sometimes, Hobbs warns, talent may be overly influenced by what reacts among core listeners who phone their shows, rather than taking a bigger picture approach.

“Don’t beat a dead horse. Believe it or not, there are other topics besides national politics that are either funny or important.”

### COMPETITION FROM PODCASTS AND STREAMING

Hobbs’ co-producer for Talk Show Boot Camp, Don Anthony, cites new technologies as the biggest change in the 10 years he’s organized the event.

“Podcasting and streaming has impacted all radio, but especially talk radio,” Anthony says. Finding the next generation of talk radio listeners is on everyone’s mind for the format.

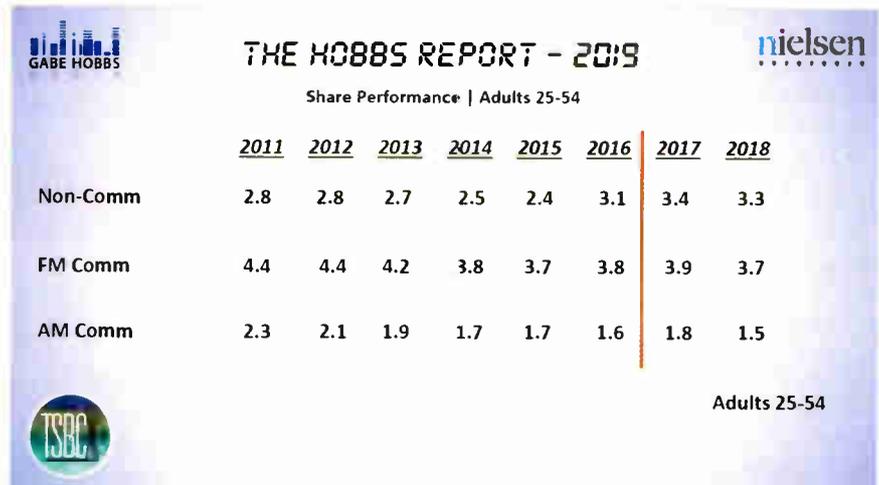


Gabe Hobbs

“Rush Limbaugh breathed new life into AM and gave it much more shelf life” than many would have predicted, says Anthony. Yet, says Hobbs, “Rush was 35 when he started, his listeners were 35, and he’s 65 now. That’s just the way it is. They stopped making new ‘dittoheads’ about 20 years ago.”

Still, he cautions that simply moving your existing product from AM to FM isn’t the solution. “You can’t move that rundown antique

store in the alley behind Broadway to the mall and not change the motif a little bit. If you’re going to attract 25–54 sampling, you need to change your store window.



This graphic shows share of performance in adults 25–54 for several types of radio station categories, across several years, among news/talk stations in the U.S.

Podcasts are a growing option for talent, but they’re expensive and time-consuming, says Anthony. “We conducted a huge talent survey with Jacobs Media and will update it soon. A good number of people express interest in podcasting but say they just don’t have the time to devote to it.”

Then there’s the issue of incentive. Hobbs said, “Some companies want a big piece of the action. They’re oppressive when it comes to digital. iHeart’s got that damned clause in talent contracts that restricts all the existing technologies and ends with ‘and all technologies not yet contemplated.’”

### DON’T ABANDON OTA

Still in 2019, Hobbs says, digital delivery of talk content is no substitute for being on FM. “Eighty percent of the Nielsen meters never hear an AM signal in a week. Like 98% of them hear an FM meter. So you tell me where you want to be. FM is where younger people are.”

“I really believe that the smart speaker and artificial intelligence of all kinds can help level the playing field,” says Hobbs. “Of course, the challenge is that it doesn’t just level the playing field among the 10,000 radio stations, it levels the playing field for 700,000-plus podcasts, too. So you have to be well-branded, have great talent and compelling content. That’s not going to change.”

Anthony agrees. “You can understand the art of the podcast. You can understand streaming and smart speakers, but if you have amazing talent, you will have an amazing station.”

Years ago, 21st Century PD columnist Dave Beasing programmed news/talk at the legendary KRMG in Tulsa. He’s programmed and consulted many formats since and recently founded “Sound That Brands,” a Los Angeles studio that specializes in branded podcasts. He can be reached at DaveBeasing@SoundThatBrands.com.

# PEOPLE NEWS



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**Devon van der Merwe**  
*Entercom*  
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**Jeff Welton**  
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**Erika Beasley**  
*Beasley Media Group*  
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**John Collinson**  
*Society of Broadcast Engineers*  
 Elevated to Fellow

**Patrick Warrington**  
*Lawo*  
 Joined as senior director for technical business development

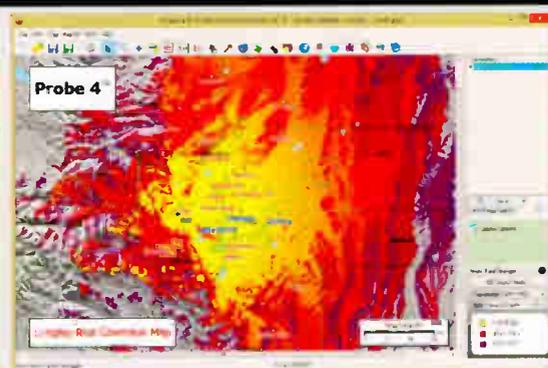


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I'm looking for KFRC radio special of Elvis Presley which aired on January 8, 1978. I'd be willing to pay for a digital copy. Ron, 925-284-5428.

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

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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 home-run 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](mailto:ronwtamm@yahoo.com).

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

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READER'S FORUM

REMEMBERING THE RACKLEY MAGIC

*Radio World joins our colleagues in remembering Ron Rackley, who died on April 12. Below are two of the many memories being shared with us.*

Ron Rackley put his mark on most of Univision Radio's (aka Hispanic Broadcasting, Heftel Broadcasting and Tichenor Media) AM stations.

WADO New York went from 5,000 watts to 50,000 watts day and 7,200 watts nights and rebuilt a 1934 plant to a state-of-the-art facility. Ron pushed for rule changes all through the '90s that made the upgrade possible.

KTNQ Los Angeles went full-time in the mid-1970s. In the '90s, he and Augie Presthold designed the warehouses that went up around the five towers east of L.A. The rebuild improved the adjustability and bandwidth of the system and freed millions of dollars of land for reuse. Ron's detailed study of the site and pioneering the use of computer analysis led to sharing the site with another 50,000 watt AM a few years later.

Additionally, Ron and his protégé Matt Folkert designed a new and improved system for the new site of 1200 AM in Chicago. More power day and night, using fewer towers with better stability and system specs.

Miami got two rounds of Rackley magic. When 1140 WQBA moved, Ron built day and night systems that

were flatter than the dummy load, using optimized tower spacings and designing a phaser at the same time as the pattern. WAQ 1710 had power division and phasing systems designed to maximize tune up time. Ron redesigned the system, using existing parts laid out on the back of restaurant place mats. Two weeks of overnight work was required to make the changes. Every parameter was inside the 3 degree and 5% tolerance at night's end. Two weeks of night work with no

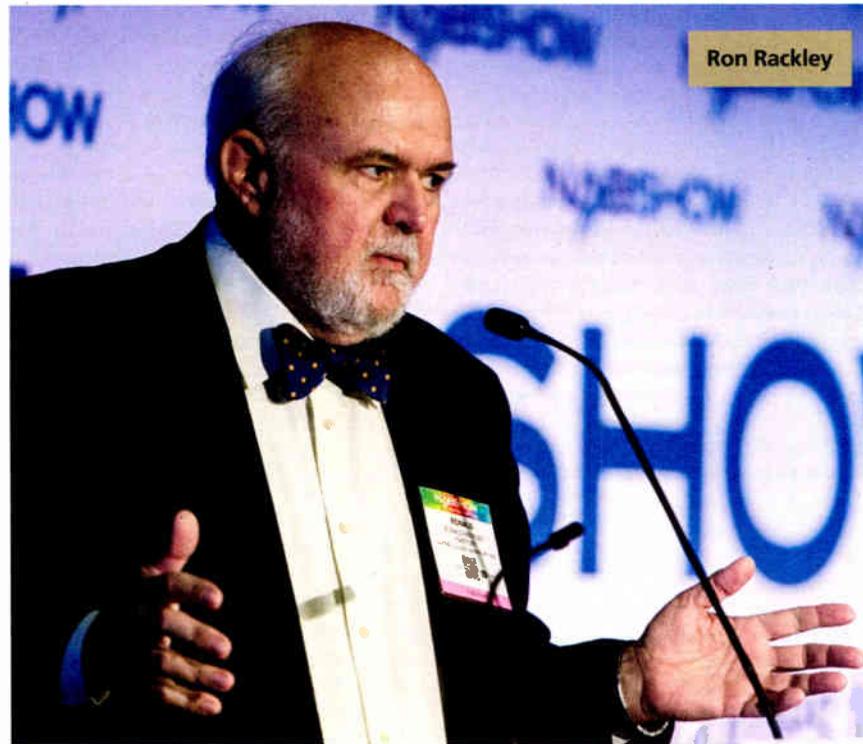


Photo by Jim Peck

STA — like a surgeon able to work without an anesthetic.

Also, 1270 Fort Worth (Burluson) got a 50 kilowatt days and a night system that sounded like a new radio station, and 1010 Houston and 980 Rosenberg-Richmond got their own clever night sites. 870 KLSQ got a city of license change from a little town to the Las Vegas metro area and a pattern that coexisted with massive power line structures. Ron helped many of the rest with broadbanding or conversions (AM stereo in earlier years, HD Radio in later years) to

update their technology.

Ron was great as an expert and great as a human being. He was easy to work with and generous with his expertise. He was decent and principled. I use tips and tricks that Ron showed me on a daily basis.

He visited with us Wednesday at the NAB Show. Ron was advocating that AM broadcasters should ask the FCC to split Class A stations out of the current rulemaking, so that several thousand stations (everyone except those on or adjacent to Class As) could improve facilities sooner rather than later. He reasoned that if we could split dockets up like we did for FM translators for AM stations, then we could do it for the 98% or 99% of AM stations that are not Class A, thus creating hardened disaster coverage entry point stations.

Thank you, Ron. We will miss you. Rest well.

*David Stewart  
KPET/KWFB/KXXN  
Moving Target Consulting Works  
and former Vice President  
of Engineering,  
Tichenor/Heftel/Hispanic/UVN Radio*

I have known Ron as far back as the 1980s. I cannot say enough great things about him. Here are only two anecdotes of many. Ron designed our WADO power increase from 5 kW to 50 kW, which involved adding two towers.

As we were performing measurements (Ron and myself) at 2 a.m. one winter morning in December 1999, we experienced a vacuum cap failure in tower #3. Ron said we are not going to wait for a replacement and he sat down and drew it out of the ATU circuit which involved repositioning of coil taps and retuning of other caps among major retuning surgery in the system. By dawn we had a perfect in spec operating system.

*Richard Ross  
Chief Engineer  
Univision Radio  
New York*

IS AM FULFILLING ITS OBLIGATIONS?

Ernesto Aguilar's article regarding radio's place in news coverage ("Community Broadcaster: Post-Mueller, It's Radio for the Save," *radioworld.com*) was an interesting read.

Without doubt radio has the unique ability to tap into its audience interests, concerns and opinions of local and national events. However, in practice across the nation that is rarely the case. Instead the cash-starved AM stations are regurgitating nationally syndicated, politically oriented programs that actually tell people what to think instead of truly informing them.

Keeping the doors of an AM station open and on the air has become difficult, so the appeal of a satellite delivered program outweighs the cost of a homegrown news staff or in some cases even a single local DJ. Many stations buy into the sales pitch of a revenue generating syndicated program, the idea of airing programming that can fill the radio stations coffers in appealing.

My work takes me around the country, and I spend a fair share of time listening to AM radio while in my car. Quite often, in medium-sized cities, I can tune the dial and hear the same "cigar smoking political commentator" on several sta-

tions at the same time. It so happens that he pushes a particular political perspective that favors one party over the other. This in itself wouldn't be a terrible issue, if other political parties had similar audience reach, but they don't. Often, I long for the days of political fairness, but I digress.

In my hometown, the top billing AM station, which always places in the top 5 Nielsen Ratings, is formatted as a news/talk station that focuses on local information with some unbiased national coverage. Fortunately, it is a 50 kW station that can be heard with no trouble at all. This station is successful because it gives the audience what they want. Time, temperature, weather, road conditions, stock reports, farm reports, unbiased local political coverage, unbiased national headlines, and weekend community oriented programs and interviews. They still provide public affairs programming, successfully.

As Ernesto Aguilar pointed out, there is much that can be covered to serve your audience and do it well. You just have to put in the effort to find out what the audience wants.

*Dave Dybas  
Owner/Engineer  
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# All-Digital AM, Breaking New Ground

Why I've asked the FCC to allow optional all-digital operation

## COMMENTARY

BY BEN DOWNS

*The author is vice president and general manager of Bryan Broadcasting in College Station, Texas, and was an early proponent of AM revitalization and the migration to FM translators. On March 25, Bryan petitioned the FCC to initiate a proceeding to authorize the MA3 all-digital mode of HD Radio for any AM station that chooses to do so.*

In September last year, Commissioner O'Rielly spoke to the NAB Radio Show and said the FCC hadn't seen "game-changing innovation" around the AM revitalization initiative. And while the introduction of paired FM translators was a game-changer for operators, it's no secret that this innovation mainly moved programming away from the hostile listening environment that the AM band has become without fixing the underlying problem of impossible noise.

Start a conversation about AM in any

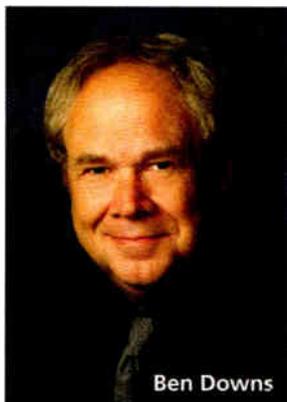
group of broadcasters and stand by for a flood of reasons to explain the band's decline: Background noise and trash are the main reasons followed by poor quality receivers.

At this late date in the AM revitalization process there's only one option that addresses the problems that still face operators on the AM band. AM licensees must be allowed the option to convert their stations to full digital.

### THE NOISE IS GONE

The HD Radio hybrid system that we are allowed to use today was always intended to be a temporary system to hold our place in the digital line while HD Radio receivers arrived in the market.

In this case, this "patch" may have done a good bit of damage to the perception of digital. As it's implemented today, it sounds great; but it is a fragile RF product, prone to dropouts, and it uses



Ben Downs

a lot of occupied bandwidth. These concerns are mostly addressed by the MA3 all-digital mode of HD Radio.

Our WTAW(AM) is one of the few AM HD stations. And it sounds great even in the current hybrid, rather than all-digital, mode. We program mostly talk, but any music plays in stereo, voices are far clearer and most important, the noise

from my home computer, lights and phone charger is gone. The station has a sound as clear as AM was in the beginning but with better audio fidelity.

An important point: If a car has an HD FM radio installed, that radio will receive the all-digital AM signal. It was part of the original license and remains so today. You buy one version; you get them all.

But we need permission from the FCC to broadcast in all-digital AM. Hubbard's Maryland AM WWFD has an experimental license to broadcast in all-digital. All reports indicate that the experiment is yielding the results they hoped for.

### POINTS TO CONSIDER

As a thought experiment, make a list of the problems you think AM has, and let me argue my side why we only have one arrow in our quiver that fixes almost all of them:

*AM has so much noise.* It does. And as a practical matter, we'll never get rid of it. The day has come and gone to clean up home lighting, TVs, computers and (help us!) phone chargers.

With conversion to all-digital, the noise will still exist ... but it's ignored by the radio. The result is a clean background for your programming. And maybe, just maybe, the car manufacturers who took AM radios out of the auto dashboard will put them back. The noise heard from their electronics will be eliminated.

*AM radios are poorly made and sound awful.* Most are and most do. But radios engineered with HD chips inside are of much higher quality, and that design is baked into the digital experience. If we present clean, perfect, digital sound ... why would a manufacturer shut us down?

*It's expensive to install.* Again, that's true. But it's easier to install all-digital HD into a directional array than the existing hybrid HD system.

*It's subject to dropouts when the*

*signal fades very low:* This is how the digital world works. Indeed your phone does that at the fringes. But for in-town driving, WWFD finds their digital signal has performed much like their analog AM signal did. Remember, the HD hybrid model we have now is less robust than the all-digital.

*There aren't enough radios:* And if we broadcasters don't step up, there won't be any listeners either. Every year more and more HD Radios are hitting the market. Can we say the same about AM listeners?

*I'll lose listeners when I switch.* The beauty of the AM revitalization process was that it allowed us to pair our AM stations with FM translators. Your translator can carry the audience load while the audience becomes accustomed to all-digital AM.

### TAKE YOUR MARKET BACK

There are always people who say poor programming damaged AM. I suppose that's possible, but those choices were forced on us by radios that had such poor performance we were embarrassed to try to compete against FM music stations with what we had to work with.

When you convert to all-digital, you have a tool that allows you to pick any format, including music, and compete on quality and promotion just like AM once did.

It would be a tougher call, but in major markets without spectrum available for an AM to add meaningful FM translator coverage, this could be a brave first step that stops AM audience erosion in the big city.

HD Radio receivers in cars are at 25% total penetration, and over half of new cars sold today contain HD Radio. How could that not be a clear indication of the future?

AM all-digital HD fixes what we have wrong. David Layer and the NAB Pilot study shows that there are all-digital weak spots in special cases, but I believe that as long as you have an FM translator as your backstop, the day you convert to all-digital AM is the day you can begin to take your market back. The technology will be there to let you compete, and that's really all we should ask.

Not only will your audience erosion stop, you'll be breaking the new AM ground that the FCC is expecting from AM operators.

But first the FCC has to approve this change. We should ask them to do it.

*The FCC is accepting statements opposing or supporting the Bryan Broadcasting petition through May 11. Refer to RM No. 11836 and the "Petition for Rulemaking to Allow the MA3 All-Digital Mode of HD Radio for AM Stations."*

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